# B.B.C.

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# HANDBOOK

# 1929


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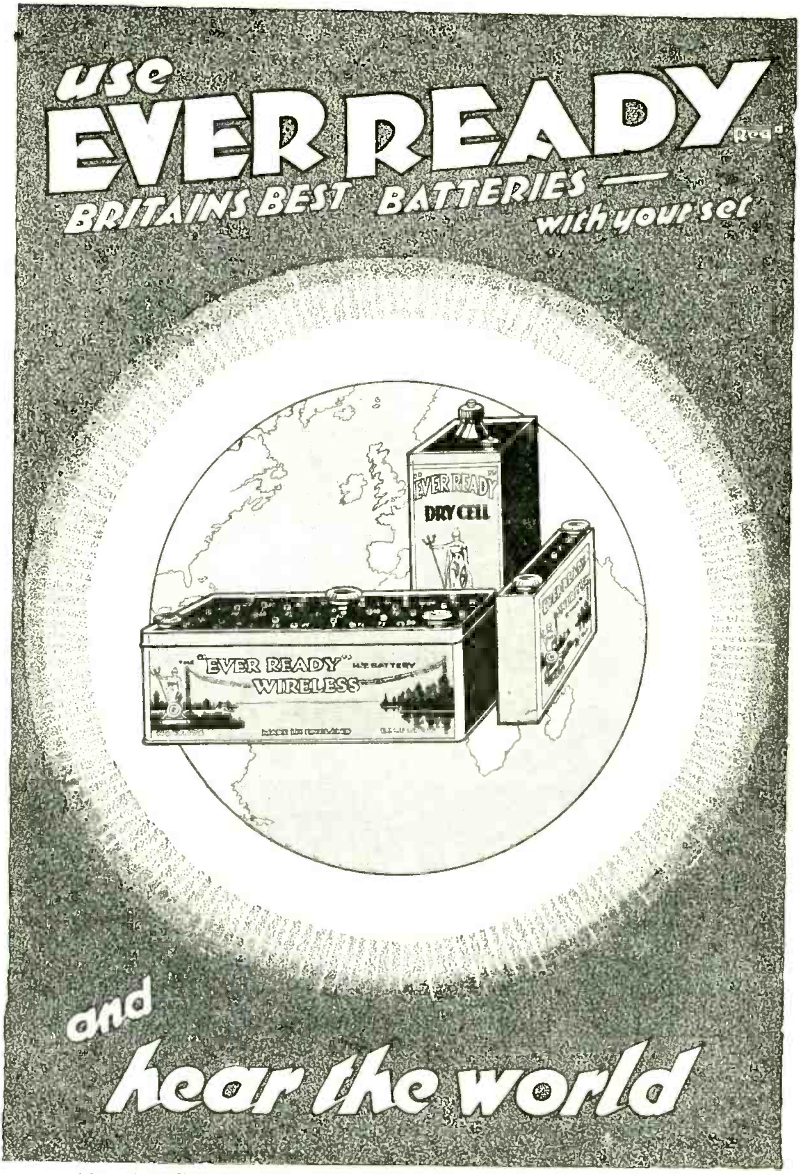


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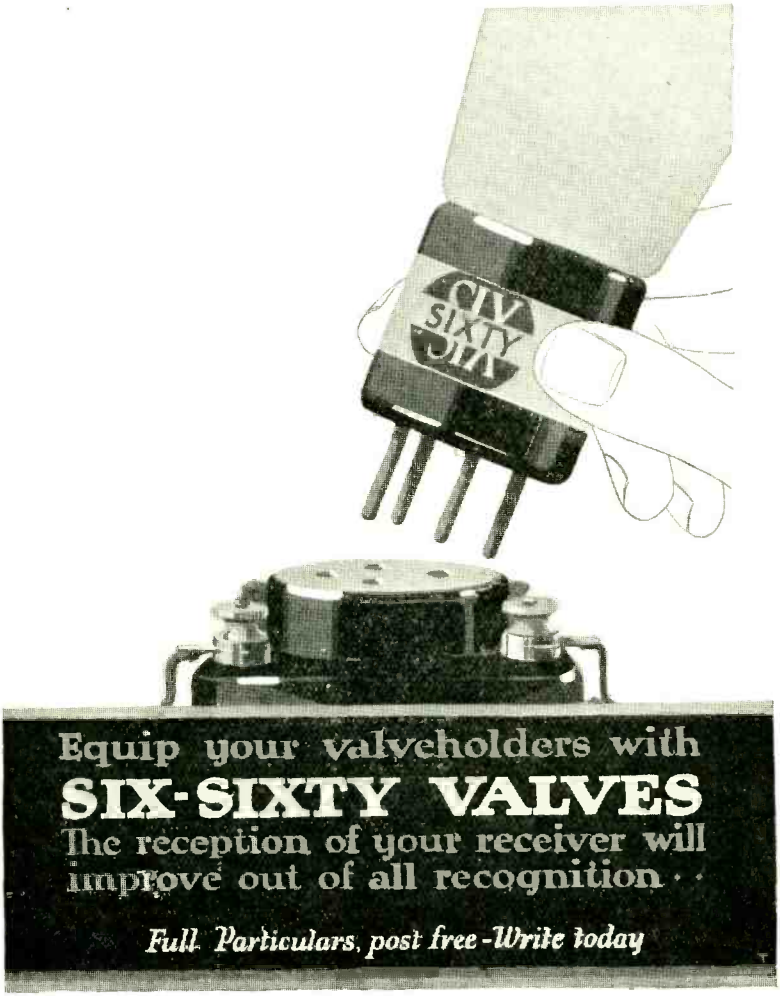


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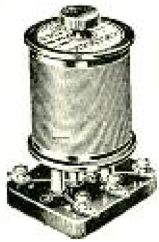

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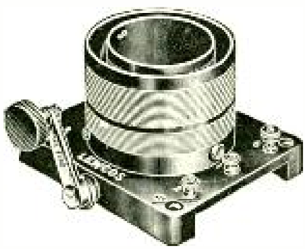

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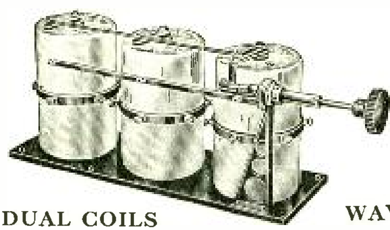

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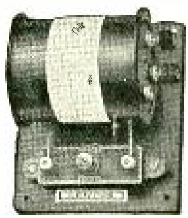

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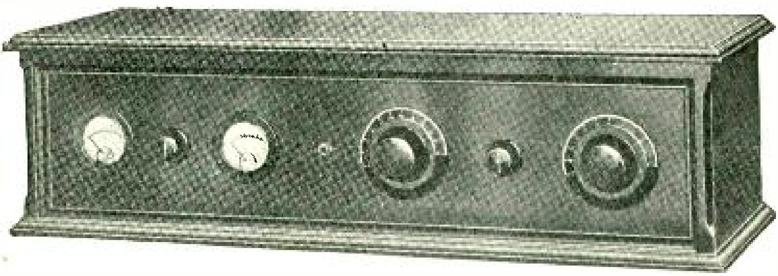

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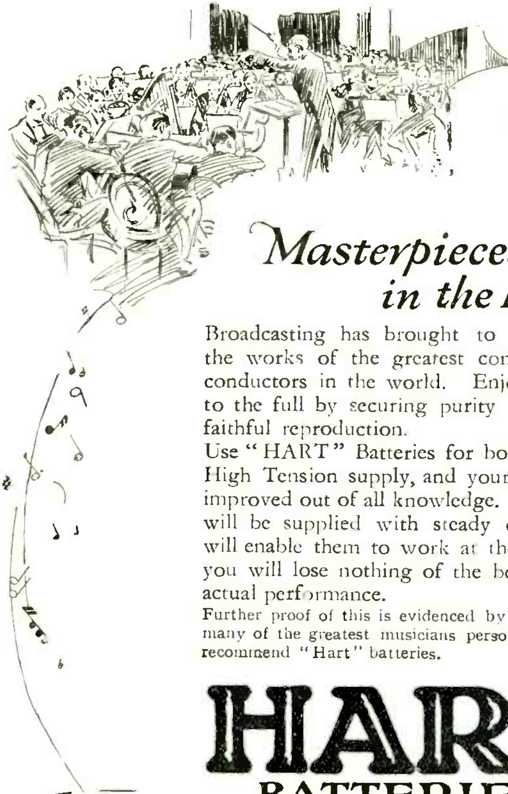

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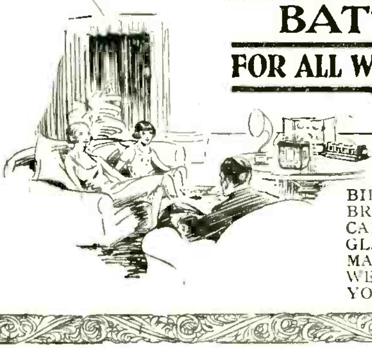

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(2) World-Radio, the B.B.C.'s official foreign and technical journal—the world's programmes—authoritative technical articles. Weekly, price 2d. See pages 275–6 and 393–6.

(3) B.B.C. Books, cheap, well printed, obtainable everywhere. See pages 278 and 429.

(4) Opera Librettos, issued monthly, price 2d. See pages 277, 430 and 465.

(5) Talks and Schools Pamphlets, issued by terms or sessions three times a year: illustrated. See pages 278 and 465.

(6) Technical Pamphlets, help you to look after your set and get the best results. See pages 278 and 426.


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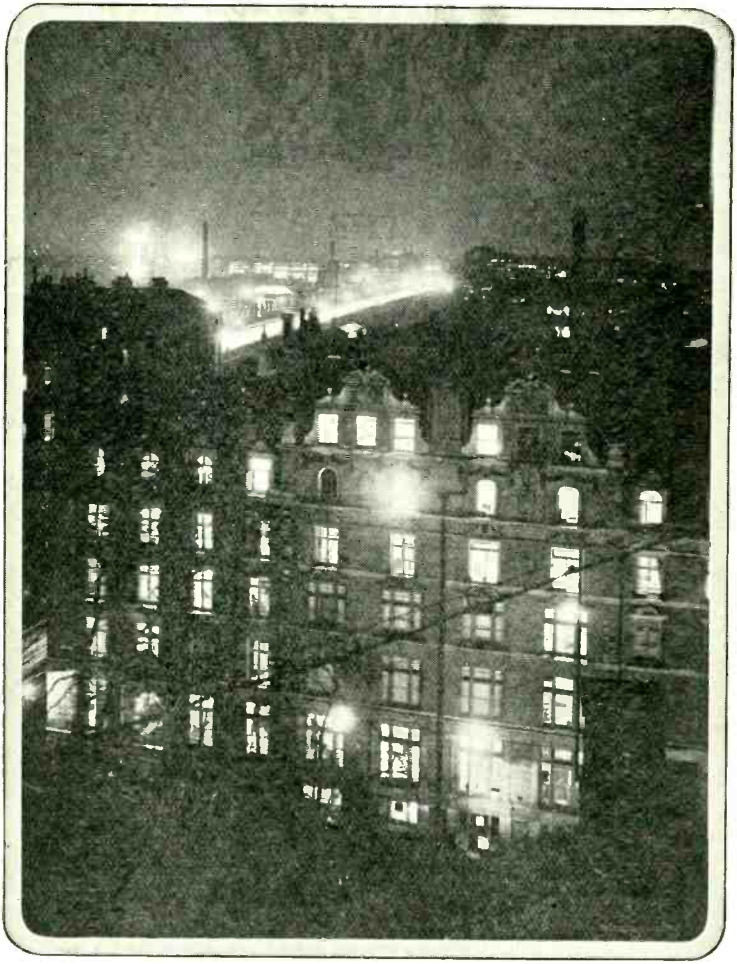
# B. B. C. HANDBOOK

1929

THE BRITISH BROADCASTING CORPORATION

SAVOY HILL, LONDON, W.C. 2



"SAVOY HILL" BY NIGHT

*The home of "silent sound" lies between the roar of the Strand traffic and the quiet Thames. Waterloo Bridge and the lights of the Surrey side are seen in the distance*

# INTRODUCTION

THE second issue of this Handbook shows that consolidation and further preparation are the characteristics of 1928 in broadcasting. The plans for an improved system of distribution by fewer and higher powered stations, framed two years ago, received official sanction in principle, and the construction of a twin wave-length regional station for London and the south-east has begun. The work of the Daventry Experimental Station has been continued and developed.

It will be seen that there has been no relaxation of effort to improve the programmes. The introduction of a certain amount of controversial matter has helped to make the talks more interesting, and the technique of talks generally has made definite progress. Of new programme features, the introduction of the regular morning religious services has been the most appreciated.

The publication of the report of Sir Henry Hadow's Committee on Adult Education and the report of the schools experiment in the area of the Kent Education Committee (under the financial auspices of the Carnegie United Kingdom Trust) have attracted widespread attention and given new impetus to the development of educational broadcasting. In music, the National Concerts were continued, and a second season of Promenade Concerts was undertaken, both at the Queen's Hall. An experiment in subsidising local musical endeavour was initiated at Cardiff, where the Welsh National Orchestra has come into being.

Next year should witness the opening of the first regional station. The change-over will be made gradually and experimentally. There will first be transmissions from the new station after the normal programme hours, and problems of signal strength will be solved before the introduction of the second wave-length, with the attendant necessity of separation between the two wave-lengths. There will thus be ample opportunity for the adjustment of apparatus, and the new station may therefore work for some time on a single wave-length basis. Some dislocation and inconvenience are bound to occur, but these factors are inevitable in a progressive move of such importance.

Recently the interference experienced by the Relay Stations increased to such an extent that it became necessary to devise other means of economising the available wave-lengths. All these stations have been provided with apparatus to enable them to work together on one wave-length which will not be shared by any station on the Continent: which means that from about November 1st, 1928, all the Relay Stations must usually transmit identical programmes. This reorganisation, involving curtailment of local activities, is necessary to bridge over the period before the new system of high-power stations is complete.

Broadcasting in this country has been built up on definite policies of comprehensive and constructive public service. Those connected with the organisation are fully conscious of the new territories which have to be penetrated and opened up, and of the known areas still to be further developed. Their belief in the influence and usefulness of broadcasting and their determination to exploit these to the full are unabated.

# THE FIRST REGIONAL STATION

THE Postmaster-General has given permission for the erection of a twin wave-length high-power station for London. This station will be the first of its kind in the world. Daventry is in performance a twin-wave station, giving alternative services, but this has been achieved only by the addition of a second station to the first—the London station is designed specifically as a twin-wave station housed in one building, and sharing between the two transmitters as much common auxiliary gear as possible.

The site chosen is on the north side of London, beside the Great North Road on the Brookmans Park estate. It consists of 30 acres of field, practically dead flat.

The entrance to the building will face the North Road, and on each side of the building, to right and left, a pair of masts 200 ft. high will support the two aerials necessary for double transmission.

Perhaps the best way of describing the station in more detail will be to start at the back of the building and follow the processes from crude oil to wireless waves. Thus first we go right round the building and open a door into the engine-house. Here are four 300-H.P. engines of the Diesel type, using crude oil. To each of these is coupled a direct-current dynamo generating 220 volts. The output of the dynamos is taken to a large 2000-ampère-hour battery next door. The object of using direct-current supply with a battery is to ensure absolute reliability. If anything were to happen to the working engines, the battery could "carry on" for a quarter of an hour supplying power to the station while a new engine was started up. Large copper cables carry the power from the power-house to the electrical machine-room, where the 220-volt D.C. supply is converted into the various types required for the transmitter.

The most arresting of the electrical machines will be those for the high-tension supply. There are three of these, one working on each transmitter and one spare, each capable of an output of 160 kw. at 10,000-volts direct current. The B.B.C. will use D.C. because it represents a substantial economy over the older methods—power costs are a large proportion of total maintenance costs.

There are several other interesting machines in the room, and, if quantities impress, the filament lighting machines are remarkable. The average loud-speaking wireless receiving set absorbs about 1 ampère to light the valves. The transmitters absorb 2600 ampères. This may sound like a figure to be proud of. It is not by any means, but unfortunately transmitting valves require this extravagance, and distribution in terms of high power requires these valves, and the result is an impressive quantity—in current if not in power.

A group of smaller machines, about fifteen of them, take up the remainder of the space. These machines are doing auxiliary and low-power jobs, such as running the drive panel, putting 3000 volts negative on the grid of the main magnifiers, energising the modulated magnifier, and so on. They are not particularly interesting, except that they are dealing with high voltage at small power on one commutator.

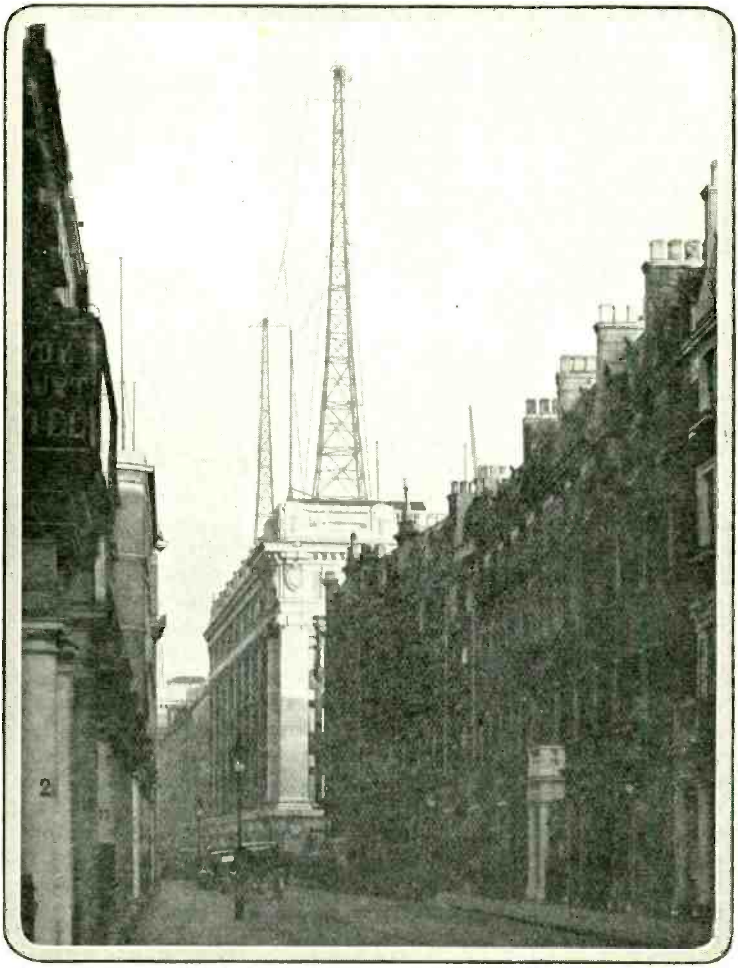
Through a door from the engine-room we pass into the transmitter-room, the most impressive sight in the station. The room is nearly square. On either side are the transmitter panels, looking rather like jewellers' show-cases. The biggest panels contain the high-frequency condensers and inductances; on either side there are the valve panels. Further along there are other panels for magnification, for modulation, and for frequency stabilisation of an extremely high order. The transmitters face one another symmetrically and an engineer sits in front of each at a table containing the essential controls, emergency grips, etc.

There is a large switchboard at the end of the transmitter hall containing the controls for the outputs of the machines.

In the "office" block of the building still further beyond the transmitter-room are found the two separate control-rooms, with a common battery-room, the quality checking-rooms, studio and the usual offices, waiting-rooms, etc.

The above is a bald and unconvincing narrative, but rhapsodies had better await actualities upon which to drape them. Certain it is that the station will be unique—unique, it is hoped, in excellence as well as type!

The effect upon the London listener will in general be two-fold. Firstly, a change in strength of signal, secondly, a necessity to have a sufficiently selective set to take full account of the new facilities. As to the change in strength, it is



A FAREWELL GLIMPSE OF THE PRESENT LONDON STATION promised that this will be for the majority of people in the direction of more, not less. If you draw a circle about three miles radius around the Oxford Street transmitter, then those within that circle will get *weaker* signals from the new station, whilst others outside will get stronger. This is a qualitative statement. Owing to all sorts of vagaries of field strength in large cities, it is *impossible* to define exactly the boundary enclosing those who will get weaker signals on change over. But as a general statement the above suffices to give the order of magnitude of the changes. Those who have weaker signals will still have strong signals if they like to take a little more trouble to get them. Whereas a very short bit of wire round the interior of the living-room and no earth now suffices to give a crystal set ample signal for the flat inhabitant of Park Lane, some slight modifications towards the installation of a wireless set as such will be necessary on change over. In North London the signal will be very much greater; Barnet and environs will need perhaps to cut down the size of their aerials to avoid saturation. South London gets a little comfortable extra, as does the East and West.

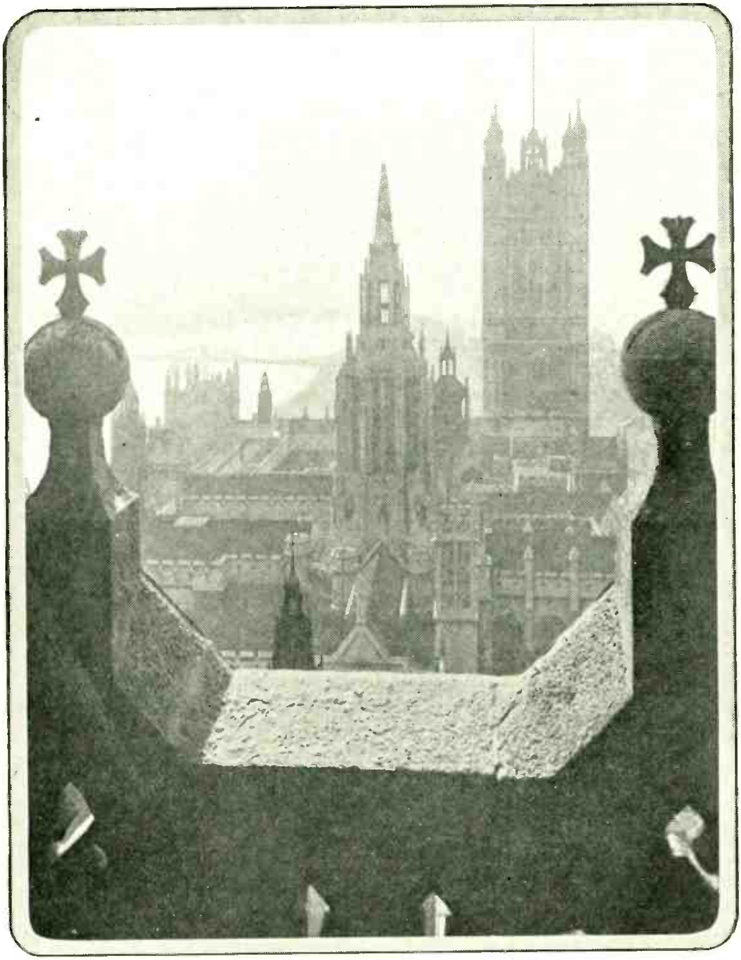
All will be affected, and as any change means complaint, many will complain. Progress must aim at leaving the majority better off. The object of the new station is firstly to cover larger and wider areas without interruption, and secondly to give to all South-east England sooner or later an alternative programme. It is up to the listener to prepare for the change, because the alternative programme is only to be tried as an experiment, and if too great dislocation arises from obsolescent sets, then it will be delayed or abandoned. The B.B.C. is confident, however, that listeners will help it, for their own and others' good, and as time goes on it will issue more and more definitive advice as to how and when to make the necessary changes. In the meantime, this article merely says that the station is being built, and gives some account of it and its possible effects upon the London listener. When permission is forthcoming, similar stations will be erected throughout the country.

# EMPIRE BROADCASTING

AFTER many months' practical experience with the short-wave station, 5SW, the article which appeared on p. 297 of the 1928 Handbook could be reprinted to-day almost word for word as a faithful presentation of the problem and all its factors.

5SW began experimental operations in November 1927, and from mid-December it relayed as its experimental material a considerable part of the London evening programme for those days in the week on which it was working. The object of this was partly to make a prolonged (and in some way monotonous) experiment more interesting to the listening engineers and amateurs at the innumerable points of reception, but still more to bring into the scope of the experiments the various types of programme material which would have to be dealt with in the event of a service being established. But it was neither claimed nor admitted that the output of 5SW constituted *programmes* in any accepted sense. From the technical standpoint, from that of copyright and financial obligations, and even from that of pure programme-building, the situation was, and is, unripe. To take an example, it will be agreed that news constitutes an element of the broadcast programme that is even more important for far-away listeners than it is for those at home. But it was out of the question to radiate news bulletins from 5SW, because the B.B.C. possesses no rights over their contents other than that of broadcasting them for home consumption, and no one could seriously claim that their interest is experimental.

It is important to stress these facts, as most of such criticism as has been directed against the B.B.C.'s policy assumes as the basis of argument that, if the "London programme" is being transmitted by 5SW, it is a programme. In reality, that is just what it is not. With respect to its own public, the B.B.C. has always taken the view that, although it is not responsible under its charter or licence for anything but transmissions, its success or failure in carrying out its obligations must ultimately be judged at the reception end. This does not imply that the possessors of poor receiving sets have the right to condemn a transmission as bad, but it does mean that the Corporation is prepared to stand or fall by the sum



THE HEART OF THE EMPIRE, AS SEEN FROM BIG BEN of its achievements as judged locally by competent people equipped with adequate receivers. Now, Empire (or, better, World) Broadcasting is particularly amenable to this criterion. For here reception is in the main* in the hands of professional broadcasting engineers and qualified amateurs, and high-grade apparatus may be taken for granted.

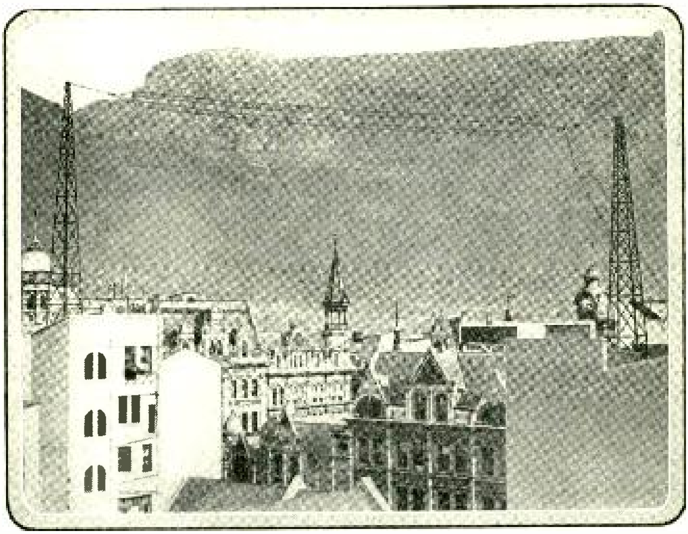
Under this criterion it has to be admitted that the output of 5SW has never and nowhere been received regularly enough or continuously enough to be called a programme.

But, it will be asked, does this criterion hold at all for Empire Broadcasting? Do not, first of all the interest of novelty, and then the desirability of touch of some sort—any sort—between peoples of kindred instincts and language override the artistic criteria altogether?

Here we reach a question to which practical experience alone could give the answer. Even now the answer is provisional only. But, for what it is worth, the evidence accumulated in the past year tends to show that (*a*) the "novelty" of an overseas broadcast differs in no way from similar novelties in home broadcasting—the interest exhausts itself after a few transmissions; (*b*) the "linkage" interest, while very real and constant, is found to be concentrated on news and certain features of sentimental appeal, either occasional (such as a State funeral) or regular (such as the chimes of Big Ben); (*c*) a large proportion of the demand for short-wave transmissions comes from amateurs whose primary and almost exclusive interest is the "logging" of more and more distant stations, irrespective of what is received. But, further, (*d*) ordinary programme material, even if offered experimentally, is at once compared with the local programme and criticised in terms of local taste, except in countries where there is little or no broadcasting.

Clearly, the most careful examination of all these results is necessary before any broadcasting organisation would be justified in embarking upon commitments, both in plant and in contracts, which would be involved in a programme service for distant audiences, even after the practicability of such a service had been technically certified.

* We say " in the main," but trouble has not seldom been caused by local oscillators attempting, with inadequate sets or skill, to receive directly short-wave transmissions that the local broadcaster is relaying.



IN THE SHADOW OF TABLE MOUNTAIN: CAPE TOWN AERIAL

To rule out (*a*), the "novelty appeal," as a justification is easy enough, while as to (*c*), it is manifestly not the business of a broadcaster with national responsibilities to spend money in satisfying the distant "reacher-out." The case for long-range broadcasting rests, therefore, upon (*b*) and (*d*), and can be re-stated thus.

There are two ways in which broadcasting initiated, say, from Britain reaches the listener at the Antipodes and in British Columbia (and, it must not be forgotten, in Siberia also), viz., direct reception and local relay. The direct listeners again fall into two categories: those resident in what we are pleased to call the "wilds"—isolated in the midst of an alien nature, or an alien people, or both—and those who are served by a local broadcaster and whose pleasure in direct reception is simply that of the wireless amateur. It will not be seriously contended that a public broadcasting service is under any obligation to provide for the latter, but the case of the "marooned" fellow-countryman is on quite another footing. Yet, as a practical matter, his case has to be considered as ancillary to the case of the relay broadcast. For, while on the one hand he is usually, in his isolation, content with any quality of performance superior to that of a more or less worn gramophone, and is not affected by local copyright questions, on the other hand he cannot be supplied with programmes at all unless these are broadcast to all the world, which means that they are liable to be relayed. Inevitably, therefore, we come back to the local re-broadcaster as the primary recipient to whom an overseas programme would be addressed.

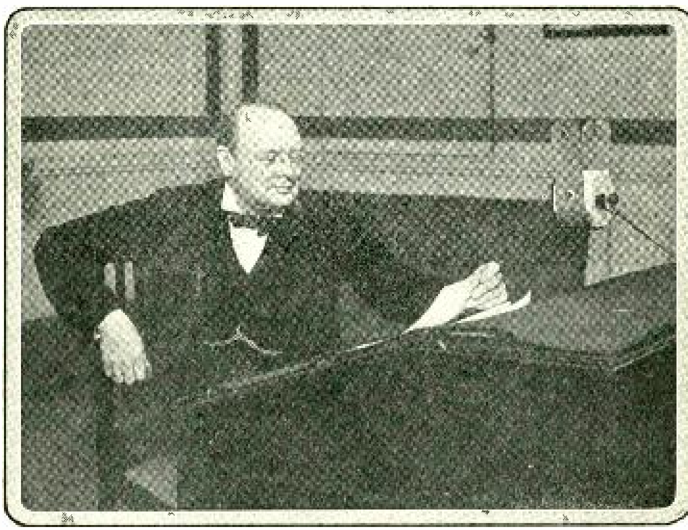
There are higher reasons for this than those of finance. Broadcasting is much more than a means of transmitting news: it is a public service for the provision of entertainment and information for the masses, and inter-continental broadcasting will be judged by its ability to reach and interest those masses. From this point of view the service areas around the last centres of radiation are the real measure of the audience, whether the matter heard is played in Sydney or in London.

It must be accepted, therefore, that when in the future adequate regularity and quality can be guaranteed by the technicians, pure programme questions will have to be considered as well as copyright and finance. The B.B.C.'s postbag has already shown that listeners overseas consider themselves entitled to criticise the London programme even before it is offered to them as a programme and before they contribute to it financially in any way. As was pointed out in last year's article, "the interest of the programme and nothing else will determine its popularity . . . the overseas programme cannot expect to enjoy a privileged status in point of acceptable quality."

The final judge of whether a service of distant origin is acceptable or not is therefore the broadcaster giving the local service. It is he who is responsible to his own people, his own Government, his own copyright-holders, his own artists. It is his position that is improved or impaired, his stock of goodwill that is enhanced or reduced, by relaying the distant programme in preference to his own. "Only programmes can compete with programmes." And the needs of different broadcasting centres for outside reinforcement vary from country to country, adding complications of programme choice to those of longitude.

To ignore these factors for the sake of ephemeral publicity values, to risk the real popularity of a future service by surfeiting the local audience with overseas material that reaches them neither in the purity nor with the continuity that a properly-served listening public expects, would indicate, not that the broadcaster is alive to the possibilities, but that he takes a short view of his responsibilities.

The above survey is not to be read as a confession of pessimism. True, the work of 5SW and Keston, like that of other short-wave transmitters and receivers, has not forced the major secrets of trans-oceanic broadcasting. Everything still depends on that guarantee of service which it is not even now possible to give. But the very fact that even at this stage it is not premature to devote time and thought to these questions of programme-building and listeners' reactions, copyright and finance is, or should be, indicative.



A HISTORIC OCCASION: THE CHANCELLOR OF THE EXCHEQUER EXPLAINS HIS BUDGET

# CONTROVERSY IN BROADCASTING

BEGINNING in 1923 the B.B.C. made repeated attempts to secure authority to introduce controversial subjects. But the rule against controversy was maintained both under the Company and for the first year of the Corporation. During the régime of the Company, the Post Office exercised an over-riding censorship of subject and material. Arising out of the recommendations of the Crawford Committee on broadcasting, the Government, in licensing the Corporation at the end of 1926, decided to transfer censorship functions from the Post Office to the Corporation for an experimental period. But the prohibition of political, industrial and religious controversy was to be maintained. Apparently the intention of the Government was to test the discretion of the new authority. Six months was the duration of the experimental period originally contemplated. This, however, was extended to fourteen months. Meanwhile the B.B.C. lost no opportunity of emphasising the view that controversial matter should be admitted. Some debates were organised, but the limitations necessarily imposed irritated both the speakers and the listening public. The situation became acute when a series of "debates and counter-debates," organised in co-operation with King Edward's Hospital Fund for London, had to be abandoned before completion. There followed a period of violent Press attacks, most of which were directed unfairly against the B.B.C. These attacks subsided when it became generally realised that the B.B.C. did not agree with the policy of restriction which it was reluctantly applying. It should be noted, however, that the violence of the Press discussion was not discovered to reflect any widespread or deep interest in the subject. On the contrary, the general body of listeners was apathetic.

Late in February 1928 the Government re-considered the position and decided to remove the restrictions. On March 5th the Prime Minister gave the following reply to a question from Captain Ian Fraser, C.B.E., M.P.:—

> "The Government have reviewed the decision taken at the time of the constitution of the British Broadcasting Corporation, under which the Corporation has been

prohibited from broadcasting (*a*) expressions of opinion by the Corporation on matters of public policy, and (*b*) statements involving matters of political, religious or industrial controversy. The Government have decided that the first of these prohibitions, *i.e.*, that on the issue of 'editorial' pronouncements, must be maintained; but that the second shall be withdrawn forthwith. The Corporation has been informed that the Government expect it to use the discretionary power thus experimentally entrusted to it strictly in accordance with the spirit of the Crawford Committee's Report, and that it is its responsibility to see that this is done."

On the same day the Postmaster-General sent to the B.B.C. a formal communication elaborating the Prime Minister's statement and making the following comment:—

"The prohibition has now been in operation for fourteen months, and the Postmaster-General desires me to convey to the Governors his appreciation of the loyal and punctilious manner in which they have conformed to the obligations thereby imposed."

The effect of the Prime Minister's announcement was to give the B.B.C. freedom to develop controversial subjects in an experimental way in accordance with the spirit of the Report of the Crawford Committee. It is pertinent, therefore, to refer to this report, of which the relevant passage reads:—

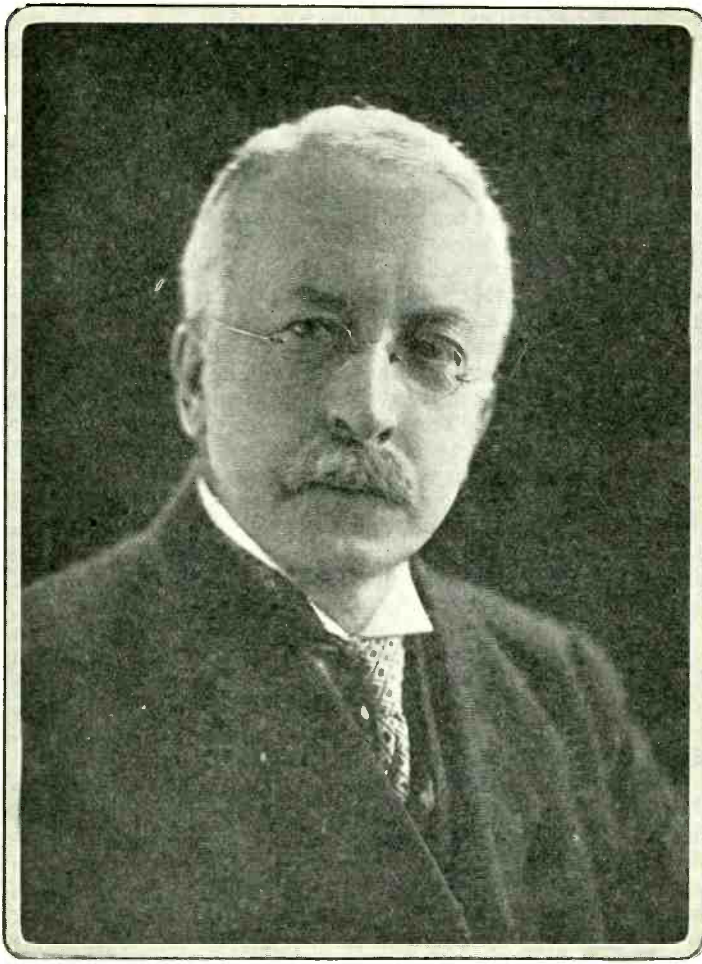
"We are unable to lay down a precise line of policy or to assess the degree to which argument can be safely transmitted. In the absence of authoritative evidence, such advice would be premature. But, speaking generally, we believe that if the material be of high quality, not too lengthy or insistent, and distributed with scrupulous fairness, licensees will desire a moderate amount of controversy. But the discretion of the new authority must be upheld. Provided the Commission is strong and impartial, it will gradually assess the nature and extent of the demand; in this and in other problems to be solved the Commissioners will do well at the outset to act with firm and consistent circumspection.

"Broadcasting Parliamentary speeches, although parallel, raises a different group of issues, on which we do not feel authorised to offer an opinion."

An attitude of "firm and consistent circumspection" was entirely in accord with the policy of the Corporation in taking advantage of the Government's concession. It was decided to begin by the gradual and experimental introduction of political and economic controversy on clearly defined occasions with adequate safeguards for impartiality and equality of treatment. It will be observed that there was no change in the policy of the Corporation on matters of religion. Controversial matter was to be limited to the field of politics and economics. Moreover, subjects were to be dealt with in such a way that the main opposing views could be presented on occasions clearly contrasted yet linked as closely as possible. The obvious, and perhaps the most attractive, form of presenting controversy is by way of debates. It was natural, therefore, that broadcast debates should be resumed now that the irritating restrictions had been removed. Care had to be exercised first of all in the selection and wording of subjects, so that there might be some inherent equality in the contending opinions. It was also of importance that the debaters should be well matched.

"Discussions" provided an effective alternative form for the presentation of controversial views. A "discussion" in this sense is a kind of symposium. The various challenging and opposing points of view on a controversial subject are expounded in prepared statements in sequence, but emanating if necessary from widely separated parts of the country.

The Corporation is fully alive to the considerable possibilities of the development of controversy in programmes. It is felt that this new phase of the work should produce cumulative results not only by informing public opinion on politics and economics, but also by establishing a new and intimate contact between political leaders and voters. It should not be presumed, however, that this development involves any revolutionary or transcending change in programmes generally. Controversy is not to dominate the talks. For the most part they will continue as before, endeavouring to interpret the vast field of interest and knowledge which is happily beyond the frontiers of acute current partisanship.



SIR HENRY HADOW
*Vice-Chancellor of Sheffield University*

# THE HADOW COMMITTEE

THE term adult education is not, on the face of it, a very attractive one. In actual fact, however, it represents the spread of a remarkable spirit which has grown up during the last hundred years, and which has developed rapidly since the Great War.

Men and women whose careers as breadwinners started directly they left school began to realise how greatly they were handicapped as workers and as citizens by their lack of opportunities for further learning, and how much more interesting life could become if they made new interests for themselves. The War brought this home both to the men who served overseas and to the women who took on new responsibilities at home, and the desire to hear and perform music and plays, to make use of libraries, to read, to discuss, and even to travel, has brought many new recruits to the older organisations and led to the creation of new ones.

From the very beginning of broadcasting it was clear that many people found their chief pleasure in those parts of the programme which brought them into touch with the wider world—with news and speeches, with national ceremonies and national sport, with talks and lectures—and it has been clear also, for the last year or two, that many thousands of listeners are looking to broadcasting to help them to find some form of continued education. For, while the adult education movement had made great strides, it could not reach the remote or isolated student, nor could it always, in every place, provide for every kind of interest. Broadcasting has the supreme advantage, moreover, of being able to put every listener in touch with the greatest thinkers and leaders of the day, from whom he may perhaps derive some of that inspiration which the more fortunate find in a University.

In 1926 the B.B.C. and the British Institute of Adult Education—a body which represents all the main forces in the adult education movement—decided to set up a Joint Committee to investigate the possibilities of broadcasting as a means of general adult education. Sir Henry Hadow, Vice-Chancellor of Sheffield University, was appointed Chairman.

This Committee spent eighteen months interviewing witnesses, considering memoranda, and inviting expressions of opinion from organisations and individuals who wished to put forward suggestions. The results of their inquiries and discussions have been embodied in a small book called "New Ventures in Broadcasting—A Study in Adult Education," and made available for the general public.*

During the course of the inquiry many experiments were made in series of broadcast lectures dealing with a variety of subjects, and in group-listening by bodies of students, followed by discussion under the guidance of group leaders. The results have been very encouraging; and while it is impossible as yet to give any exact statistics or figures, it is some guide to the interest that has been aroused that 60,000 copies of the printed Programme of Talks and Lectures and 80,000 copies of the Aids to Study pamphlets were applied for in the spring session of 1928.

It is impossible in a short article to give anything approaching a summary of this little book, but the main conclusions of the inquiry were reduced to fifteen points, which, still more briefly, may be shown as follows:

1. The provision of recreation and entertainment has been, and still is, one of the main functions of the broadcasting service.

2. It is impossible, however, to draw a hard-and-fast line between recreation and education. For many, recreation may mean not only music and drama of all kinds, but also the general talks, debates, etc., which keep them in touch with current thought and affairs. This is broadly educational in its effect.

3. There is also a growing demand that broadcasting should provide facilities for more systematic education.

4. This involves a close analysis of the listening public and of the varying interests which it represents.

5. Such provision is dependent on the full development of the policy of alternative programmes, which will give every listener a choice of programmes.

6. Broadcast education can, in many directions, supplement the existing methods of adult education, without any fear of supplanting them.

7. Discussion groups, formal or informal, may draw an added value from broadcast lectures, and it is hoped that all educational organisations will experiment with them.

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* Published at 2*s.* cloth, 1*s.* paper, by the British Broadcasting Corporation, Copies may be obtained either direct from the B.B.C. Bookshop, Savoy Hill, London, W.C.2 (postage 3*d.*), or through any bookseller.

8. Broadcasting by itself is not enough. The B.B.C. can help the listener also by publications, including a weekly educational journal, by advice on technical matters, and in various other ways.

9. It is of the utmost importance that the standard of reception should be raised. This will involve giving advice on the correct use and maintenance of sets for educational purposes, as well as on their construction.

10. The subjects best suited to broadcasting and the best way of dealing with them can only be found by constant experiment in matter and in presentation.

11. Controversy is an essential part of education. Those chosen to deal with controversial subjects should have a sense of responsibility which will make it safe to give them as much freedom as possible.

12. Increasing attention must be paid to broadcasting technique. Personality in the lecturer is all-important.

13. The best way to provide an adequate educational service would be to set aside the whole or the main part of one wave-length for this purpose. Until this is possible, a definite proportion of time, in suitable hours, must be set aside in general programmes.

14. To make a success of broadcast education close contact must be built up between the B.B.C. and the interests representing listeners. Such contact can best be developed by the creation of a Central Council for Adult Education, representing all the more important adult education bodies, and supported by Area Councils, representing local opinion and local organisations.

15. The main cost of developing such a service can be met out of that part of the revenue from licences which is at present retained by the Postmaster-General.

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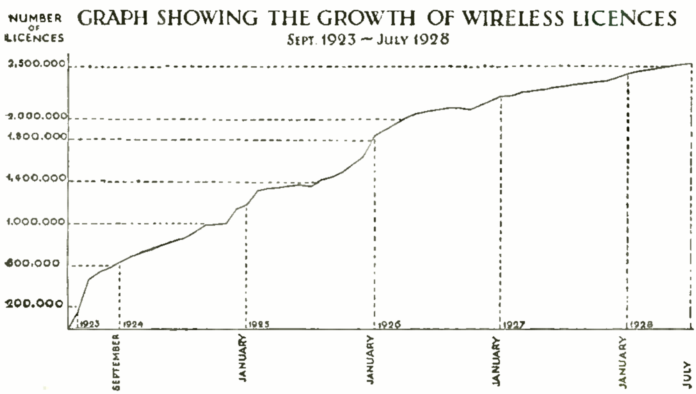
GRAPH SHOWING THE GROWTH OF WIRELESS LICENCES

SEPT. 1923 ~ JULY 1928



# FINANCE

THE financial side of broadcasting is probably the least familiar to the public, and there are many points on which misconceptions can arise. The constitution of the B.B.C. and its financial consequences, for instance, may not be very generally understood; the magnitude of the service is difficult to realise; and the many kinds of expenditure involved are by no means obvious.

One of the most striking differences between the B.B.C. and an ordinary corporation is that it has no capital in the ordinary sense. Another is that it is not a profit-earning concern; the whole of its revenue is devoted to the service. Again, its revenue is not received direct from the public it serves, and does not increase in proportion to the development of the service. The effects of these conditions will be seen in discussing income and expenditure, and by reference to the Balance Sheet and Accounts for 1927 printed overleaf.

## *LICENCE REVENUE*

The Revenue Account shows that the bulk of the B.B.C.'s income comes from the Post Office, and the amount is based on the number of receiving licences issued. Of all fees collected, $12\frac{1}{2}$ per cent. is retained by the Post Office to cover costs of collection and administration. Then, in respect of the first million licences issued, the Treasury retains a further 10 per cent.; in respect of the second million, 20 per cent.; of the third, 30 per cent.; of anything over 3 millions, 40 per cent. If, for example, 2,500,000 licences are issued during a financial year, the total fees collected amount to £1,250,000. From this sum the following deductions are made:

| | | |
|---|---|---|
| (*a*) $12\frac{1}{2}$ per cent. of the total . | £156,250 | |
| and of the balance— | | |
| (*b*) 10 per cent. in respect of 1st million licences . . . | 43,750 | |
| (*c*) 20 per cent. in respect of 2nd million licences . . . | 87,500 | |
| (*d*) 30 per cent. in respect of part of 3rd million licences . . | 65,625 | £353,125 |

leaving a balance of £896,875, or 71·75 per cent., for the B.B.C. As the number of licences increases, the percentage handed over decreases, so that in respect of 5 million licences, the percentage falls to 63. It should also be noted, however, that the payments on this basis are made in arrears; that is to say, the Corporation receives during any one year payments calculated on the number of licences issued during the preceding year, and its income, therefore, does not keep pace with the current licence position. The effect both of the basis of calculation and of the system of payment in arrears is indicated in the following table, relating to the financial year ended 31st March, 1928:

| | Actual division of licence fees collected during year to 31.3.28. | | Division which would have applied if licence income were not paid in arrear. | |
|---|---|---|---|---|
| | Amount (£). | % | Amount (£). | % |
| Retained by Post Office . | 141,875 | 12·50 | 141,875 | 12·50 |
| Retained by Treasury . | 192,166 | 16·93 | 105,425 | 9·29 |
| Paid to B.B.C. . . | 800,959 | 70·57 | 887,700 | 78·21 |
| | 1,135,000 | 100·00 | 1,135,000 | 100·00 |

*INCOME FROM PUBLICATIONS*

The next source of income is the sale of publications, established as a necessary means of supplementing programme work. These publications are managed on a commercial basis, and the net income, which amounted in 1927 to £93,686, goes to augment the revenue available for broadcasting purposes. The Corporation is specifically empowered by its Charter to undertake this activity. The third item, interest, etc., needs no special explanation.

*PROGRAMME COSTS*

Out of the total income the cost of transmitting programmes for an aggregate of 68,000 hours in a year has to be met.

# BALANCE SHEET

## as at 31st December, 1927

### LIABILITIES.

| | £ s. d. | £ s. d. |
|---|---|---|
| **Capital Account—** | | |
| Value placed upon Premises and Plant, Furniture and Fittings, Musical Instruments, Music, Stores, etc., taken over (without payment) from the B.B.C., Ltd. | 171,938 0 0 | |
| Appropriated from Revenue to cover Capital Expenditure incurred by the Corporation to 31st December, 1927, and to be incurred on the construction and equipment of Regional Stations | 110,108 1 11 | |
| | | 285,046 1 11 |
| **Reserve for Depreciation and Renewal of Premises, Plant, Furniture and Fittings, Etc.** | | 26,350 0 0 |
| **Creditors and Credit Balances—** | | |
| Sundry Creditors | 93,163 16 0 | |
| Contingency Reserve | 20,000 0 0 | |
| Provident Fund Trustees | 8,114 0 10 | |
| | | 121,307 16 10 |
| **Revenue Account—** | | |
| Balance at credit at 31st December, 1927, carried forward as per Account | | 18,228 15 7 |
| | | £450,932 14 4 |

CLARENDON } Governors.
GAINFORD }
J. C. W. REITH, Director General.

### ASSETS.

| | £ s. d. | £ s. d. |
|---|---|---|
| **Freehold and Leasehold Premises—** | | |
| Transferred by the B.B.C., Ltd., as valued by the Corporation's Officials | 22,300 0 0 | |
| Additions made by the Corporation, at cost | 105 7 6 | |
| | | 22,405 7 6 |
| **Plant—** | | |
| Transferred by the B.B.C., Ltd., as valued by the Corporation's Officials | 99,897 0 0 | |
| Additions made by the Corporation, at cost | 2,776 5 9 | |
| | | 102,673 5 9 |
| **Furniture and Fittings—** | | |
| Transferred by the B.B.C., Ltd., as valued by the Corporation's Officials | 40,503 0 0 | |
| Additions made by the Corporation, at cost | 3,994 11 3 | |
| | | 44,497 11 3 |
| **Musical Instruments, Music and Books—** | | |
| Transferred by the B.B.C., Ltd., as valued by the Corporation's Officials | 12,238 0 0 | |
| Additions made by the Corporation, at cost | 3,231 17 5 | |
| | | 15,469 17 5 |
| | | 185,046 1 11 |
| **Stores on Hand and Work in Progress,** at cost | | 4,417 12 5 |
| **Debtors and Debit Balances—** | | |
| Sundry Debtors | 63,287 7 2 | |
| Unexpired Charges | 5,889 14 5 | |
| | | 69,177 1 7 |
| **Investments—** | | |
| £180,000 5% War Loan, 1929/47, at cost (Market Value at 31st December, 1927, £182,250) | | 180,958 11 7 |
| **Cash at Bank and in Hand** | | 11,333 6 10 |
| | | £450,932 14 4 |

**Report of the Auditors to the Members of the British Broadcasting Corporation.**

We have examined the above Balance Sheet dated 31st December, 1927, with the books and vouchers of the British Broadcasting Corporation, and have obtained all the information and explanations we have required.

The above Balance Sheet is, in our opinion, properly drawn up so as to exhibit a true and correct view of the state of the Corporation's affairs according to the best of our information and the explanations given to us and as shown by the books of the Corporation.

5, London Wall Buildings, London, E.C. 2.
24th March, 1928.

DELOITTE, PLENDER, GRIFFITHS & CO., Auditors,
Chartered Accountants.

# REVENUE ACCOUNT

## for Year ending 31st December, 1927

### EXPENDITURE.

| | £ | s. | d. |
|---|---|---|---|
| To Expenditure on Programmes, etc. (including cost of Artists, Orchestras, News Royalties, Performing Rights and Simultaneous Broadcast Telephone System and Salaries of Programme Staff) | 487,728 | 8 | 6 |
| ,, Maintenance of Plant, Power, Salaries and Expenses of Engineering Staff, Development and Research etc. | 131,036 | 14 | 8 |
| ,, Rent, Rates, Taxes, Insurance, Heating and Lighting, Upkeep of Premises, Telephone, etc. | 63,252 | 9 | 2 |
| ,, Administration Salaries and Expenses | 50,903 | 18 | 6 |
| ,, Contributions to Staff Provident Fund | 7,918 | 5 | 10 |
| ,, Governors' Fees | 6,100 | 0 | 0 |
| ,, Provision for Depreciation and Renewal of Premises, Plant, Furniture and Fittings | 26,350 | 0 | 0 |
| ,, Balance carried down, being Net Revenue for year | 128,336 | 17 | 6 |
| | £901,626 | 14 | 2 |

### INCOME.

| | £ | s. | d. |
|---|---|---|---|
| By Licence Income | 800,959 | 5 | 0 |
| ,, Net Revenue from Publications | 93,686 | 10 | 1 |
| ,, Interest and Sundry Receipts | 6,980 | 19 | 1 |
| | £901,626 | 14 | 2 |

# REVENUE APPROPRIATION ACCOUNT

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| To Transfer to Capital Account to cover— | | | | | | |
| Capital Expenditure incurred by the Corporation during the year | 10,108 | 1 | 11 | | | |
| ,, Capital Expenditure to be incurred in the construction and equipment of Regional Stations | 100,000 | 0 | 0 | | | |
| | | | | 110,108 | 1 | 11 |
| ,, Balance carried forward, as per Balance Sheet | | | | 18,228 | 15 | 7 |
| | | | | £128,336 | 17 | 6 |

| | £ | s. | d. |
|---|---|---|---|
| By Balance brought down, being Net Revenue for year | 128,336 | 17 | 6 |
| | £128,336 | 17 | 6 |

For each of the twenty-one stations, artists, speakers, orchestras, etc. must be engaged; there are the engineering costs; and the studios, offices and transmitting stations and their rents, rates, insurance, and upkeep generally. Other items in connection with programmes referred to in the Revenue Account are, however, probably less familiar to the public. Performing rights have to be paid on all copyright works broadcast, and with the enormous programme output of the B.B.C., the bill is naturally considerable. Royalties are also payable for the news supplied by the news agencies. For the land-lines rented from the Post Office for connecting stations for simultaneous broadcasting the Corporation pays at the same rate as private subscribers, and over 4000 miles of lines are needed. The costs of one or two typical programme items may help the reader to realise how the totals mount up. The production of one of the series of operas broadcast from the studio involved the following direct expenditure, apart from overhead charges of various kinds: Copyright fee, £20; artists' fees, £75; orchestra, £75—a total of £170 for roughly two hours' programme time. The running commentary on the last Grand National, lasting less than three-quarters of an hour, cost approximately £175, made up of: hire of trunk lines, expenses of engineers, and the commentator's fee and expenses.

## *TECHNICAL EXPENDITURE*

On the engineering side, besides the costs of power and the maintenance of plant, there are royalties to be paid in respect of patents covering transmitting apparatus. Depreciation has also to be provided for—at particularly heavy rates on wireless apparatus, because of its rapid obsolescence. The technical possibilities of broadcasting are constantly being explored, as the reference to development and research in the Revenue Account indicates. This applies equally to the programme aspect. There is practically no limit to the potential development of broadcasting, and a very much larger revenue than will ever be available could be rapidly absorbed in giving effect to some of these possibilities.

*DISTRIBUTION OF EXPENDITURE*

The various headings in the Revenue Account show the following percentages of the total expenditure:

| | |
|---|---|
| Expenditure on Programmes . . | 63·07 |
| Maintenance of Plant, Power, etc. . | 16·95 |
| Rents, Rates, Insurances, etc. . . | 8·18 |
| Administration Expenses . . . | 6·58 |
| Provident Fund Contributions . . | 1·02 |
| Governors' Fees . . . . . | 0·79 |
| Provision for Depreciation . . | 3·41 |
| | 100·00 |

The first two items, representing the direct cost of the service, amount to over 80 per cent. The percentage for Administration Expenses is decreasing as the service grows.

*CAPITAL PAYMENTS*

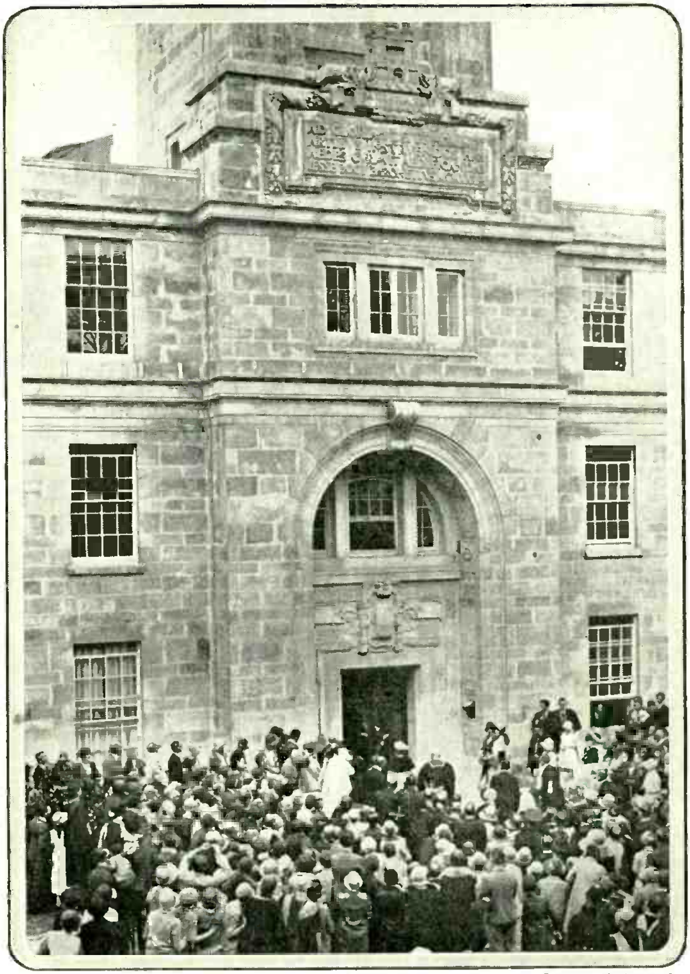
It has already been pointed out that the Corporation has no share capital. The consequence is that all capital expenditure —such as on the erection of new stations or the installation of new plant—must come out of income. This is not merely the theoretical position, for although the Corporation took over from the British Broadcasting Co., Ltd., twenty-one fully equipped stations, the erection of new stations is now an urgent need. The establishment of wireless stations all over the world has resulted in serious ether congestion, and this can only be remedied in this country by the adoption of a new scheme of station distribution. The development of broadcasting too depends on the provision of alternative programmes to all listeners. The Regional Scheme advocated by the Corporation is designed to satisfy both requirements, and preparations have been under way for some time. Large amounts have therefore to be reserved out of income to meet this projected expenditure as well as for the normal additions to the assets, and reserves for both purposes are shown as having been made in the Revenue Appropriation Account.

### *BORROWING POWERS*

It is true that the Corporation has certain borrowing powers, and that the Regional Scheme could be financed in this way. But it must be borne in mind that the term of the B.B.C.'s Charter is ten years and any capital borrowed would have to be repaid by the 31st of December, 1936, at least to the extent of the difference between the initial cost and the valuation of the assets at the latter date. To do this, heavy sinking-fund contributions would have to be made from income during the last few years of the Corporation's term, with the probable result that the expenditure on the service would be considerably reduced then, as compared with the present expenditure. In these circumstances, it has been decided to finance the Regional Scheme to some extent out of current income, and thus spread the cost over the whole ten years.

### *FINANCIAL CONTROL*

From these indications of what broadcasting involves financially, it will be realised that it is no easy matter to regulate expenditure to the best advantage. This can be done only by the most careful planning and the strictest control throughout. A system of financial control at the Head Office has been evolved to meet these conditions. The income for the year can be fairly accurately estimated. Estimates of expenditure are also drawn up, taking into account all fixed charges and commitments, and programme and engineering requirements. Allocations are then made in accordance with these figures, and actual expenditure is carefully compared with the estimates at frequent intervals. The same principle is carried out with regard to particular items of expenditure; the estimated cost is submitted for approval beforehand, and is checked with the actual cost. The kinds and the extent of expenditure to which the principle of approval in advance cannot apply are reduced to a minimum, and all transactions are scrutinised in detail. This strict control is not, however, allowed to stifle initiative. Station Directors, for example, have a large measure of freedom in planning and presenting their programmes, so long as they keep within a certain allowance. This combination of freedom and control in all the B.B.C.'s activities insures the best possible use of the money at its disposal.



Sport and General

H.M. THE KING OPENING THE NEW UNIVERSITY BUILDINGS AT NOTTINGHAM

*A description of the ceremony was broadcast on July 10th, 1928*

THE LATE DAME ELLEN TERRY, THE FAMOUS ACTRESS
*a tribute to whom was broadcast on her eightieth birthday, February 27th, 1928*

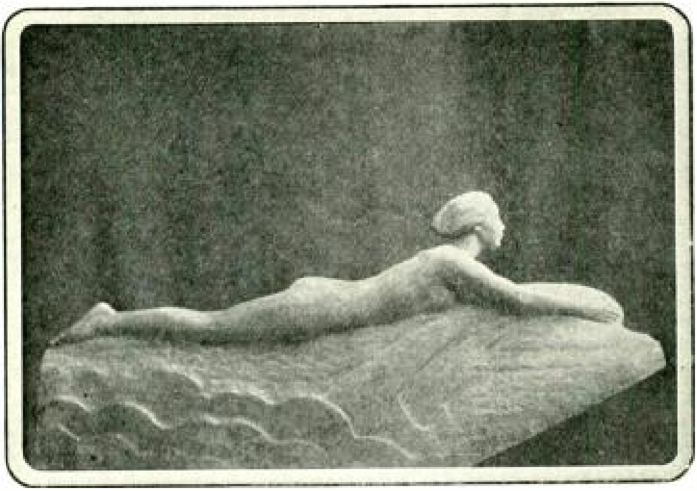
# THE YEAR

## PROGRAMMES

A GENERAL review of the position of broadcasting at the beginning of August 1927 showed a considerable measure of progress. What may be called the routine services—the News Bulletins, Weather Forecasts, S.O.S. Messages, Appeals and the like—continued to fulfil their useful functions in the life of the community; important contributions had been made to concert-giving in the British Isles; great figures in every branch of artistic endeavour had given of their best to the listening public; men whose ability commanded immediate respect had talked, with the authority which only an intimate and first-hand knowledge of a particular subject can give, to an audience which grew larger every month; historic ceremonies had been relayed from the Continent as well as from many places in the British Isles; the standard of the everyday programme of entertainment had risen appreciably—and all this had gone hand in hand with a perfecting of technical resources which had brought efficient and faithful reception within the reach of any one who was normally careful in choosing and maintaining his set. What was still more important was the realisation of the constant growth of a body of listeners who completed the work of the programme-builders by giving to their programmes careful and instructed listening and criticism. In almost every case, of course, achievement had fallen short of design, the best had become the good, and perfection was still far away. Self-satisfaction was quite impossible, but with that body of solid achievement in the immediate past the next stage in the development of broadcasting could be faced with a certain confidence that a solution would be found to some of its problems.

The original system of programme-building, in which an attempt was made to satisfy on one wave-length the varying tastes of an audience of some seven million individual listeners, has always been open to the charge of being "bitty" and superficial. "Your system may be as efficient and smooth-running as you like," a critic would say, "but so long as you try to cater for all tastes on one wave-length you will be doomed to failure. You try to make the best of about thirty worlds, with the inevitable result that you are uncomfortable in them all. What is the use of trying to frame a Symphony Concert so that it will appeal to the music-hall enthusiast, or of singing ballads to a man who wants Beethoven?" That is an exaggerated statement, a caricature, of what is taken to be the truth, that in the ideal state of broadcasting, specialisation in both serious and light programmes will take the place of compromise, even more than is the case to-day. But this cannot happen until alternative programmes are possible, and the choice between two or more types of programme available at a given moment is left to the individual listener. The provision of such alternatives was seen to be the main problem to be tackled, and a scheme of broadcasting from regional stations has been prepared which, it is hoped, will have the desired effect. But before any such scheme could be finally settled, much less put into effect, it was necessary to experiment widely both from the engineering and the programme points of view to enable the necessary decisions to be made with adequate knowledge of the questions involved. With this end in view, 5GB, the Daventry Experimental Station, was opened on August 21, 1927.

The first question which experiment on the 5GB wave-length was called upon to answer was: "By what principle of contrasted programmes is it possible to ensure that the great majority of listeners will be able to find one of the two programmes available at a given time suited to their tastes?"



THE "WIRELESS WAVE" AS VISUALISED IN MODERN SCULPTURE
*"The Hertzian Wave," by Miss Mabel White, exhibited at the Paris Salon*

The contrast of the spoken word with music was rejected as being far too general and broad in application; that of majority and minority appeal is vague and open to so many different interpretations that it is useless as a court of appeal in case of doubt; "highbrow" and "lowbrow" has been found to be a false distinction, because the bulk of listeners are demonstrably catholic or "broadbow" in taste—for most listeners the most effective contrast to a serious item of limited appeal is not dance music, but one of the range of items between an orchestral concert of the more popular "Promenade" type and a ballad concert or variety programme. It is, in fact, impossible to formulate any one principle which will be an infallible guide in every case of doubt, but it has been found that a useful test to apply is the distinction between items which demand concentrated listening and those which repay more casual listening. This may appear a dangerous sort of distinction to make, since every programme demands a measure of concentrated listening, and the completely casual listener will never get from any programme, however trivial, the fullest measure of enjoyment which it has to offer. But every individual must be conscious that there are times when he is ready to sit down and listen solidly for an hour or an hour and a half, and times when, for reasons of tiredness or restlessness, he prefers to hear a programme which does not call for such prolonged periods of concentration. It is this difference of mental attitudes in the individual listener, or in classes of listeners, which this principle of contrast is intended to satisfy—the difference which makes a man turn from the serious chamber music or poetry reading which he usually prefers to a military band or musical comedy programme which would normally leave him uninterested. No principle, of course, can be allowed in programme-building to degenerate into a hard-and-fast rule, but experience in the contrasting of 5GB and London programmes suggests that consideration of the different degrees of concentration needed for different programmes, when coupled with the programme sense or instinct, which must always be the deciding factor in making a choice between two courses of action, will be of considerable value when the time comes for alternative programmes on a larger scale.

5GB, then, has given us this valuable experience in constructing alternative programmes; but it has done more than this: it has given us the opportunity of experimenting, in a way which could not be done on a one wave-length programme, with material whose suitability for broadcasting or whose immediate success is in doubt. A series of concerts of chamber music of an advanced and difficult order has been broadcast, and has not only given musicians a chance which they might never otherwise have had of hearing performed the work of some of the most important modern composers, but has also enabled listeners to form their own judgment of those works at first-hand instead of by hearsay. Again, it had been thought that no one person could talk and hold the interest of a broadcast audience for more than about twenty-five minutes at a stretch, but experiment on 5GB has shown that this is not so. Story-readings, story-telling, talks on intricate subjects and even a play which took the form of a monologue lasting for a whole hour have been broadcast and have proved to be gripping and interesting in spite of the limitations of one voice. It is by experiments such as these, with their occasional failures and half-failures, that the horizon of broadcasting is widened, programme technique perfected, and fresh sources of enjoyment are discovered.

One thing has happened during the period under review which has caused particular interest and speculation—the removal of the ban upon the broadcasting of certain types of controversial matter. Theoretically, it is now possible to broadcast talks upon all controversial subjects, but great care must still be exercised in the choice and handling of such subjects. Though the formal restriction has been removed, a definite responsibility remains. Broadcasting goes direct into the homes of people of every shade of opinion, and it would be a misuse of such a privilege to allow it to be the vehicle of unchallenged partisan statements. It has been decided, therefore, that controversial subjects shall be presented in such a way that the opposing points of view are fairly stated. This may be done by a series of consecutive talks, or by a debate, or by an informal discussion among a group of people: but it will be for listeners themselves to form their own conclusions. The greatest care is taken to prevent listeners having conclusions thrust upon them.

Nothing has been said in this article about the outstanding programmes of the year—the Menin Gate broadcast, Schönberg's Gurrelieder, the broadcasts from Covent Garden, the Promenade Season, the series of Libretto Operas, the appearance of the greatest stars in the world of light entertainment, and so on—for each listener probably has his own catalogue of such events. "Peak" programmes do appear from time to time, but it is regarded as more important to try to raise the general level of programmes to the point where what would once have seemed to be a peak is accepted as normal.

The keynote of the year's work has undoubtedly been the insistence on continual experiment, both on the general lines indicated above and, more specifically, in such directions as the improvement of broadcast drama, the weeding out of material which may be good in itself but is unsuitable to broadcasting, and the most important question of microphone presentation. It is clear that there is a great future for broadcast plays, but they must be written specially for broadcasting, with a clear understanding of the problems involved, which are not at all the same as those with which the stage dramatist is concerned. Particular attention, again, is being paid to what have been called "feature programmes"—composite programmes in which the aid of music and the spoken word is asked to evoke a mood, or to present an idea. Such programmes call for a great deal of research, but such work is repaid by the interest which they arouse. Broadcasting is probably the only medium which could convey ideas by such means as these, and development along these lines may be expected to produce a number of good programmes with ever-widening possibilities as the technique of handling them becomes better understood.

In conclusion, it should be clearly understood that all the experiments to which reference has been made, and all those which are to come and which will be the only channels of progress towards the maturity of broadcasting, are directed not towards the intellectualising of broadcasting, but to the discovery of fresh means of entertaining, interesting and stimulating the vast public served by the B.B.C. It would be a disaster if broadcasting aimed at satisfying the enthusiasms of any limited class. It is a public service, and as such must jealously preserve its wide appeal.

*Sport and General*

"AND OLD DAMŒTAS LOVED TO HEAR OUR SONG"—MILTON

# EXTERNAL RELATIONS

THE year under review may be said to begin at the end of what Parliament, Press and the public alike regarded as the probationary period of the Corporation. The old B.B.C. had achieved a general, almost affectionate, popularity. Its early struggles, reverses, and successes had awakened the keenest interest, sympathy, and admiration in a vast constituency of listeners. It was not surprising, therefore, despite all assurances of effective continuity, that there was some apprehension of the effect of the change at the end of 1926. But the lapse of six months tended to reassure those who had misgivings, because it was then apparent that the promise of continuity had been implemented—that the service was being conducted on the old familiar lines.

There was still, however, a residuum of anxiety on the score of the possible progressive intervention of the State, leading as this might to the transformation of the B.B.C. into a "Government Department." Critics were on the alert for any sign of a change of attitude which would justify this suggestion.

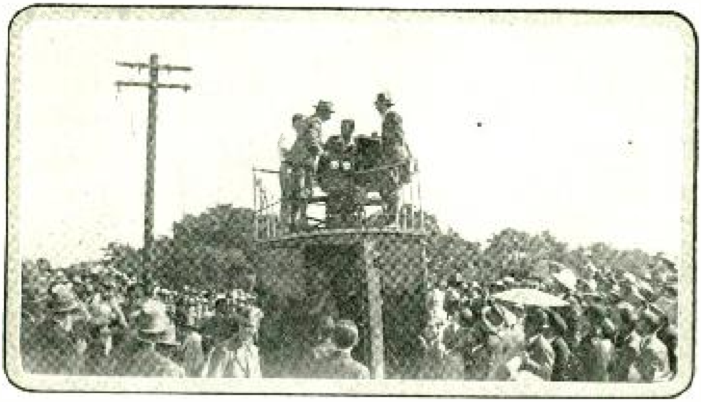
Discussion of the Regional Scheme as planned by the old B.B.C. had prepared public opinion for the first large-scale experiment in contrasted programmes. The advent of the Daventry Experimental Station (5GB) was warmly welcomed. Its early transmissions focussed more interest than any other development of the year. The necessity of substituting 5GB for the old Birmingham transmitter (5IT) caused temporary dislocation and inconvenience close to the Birmingham transmitter. But the retention of the station, staff and the studios at Birmingham made it possible to continue to draw upon the artistic resources of the Midlands. There was the further consideration that the programme service of 5GB was considerably broadened and enriched by the infusion of new London material. Then, of course, there was the novelty that throughout its service area 5GB provided a contrast to 5XX. Thus the early alarm of Birmingham and the west Midlands was soon appeased.

Apart from its reactions on opinion in Birmingham and the Midlands, the work of 5GB has had a marked influence in popularising and extending the listening habit. Through all points of contact with public opinion comes the same story of enthusiastic appreciation of 5GB.

In the autumn of 1927 public opinion was stirred by the possibilities of broadcasting to the Empire on short wavelengths. Enthusiastic reports were received of the reception in the East Indies of a Dutch short-wave station. The B.B.C. was the target of much hostile criticism because of its alleged lack of sympathy with proposals which would place British programmes at the disposal of the Dominions and Colonies. More than a year before this time the B.B.C. had decided, when funds were available and when the Postmaster-General permitted, to conduct experiments with short-wave transmission. Plans were complete, and the work was to be put in hand towards the end of 1927. The agitation against the B.B.C. disregarded these plans. No change was made in the policy that had been laid down. The experimental short-wave station (5SW) began its transmissions at Chelmsford in November, 1927, and has continued on five days a week since that time. Of the results which have been secured from the experiments so far, the most significant is that the factor of safety is still as inadequate as it was during the controversy of 1927. Technical limitations seem now to have impressed themselves upon public opinion, which is more disposed to accept the view that until some kind of guarantee of service is possible, it would be both improvident and unwise to attempt permanent relaying.

The position of the B.B.C. with regard to controversy afforded several opportunities of stimulating discussion. When, early in March, 1928, the Prime Minister announced the suspension of the "ban" on controversy, some of its more ardent advocates expected that public opinion would seek revolutionary changes both in the matter and presentation of talks. But general interest in broadcast controversy subsided as suddenly as it had arisen, thereby confirming the impression that it owed its origin partly at least to artificial stimulus. The gradual introduction of uncensored debates and discussions on subjects of acute current interest is now accepted as part of the normal programme service.

Hardly had the controversy campaign concluded when there began a determined and widespread attempt to arouse public opinion to insist upon sweeping changes in Sunday



THE B.B.C. VAN AT BISLEY
*The King's Prize-winner broadcasting*

programmes. It was alleged that the religious character of these Sunday programmes was unpopular, and that, on the lowest terms, an "entertainment" alternative should be made available. Careful examination of the problem provided no evidence of any substantial dissatisfaction with existing arrangements. On the contrary, the opinion was confirmed that the services and concerts on Sunday represented the most highly and widely appreciated part of the work of the B.B.C.

The year was marked by a gratifying improvement of external relations in Scotland, where the closer identification of the service with national and artistic aspirations was reflected in a new cordiality of the public and Press alike.

Preparatory to the introduction of the Regional Scheme, steps were taken to bring about an effective grouping of stations in the North of England, from Liverpool to Hull, with headquarters at Manchester. Here, as in Scotland, the new idea of "group consciousness" found congenial soil.

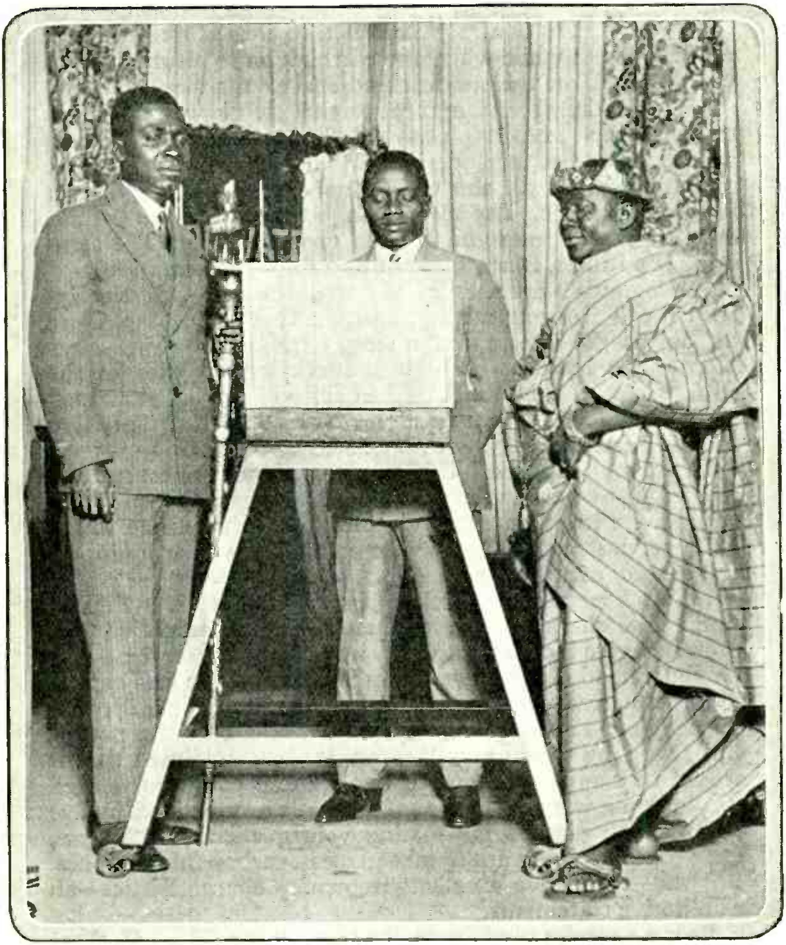
Opinion in Wales underwent a favourable change during the year. There was at the beginning considerable irritation because of the alleged neglect by the B.B.C. of the Welsh language, literature and music. A new series of all-Welsh programmes was introduced into the Daventry 5XX programmes for the benefit of those Welsh people outside the range of Cardiff and Swansea. This development, taken in conjunction with the effective co-operation of the B.B.C. in forming and sustaining the Welsh National Orchestra at Cardiff, has dissipated most of the prejudice formerly so prevalent in the principality.

Parliamentary interest in broadcasting has been confined to occasional questions on subjects such as the Regional Scheme, controversial broadcasting and heterodyne interference. The first Annual Report of the Corporation was presented to Parliament by the Postmaster-General in June.

In general review, the external relations of the B.B.C. during the past year show more decisive progress than in the previous year. The growth in the circulation of B.B.C. publications—particularly of *The Radio Times* and *World Radio*—signifies the strengthening of an already appreciable direct influence on public opinion. It can now be said, without danger of over-statement, that broadcasting is accepted as part of the normal efficient machinery of civilisation. Moreover, the impressive reception of the report of the Hadow Committee ("New Ventures in Broadcasting") has resulted in the recognition of the B.B.C. as an essential factor in all future schemes of national education.

While a survey of the public attitude towards the B.B.C. in previous years would have yielded perhaps as striking reports on the general warmth of appreciation, the past year is conspicuous in its attraction for the first time of the interest and commendation of the intellectual minority. It has been observed that one of the chief dangers ahead of the B.B.C. is its growing "respectability." Savoy Hill is fully alive to this menace—one which is akin to self-satisfaction, placidity and complaisance—enervating characteristics which have been successfully combated since the beginning.

Programme information is now published in more than 2,000 newspapers and periodicals in Great Britain and Ireland. Contact with the Press during the past year involved 30,000 communications of various kinds. These amicable arrangements are not only gratifying in themselves; they are also definitely productive of better programmes. In its outside contacts, the B.B.C. continues to develop its relations on the basis of partnership in public service.



A GOLD COAST POTENTATE IN THE LONDON STUDIO
*Sir Ofori Atta, K.B.E.*

C

# TECHNICAL PROGRESS

CLIMBING a mountain is a tedious affair and most worth while when one can sink on to a sun-warmed rock on the summit and survey the view, the way of the ascent, and triumphantly chew the cud of reminiscence. The first stage of the climb is easy, views quickly open up, reminders of tame valleys become fewer, and high above all the top shines out so clearly that it looks no distance. The second stage takes away the breath, eyes are riveted more on a path grown stonier. The third stage is pathless, steep, difficult and discouraging.

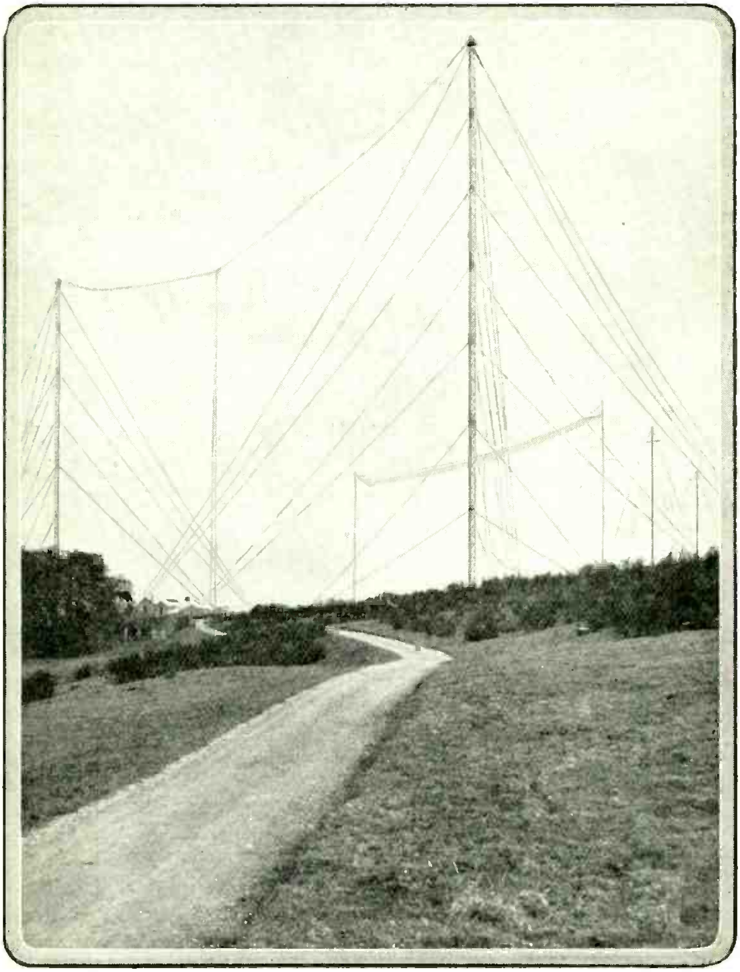
Analogously, progression towards the B.B.C.'s clearly-seen ideals in broadcasting is in the first stage easy, more difficult in the second, and a steep climb in the third.

The past year has been spent surveying the way for the stiffest part of the climb, and in spite of having remained stationary, feverish preparation gives hope that now, if a start is permitted, a way over is ready.

In the past, progress has been along obvious lines: stations erected just where the need for them was felt, control rooms equipped with elementary circuits to do the simple thing, etc., etc. But now a start has to be made all over again, on the basis of experience gained.

It has been found, for instance, that there is a limited number of channels for broadcasting; that alternative programmes give a chance of vastly improving the service; that cable (instead of overhead) lines are being built and can be used, with great gain in reliability of working, for S.B.; that service area is determined by fading, whatever the power, but that long waves give less fading than medium; that it would be a great economy if two stations could be worked on the same wave-length; that dramatic productions involve complicated circuits for mixing voices, effects, orchestras, etc.; that blasting is apt to take place in carbon microphones, but that these give excellent frequency characteristics—all qualitative statements.

Before progress obvious to the listener can be made, these qualitative statements must be investigated quantitatively and the amounts involved measured and assessed, so that a final scheme is based on scientific facts.



THE HILL OF MASTS—BOROUGH HILL, DAVENTRY

Progress this year is unseen by the public in any large sense, but the scientific foundations have been laid for so complete a reorganisation as largely to revolutionise the art.

It is a busy time for the Development and Research Sections, while the Maintenance side continue to keep the old system running in an unrivalled state of efficiency. It may be of interest to readers to have the above statement explained in more detail under definite headings.

### *MICROPHONES*

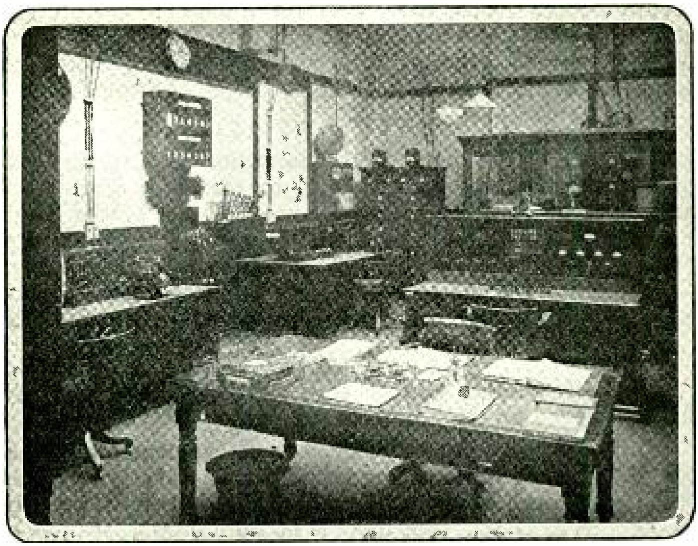
There are two types of microphone in use by the Corporation, electro-magnetic and carbon. Investigations in our laboratories show that the electro-magnetic type has an inferior frequency characteristic, but excellent freedom from background noise. The carbon type has a very good frequency characteristic, some background noise, and tends to limit or blast when the pressure of the air wave increases beyond a certain point. Investigations of other types of microphone are continuing.

### *STUDIOS*

During the year much progress has been made in equipping studios. Drapery has been done away with, and all new studios built are now treated by covering the walls with wall-paper backed by felt. The constants of studios, given shape, size and material, are, in some degree, calculable, thanks to continued research work. Synthetic echo devices make it now possible to obviate the dead effect of studios.

### *CONTROL ROOMS*

A complete new design of control room has been decided upon, wherein effects, echoes, background music, etc. can be mixed together and so balanced by a specially-trained operator, where studios and microphones can be switched on by remote control, where volume can be controlled by musicians sitting alone in a silence cabinet, where S.B. switching involves the least possible time, and, lastly, where, in general, the human element which may introduce error is eliminated, and where automatic action is largely responsible for the many permutations and combinations involved.



A GENERAL VIEW OF THE PRESENT LONDON CONTROL ROOM

*LAND-LINES*

Continual study is being made to improve the reliability of S.B. Owing to the severe storms that attack the overhead line system of Great Britain, no precautions can possibly eliminate all unreliability. Investigations are being made as to the best method of using the new cable lines that are being installed by the Post Office. It is hoped soon to use these where possible for permanent service.

The land-line network is being extended internationally, and during 1927–28, broadcasts radiated by our stations have been relayed by land-line from Ostend, Brussels, Liège, Cologne, and the Menin Gate.

*TRANSMITTERS*

Experimental Station 5 GB (frequency 610 kilocycles, power 30 kw., location Daventry) was put into service in August 1927. This station has given on the one hand much experience in the design and operation of a high-power medium-wave transmitter, and on the other a complete service of alternative programmes to listeners 100–150 miles from Daventry. The station is an experimental model on which to base the design of the new Regional Stations.

### *WAVE-LENGTH STABILITY*

In conforming to the agreed international plan, methods of operation have been adopted to maintain with great accuracy the stability of frequency of carrier waves of all British stations. Every station can be now held to an accuracy of frequency representing 1 part in 10,000, and the Daventry Experimental Station to 1 part in 20,000 from hour to hour and day to day. No tuning-fork or crystal drive is employed.

### *RESEARCH WORK*

Among other more simple investigations, research work has proceeded on the following subjects:

(1) *World broadcasting.*—A short-wave experimental transmitting station using 10 kw. power was started in the autumn of 1927. These transmissions have proved, as expected, that there is no minimum guarantee of service, but enable serious experimenters in various parts of the world to concentrate on the solution of the problems of equalising fading.

In co-operation with the Marconi Company, experiments are proceeding in this country to attempt to solve the problems of the fading of short-wave signals from distant telephony stations.

(2) *Studio acoustics.*—Quantitative measurements on studio acoustics and oscillograph records of the effects of transients have been taken.

(3) *Working of two stations on a single carrier wave frequency.*—This work is still proceeding, and, by some simple modifications of the method originally proposed, shows that much may be hoped for from a practical application of the method towards eliminating interference between broadcasting stations.

(4) *Attenuation constants of waves of frequencies between* 1500 *and* 500 *kilocycles.*—A laborious study is being made to determine the variation of service area with power, wave-length, type of country and aerial design.

# MUSIC

OF the 65,000 hours during which broadcasting was carried on in the past year, some 44,000 hours were allotted to music. It is no easy task to summarise in a few words the programmes of which these hours were made up, nor to give much idea of the work entailed in preparation, rehearsal and performance. Nor is it easy, where so wide a field of musical activity has been covered, to point to this or that programme as outstanding or specially important. It must suffice to indicate briefly the main divisions into which the programmes fall.

### *SYMPHONY CONCERTS*

The past year saw the first series of London Promenade Concerts under the auspices of the B.B.C. There was a time when it seemed very doubtful whether this old-established institution would be carried on, but with the co-operation of the B.B.C., a successful six weeks' season was given from August 13th to September 24th. Sixteen of the concerts were broadcast, and listeners had the opportunity of hearing the Queen's Hall Orchestra, conducted by Sir Henry Wood, playing such music as symphonies by Beethoven, Mozart, Haydn, Elgar, concertos and shorter works by Bach and many of the great masters to Wagner and a later day.

Abandoning the Albert Hall, the scene of the first series of National Concerts, these moved last winter to the Queen's Hall and the People's Palace, Mile End Road. In the former hall twelve concerts, and in the East End eight were given. Special interest was aroused by the performance in the Queen's Hall of Schönberg's "Gurrelieder" for the first time in this country, and with an English text. The composer came over specially to conduct, and devoted long and arduous days to rehearsal, and the performance was acclaimed on many hands as the musical event of the season. Other outstanding new works which were included in the series were the first performance in this country of Bloch's impressive "Israel" Symphony, and of the rather strangely conceived "Sinfonietta" by the veteran Janacek. Mention must be made of the performance of Beethoven's Ninth

Symphony under Sir Henry Wood, with the Royal Academy Choir.

The programmes at the People's Palace were inevitably on more popular lines, but even so the attendance was on the whole disappointing, and the hall proved not to be quite ideal for broadcasting.

### *OPERAS*

Studio performances of some thirty operas were given, of which twelve formed the series for which libretti were prepared and issued. These included a number of old and almost wholly forgotten works, the idea being to present as far as possible a chronological survey of opera. Particularly interesting were the revised version of Monteverdi's "Return of Ulysses," given for the first time in English, Handel's "Rodelinda," Méhul's "Joseph and his Brethren," and Gluck's impressive "Armide." An important work by a British composer, to his own libretto, was "Penelope," by Herbert Ferrers, on the same subject as the old Monteverdi work, but conceived on a larger scale, and with a more strictly classical outlook. Individual acts of opera were relayed on many occasions from the Royal Opera at Covent Garden. These mark a considerable advance in the broadcasting of big sound masses from a large and resonant auditorium; in many cases listeners expressed the view that the opera was heard as well by wireless as in the theatre itself.

### *NEW MUSIC*

Among new works of European importance which have been given in the course of studio concerts, mention must be made of Stravinsky's opera-oratorio "Œdipus Rex," under the composer's own direction, and of Kodaly's "Psalmus Hungaricus." Two studio concerts also were devoted to the works of Dame Ethel Smyth in celebration of her musical jubilee. Dame Ethel herself conducted the choral one.

In addition to what may be called "the standard symphony orchestra repertoire" (the best works of the great masters, old and modern), which is played at London and main provincial Stations in accordance with a definite scheme, the programmes have included many outstanding British works, such as McEwen's "Solway Symphony," Walford Davies' "Everyman" Overture, Bantock's "Old English Suite," Harty's "With the Wild Geese," and many works of Parry, Stanford, Elgar, German, Mackenzie, Vaughan Williams, and younger composers. Among the conductors and visiting artists have been Sir Edward Elgar, Sir Henry Wood, Sechiari, Stravinsky, Turina, von Zemlinsky, Oskar Fried, Bela Bartok, Schneevoigt, Scherchen and Kodaly.

A large share of the programmes has been in the hands of the Wireless Military Band, an organisation formed of a number of leading London instrumentalists, under the direction of B. Walton O'Donnell. Realising the inadequacy of the existing repertoire for Military Band, the B.B.C. has commissioned new works for that combination from Gustav Holst and Granville Bantock, and hopes to enlist the energies of other well-known composers in the same direction. Arrangements of existing music are also being made by musicians specially chosen for their skill and knowledge.

## *CHAMBER MUSIC*

Chamber Music was planned so as to cover the ground in a representative way under three categories:—

(1) Classical and Romantic works.
(2) Contemporary composers.
(3) English Chamber Music.

All three categories were as fully represented as available time permitted. All the seventeen String Quartets of Beethoven, for instance, as well as some thirty other Chamber Music works of his, were included. In the British section over fifty works, by more than twenty composers, were given.

Although in the foregoing lines emphasis has been laid rather on the serious side of broadcast music, this brief article cannot be closed without reference to the almost daily programmes of lighter music—orchestral, military band, ballad and instrumental—all of which entails much care and labour in its preparation and presentation. In these also a large share has been borne by native composers and artists, many of whom may be said to have been discovered by the B.B.C.

# DRAMA

AT the moment, thousands of those who give a prominent place to drama as one of the arts which offer a wide and satisfying field for artistic expression deplore that no means have yet been found to establish a national theatre.

The commercial theatre, as at present constituted, must of necessity present only those works which cater for the *average* theatre-goer. The majority of these supporters are those who seek to be *entertained*—to obtain a relaxation which relieves the tension of the day's labours. The serious seeker after drama of a high order is seldom offered the opportunity of hearing those plays which may be justly called outstanding contributions to a great art.

The plays presented on the stage of to-day must be first and foremost " a commercial proposition." The art of the genius who is impelled from within to work "for art's sake" is rarely of a kind which will cause a board of directors of a theatre to back it financially to the tune of some thousands of pounds: it is only for the few, who are themselves almost artists in sensibility and appreciation, if not in execution. At the present stage of dramatic evolution the greatest dramatic creations belong to a "no-man's land" as far as theatrical presentation is concerned. It should be remembered, however, that to-day's student of the drama is likely to be the average play-goer of to-morrow.

Where, then, is he to receive his initiation? How can he hear those dramatic works which bid for classical permanence, while all the available play-houses are concerned only with "commercial propositions"? Of course he may read them. But plays are written to be spoken, and must be well spoken if the interpretation, characterisation, climax, preservation of unities are to receive their due. It is hardly to be expected that the untrained reader of the printed page will invest a play with the life and force with which the author conceived his work.

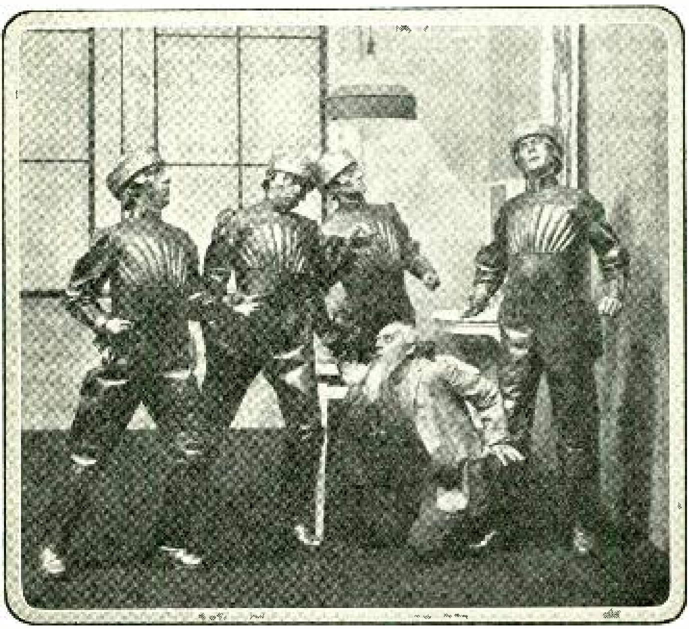
Even a national theatre could satisfy but a mere handful of the people.

Wireless transmission of plays offers a bridge over the gulf. It has the means of spanning the unprofitable dramatic ground which lies between the commercial and the artistic; between the business theatre of to-day and the national theatre of to-morrow.

Many plays have been written for which hearing, not seeing, is the essential part. The Greek drama did not rely upon painted scenery or complicated lighting for its effects. Simplicity was the key-note of presentation, and dramatic effect was gained chiefly by the masterly manipulation of words.

Nearer our own time, it is doubtful if Tennyson, Browning or Shelley envisaged their plays as stage productions, but they certainly did not write them for silent reading alone.

Broadcasting, not being swayed by narrow financial considerations, may let a million serious listeners hear



*Stage Photo*

A SCENE FROM "R.U.R."

*Karel Kapek's play, broadcast in November 1927*

Strindberg, Ibsen, Euripides, Shakespeare, Sheridan, spoken by the most accomplished players (from the vocal point of view), and yet not be haunted by the awful possibility of being forced to close its doors because the play has not drawn the public. It may be impossible to gather audiences for such plays under one roof; but wireless delivers the play to the home of the listeners who wish to hear it. At the same time it would not be desirable or politic that all plays by radio should be of this classic character.

Amongst the dramatic works of the highest quality presented during the past year has been a selection from the Shakespeare plays, which included "Macbeth," "A Midsummer Night's Dream," "The Taming of the Shrew," "Twelfth Night," "As You Like It," "King Henry V.," "The Merchant of Venice," "Julius Cæsar," "King John" and "King Richard the Second." In order that the interpretations should be of the highest order, well-known Shakespearean players were chosen for the important parts. Lady Forbes-Robertson, Phyllis Neilson-Terry, Robert Atkins (whose work for the Old Vic will be long remembered), Nancy Price, Harcourt Williams, Fay Compton, Mabel Terry Lewis, Dame May Whitty, John Gielgud, and many other well-known players were included.

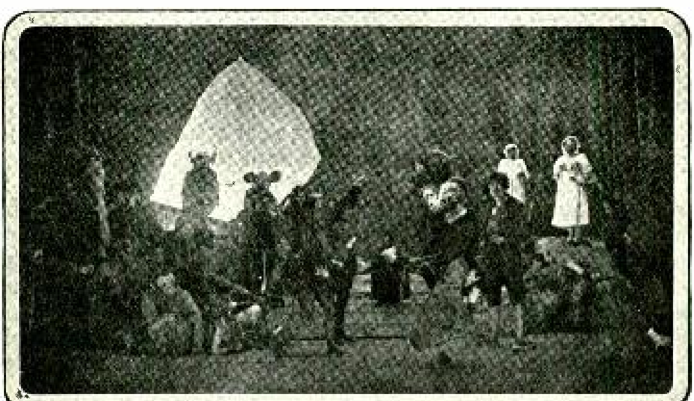
Norway and Sweden, countries rich in dramatic literature, were represented by productions of "Pariah" by Strindberg, "Peer Gynt" and "The Master Builder" by Ibsen. The mystic spirit of Ireland was caught in the productions of "Land of Heart's Desire" (Yeats), and "Riders to the Sea" (Synge), while the comedy of the "sorrowful counthry" was exemplified by "The Playboy of the Western World" (Synge), and "The Tinker's Wedding" (Synge).

An excellent example of construction and handling of comedy situations was Henry Arthur Jones' "The Liars."

Drama by modern British writers provided a large portion of the year's dramatic programme. "Abraham Lincoln," "Oliver Cromwell" and "Mary Stuart" were by John Drinkwater. The polished wit and brilliant dialogue of Oscar Wilde proved well suited for wireless transmission, the productions being "Lady Windermere's Fan" and "The Importance of Being Earnest." Equally suitable to the microphone, but in an entirely different way, the mystic quality of "The

Wandering Jew," by Temple Thurston, was excellently conveyed by Mr. Matheson Lang, who also took his original part in the popular broadcast of "Mr. Wu." The drama fantasy as created by Maurice Maeterlinck in "The Blue Bird" and Granville Barker in "Prunella" stimulated considerable correspondence. Other stage plays of a popular nature were "The Butterfly on the Wheel," "Hobson's Choice," "Tilly of Bloomsbury" and "The Way of an Eagle."

Mr. Cecil Lewis presented an adaptation of Karel Kapek's Robot play, "R.U.R.," and also surmounted the very difficult task of making a story-play for wireless transmission of Joseph Conrad's novel "Lord Jim." One of the greatest difficulties in the development of radio drama is the procuring of original work or specially prepared adaptations of existing plays or novels which are suited to the requirements of the new medium. At the moment it is only those who have been closely connected with microphone work who can adequately gauge what is required. Mr. Cecil Lewis, during the early stages of the Corporation's activities, became extremely familiar with the microphone and its demands. The above productions, together with "The Night-fighters"



PEER GYNT IN THE HOME OF THE MOUNTAIN TROLLS

*A scene from the play broadcast in March 1928 in celebration of the Ibsen centenary* and "Pursuit," have made his contributions to the new art of considerable value.

Amongst other writers who have made original contributions are L. du Garde Peach (many listeners will remember the daintiness of "Pixie Led" and his amusing short sketches), "Charles Croker," who contributed the play "Speed," Mabel Constanduros, and Michael Hogan, whose play "The Survivor" made yet another successful broadcast.

Two specially adapted German plays were also presented—"Rampa," translated and adapted by Cecil Lewis, and the outstanding play monologue by Herman Kesser entitled "Nurse Henrietta." This last was an experiment along entirely different lines from any of those hitherto followed. The nearest approach to the type was the very short play "Shadows" by Valerie Harwood. This play had only one character but it was the portrayal of an actual scene. "Nurse Henrietta" was a play with one character and no scene: the whole of the action of the play—which was abridged for wireless transmission to an hour and a quarter—took place only in the mind of the character. It was purely psychological drama, offering what may be a new line of development. "Nurse Henrietta," as played by Lilian Harrison, at no time failed to convey the introspective quality necessary for the interpretation of thought as apart from speech.

This year has been marked by yet another event of importance to the drama, inasmuch as G. B. Shaw gave permission for the broadcast of his play "The Man of Destiny," and it is hoped that in the coming year it may be possible to present other examples of this brilliant playwright's work.

With the ever-growing interest in radio drama which is being exhibited by listeners all over the country; with the additional experience and knowledge gained during every production; with the increased ability of artists to forget the theatre and its artificialities and realise the greater finesse along the lines of reality in expression which the microphone demands; with the increased ability of listeners to create their own atmosphere from the spoken word; there is a definite prospect of this new form of dramatic art settling itself on a firm basis of acceptability to the listening public, if indeed it has not already achieved this.

# EDUCATION

PROBABLY when the history of Educational Broadcasting comes to be written it will be found that the year 1928 is of the first importance. It was in 1924 that the B.B.C. first devoted itself seriously to the task of discovering what contribution it could make to education. The intervening years have been largely a time of exploration and experiment in all fields. During 1928, the experimental period may be said to have closed definitely with two verdicts, both favourable, one relating to Adult Education and the other to School Broadcasting. The two documents containing these verdicts are reviewed elsewhere in this Handbook.* It will be obvious that the time and attention of the Education Department of the B.B.C. have been mainly devoted to contributing its share to the two investigations conducted respectively by the Joint Committee under the chairmanship of Sir Henry Hadow for Adult Education, and for the schools experiment, by the county of Kent. These have naturally involved long sittings in committee, visits of exploration to the schools, demonstrations in provincial areas, and an enormous amount of spade-work by the staff at Savoy Hill and the Schools Advisory Engineers. There are now twelve of the latter, who spend as a rule two or three months in a particular area, paying daily visits of investigation to schools and other places which have asked for advice and help towards securing better reception, which is the first essential of successful educational broadcasting.

Important provincial conferences have taken place at Maidstone, Manchester, Liverpool, Leeds, Glasgow, Barnstaple, Grantham, and Southampton. Some of these have been mainly concerned with schools, and some with adults. Wherever the Director of Education has spoken he has been at pains to point out that the two branches cannot be separated, either in theory or in fact. In theory education is one problem, and in fact a set installed in a school, even in the remotest parts of the country, ought to be available in the evening for purposes of group reception by evening classes or special adult education groups. There are some who hold that the value of broadcasting in schools is

* See pp. 43 and 112.

doubtful, whilst they admit the importance of the contribution it can make to adult education. There are others who hold the contrary opinion. It is the task of the Education Department of the B.B.C. to maintain the essential unity of the two branches. It is not only at the listening end that the twofold problem has to be considered as one, but the same unity is felt as regards the studio. To begin with, faultless reception is a first postulate with both, and the problems of devising and recommending the best circuit for the production of clear speech and the living tones of the human voice are the same in both cases. It is essential for the B.B.C. to devote all its technical talents to encouraging the production of the cheapest possible set for these purposes.

Although there may be differences in method, according to the age of the audience, yet on the whole Adult Education may well apply to itself the lessons derived from School Broadcasting. For example, it is probably as true of Adult Education as of Juvenile that the lecturer must not merely read a manuscript or speak in the tones of the platform lecturer. He must address himself to a clearly imagined audience, and seek to secure active response whenever possible. Otherwise there is no valid answer to the questions, "Why not read it in a book? Why not turn on a gramophone record?" The speaker must in both cases convey the impression of a living personality.

Two lecturers stand out as exemplifying these principles. Both Monsieur Stéphan and Sir Walford Davies may be described as "standing dishes," both for juveniles and for adults. Both have an enormous following. They do not substantially alter their methods whether speaking in the afternoon to boys and girls or in the evening to adults.

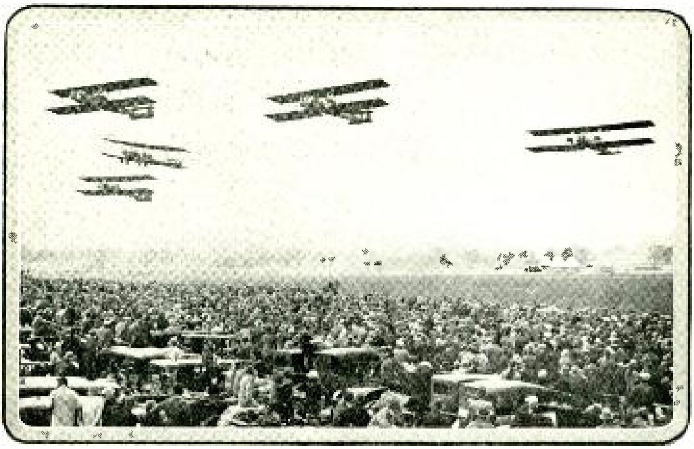
It was in the Schools Section that the B.B.C. first learned the essential importance of issuing follow-up pamphlets, to contain the notes, maps, diagrams, illustrations, book-lists, and so on, which cannot be given orally without great waste of time and repetition. The Adult Section has followed suit. At the time of writing (June 1928), the B.B.C. has already issued more than half a million pamphlets.

One of the most important and interesting occasions since the last Handbook was written has been the Imperial Conference on Education held in July 1927. The B.B.C. was afforded the opportunity of a whole afternoon for a discussion of the value of educational broadcasting. The Director-General expounded the theory and practice of the B.B.C. in a speech which the Board of Education later printed and circulated to all the Dominions representatives. Sir Walford Davies and Monsieur Stéphan then gave demonstrations of their method, which were transmitted with admirable clearness to the conference room at Whitehall. In the discussions which followed several of the Dominions representatives expressed themselves as strongly impressed, and even surprised, by the pitch of excellence which had been attained in this country, some of them having made previous experiments with much less effective results. Several of the Dominion broadcasting stations appear to have copied the example of London, but it is too early to say how much success has attended the experiment. Foreign broadcasting stations have also devoted considerable attention to the British example, and there are few foreign stations which do not now devote a good deal of their time to educational broadcasting, although even now it is doubtful whether any country is in such direct wireless touch with so many of its schools as is Great Britain.

The development of Adult Education groups is one of the striking features of 1928. During last winter experiments in the running of wireless discussion groups were undertaken at about sixty different centres in England. Some of the evidence received in reports from these centres is unexpectedly encouraging. This topic is dealt with on p. 226.

A special sub-section has been formed in the Education Department to deal with the needs of the adolescent. The juvenile organisations, such as Boy Scouts, Girl Guides, Boys' Clubs, etc., have met with enthusiasm the suggestion that special talks should be devoted to their interests, dealing, for example, with hobbies and pastimes dear to the heart of youth. Some successful experiments have been made in this direction during the holiday interval, when the Adult Education classes were in abeyance. The demand is easier to perceive than the method of supplying the need, until alternative wave-lengths give more room for alternative programmes.

Until this development has taken place the B.B.C. has not felt justified in extending the hours devoted to talk, except



THE R.A.F. PAGEANT AT HENDON

*a description of which was broadcast on June 30th, 1928*

that a period of half an hour on Tuesday nights, at 8 p.m., on the Daventry Station is given to an Adult Education talk. The talks given at this time have received a very high measure of appreciation, and there has not been as much opposition from exclusive entertainment lovers as was anticipated. Also experimentally on one or two occasions there have been longer talks, lasting up to an hour, by specially eminent authorities at a late hour on the evening programme.

## THE LISTENER'S AERIAL

Legal questions occasionally arise as between a tenant and a landlord, or a listener and his neighbour, from the desire to install an aerial. Advice on the whole question is given in a pamphlet, under the above title, issued by the B.B.C. *free* on application to

The B.B.C. Bookshop,
Savoy Hill,
London, W.C. 2.

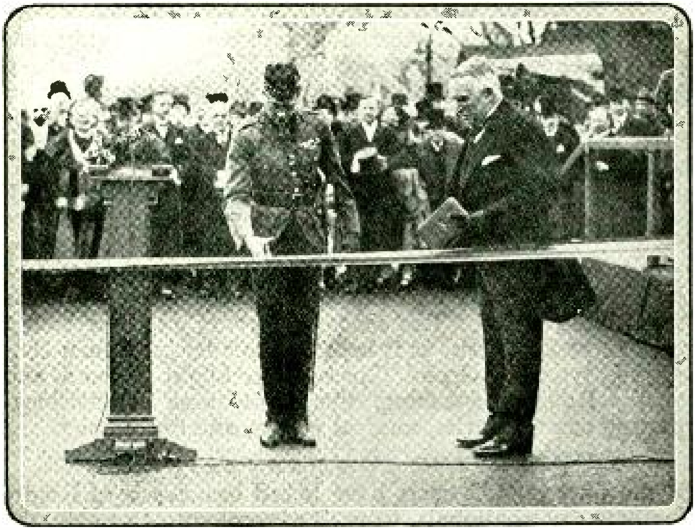
# OUTSIDE BROADCASTS

OUTSIDE broadcasts fall into two main categories. There are, on the one hand, the concerts arranged by the B.B.C. and presented in outside halls, where unrestricted space and the presence of an audience make possible the performance of more important musical works than could be undertaken even in the largest studio; and, on the other hand, events of public interest which broadcasting is able to bring into the homes of many who are unable to attend in person. Of the former it is only necessary to mention the series of concerts from the Queen's Hall and the People's Palace, and the Chamber Concerts from the Arts Theatre Club. The second category requires rather more careful analysis, as it includes broadcasts of such contrasting types as Grand Opera, Searchlight Tattoos and boxing. Roughly speaking, there are three subdivisions: sporting commentaries, musical events, and ceremonies.

### *SPORTING COMMENTARIES*

In the past year listeners have heard broadcasts of Rugby Football Internationals from Twickenham, through the courtesy of the English Rugby Union; Association matches from Highbury and elsewhere, including the various rounds of the F.A. Cup; athletics from Oxford, Cambridge, Stamford Bridge and Queen's Club; the Boat Race; racing from Aintree, Epsom and Doncaster; tennis from Wimbledon; and the Baldock–Smith fight at the Albert Hall.

Each of these has presented its own peculiar problems, and on the ease with which these have been overcome has depended the success of the broadcast. Twickenham, for instance, is a far less difficult problem than the Boat Race. In the former case it is possible to approximate very nearly towards actual studio conditions, inasmuch as a special permanent stand has been erected at one corner of the ground sufficiently large to contain a portable hut from which the commentators can give their description in comfort. Broadcasting from the bows of a rapidly moving launch is far less of a sinecure. Apart from the actual discomfort, the situation is complicated by the fact that there is no means of communication between the engineers on the launch and the Control Room at Savoy Hill.



THE PRINCE OF WALES OPENS THE ROYAL TWEED BRIDGE
*A description was broadcast on May 16th, 1928*

Of the other running commentaries broadcast during the year, the Cup Tie Final from Wembley in April, apart altogether from the public interest in Mr. Allison's description of the match, was distinguished by the exceptional vividness of the hymn "Abide with me," sung by an audience of 90,000 to the accompaniment of massed bands.

*MUSICAL EVENTS*

Musical events broadcast during the last year have been widely different in character. There have been excerpts from the Covent Garden Operas during each week of the season, popular concerts from the Kingsway Hall, Municipal Orchestras from the White Rock Pavilion, Hastings, Devonshire Park, Eastbourne, and the Leas Cliff Hall, Folkestone, Military Bands conducted by the O'Donnell brothers from Portsmouth Guildhall, and Salvation Army Massed Bands from the Congress Hall, Clapton. In each of these places the acoustic conditions were found to be extremely suitable;

the broadcast from the Congress Hall, Clapton, being noticeable for its quality. On Empire Day, Dame Clara Butt and Community Singing was broadcast from Hyde Park.

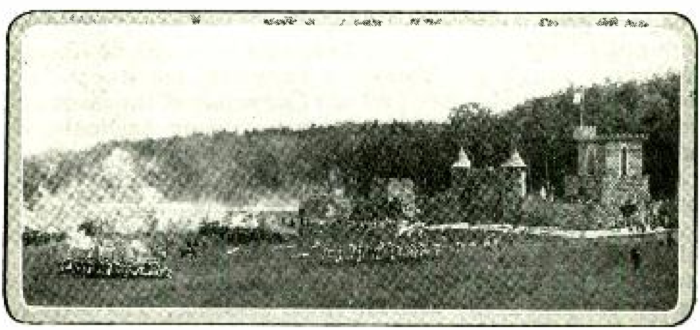
Albert Sandler has come to London, and listeners are now able to hear his Sunday concerts from the Park Lane Hotel. His departure from Eastbourne seems to have coincided with the disappearance of the "bravo," so well known to listeners, which used to lead the applause at every Eastbourne broadcast. In place of Sandler, Tom Jones, well known in Birmingham, is heard in the wonderful acoustic atmosphere of the Grand Hotel, Eastbourne.

Two continental Outside Broadcasts have been carried out during the year: one, of the La Legia Choir from a hall in Liège, and the other the Service from Menin Gate, Ypres.

Music of another kind, the song of the nightingale, was broadcast again this summer from "somewhere in Berkshire." "Somewhere" is said advisedly. In 1927 the background of motor horns and gear grinding which attended Miss Beatrice Harrison's and the B.B.C.'s efforts to capture the elusive atmosphere of nightingales in their own haunts, was directly due to the locality becoming known.

### *CEREMONIALS*

Ceremonials and displays, especially when accompanied by music, make extremely effective broadcasts. Of these the



*Sport and General*

THE ALDERSHOT TATTOO

*The storming of Badajoz*

*Topical*

GOD PRESERVE KING GEORGE!
*The nightly Ceremony of the Keys at the Tower of London*

Searchlight Tattoo at Aldershot, probably the most impressive spectacle the country has to offer, has this year been broadcast from Rushmoor Arena, after a two years' absence from our programmes. There have also been the Southern Command Searchlight Tattoo at Tidworth, the Royal Air Force Display at Hendon, and the Ceremony of the Keys at the Tower of London, the last named being particularly successful.

A fitting termination to this brief description of the year's activities can be made with a reference to the Armistice Day Service at the Cenotaph. A very great number of listeners will have been relieved to hear that the Home Office has authorised the broadcast next November, and that it will be carried out practically without visual evidence. The British Legion Service on May 27th was broadcast under similar conditions, and the results would seem to augur well for the transmission on Armistice Day.

# SCOTLAND

MUCH has been said and written of the effect which broadcasting is having in raising standards of taste and standardising English pronunciation. In equalising opportunities for all countries, classes, and conditions of men of hearing the best of culture and entertainment, surely broadcasting can at the same time foster local divergencies, keep alive the memory of historical associations and import into its programmes the colour derived from romantic ceremonies and dialect survivals. In this service the Scottish Stations have played their part.

### *FOSTERING NATIONAL INTEREST*

Throughout this year the fortnightly series of Scots Concerts has been continued, arranged by each of the Scottish Stations in turn and broadcast also by the other three. Among the more successful of this series may be mentioned a second "Sandy Soutar" programme from Dundee, a Highland "Ceilidh" programme from Edinburgh and a "Tinkers'" programme from Aberdeen. Few new Scottish dramatists have come to light in the period under review, but the two most interesting play transmissions of the year have been a performance of Shakespeare's "Macbeth" by a Scottish caste, which was relayed to all Stations, and a broadcast version of "Clyde Built," a powerful play by George Blake, the editor of a popular weekly, and one of the foremost of the younger Scottish writers of to-day. In addition to those transmissions, Glasgow Station also broadcast, for the first time in Scotland, the Hebridean Opera, "The Seal Woman," by Granville Bantock and Mrs. Kennedy-Fraser.

Works by living Scots composers have found their place in many of the evening programmes throughout the year, and, in addition, a special series of song recitals was arranged for some of them, to make their work more widely known. A similar series was arranged to give Scots listeners the chance of hearing some of the better-known Scots poets reading their own works. The Scottish Humour features have been revived for a second series during the year, and when they have concluded, arrangements are being made to follow them on with readings by living Scots writers of short stories.

## *THE VERNACULAR*

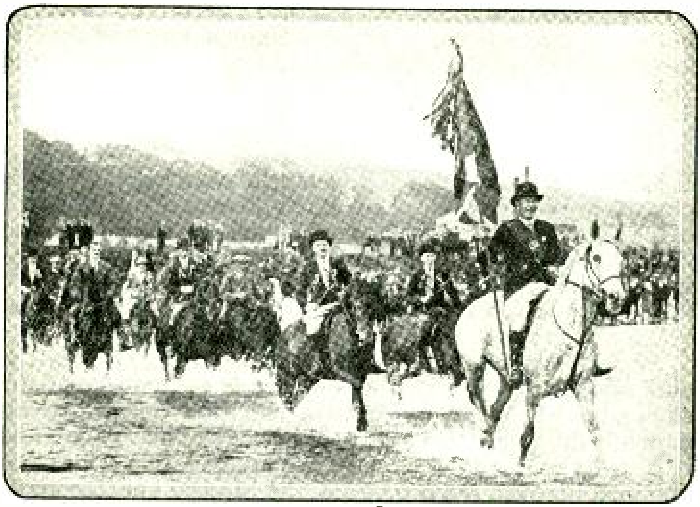
Following the talks on the Doric given last year by Neil Munro, Anna Buchan and others, four further provocative contributions have been broadcast on this thorny topic: by Lewis Spence, Marion Angus, C. M. Grieve and Thomas Henderson; and Rosslyn Mitchell's delightful Sunday evening discourse on "Scotland—a Singing Folk" must have been appreciated by those listeners who look to wireless to foster the highest aspirations of their country.

North, South, East and West further contributed to a group of talks in the Vernacular entitled "Frae a' the Airts."

## *NATIONAL SERVICE*

In order to foster interest in the activities of the Society for the Preservation of Rural Scotland, the Scottish Zoological Park, and the National Savings Committee, arrangements were made during the year for special broadcasts by Lord Constable, Sir Ian Colquhoun, the Earl of Haddington, Lord Salvesen and Sir Alexander Kemp Wright. Most important national charities and organisations for young people have been allotted regular programme times, and it may be interesting to those who still accept the traditional view of Scottish parsimony to learn that the response to one of the twelve national broadcast appeals, that given by Sir Donald MacAlister on behalf of the colony for the mentally defective at Larbert, totalled over £1,200. The problems of health and housing in Highlands and Lowlands and of slum clearance have been dealt with in three special talks by Major Walter Elliot, M.P., Sir Leslie Mackenzie, and Dr. MacGregor, the Medical Officer of Health for Glasgow.

In addition to the services broadcast locally and nationally from church and studio, the historic development of the Church in Scotland, its contribution to education, rural and urban development, and its more interesting present-day activities among boys, migrants and fisherfolk, have been described on alternate Sunday afternoons throughout part of the year. Well-known choirs have also come to the studio on Sunday evenings and broadcast recitals of the hymns in the New Hymnary now in use in the Presbyterian churches.



*By courtesy of the "Southern Reporter"*

THE SELKIRK COMMON RIDING CEREMONY

*The standard-bearer crosses a river during his ride round the Marches*

### *GAELIC*

The Gaelic Half-hour broadcasts arranged from Aberdeen Station every fortnight have this year been supplemented by a scheme to bring before the microphone the best-known Gaelic choirs in Scotland. At the inaugural concert, which was given by the Oban choir, the Lady Elspeth Campbell of Argyll presided. Again, as in past years, a special Gaelic service was broadcast from King's College Chapel, Aberdeen, the preacher being the Moderator of the Church of Scotland.

### *THE MICROPHONE TOURS SCOTLAND*

Perhaps the sense of thrill and mystery has now begun to lift from happenings in the studios and listeners have a keener interest in those transmissions which are in effect eaves-dropping upon activities in the outside world. Acting on this belief, the B.B.C. has followed up visits to Inverness and Ayr by broadcasts from Arbroath, Anstruther, Buckie, Banchory, Stirling, Perth, Dunfermline, Galashiels, Peebles and Selkirk; in the last case relaying a running commentary and concert in connection with the Common Riding celebration on the Borders.

### *INSTITUTES AND FESTIVALS*

It is two years now since B.B.C. officials carried out a series of visits to Women's Rural Institutes all over Scotland to tell of the potential influence of broadcasting in national life, and there is to-day among the membership of that great organisation a growing interest in wireless. To meet this six afternoon talks were broadcast by Rosaline Masson and others on Women's Part in Scottish Village Life.

While there still continues a stream of aspirants to the auditions arranged for those who wish to perform in the studio, there is in the co-operation with the Musical Festivals a useful additional source for the discovery of new talent, and it is to be hoped that the effective co-operation which has obtained between the B.B.C. and the Musical and Dramatic Festivals has been of real mutual benefit.

### *EDUCATION*

Geographical conditions and their effect upon reception have hitherto severely limited the development and extension of the use of wireless in Scottish schools, but it is possible to report a steadily increasing interest in this side of broadcasting. The issue of a separate syllabus for Scottish educational transmissions and a series of visits of inspection have acted as a stimulus to experiment, while the interest shown by the Training Colleges and the Educational Institute gives promise of more rapid progress at an early date.

In adult education, following on the Conference at Edinburgh organised jointly by the B.B.C. and the British Institute of Adult Education, listening groups have sprung up in various parts of the country and serious consideration is being paid by all the more important educational organisations to the potential contribution of wireless. Scotland has always prided herself on her advanced educational facilities, and if she has been lagging in this matter up till now, she is likely to make up for lost time.

# NORTHERN IRELAND

FOR the last six years Ireland has been partitioned, the Northern territory, comprising the six counties of Antrim, Down, Armagh, Londonderry, Tyrone and Fermanagh, being governed from Belfast.

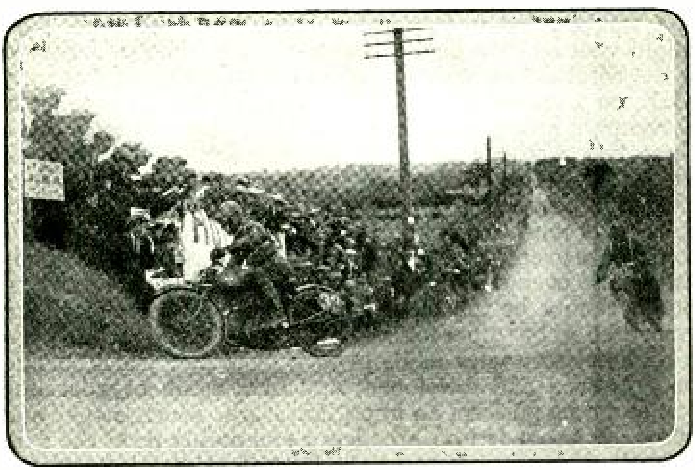
The Government of Northern Ireland evidently believed that one of the most efficient ways of fostering the imperial link was through broadcasting. Northern Ireland was fortunate in being the only British Dominion (with the exception of the Irish Free State) sufficiently near to the Mother Country to be able to share the latter's broadcasting service. When the B.B.C. was invited to establish an outpost in Northern Ireland it readily agreed to do so, and in August 1924 opened a station in Belfast. For four years the six Northern counties have been able to take part in the best of the London programmes.

The reader may find it a little difficult to understand how Belfast, with its peculiar geographical position, can be brought into the B.B.C.'s scheme. It so happens that there are two available links between Belfast and London. The first link is a combination of submarine cables and land lines. This might well be described as the telephonic link. The second is the wireless link which involves the reception of Daventry 5XX on a special receiving set and the re-broadcasting of Daventry's programme from the Belfast transmitter. Whilst these two methods are often interchangeable, the wireless link is more frequently used in the daytime, and the telephonic link at night. The result is that Northern Ireland, in spite of its comparatively remote position on the map, is able to listen to events on the other side of the water as effectively as if those events were taking place within its own borders: but it cannot be too clearly emphasised that the Northern Irish Station has other functions than this. Every country has a national character of its own, a character which should be preserved and developed, and here again broadcasting can and does perform an important work. Much money and effort are expended on broadcasts emanating from the Province itself, and more especially from the B.B.C.'s Studios.

The past year has been one of exceptional development. It had been obvious for some time that the studio and office accommodation in Belfast was inadequate to the growing needs of the Service. To meet these inadequacies the premises have recently been trebled in size. Spacious and comfortable accommodation has been provided for the staff, and, more important still, two new and up-to-date studios have been constructed. The larger of these two studios is probably one of the finest in the British Isles. Its cubic capacity is more than double that of the old studio, and acoustically it leaves little to be desired. A new studio first began to be used for broadcasting at the beginning of March 1928, and the improvement in transmission resulting from the change was very apparent from the first. Development work at 31, Linenhall Street is by no means finished, and many other improvements are to follow in the near future.

### *MUSICAL ACTIVITIES*

The Belfast Station employs a permanent orchestra, comprising thirty musicians of high standing in the musical world. Ireland has never before possessed a permanent

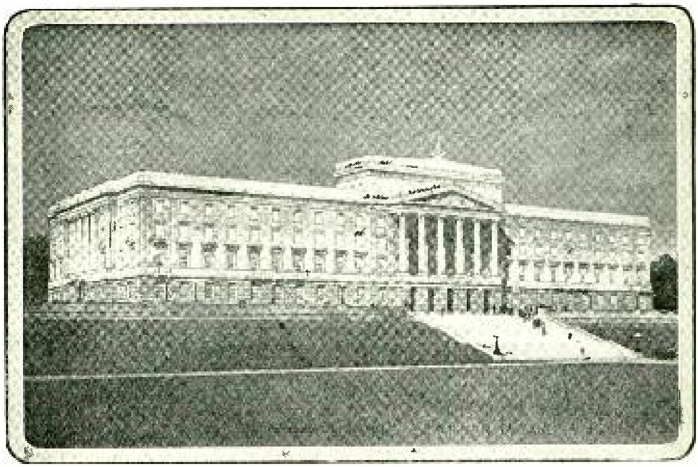


THE ULSTER MOTOR CYCLE T.T. RACES
*on which a commentary was broadcast by the Belfast Station*

orchestra of this calibre. It is an incalculable asset, not only to the broadcasting service, but also to the community at large, because its presence in Belfast makes it possible to give public orchestral concerts of a standard hitherto impracticable. For many years past the musical life of Northern Ireland has centred round the Belfast and Londonderry Philharmonic Societies, and of recent years the B.B.C. and these societies have co-operated, to their mutual advantage. For geographical reasons, contact with the Belfast society has been the easier of the two, but it is hoped that with the advent of the Regional Scheme Derry will become more closely associated with the service. During last winter all the concerts promoted by the Belfast Philharmonic Society were broadcast, and they were received with satisfaction by Irish listeners. Nor has the B.B.C. been backward in providing public concerts of its own, of which the two biggest were given on September 30th, 1927, and February 14th, 1928. On both these occasions the famous conductor, Sir Henry Wood, was brought to Belfast to conduct an orchestra of eighty musicians. Concerts have also been given in several of the larger Belfast schools for the benefit of the pupils, and a special concert was given in July 1928 for the Irish Summer School of Music. A suggestion has recently been put forward that occasional concerts might be given in public for the pupils at elementary and secondary schools. This scheme will necessitate the full co-operation of the Education authorities, and is being explored at the present moment.

## *TOPICAL EVENTS*

Broadcasting has in Northern Ireland made considerable headway as a transmitter of current and topical events. A complete list of the events broadcast during the past year would be outside the scope of this article, but a few of the more important ones may be mentioned. In September 1927 a running commentary was made on the Ulster Motor Cycle Tourist Trophy Races. No event of the kind had ever before been transmitted in Great Britain, and the broadcast was a marked success. A similar broadcast is under contemplation for the International Motor Car Races in August 1928, the latter event being one of the greatest importance



THE NEW ULSTER HOUSES OF PARLIAMENT
*of which the Foundation Stone was laid on May 19th, 1928*

in the motoring world. On May 19th, 1928, the foundation stone of the new Ulster Houses of Parliament was laid by His Grace the Duke of Abercorn (Governor of Northern Ireland). The ceremony was performed in the presence of a vast crowd, and historic speeches were delivered by prominent men, including the Prime Minister of Northern Ireland, the Imperial Home Secretary, and Viscount Peel.

Ulster drama and Ulster humour find places in the programmes. The very existence of broadcasting has stimulated the writers of dialect drama, and many interesting plays written specially for broadcasting by Irish writers have been produced in the Belfast studio.

The Government of Northern Ireland, although it exercises no direct control over the Irish Station, enjoys its co-operation in all matters outside party politics. Similar facilities are placed at the disposal of the various municipalities within the Province. Deserving charities are in no sense neglected, and, in short, the station may be said to serve the interests of all the important social organisations within the State.

# WALES AND THE WEST OF ENGLAND

## *WALES*

THE key to the situation in South Wales from a human standpoint is the mining village. To stand on the heights above the gash in a beautiful valley and look on the village straggling up the side of the opposite slope, to watch the lights come out in the evening all along the valley, is an eerie experience. For the great shafts of the mines rise in stark contrast to the peaceful country beyond; they come up so sharply against the sky and the hills that they strike the eye more than the shafts of chimneys in factory towns. Nature has been gashed to wrest from her bosom the coal which is so great a problem to our statesmen. In these surroundings men, women, and children live, love, and die.

At a meeting in one of these valleys a B.B.C. official felt, coming in from the outside, that he would have the sensation of being imprisoned, isolated, cut off from his kind, if he were compelled to stay there. As the thought crossed his mind a member of the audience said very informally, and very simply, "I wouldn't be without the wireless for anything!" Then, as if by magic, the constraint and the sinister isolation of the valley seemed to be broken, although the wish remained that a set could be installed in every house in the village. For tragedy has darkened the doors of many a home in that village, in which it is believed that there have been more suicides per head of population since the coal stoppage than in any other place in the United Kingdom.

While the Cardiff and Swansea Stations, working conjointly, broadcast the usual programmes of general interest as well as those appealing particularly to Welsh-speaking people, they cannot forget the special needs of the depressed valleys. Endeavours have been made to start Study Groups and to mitigate in various ways the effects of industrial distress. Unfortunately, difficulties of reception in the valleys have to be met, not always successfully, but various plans are being made to enable people throughout Wales to hear easily the Welsh Station.

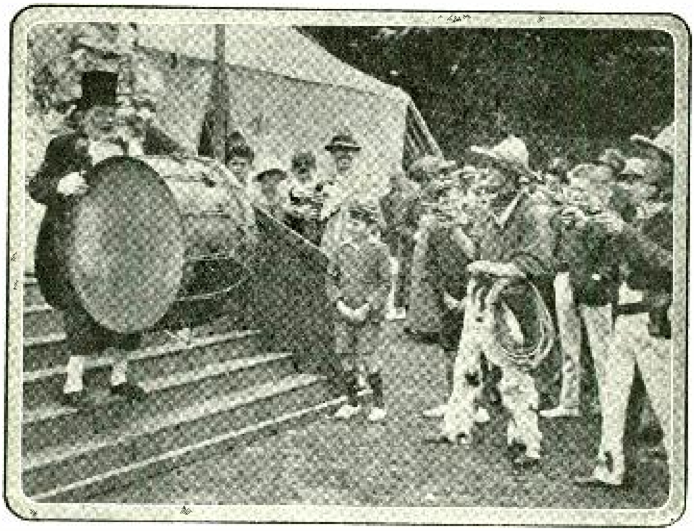
One of the most impressive broadcasts of the year was the Unveiling Ceremony of the Welsh National War Memorial on June 12th by H.R.H. the Prince of Wales.

During the past year official Welsh bodies, such as the Welsh University, have keenly advocated the development of the broadcasting service in Wales. No doubt the excellence of the National Orchestra of Wales has done much to strengthen the interest shown in the local Stations. Wales is sharply divided into north and south so far as internal emulation is concerned, but so far as the outside world is concerned, Wales is intensely conscious of herself. There is a cry for a broadcast service which will cover the whole principality. The listener in Caerphilly has friends in Bangor who cannot hear the programme which pleases him. The singer from Tonypandy is not heard in Cardigan. The efforts of the B.B.C. to give Wales a Regional Station, with studios in the important centres, are being much appreciated, and will have far-reaching effects in the development of the country.

### *THE WEST OF ENGLAND*

The needs of Wales are well met by the various specialist committees set up by the B.B.C., whilst Bristol's interests are watched over by an Advisory Committee which meets every month, with the Lord Mayor in the chair, and in his absence Mr. F. C. Luke, former Postmaster of the Bristol area. This committee, which has now functioned successfully for several years, deserves praise for the maintenance of its keen interest and for the help which it has consistently given to the Cardiff Station.

During the past year, in addition to the various Bristol or West Country programmes given from Cardiff, two events of outstanding importance were arranged in Bristol and Weston-super-Mare. A week, November 20th to 26th, was set apart for the study and development of wireless telephony in Bristol. It was called "Bristol Radio Week," and was arranged in a co-operative way between the B.B.C. (with its Advisory Committee) and the public. It was an experiment which proved so successful that it is likely to be followed by others in various parts of the country. Joint advertising was arranged by the wireless firms and, more important still, an association was formed, a Radio Traders' Association, in which members discovered that co-operation was more valuable than competition. This Association was inaugurated by a dinner at which the Chair was taken by Mr. E. R.



AT WESTON-SUPER-MARE CARNIVAL

Appleton, the Cardiff Station Director, and enthusiastic speeches were made by various members of the wireless trade in Bristol.

The second outstanding broadcast in the West of England was the Sunshine Carnival, which was held for the third time at Weston-super-Mare. Almost continuous programmes were given from 2.30 until midnight each day, and with the aid of a large number of amusing side-shows, over £1500 was given to the *X*-Ray Department of the new Weston-super-Mare Hospital.

Among many famous West Country men who have broadcast from Cardiff, special mention must be made of the veteran song-writer, Mr. F. E. Weatherly, K.C., and Mr. G. Wilshire. One of Mr. Wilshire's stories was so funny that a soldier rendered dumb by shell-shock laughed so heartily that he regained his speech. This speaks well for the West of England as a hunting-ground for humorous material for future broadcasts.

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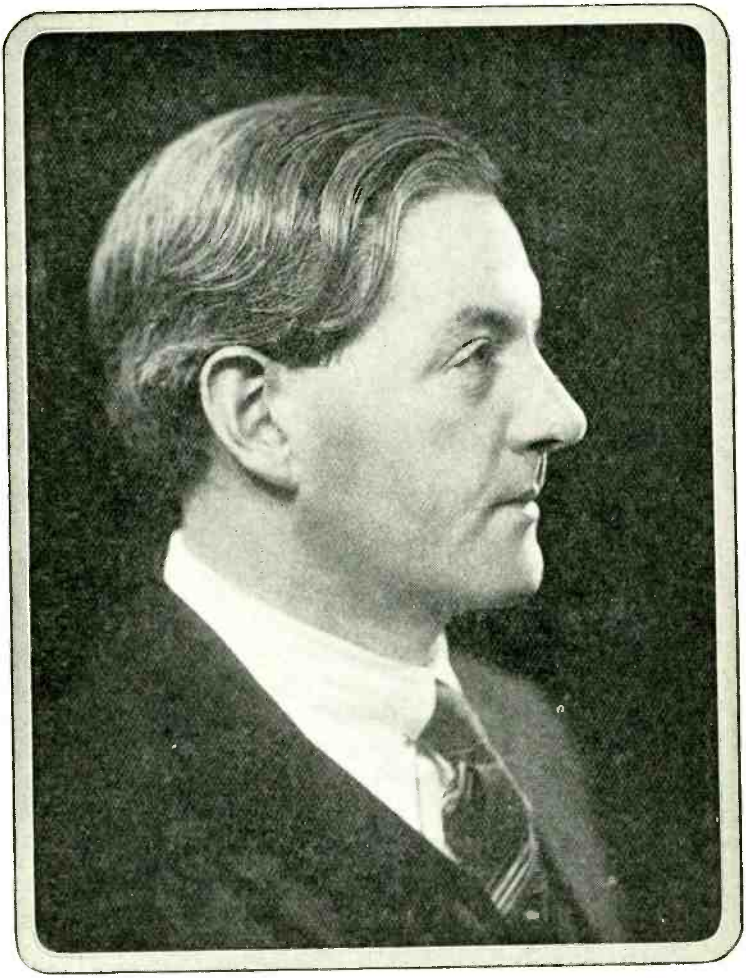


SIR HAMILTON HARTY

*Conductor of Manchester's famous Hallé Orchestra*

# THE NORTH OF ENGLAND

LISTENERS all over the country who take their broadcasting seriously will long ago have realised the value of the North of England's contributions to wireless programmes. They will have heard the Hallé Concerts from Manchester, the Liverpool Philharmonic Concerts, the service of York Minster broadcast through the Leeds Station; and talks by men of science and scholarship who hold chairs of learning or lectureships at the various northern Universities, which, although founded so much later than their famous sister Universities in the shire counties, are rapidly growing in influence and importance. It may be truly said of the North of England that it is a nation within a nation. Its characteristics and its potentialities for regional broadcasting were described in an article in last year's Handbook. Since that article was written measures have been taken to co-ordinate the activities of the Lancashire and Yorkshire Stations—Manchester, Liverpool, Leeds–Bradford, Sheffield and Hull—and to offer to northern listeners a liberal interchange of programmes between these stations.

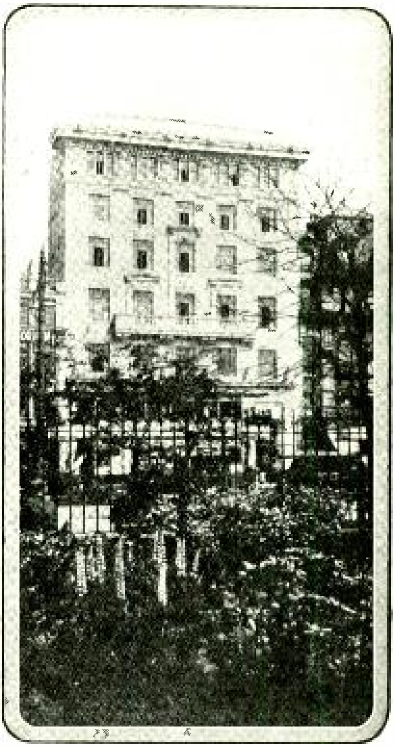
These alterations, paving as they do the way to regional broadcasting, were anticipated in the summer of 1927, when four of the five stations co-operated in relaying music and entertainment from the northern resorts of Blackpool, Buxton, Harrogate, Morecambe and Grange-over-Sands. Certain programmes and accounts of events in the North were interchanged between two or three of the stations in the group during the winter months. Endeavours were also made to break other new ground in the region; and the microphones of the Manchester Station were taken up into Westmorland and Cumberland during a "Lakeland Week" in August, when commentaries on the Rydal Sheep Dog Trials and the Grasmere Sports and a service from Grasmere Church, where Wordsworth lies buried, were broadcast.

It was not, however, until the beginning of this year that a regional administration of the various stations in the area was centred at Manchester. Sufficient progress had already been made by July to show to listeners the advantages of linking the various stations to each other. Civic, athletic and other events in our part of the North became available to listeners on both sides of the Pennines. The laying of the foundation stone of Hull University College, the opening of the new tunnel under the Mersey, outstanding Association Football and Rugby Union matches, the Yorkshire *v.* Lancashire cricket matches at Sheffield and Old Trafford, have been heard by listeners from the mouth of the Ribble to the mouth of the Humber. The history and industrial growth of the North have been fully brought home in the series of evening talks, which started on April 17th, on "Cities of the Industrial North." Each talk has been delivered by a well-known representative of each city, the speaker broadcasting from the station nearest at hand. Among the speakers have been the Dean of York, Mr. T. D. Simon, Professor G. W. Daniels, Alderman J. R. Nuttall and Miss Margaret Law. The talks have given a comprehensive survey of northern characteristics and the evolution of industry; they have shown the importance of each city not only as an individual entity, but also as a member of a great commonwealth.

Turning to lighter fare, there was the debate at the beginning of May on the subject "Manchester Man *v.* Liverpool Gentleman." A pleasant irony lay in the fact that the chair was taken by a famous Yorkshire Labour politician, Alderman Ben Turner, who presided over a witty duel between two Lancashire Conservatives, Sir Edwin Stockton, representing Manchester, and Sir Arnold Rushton, representing Liverpool. The debate took place in Blackfriar's Building, Manchester, loaned for the occasion by the Bleachers' Association, and the proceeds from attendance were given to the Northern Branch of the Libraries for the Blind. As the result of a suggestion made by Sir Arnold Rushton during the course of the discussion, annual meetings between leading representatives of both cities are likely to be arranged.

The scheme initiated in the summer of 1927 for providing listeners with music and entertainment from northern resorts has been extended this summer to include every important spa and seaside town. Listeners to all the stations in the grouping have heard McLean's Orchestra at Scarborough, the Municipal Orchestra conducted by Basil Cameron, playing in the Royal Hall, Harrogate, various concert parties and orchestras at Blackpool, the new Municipal Orchestra of Buxton, Llandudno's Orchestra in the Pier Pavilion, and band concerts from Southport's promenade.

The establishment of a large permanent orchestra at Manchester, consisting mostly of members of the Hallé Orchestra, and the equipment of that station with the latest control and echo apparatus, have enabled it to offer musical programmes of a very high standard to the other stations. All stations, however, have played their part in studio programme activities, and the series of programmes entitled "Famous Artists of the North" have been contributed to by all centres.



MANCHESTER STATION'S NEW PREMISES IN PICCADILLY, MANCHESTER

In October the Manchester office and station is moving into large new premises in Piccadilly, and will have at its disposal some of the largest and best-equipped studios in the country for orchestral concerts and radio drama.

Only the salient developments of broadcasting in the North of England have been described in this article, but perhaps enough has been written to show that broadcasting in this densely populated area is giving full expression to the distinctive life and culture of the people whom it serves.

## THE MIDLANDS

THE period of a year covered by this issue of the Handbook—August 1st, 1927, to July 31st, 1928—has seen the transference of the allegiance of listeners in the Midlands from the old Birmingham Station (5IT) to the new Experimental Station at Daventry (5GB). The change was necessary owing to the limited number of wave-lengths allotted to Great Britain by international agreement and the desirability of providing an alternative programme service covering the greater part of the country. In other words, a second high-power station was required, and it could not be introduced except as a substitute for one of the existing stations.

In the early days there were frequent complaints that the new station could not be received on sets which had given so much satisfaction under the old conditions; but it is interesting to note that the number of *new* licences taken out in the Birmingham area alone since 5GB began to function reaches 15,811, whilst the renewals for the same period show an increase over the corresponding period in 1926–1927. The effect, therefore, of the change of stations cannot, on the whole, have been unfavourable. A further indication of this is the increased popularity of the Birmingham Children's Hour. The Radio Circle membership shows an increase of 6,501 since 5IT became 5GB, and during that time approximately £400 has been raised by the children towards the fund for endowing a cot in the local Children's Hospital—a fund which is now happily almost complete.

Throughout the period the B.B.C. has once more had the valuable support of the Birmingham Civic Authorities, with a very sympathetic Lord Mayor—in the person of Alderman A. H. James—at their head. Through their kindness many important outside broadcasts have been made possible, including the Symphony Concerts given by the City of Birmingham Orchestra, and regular broadcasts of the ever-popular local Police Band.

In programmes it is unlikely that many listeners will consider that they have been the losers by the change of stations. The new programme broadcast by 5GB has been enriched by contributions of considerable importance from the artistic resources of London without suffering any loss of local talent and personality. It is true that, being an alternative to 5XX, the 5GB programme has not been a comprehensive balanced programme of the normal kind, but listeners who have missed any of their old favourite programme features in the new service have always had the opportunity of hearing similar programmes through 5XX. To put it in another way, Midland listeners now have, in 5GB, a programme of wider range, experimental, free, and stimulating, while they retain the opportunity of hearing a balanced programme of the old type through 5XX.

The new responsibilities with which the Birmingham staff has been saddled have resulted in a greatly increased output of serious music. Important symphony concerts have been performed in the Birmingham studios as well as many complete operas and oratorios.

In educational matters it is gratifying to be able to record an enormous advance in what is almost a new field of exploration—that of Adult Education. Rapid strides have already been made in this branch of the work, and here again the B.B.C. is indebted to the University and local educational bodies for invaluable help. Already a considerable number of "Listening Classes" have been formed under the auspices of the various organisations interested in Adult Education; and a strong local Committee—with Sir Charles Grant Robertson, Vice-Chancellor and Principal of the Birmingham University, as President, and Professor J. F. Rees as Chairman—is doing very valuable work.

In summing up it may be safely said, after a year's working of the new station, that the change has not only been to the advantage of listeners all over England in providing an alternative programme receivable in most parts of the country, but it has also proved a benefit to Midland listeners generally, by giving substantially more than it originally took away. The temporary inconvenience of some Birmingham listeners has secured a general advantage in which most of them have, after a period of adjustment, succeeded in sharing.

# EUROPE

THE year in Europe discloses no sign of slackening either in popular interest or in the realisation of the important part that broadcasting has to play in the life of organised societies. The Rome copyright conference was largely concerned with broadcasting problems. More countries came into the broadcasting family that has its hearth at Geneva. Licences in Germany rose to the figure of over two millions, approaching, but not yet equalling, the figure for Great Britain, and now one, now another country claims the "record" proportion of licences to total population. And public service is increasingly recognised as the sole foundation of properly organised broadcasting.

Organised systems under a régime of unified control now exist in the following European countries: Austria, Czechoslovakia, Denmark, Germany, Great Britain, Hungary, Irish Free State, Italy, Poland, Russia, Sweden and Switzerland. In the following countries broadcasting is only just beginning its development, either under direct Post Office control or under working concessions: Bulgaria, Esthonia, Latvia, Lithuania, Portugal, Rumania, Turkey, Yugoslavia. Finland has a considerably developed system which is partially under private control. Norway is likely to reorganise on a national basis in the near future. Greece and Albania have not yet commenced broadcasting.

There remain four countries—France, Spain, Belgium and Holland—in which broadcasting is at the moment of writing still in a state of crisis. In France the "P.T.T." group of stations and the private stations are still at odds with one another. It is understood, however, that the new Cabinet is (July 1928) preparing a definitive national solution.

In Belgium, "Radio-Belgique" still maintains its uphill fight against adverse circumstances, such as the absence of licence revenue. There also, however, reforms are in the air.

The system which is being introduced in Holland is peculiar. It has been decided in principle that broadcasting programmes not only may, but shall, have a bias. The licence to broadcast is split between the station itself, which is merely authorised to transmit provided programmes, and the programme organisations, each of which is licensed to use a particular station. Further, each of these programme

A GROUP OF BRITISH AND GERMAN BROADCASTING OFFICIALS

*Taken on the occasion of the visit of a German delegation to this country in November 1927. The German delegates are seated, with the exception of one standing at the left of the photo*

organisations (with, at present, one exception) is constituted for the furtherance of the aims of a religious, political or other cause. The rôle of the Post Office is to see that time is allocated reasonably among these interests. No revenue from listeners' licences accrues to any of these organisations.

There have been no important developments in Spain during the past year.

So much for organisation. As regards developments in the programmes themselves, there is little or nothing of a general character to report. All the more highly organised systems have much the same problems, much the same practice, much the same acquired stock of goodwill. There is, however, a distinct trend towards more "actuality," evidenced chiefly in the increasing popularity of the "running commentary" and the greater freedom in the choice, handling, and topical timing of talk subjects. In this connection perhaps should be mentioned the introduction into the programmes here and there of two novelties, still immature (and, in their real relation to broadcasting, unexplored), but held to possess at least a topical interest, viz., picture transmission and phonofilms.

In the international domain itself the year has been remarkable chiefly for three things—the growing realisation of the fact that there is an international "comity" in broadcasting, the increased practical possibilities of international line relay, and the question of ether channels raised by the Washington decisions. The last is dealt with elsewhere.

The international comity of broadcasting has been illustrated in two ways. First, the Geneva Union has arranged for the broadcasting by its members, at intervals of about a month, of a series of "national nights." On these occasions all Europe gives programmes typical of Holland or Italy or Poland, as the case may be, chosen as a rule by the country concerned. Secondly, broadcasters have discussed frankly amongst themselves the awkward questions which are arising from the perfectly explicable—and up to a point entirely proper—tendency to use the broadcast programme for promoting knowledge at home and abroad of the country's outlook, its culture, and opinions on national and international problems. The word propaganda has acquired an evil connection that it only partially deserves. There is all the difference in the world between openly provocative matter, which is a very real peril to the peace of Europe, and a talk on the tourist attractions of a country. But between these extremes there is a multitude of cases in which only good taste and mutual personal respect can distinguish between "admissible" and "inadmissible" propaganda, and it will prove in the long run to be one of the most important results of the Geneva Union that it has established camaraderie among broadcasters. Another aspect of the same question is the practice that has grown up of erecting stations (often of high power) close to frontiers. Here again the goodwill existing internally in the Union is the first step towards give-and-take agreements *à l'aimable*, which are obviously preferable to a competition in power—if only because competition diverts resources that would be better devoted to internal broadcasting developments.

To refrain, however, is only the negative side of good manners—there is an active side as well. As is well known, most broadcasting organisations have given sporadic relays of foreign programmes for years past. But the practice never became general, both because of the untrustworthiness of the "wireless link" and because steady improvement in the quality of the local transmission has continually sharpened up the public's standards of what is "worth listening to." Now, however, Europe is being provided in all important directions with a network of cables which, suitably equipped with amplifiers and correctors, are capable of S.B. work. In Eastern Europe, the group formed by Prussia, Poland, Czechoslovakia and Austria is now continually experimenting with long-distance relays, and in the West (which more immediately concerns us) the link Britain–Belgium–Rhineland was tried out on a serious scale on March 11th, 12th and 13th, 1928. On the first day a choral programme was given from Liége. On the second day Britain and Belgium took Act II of Mozart's "Figaro" from Cologne. On the third the special orchestral programme of 5GB was radiated from Brussels, Aachen, Cologne and Langenberg.

Much work still remains to be done before these inter-state group S.B.'s can be linked up on a true "European" S.B. Important sections of the cable network have still to be built, and Southern Europe in general is for the present unequipped. Moreover, the detail side of programme-building, and the rather complicated question of equitably charging all participants for the lines, the performance, and the copyright dues, have still to be worked out, and at its meeting at Lausanne in June 1928 the Union created a special Commission to deal with these matters.

But that the introduction of international S.B. as a normal element of programme practice is imminent, is not doubted by anyone who is close to the facts.

* * * *

At the Annual Meeting of the Union Internationale de Radiophonie at Lausanne (May 29th to June 1st) Vice-Admiral C. D. Carpendale, Controller of the B.B.C., was unanimously elected for a fourth term as President of the Union. Britain is also represented on three of the our Committees of the Union.

# THE SCHUBERT CENTENARY

By Francis Toye

IN a short article dealing with a composer of such genius and significance as Franz Schubert only one method is possible: to wit, to call the reader's attention to what may be called the high lights of his career, characteristics and musical output. Even so, much must be omitted that should be said, and it seems preferable on the whole to subtract from the chronicle of his material rather than his spiritual life.

About the life of Schubert, therefore, nothing will be said except to remind the reader that he was the son of a schoolmaster, was born in December 1797 at Vienna, and that he died in the same city in November 1828, the victim of typhus, like Mozart. The inferiority of his social position has, on the whole, been exaggerated. Though never mixing, as Beethoven did, with the Viennese aristocracy on terms of something very like equality, one or two fashionable houses were open to him. The truth of the matter, however, is that Schubert, almost pathologically shy and awkward, hated society; but that is not to say, as one writer puts it, that he "preferred the servants' hall." Schubert was a thorough Bohemian; he liked carousing with his friends in the cafés of Vienna, and we know that he was the life and soul of these carousals—which to anyone with a knowledge of human nature explains a great deal—and that his friends adored him. But these friends, so far from having anything in common with "the servants' hall," were in practically every instance men of intellect, men like Mazshofer, the poet, and Vogl, the singer. It was a careless, casual kind of life, admirably suited to one like Schubert, who was constitutionally incapable of bothering about money—he earned, on the average, I am told, considerably less than a hundred pounds a year—but it was not, as has sometimes been said, a life of excess. Schubert's industry proves this much. He worked every morning from six to one, an impossibility to anyone addicted to regular dissipation.

Now these facts, taken together, are of importance if we are to understand Schubert's music aright. In Vienna, the

SCHUBERT AT THE PIANO AT A RECEPTION IN VIENNA

city itself and the country round, lay his whole life; and it is the romanticism of contemporary Vienna that inspires his whole musical output. I doubt if his compositions could have appeared in exactly the same form in any other city at any other period. What Elizabethan England was to Shakespeare, Vienna of the early nineteenth century was to Schubert. His dislike of social convention, his careless Bohemian tastes, count for much, too, in the fashioning of his music. To these we may trace, I think, the excessive length of some of his compositions, the easy, spontaneous nature of his inspiration. To be more accurate, perhaps, these characteristics all spring from the same root.

Professor Donald Tovey, in the best essay on Schubert that has appeared in English hitherto, has shown that Schubert's lack of knowledge of musical form is more or less a myth. What he did, he did deliberately and of set purpose. But I think it is fair to say that his character was not one to trouble itself overmuch, as a Debussy or a Mozart would have done, with questions of form. The germinal, musical idea is what mattered to Schubert first, last and all the time. Temperamentally he was the natural musician—probably the most natural musician in the whole history of music. Not only could he set anything to music, as his contemporaries truly said, but nothing could stop him setting anything and almost everything to music. When he was not satisfied with a song, he did not, as a rule, revise it; he just wrote a completely new version. Essentially this generous, magnificent outpouring of ideas is characteristic of one temperament; we cannot expect to find allied with it the restraint characteristic of quite another temperament. Together with the great industry already referred to, it explains how Schubert, dead at the age of thirty-two, left behind him a musical output considerably larger than that of most composers who attained the proverbial threescore years and ten. Compare it, for instance, with that of Bizet, who also died in the thirties. I do not propose to give a list of Schubert's compositions, symphonic, operatic, ecclesiastical or chamber; they can be found in any standard book of reference, but I will remind the reader that of songs alone he wrote nearly six hundred, and that some three hundred of these are masterpieces! Would you have such a man different in any particular even if you could? I know that I would not.

For in his music, as in his life, Franz Schubert's personality is the quintessence of lovableness. I always like to imagine his real self, underneath the uncouth, unattractive exterior, to have been something very like the first subject of the so-called "Unfinished" symphony, when the clarinet steals in rather shyly against a background of busy, friendly strings, who are none other, of course, than Schubert and the other "Schubertians." Nevertheless, somewhere in this timid man there was a vein of boldness, of almost Beethovenian nobility. Think of the daring modulations characteristic of his best work, of the Scherzo of the "Death and the Maiden" quartet, so prophetic of "Siegfried"—above all, of the glorious Finale of the C Major Symphony (perhaps the greatest of essays in diatony), particularly towards the end, where the body of strings, like a Titan, hammers out the four great C's over and over again. Think of the bustling, headstrong Scherzo of the marvellous Quintet for Two Cellos, Two Violins and Viola, probably the best of all his chamber music, and heard far too infrequently. Think of one or two of the Piano Sonatas.

Nevertheless to the public at large Schubert remains primarily, I suppose, a song-composer, and in a sense the public is not wrong, because if any branch of composition had to be isolated and alone preserved we should all vote for the songs. Other composers may have surpassed Schubert in other forms; nobody, before or since, ever wrote such songs. Everything about them is well-nigh miraculous—their mere number, their variety, the ease with which they were composed. On the 7th or 8th of July, 1815, he wrote six songs; on the 19th of October he wrote no less than eight, one being in two versions. He composed "Gretchen am Spinnrade," the most remarkable song that had appeared in Germany up to then, when a lad of seventeen; "The Erl King," perhaps the most popular ballad in the world, was one of a hundred songs written only a year later. A learned biographer has classified the total output into more than a dozen well-defined categories, which gives some indication of their range of expression and emotion. In truth, Schubert's songs constitute a miracle every bit as inexplicable as other miracles less well attested.

In conclusion may I express a hope that music-lovers will not let Schubert's Centenary pass without making the acquaintance of his piano-duets? Schubert himself loved playing piano-duets, and here is an opportunity for the average amateur himself to pay a tribute to the great master in a manner that would be certain to win his heart. Not all the duets are of equal merit, but the four volumes of them contain at least three masterpieces, the Grand Duo, the Grand Rondeau and the "Fantaisie," not to mention the popular March Militaire and many other agreeable pieces. It is an opportunity—and a privilege.

The B.B.C. will celebrate the Schubert Centenary by special concerts, representative of every side of his genius, in the week November 18–24.

The issue of *The Radio Times* dated November 16th will be a special Schubert number.

# THE KENT EXPERIMENT

THE first half of 1928 has seen the publication of two documents of the first importance to broadcasting. "Educational Broadcasting" completes the account given in "New Ventures in Broadcasting." Both are judicial surveys of the work begun by the British Broadcasting Company and carried on by the Corporation in the educational field, the former dealing especially with schools, and the latter with adult education. In effect both pronounce a favourable verdict, and the B.B.C. is unquestionably justified in the claim that broadcasting has an important part to play in the education both of juveniles and adults. Whilst the B.B.C. is a direct participant in the latter report, it is not so in the former, although it has done its best to see that the experiment should be conducted under favourable conditions.

The first suggestions leading to the Kent experiment were made during informal discussions between the Carnegie Trustees and the B.B.C. in the summer of 1926. The county of Kent was considered a specially suitable area, owing to its proximity to London, the varied conditions of its economic life, and the fact that there were already a considerable number of listening schools. The Kent Advisory Committee of Teachers accepted the suggestion and appointed a sub-committee to organise the experiment, which began with the Easter Term of 1927, and lasted throughout that year. At different stages of the experiment twenty urban and forty-two rural or semi-rural schools took part. Of these twelve were small schools with an attendance of less than eighty pupils, and fourteen were big schools with more than 250 pupils. Opinions were collected by means of questionnaires, a method which has distinct merits, but also clear disadvantages. It is bound, for example, to produce a statistical form of report which may strike the reader as colourless.

Yet the summary of conclusions printed at the beginning of the Report is by no means wanting in interest, *e.g.*:—

(1) There is a real and persistent demand from teachers for courses of wireless lessons in subjects associated with the ordinary subjects of the curriculum.

(3) In the opinion of the teachers, the wireless lessons:—
- (*a*) imparted a knowledge of facts:
- (*b*) stimulated interest in ways which could be definitely observed;

(*c*) created impressions as durable as those produced by their ordinary lessons;
(*d*) did not encourage inattention;
(*e*) were particularly stimulating to clever children;
(*f*) supplied views and information which the teachers themselves could not have supplied;
(*g*) gave fresh ideas for lessons;
(*h*) interested parents in some of the work that their children did in school.

(4) All courses were not uniformly successful. Much remains to be done to ensure better co-operation between lecturer, teacher, and pupil, and further investigation is required in many directions.

(8) Successful wireless lessons depend on co-operation between teacher and lecturer. Co-operation has grown during the period of the experiment, and is still growing. For further growth it is essential that the B.B.C. should maintain close touch with the schools.

(11) Permanent machinery is needed to secure continuous contact between the B.B.C. on the one hand and, on the other hand, the Board of Education, Local Education Authorities and the whole body of teachers.

(12) Secondary Schools have found the provision hitherto made for them unsuitable. It is desirable that the B.B.C. should, after consultation with the schools, experiment with further types of courses.

This summary is reinforced by statistics which are themselves striking. On particular courses there is often a difference of opinion. Thus the first questionnaire, taking the six courses in turn and asking of each "Did the class obtain a reasonable grasp of the matter of each lecture?", produced a total verdict of Yes, 112; No, 19; no opinion or no information, 5. The courses by Sir Ernest Gray and Mr. Clifford Collinson received a *nem. con.* "Yes." On the other hand, Sir Walford Davies got a mixed verdict: 12 ayes, 7 noes, 1 uncertain.

After that, however, there was a conference at Maidstone, at which Sir Walford demonstrated and explained his method, and the second edition at the end of the third term produced a much more favourable answer: 21 ayes, 6 noes. It must be added that the B.B.C. itself learned much from these interim reports and conferences. There was a revision of studio methods. The lecture was made more like a lesson, in which response was expected, the classroom teachers were shown what part they were expected to play, and valuable reinforcement was given by means of the printed pamphlets.

On the main issue the judgment is conclusively favourable:—

*Q*. Having used a wireless set in your school, would you regard it as an educational loss to be deprived of it?

*A*. Yes, 39; No, nil; no opinion or no information, 1.

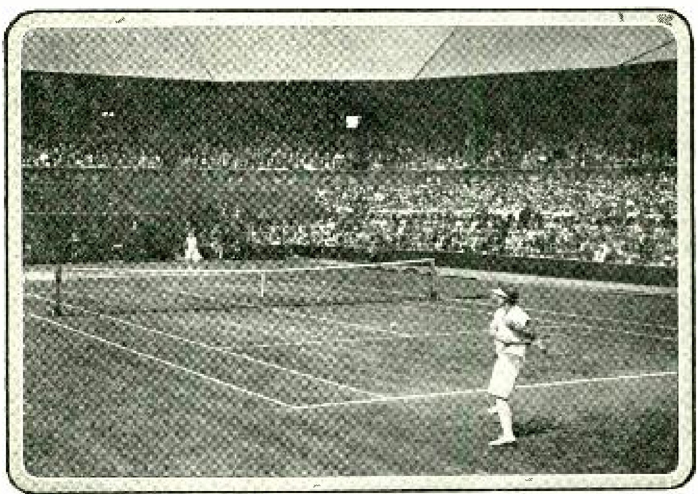
Another interesting question relates to the duration of impressions made by wireless lessons. Do they last as long as ordinary class lessons? Yes, 26; No, 4; no opinion, 10.

Finally:—

*Q*. From your experience, do you consider wireless lessons stimulating, particularly to (*b*) the clever pupil?

*A*. Yes, 36; No, nil; no opinion, 4.

This last verdict is the one which the B.B.C. particularly regards as the proof of its claims, which rest very largely upon its ability to provide stimulating provender for the brighter pupils in the elementary school. It knows that it cannot do the groundwork of school instruction, but it can enrich and fertilise the whole curriculum. To this task it will apply itself with fresh enthusiasm after the endorsement from the Kent Report, and with more knowledge derived from the teachers' co-operation in the preparation of it.



*Sport and General*

THE MICROPHONE VISITS WIMBLEDON

*Miss Helen Wills playing Señorita De Alvarez in the final of the Ladies' Singles*

# SPORT

## THE DERBY

June 6th, 1928. Commentator: R. C. Lyle

"THEY'RE OFF! THEY'RE OFF! Good start. . . .

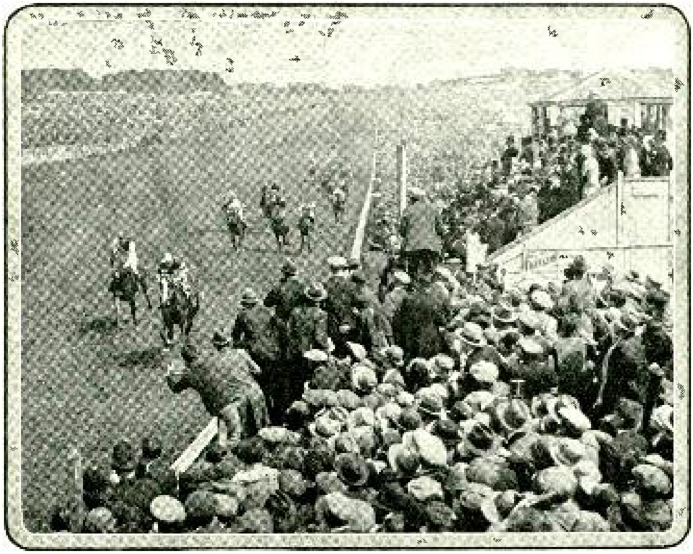
Royal Crusader's left. Scintillation's just away on the far. . . . Flamingo's just away on the far side, followed by Felstead. Fairway's not too badly away. Flamingo's best away of all the fancied horses. Royal Minstrel is well up there. Now they're going behind the cars, and I can only see odd bits of caps and things. I can't quite see Fairway. Flamingo's there. . . .

Ranjit Singh . . . I can see nothing except motor-cars and caps for the moment. . . .

They're still running behind the top of the hill and coming down that bit. . . .

Flamingo's still there. Fairway's some many lengths behind—many lengths behind. There's a big gap between the leading horses. . . .

They's absolutely plumb out of sight behind the people. . . . They're coming down the Tattenham Hill now. I shall get all of 'em in a minute. . . . I don't think Fairway can possibly get up. . . . They're coming round Tattenham Corner now—still all out. Sunny Trace—Gordon Richards—is right there. Sunny Trace is there now, and Felstead is gaining—he'll stay on, as certain as anything can be. . . .



*Central Press*

THE FINISH—FELSTEAD . . . FLAMINGO . . . BLACK WATCH

Felstead will win it; Felstead's coming away. . . . Felstead's the one that's there now. . . . Felstead's coming away. . . . Felstead and Flamingo are out by themselves. . . . Sunny Trace is dropping back. . . . Felstead's won. . . . Any odds you like bar Felstead. . . . Felstead's come home. . . . Felstead must win it. . . . Felstead's won it. . . . FELSTEAD'S WON IT, followed by Flamingo. Black Watch will be third —terrific race—Black Watch will be third; Fernkloof fourth; Gang Warily fifth; Camelford sixth; Scintillation seventh, and the two French horses next. Then comes Ranjit Singh, Fairway nowhere, and last of all Yeoman Town, and just in front of him Advocate.

It's been a fine race—hard to see—and the winner's won easily the whole way from Tattenham Corner; there's been only one horse which was winning it. . . ."

# BROADCASTING THE GRAND NATIONAL

By Geoffrey Gilbey

IF ever I am asked to broadcast another Grand National, I shall endeavour to make different financial arrangements with the B.B.C. I shall offer to take a very reduced fee provided they will pay my expenses. The truth of the matter is that my expenses include the week's holiday at the sea which the doctor orders me after I have broadcast. I know many people think it is a pose when I say what a terrible ordeal I find it. It is possibly due, to a certain extent, to terror of the unknown. An actor can learn his part beforehand, a singer can have the words of the song in her hand, a clergyman can know his sermon by heart when the microphone has to be faced. The reader of the race cannot rehearse. He has to be prepared for the worst. He got it in full in this year's Grand National.

However, it is probably conceit as much as anything which gives one sleepless nights before reading a race like the Grand National. The one thing which an Englishman loathes is being laughed at, and he will do anything rather than make a fool of himself before even two or three other human beings. When the two or three are increased by several millions, it does not make things any easier.

This year's race was made more difficult by the fact that there was a thick fog, but when the six survivors reappeared out of the fog, the race then became child's play. The Grand National day was strenuous. I awoke early, and when I was breakfasting I began to do my selections for a Sunday paper. I just had time to complete them and send them off when it was time to leave by car for Aintree. As I drove to the course I wrote my first impressions of the City and Suburban weights to wire off to a daily paper. Between the races I wrote my Gossip notes for the same paper.

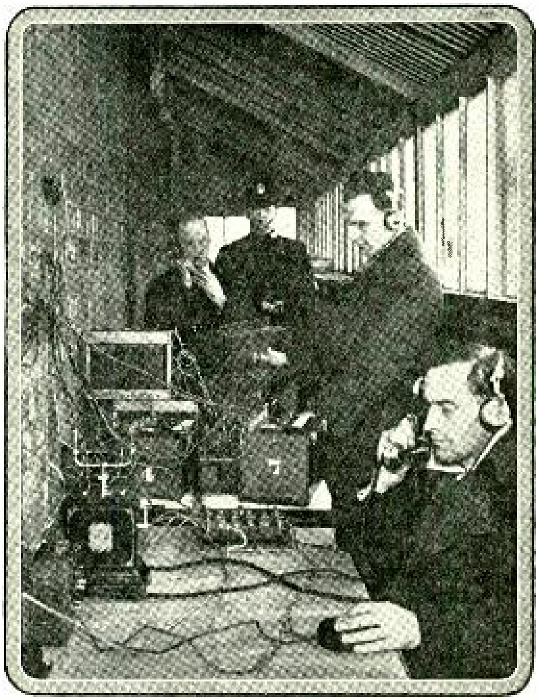
At last the moment arrived. Mr. Hobbiss and I stood in our places on Mr. Topham's stand, Mr. Cock gave me a dig in the back, and the babbling brook Gilbey began to flow. Fortunately it had the rock Hobbiss to keep it in its course.

As regards my partner, I can only say that if ever my house catches fire I hope Mr. Hobbiss will be staying with

me at the time, so that in his sane, quiet voice he can ring up the Fire Brigade and inform them of the fact. The fire, I hope, will be put out, but Mr. Hobbiss certainly won't be. I have always had wonderful support in all my broadcasts. Mr. Allison was splendid in the Derby. My brother Quintin, from my point of view, was perfect in the Leger, and so was Mr. Hobbiss in the National.

One of the things which interests me most about broadcasting is having the very candid criticisms of one's friends afterwards. People seem to have different kinds of ears, or perhaps it is different kinds of receiving sets. After the Leger I met a friend who had been listening. "What a wonderful broadcasting voice your brother has!" he said. "He really ought to be an announcer. I could hear what you said, but I might not have done so if I had not known your voice so well." A few minutes later I met another man, who said, "I could hear both you and Quintin all right, but your brother's voice at times was not too distinct."

The complaint of the majority of listeners in this year's



BOTH SIDES OF THE GRAND STAND AT AINTREE

*showing two aspects of an Outside Broadcast*

Grand National is that I had bad news to impart and that I rubbed it in by repeating the result more than once. This was the order I received from the B.B.C. In conclusion, I must answer the question of a listener who belongs to the fair sex. "Don't you find broadcasting enormous fun? It must be a great joke." I have never yet been executed, but if I am I fear that my sense of humour will not be strong enough to allow me to see the funny side of it. Perhaps one day we shall read that Mr. Steel, who broadcast the National, ate a good breakfast and walked smilingly to the microphone. Even if I do read this, I shall not believe it.

# THE GRAND NATIONAL

*Dramatis Personæ:*

Mr. Geoffrey Gilbey (*G.*) and
Mr. H. W. Hobbiss (*H.*).

*G.* One's down there! The French mare's down there! Now there are only four left standing. Billy Barton is leading from Great Span, and is that Tipperary Tim the other one?

*H.* Yes, I think that's Tipperary Tim.

*G.* It looks as though Billy Barton has won this race. There are only two more fences to jump now. Now they're coming on to the race-course. Now there's Billy Barton and Great Span, and Billy Barton looks to be going the easier of the two. Billy Barton—

*H.* —is a length in front of Great Span.

*G.* No! Here comes Great Span up now. No, I think Billy Barton will win it. It's going to be a terrific race. Billy Barton, Great Span and I think it's Tipperary Tim, but the lights are bad.

*H.* Tipperary Tim it is.

*G.* Billy Barton, Great Span and Tipperary Tim the only three standing up. The only three out of this huge number. They are approaching the last fence—

*H.* —but one.

*G.* Great Span and Billy Barton are having a terrific race, they are alongside each other. I don't know which to say is the better of the two.

*H.* Billy Barton . . .

*G.* Great Span's down! Now we've only got Billy Barton and Tipperary Tim left. I think it's Tipperary Tim, but the lights are bad.

*H.* Yes.

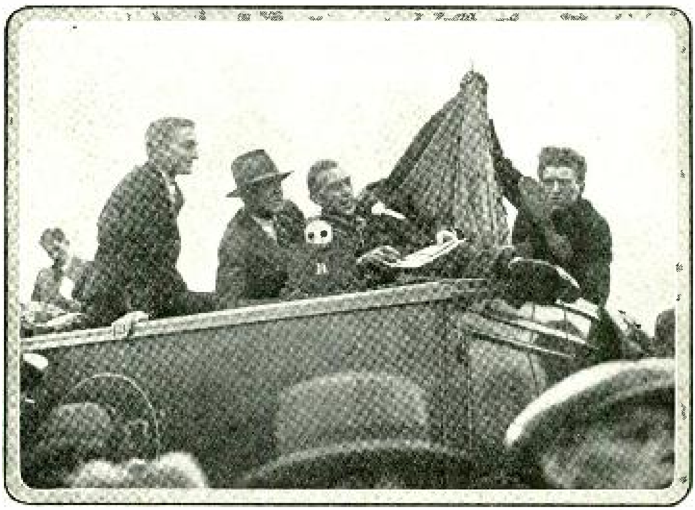
*G.* I think Tipperary Tim's almost going the better of the two, isn't he?

*H.* There's a loose horse . . .

*G.* Billy Barton's down!! Tipperary Tim the only one up! Now only one horse going to finish. Tipperary Tim is going to finish by himself. The jockey on Billy Barton is remounting, he'll finish second. Tipperary Tim!! Just think of it! finishing solitary by himself with a loose horse just behind him. The crowd are cheering like mad now. Tipperary Tim, the despised horse! Nobody seemed to think he'd got a million to one chance; nor would he, of course, if the others had stood up—being cheered terrifically by the bookmakers and by the others too. Tipperary Tim has passed the post—No. 52—with a loose horse, I can't tell you what it is, just behind him.

*H.* Great Span . . .

*G.* Great Span just behind him. Now, here's Billy Barton looks like being the only other one to finish, so all the money for the second and third horses will go goodness knows where! Now, here's Billy Barton coming in second. Now, here's some of the loose horses, and I shall be able to tell you what's happening. Billy Barton is just this second passing the post and he looks a very, very tired horse indeed. He's run a most gallant race though.



*Sport and General*

EMERGENCY BROADCASTING AT THE CAMBRIDGE *v.* THE A.A.A. SPORTS

Sport and General

# THE CUP FINAL

## WHAT THE LISTENER HEARD

Commentator: George Allison

NOW the preliminaries are over.—It is about one minute to three, and I suppose we shall see the captains shortly tossing the coin for choice of ends. Certainly it is an ideal afternoon for football. Here go the players! For the moment Huddersfield are running off to the left—that is, the left-hand side of your plan—and Blackburn are running away to the right. As soon as they toss we will let you know the positions of the teams for the match. The captains of the teams, by the way—Stephenson of Huddersfield and Healless of Blackburn Rovers—have just greeted each other in the customary way with a hearty handshake, and are now tossing the coin, carefully watched by Mr. Bryan. Oh! apparently Stephenson has won the toss, I imagine, because he has called his players away from the left-hand side of the goal from where we are sitting to the right to defend the goal on the right. . . . And now on your left you have Blackburn Rovers—on the left-hand side of your plan—and on the right Huddersfield Town, and they are just about to kick off. . . .

Here they go!

Now the ball is right in the centre of the field. It's gone over to Jones, Jones has hit it through now to McLean, he has been beaten by Brown, Brown has sent it back to Kelly, Kelly over to Smith on the left wing—too hard—and goes over the touch line, that's just about thirty yards down from the Blackburn goal. Blackburn's throw in is being taken by Campbell—Healless, I beg your pardon—Healless now down to Thornewell. Thornewell has it, puts it through to Roscamp. . . . Mercer has come out, caught the ball . . . (tremendous roar from the crowd). Goal to Blackburn Rovers in well under a minute.

# OTHER SPORTING EVENTS

## *RUGBY FOOTBALL*

THE authorities at Twickenham have always realised the tremendous pleasure which commentaries give to distant rugger enthusiasts all over the country, and they have welcomed broadcasting with open arms. Last winter as many as four International matches at Twickenham were described by Captain Wakelam, the Harlequin footballer; and the English Rugby Union's lead has been followed in Scotland and elsewhere. There is no doubt that these commentaries have also proved exciting and stimulating to people who have never seen the game played.

*Sport and General*

ENGLAND *v.* SCOTLAND AT TWICKENHAM

*An English three-quarter breaks away*

*THE 'VARSITY BOAT RACE*

In the nature of things it was not possible for this year's description of the Boat Race to be as successful as the first broadcast of it last year. The race itself was a very poor one and after the first few minutes became practically a "procession." In the circumstances the commentary by Oliver Nickalls, helped by J. C. Squire, could not be very eventful.

*ATHLETICS*

The Oxford *v.* Cambridge Relay Races were described on December 3rd, 1927, the 'Varsity Sports in March 1928, and Cambridge *v.* the Amateur Athletic Association in June. In each case the famous Cambridge athlete, Mr. H. M. Abrahams, was the commentator, on the last occasion in very difficult circumstances. Owing to the encroachments of the crowd the commentators had to take refuge on the top of the B.B.C. van in order to get a good enough view of the proceedings, and the picture on p. 121 shows Mr. Abrahams broadcasting under difficulties, the microphone, incidentally, being shielded from the wind by an overcoat held on a stick.

*Sport and General*

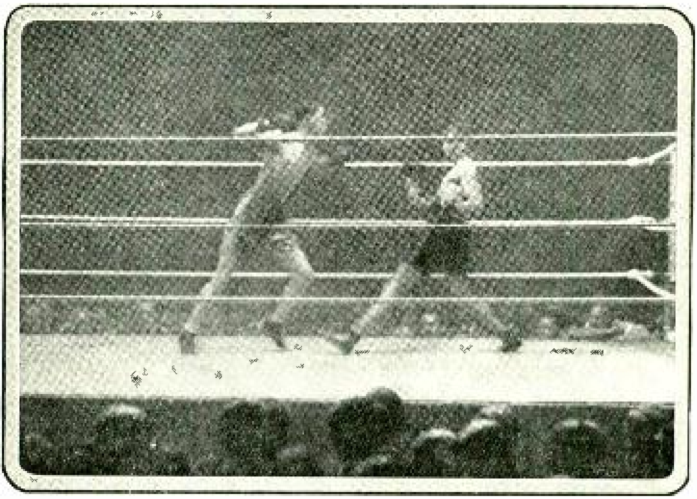
WALTER HAGEN, THE OPEN CHAMPION, DRIVING

*GOLF*

A running commentary on a golf match is not a practical proposition, although, if expense were no bar, it is not physically impossible. The great annual golfing events, therefore, were dealt with by eye-witness accounts by Mr. Bernard Darwin, who described Walter Hagen's winning of the Open Golf Championship on May 11th at Sandwich. On this occasion a listener came to the help of the B.B.C. by fitting up a temporary studio for the purpose at Deal. Mr. Darwin also described the Amateur Championship on May 26th.

*TENNIS*

In both 1927 and 1928 descriptions of the English Championships at Wimbledon were broadcast with great success. The Commentators, Colonel Brand and Captain Wakelam, in spite of the tremendous speed of first-class tennis, managed to keep the listener abreast of the run of the games and



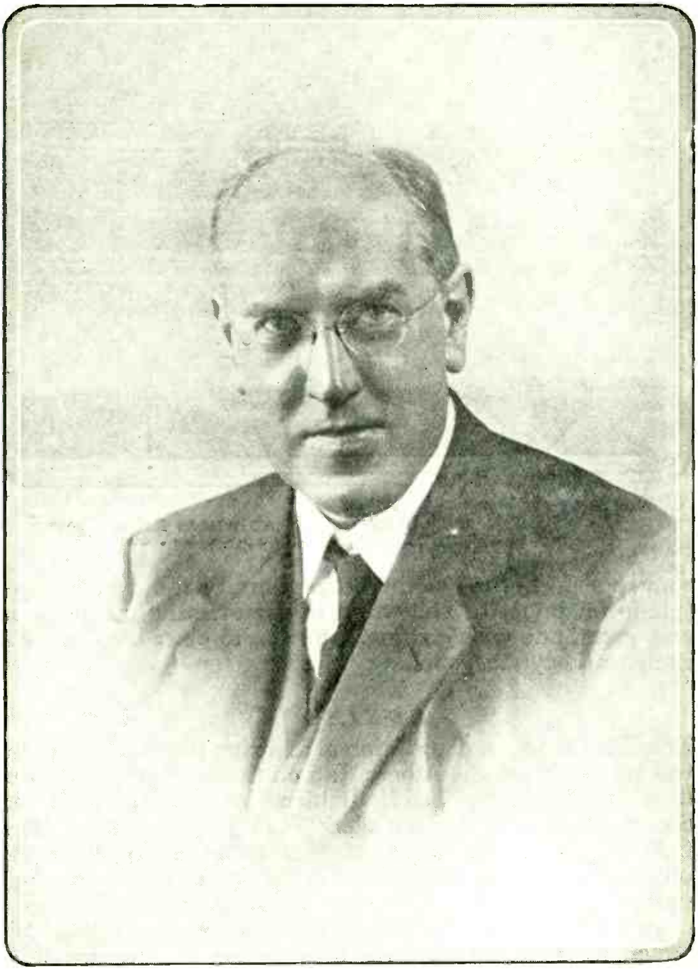
Graphic Photo Union

TEDDIE BALDOCK (LEFT) LEADS AT WILLIE SMITH

convey a great deal of the atmosphere of the centre court (photo on p. 114). The strain of commenting on tennis is very great, and each commentator has to be relieved after a comparatively short spell.

## *BOXING*

The first broadcast description of a boxing match in England was relayed from the Albert Hall on October 6th, 1927, the fight being between Teddie Baldock, of Poplar, and Willie Smith, the South African clerk from Johannesburg. The fight was an excellent one to describe, as it was close throughout, well fought, and exciting. Probably the most successful part of the broadcast was not the actual running description of the fight, but the "atmosphere" and incidental "sounds" which were picked up on a microphone by the ring-side. The stamping and shuffling of the fighters' feet, the noise of the blows, and the words of the referee, gave a wonderful feeling of the excitement of a close fight.



SIR WALFORD DAVIES

# MUSIC

## BOTH SIDES OF THE MICROPHONE

By Sir Walford Davies

AFTER many efforts to broadcast and many experiences as a listener, three possibly useful ideas seem to emerge: (1) that a mind held in common must be mobilised on both sides of the microphone; (2) that this is really always possible; (3) that it needs unceasing pains to attain the power to do it.

Euclid at his simplest might have made a perfect microphone man. Such a general remark as "Of course things which are equal to the same thing are equal to one another," if uttered naturally and casually at the very moment when it exactly fitted his talk and the listeners' thought, would (so to speak) have brought the etheric house down, and might have put the whole world wise on that particular point. Shakespeare in like manner might have made a perfect broadcaster, precisely because he knew the common mind and could say things in your and my way, and could even make a schoolboy exclaim to his approving parent: "I could have written Shakespeare, Dad, if I'd known how."

Talkers at the microphone should say what their listener would have said if he had known how. If Shakespeare had stood in a Savoy Hill studio, and quietly, at the exactly fitting tick of time, in an ordinary talk, remarked that "love is not love which alters when it alteration finds," he might have flashed a truth upon a million responsive minds, upon the myriads who are quite ready at any time to think a balanced thought, perhaps in that very wording, but are waiting for some one to do it for them. Or if St. Paul could have gone to a microphone in Athens and told the listening Western world how that, strolling along the street, he had that day noticed an inscription "To the Unknown God," and that he saw in it great hope for the groping world of devout agnosticism; or perhaps, better still, if he had given us a talk on talkers, and had slily, but with his amazing courtesy, told us that he would rather, for his part, speak "five words with his understanding than ten thousand in a tongue," he, the saint, would surely have advanced what may be called microphone-technique in an even higher degree than Shakespeare the artist or Euclid the scientist.

But the staggering fact remains that all three of these mighty men would have had to learn their job. For at the microphone it is fatal for the public speaker to public-speak, for the actor to declaim over imagined footlights, or for the preacher to preach as from a pulpit. They must all unaffectedly, responsively and responsibly, just think aloud. They must do it always with delight in life and thinking, and always, one imagines, with fear lest they should spoil it all. They must mentally compare notes with their listener. They must have the confidence that comes with common courage, and not that of conceit. They must have the fear that comes with common humility, and never the vain fear of giving themselves away. Matthew Arnold was once asked the secret of literary style. "Have something to say and say it as simply as you can," was the reputed reply. This certainly is an open secret of all microphone work, and failure to act upon it is fatal to singer, player, actor, and talker alike. The singers and players must unaffectedly think what they sing or play into the purest and most conversational tones of which they are at the moment capable, just as surely as the speaker must think what he speaks into the simplest way of expression. They fail if they sing or play as from a concert-platform. In like manner, the actor lamentably annoys the listener and badly misses fire if he (as it were) paints his voice and puts in footlight sobs and other ejaculatory trimmings. Unaffected simplicity of utterance alone gets over. I once saw Coquetin hold a whole theatre audience by standing dead still on the stage and very slightly raising his eyebrows. It is certainly the very slight raising of the voice that naturally happens in real life to real people that is all the microphone needs or indeed can stand. We must all be unassumingly natural at the wireless tribunal; and the present writer, after listening to broadcast plays, has rightly or wrongly come to the conviction that it is no more necessary, and therefore no more ultimately possible, for actors at the microphone to speak as they do apparently need to speak in the theatre. It sounds to the listening ear as absurd as it would look to the perceiving eye if they painted their faces in order to speak with a single fellow-man. For the astounding but most commonplace fact about broadcasting is that your audience may be anything from 10,000 to 10,000,000 fellow mortals at any given moment, but the utterance is from one person to another, and not from a stage to a vast or even a small auditorium.

Since the fifteenth century saw the invention of printing, there obviously has never been a more epoch-making, or hopeful, or alarming, invention than this of transmitting the tones and inflections of a single human voice to millions of listening ears. At some not too distant date men will learn how to use it. It is the anxious task of the present age to initiate a new service to preface the way for genius when it comes. This may well be done by banishing every kind of affectation, by painstaking honesty of expression, by courageous thinking, by making mistakes and getting over them, by enthusiasm and directness of utterance, by Matthew Arnold's rule quoted above, by ordinary or extraordinary *nous*, and, above all, by holding fast the faithful tenet that the common mind is everywhere ready to take delight in simple beauty in music, or in simple truth in a talk, or in any high exercise of the heavenly faculty of imagination, with which every ordinary man, woman, or child on God's earth seems to be endowed. This is a safe and saving faith which every man who stands or sits at a microphone is, in my judgment, bound to hold.

ARNOLD SCHÖNBERG WITH HIS WIFE

# THE NATIONAL CONCERTS, 1927–8

THERE were several ways in which the concerts of 1927–8 were more truly "national" in character than the series in the Albert Hall a year before. To the Englishman, to whom "Town" is the hub of the Empire, the Queen's Hall is the national centre of music—obviously the place for national concerts—and twelve of the series of twenty were given there. With the idea of presenting good music, adequately performed, to the East End of London, eight concerts were given in the People's Palace, Mile End Road. The hall there was found to be far from ideal for broadcasting, and at some of the concerts the attendance was disappointing; but, as an experiment, it was well worth while to send the National Orchestra so far East, with Sir Edward Elgar, Sir Henry Wood, Sir Landon Ronald, Mr. Percy Pitt, and Mr. Geoffrey Toye as conductors.

The Orchestra was as national as before—the best British players who can be gathered together—and, with one exception, the conductors were British also; in addition to those who "bore the burden and the heat" of evenings at the People's Palace, there was Sir Hamilton Harty, who brought his Hallé Orchestra from Manchester to the Queen's Hall on 13th January and 23rd March. The singers and players also were, with one or two distinguished exceptions, British.

A fourth "national" feature was the inclusion in the programmes, by arrangement with the Carnegie Trustees, of a number of the British works published under their scheme—most of them works which are rarely heard. And of course the sense in which the concerts were most truly "national" was that listeners all over the country heard them broadcast: "wireless listeners" and "the nation" are terms which grow day by day more nearly synonymous.

A special programme was given on Armistice Day, to which additional interest was lent by the appearance of Lord Balfour and General Sir Ian Hamilton as speakers. Sir Hamilton Harty's programmes were devoted to Wagner and (mainly on 23rd March) to Berlioz; Sir Edward Elgar conducted a programme of his own music in the People's Palace, and on Good Friday Sir Henry Wood gave a programme chosen from "Parsifal"; another notable performance was Beethoven's great Choral Symphony at the opening concert.

First performances in England were—"Sinfonietta," by the veteran Czech composer Janacek; "Church Windows," by Respighi of the present-day Italian school; the "Israel" Symphony of Ernest Bloch, and—easily first in importance—the "Gurrelieder," by Arnold Schönberg, who came over from Germany himself to conduct rehearsals and performance of his truly monumental work. Everything that could be done by way of careful rehearsal was done, with the whole-hearted enthusiasm of all concerned, and the performance was one of those events which make musical history.

1927–8 having embodied so many purely "national" features, a somewhat more "international" outlook will guide the next season: several distinguished conductors and artists from abroad are being invited to take part.

A SCENE FROM "COSI FAN TUTTE"
*Broadcast on April 27th, 1928*

# NOW THAT THE OPERA COMES TO US!

By Hamilton Fyfe

GOING to the Opera! What a business it used to be! "Must I dress?" "Don't ask such absurd questions!" "Dinner early, I suppose?" "Yes, and mind you're home in good time."

Throughout the day that warning ran in your ears. Your usual arrangements were all thrown out of gear. You had less than your usual lunch in order to keep an appetite for that early dinner, and then you found you were hungry in the middle of the afternoon! Having hurried over the last of your work, you got home with half an hour to spare and nothing to do in it.

Packed in a cab, you couldn't have the window open for fear of disturbing your wife's hair; therefore you couldn't smoke. Because you wore a white tie and a crush hat, the driver expected a great deal more than his fare. At last, however, you were in your seat and made happy by the delicious tuning-up of violins, 'cellos, and double bass.

If only the whole performance had been as soothing and satisfactory as that! Of course you enjoyed it a great deal, but what a lot of little obstacles prevented complete appreciation of the music!

There were the people who came in late and trod on your feet; went out between the acts and trod on them again. There was the grotesquely fat tenor whom you really could not accept as a fervent young lover. There was his tender sweetheart, a robust lady with vast frontal protuberance who was known to have had four husbands at least. And where, you wondered, did the management dig up such odd-looking people for the chorus? And then, however much you enjoyed it in spite of the drawbacks, you couldn't help wishing you were not obliged to sit so long in a cramped position.

Once you had taken a box; had sat at the back of it on one chair with your feet on another; had closed your eyes and given yourself up to the delight of the music alone. But you couldn't pretend even to yourself that you were comfortable: you were not able to smoke: and your wife, sitting in front, was afraid all the while that "someone might see you."

Many, it is true, were there in order to be seen. Many found their pleasure in the excitement of an evening out: in the glitter, the gay dresses, the crowd. Many went to the Opera because the Opera was part of the fashionable round, without caring for the music any more than they cared for racing at Ascot or polo at Hurlingham. An offer to bring opera to them in their homes would have been a mockery. They considered the proceedings on the stage and in the orchestra as merely a pretext for a social event.

It irked them to keep quiet while the curtain was up. Some could not refrain from talking. Charles Brookfield, the actor, once wittily reproved a lady who had kept up a conversation during a performance. She asked him at the end "to come again next Tuesday: they're doing *Rigoletto*."

"I shall be delighted," he said. "I haven't heard you in *Rigoletto*."

For lovers of music, however they did it, going to the Opera was a mixed blessing. So many little inconveniences to offset against the joy even of the finest performance. So much to mar the perfection of pleasure which they felt the music ought to give.

That perfection I have tasted for the first time since it has been possible to listen to Opera on the air. For the first time I have had opportunities to listen undistracted, to listen in comfort, to surrender my senses completely to the enchantment of exquisite sound.

What do we need more than imagination to supply the scenes, the figures, the action, of an operatic plot? No attempt to put them before us on the stage can be more than a makeshift. Material presentation is bound to fall very far short of what genius conceived.

You may retort that genius has had little enough to do with the plots of operas. I accept that as a general statement, though it does not cover *Faust*, nor *Don Giovanni*, nor *Orfeo*, nor *Samson and Delilah*, nor even *La Bohème*. And now, having agreed with you, I submit that you have strengthened my case.

For it is just this tendency of operatic stories to be feeble which makes it so hard for the stage to present them in anything but a feeble way. They are, most of them, simply props on which the composer hangs his harmonious inventions; they are mere stalking-horses from behind which the

*"The Times"*

A SCENE FROM "THE MASTERSINGERS" AT COVENT GARDEN

*Broadcast on May 15th, 1928*

music is discharged. It is difficult to endure them with patience.

If the action passes in some bygone, supposedly romantic age, the characters behave in a manner which is at the best of times sub-human and degenerates often into sheer idiocy. A pair of lovers, who are to be separated by prison walls, are allowed to meet surreptitiously outside the prison and to bid farewell. They are left alone. Instead of making a bolt for it, they sing and sing and sing, loudly enough to disturb the whole neighbourhood. A lady is represented as being in the last stage of lung disease. Her voice, if this were so, would be reduced to a whisper, but she, too, sings and sings and sings with an energy which proves her doctor's diagnosis to be criminally incorrect.

Conspirators whose lives depend on their escaping the notice of the police gather invariably in public places, and declare their intentions as noisily as possible. Assassins lying in wait, a lover beneath his mistress's window at midnight, a courtier, in love with a queen, passing sarcastic remarks about the king, all make it certain that everyone shall hear them.

If, on the other hand, the setting of an operatic story is modern, it will contain most of these imbecilities, and one other difficulty besides these which destroys any shred of reality they might have left. Suppose the hero, having sung with the heroine in her garret or on the deck of his ship, puts on, when he goes out, his bowler or soft felt, we are conscious at once of incongruity between his melodious emotion and his commonplace hat. Should he stalk off without anything on his head, we notice it, and wonder whether he belongs to the No-hat Brigade.

The composer must have a plot of some kind: that is evident. He needs it to stimulate his flow of musical ideas. But when it has served that excellent purpose, there is no reason why it should be inflicted upon us along with those ideas. All we require is an outline of the story he has worked on. His music and our own imaginations should enable us to conjure up its incidents, the men and women who figure in them, their appearance and their surroundings.

How can it heighten the excitement of the Ride of the Valkyries to see cardboard or wooden images of young women on horseback pulled to and fro across the scenery? How is it possible to give full attention to the Entry of the Gods into Valhalla while one is stirred to mirth by the absurd appearance of these woolly-bearded deities? Surely the gentle rain of melody which Puccini pours over us can be enjoyed without seeing obese Italians masquerade as naval officers and squarely-built German women pretend to be Japanese!

Opera by wireless is opera as composers must wish it to be heard. All that is irrelevant is stripped off. We get the essential element—the music. Nothing is allowed to turn our minds or our senses from it. For the rest, we can create our own characters, endow them with the beauty we most admire, dress them as we please, place them in whatever surroundings we fancy. No obstacle is interposed between us and the composer's intention.

I never thought to listen to Verdi with content, to hear Balfe or Wallace without irritation. Both those miracles have happened—on the air. The music of *La Traviata*, *Maritana*, and *The Bohemian Girl*, as soon as one escapes from the fatuity

"The Times"

A SCENE FROM "AIDA"

*Broadcast from Covent Garden on June 25th, 1928* of their stage associations, is agreeably entertaining, like pictures by Frith and Landseer, like photographs of ladies in crinolines and gentlemen with Dundreary whiskers.

The works which gain most are Wagner's *Lohengrin* freed from that jerky stuffed swan, *The Valkyrie* as a glorious symphonic poem with interludes of vivid drama, *Tannhäuser* creating in our minds the pictures appropriate to its solemn and furious strains, *The Ring* shorn of theatricality, of its pantomime dragon and wiggy, night-gowned Rhine maidens. At last we can hear the music-dramas of that master of sound relieved of everything that may divert our thoughts from his harmonies, stirring or sweet. We can see, not through the distorting mirror of stage production, but as he imagined them, Elsa and Brünnhilde, Siegfried and Walther, the romantic legendary figures dignified by the "motives" suggested to his mind.

Only when we hear opera by wireless can the imagination range free, only then can it be led whither the composer desired to lead it. Whatever scene be required, whatever of grace or beauty in the singers, the listener, inspired by the music, supplies for himself. If for the hour he be asked to surrender his reason to magic, to fairy spells, no difficulty caused by creaking illusion or crude mechanism shall stand in the way.

Here is the chief gain to lovers of music from the change which substitutes for "going to the Opera" the Opera coming to us. Yet the minor gains are not to be despised. No dressing, no early dinner, no hurrying off immediately after, no cramped position, no abstinence from tobacco.

Here I am in a comfortable chair, my dinner digested, my pipe within reach, my senses in just the right state of ease and anticipation to get full enjoyment out of music. Hush, it is beginning! I hear those adorable tuning-up sounds. Excuse me, I must stop.

*Note.*—The B.B.C., while agreeing generally that many of the anomalies and absurdities of the stage presentation of opera are eliminated in the studio performance, and that invisibility is not necessarily a hindrance, holds strongly the view that the full value of an opera can only be realised by actual attendance at a stage performance.

# THE "PROMS"

NOWHERE in the world is there anything quite like the London "Proms." In spite of all we do to prove the contrary—and much of it is done to their advantage—our continental neighbours look on us still as the unmusical race of Europe. And yet no other country—no other city even—can boast of any musical undertaking which has so firm a hold on the affections of its people, which is, in the same way, so much a part of the city's life.

Except for brother and sister artists of the performers, who come to hear each other, and the handful of earnest musicians who turn out to gain first-hand impressions of the new works, the audience is very largely made up of people—young and old, men and women—whom no one sees at other concerts, whom no one sees—it would be nearly true to say—anywhere else at all. And yet, year after year, in the late summer and the first weeks of autumn, when the world of out-of-doors is calling still, the opening night finds them there, perspiring, suffocating, fainting even on occasion, with the same enthusiasm as ever, ready to stand for two hours or more—that they may listen to Sir Henry Wood and his orchestra. And as the season goes on, it sees no whit of abatement in that wonderful nightly enthusiasm.

Last year the "Proms" experienced, and survived, the third crisis in their thirty-three years' existence. For some months it seemed as if they were to disappear, the old management having found it impossible to carry on. Luckily for London and for British music, a way was found whereby the B.B.C. might act as fairy godmother to the scheme, and, under the Corporation's auspices, a six weeks' season was carried through on the well-established traditional lines, and with all the traditional success.

Wisely, as the event proved, the B.B.C. made no change in the policy which had hitherto guided the concerts: Mondays were, as for years past, "Wagner Nights," Tuesdays were mainly devoted to Haydn and Mozart, and Friday relied mainly on Beethoven and other classical masters. The great Bach's name stood almost alone on three of the Wednesday programmes, as well as appearing in several others, the end

SIR HENRY WOOD

of the programme being given in each case to more modern music, as time-honoured custom ordains.

The Romantic era, and later stages in the art down to the present day, were worthily represented, and the claims of native music were, as always, generously met. British composers' names appeared more than fifty times in the series, and first performances were given of works by Frank Bridge, Susan Spain-Dunk, B. Walton O'Donnell ("A Gaelic Fantasy," first concert performance), V. Hely-Hutchinson (first performance in England), William Walton (first London performance), Thomas Wood (first London performance), and William Alwyn, all, except the last two, being conducted by their composers.

First performances in England were given of pieces by Ippolitov Ivanov, Paul Hindemith, and Marcel Dupré, and many other works were included, which, although not performed for the first time, are rarely heard except at the "Proms." Among these last were: Dorothy Howell's Pianoforte Concerto (the solo part played by the composer), Lord Berners' "Fantaisie Espagnole," Bax' Symphonic Variations, Dame Ethel Smyth's Concerto for Violin, Horn, and Orchestra (conducted by the composer), J. B. McEwen's "Grey Galloway," Ernest Bloch's Concerto Grosso for Strings and Pianoforte, and Goossens' Scherzo "Tam o' Shanter." Mention must be made too of Bach's Concerto for four pianofortes and strings.

Among the artists there were, for the first time, several whom the great public had hitherto heard most often by wireless: their success, in each case, amply justified their enlistment into the ranks of those whom the "Prom" audience has learned to regard as its very own singers and players.

The new season which began on 11th August is to extend over eight weeks—two weeks longer than last autumn—and while the guiding principles in the selection of programmes and artists remains substantially the same as before, special care has been bestowed on the choice of new works, with a view to adding to the value and interest of that side of the concerts.

# THE LONDON WIRELESS ORCHESTRA

THE London Wireless Orchestra takes part in so many programmes that it is perhaps of interest to recount briefly its history and mention a few personal facts concerning its members. Seldom is an orchestra called upon to be so versatile: it is rehearsing a Symphony Concert at one moment, accompanying a Musical Comedy the next, taking part in Grand Opera or Oratorio the next evening, or at another time even imitating the village band in a Revue. Many of the players also take part in Chamber Music or in solo work in the London programmes.

The present London Wireless Orchestra had its beginnings in the little band of nine players broadcasting from Marconi House in 1922–3. In those days several carbon granule microphones connected in parallel were hung round the piano, and almost every player had his own! In May 1923 the first Savoy Hill studio was opened, and the small orchestra was augmented by a cornet and a trombone; a mustel organ took the place of the woodwind instruments and horns. Later in the same year the organ was replaced by single woodwind and two horns, together with a contra-bassoon (it being found that the string bass did not broadcast effectively at that time). From then onwards there was a steady growth in the string instruments of the orchestra, and a little later double woodwind was permanently used throughout. The first really ambitious concert was given from the studio (how small and stuffy!) under Percy Pitt's direction on November 26, 1923—a complete Wagner programme, with an augmented orchestra of about forty players.

In 1926 an extra trumpet and trombone were added, and in 1927 the orchestra was organised on the basis of two trumpets and three trombones with a permanent harpist, all players being engaged on a lengthy contract at good salaries and with no deputies allowed except in special circumstances. (This no-deputy provision was a new institution so far as a permanent orchestra in London is concerned, and its effect on the performances was decidedly marked.) This brought it to the full strength of thirty-six, which of course is augmented to fifty, sixty, or even more for special concerts.

In such limited space it would be impossible to describe the personnel of the orchestra one by one; nevertheless mention may be made of certain players with long association with London broadcasting.

The leader, Mr. S. Kneale Kelley, has been with the B.B.C. since the Marconi House days; he is a well-known member of the L.S.O., Philharmonic, and other London orchestras, and left the musical directorship of the Ramsgate Municipal Orchestra in order to take the appointment. Of other string players one may mention Ambrose Gauntlett, the principal 'cellist of the Royal Opera, and member of the Royal Philharmonic, London Symphony, and other orchestras and Chamber Music organisations. In the woodwind the first flute, Frank Almgill, is one of the L.S.O. principals; Frederick Thurston, first clarinet, in spite of his youth, is regarded as one of the best players of the day, and Charles Draper, the second clarinet, who sits beside him, is a very famous artist. Here is a unique case of master and pupil playing side by side in the same orchestra.

Walter Hinchliffe, principal bassoon, is first bassoon in the Royal Albert Hall Orchestra; and Ernest Hall, the first trumpet, is principal of the L.S.O. and the Royal Opera, Covent Garden, and is one of the admittedly outstanding trumpeters of the present time.

The principal percussion player, J. B. Lees, is one of the most versatile of artists, not only taking his part in Symphony Concerts and serious programmes, but also "boiling down" several percussion parts in Musical Comedy and light programmes with extraordinary precision and effect.

The permanent harpist is Sidonie Goossens, the youngest member of a distinguished family which includes Eugene the composer, Leon the oboe player, and Marie—another of London's harpists.

Frank Hook, the orchestral pianist and celesta player, while retaining this position in the orchestra, has undertaken much more responsible and arduous duties—those of principal librarian to the whole of the B.B.C. Headquarters Music Library.

Finally one may well mention Thomas Dickie; he originally joined the orchestra to play the contra-bassoon, which gave way some two years ago to the string bass. He is now second bassoon and also Orchestral Secretary.

# COMING MUSICAL EVENTS

APART from the eight weeks' season of "Proms" which began on August 11th, and to which reference is made elsewhere in this book, the chief orchestral undertaking of 1928–29 will be a series of B.B.C. Symphony Concerts in the Queen's Hall. Beginning on October 12th, these will be given on alternate Fridays until April 12th, British conductors and distinguished visitors from overseas having almost equal shares in their direction.

Once a month, roughly, from October to February, a concert by the Hallé Orchestra, conducted by Sir Hamilton Harty, will be relayed from Manchester; unless unforeseen difficulties occur, listeners will have opportunities too of hearing the new National Orchestra of Wales, the City of Birmingham Orchestra, and the Scottish Orchestra.

Studio operas in the "libretto" series have been fixed for Mondays from 5GB and for Wednesdays from London and 5XX, once a month, from September 1928 to August 1929. They are as follows:—

"Maritana" (Wallace).
"Pelleas and Melisande" (Debussy).
"Samson and Delilah" (Saint-Saëns).
"The Blue Forest" (Louis Aubert).
"Lakmé" (Delibes).
"Le Coq d'Or" (Rimsky-Korsakov).
"Ivanhoe" (Sullivan).
"The Flying Dutchman" (Wagner).
"Le Jongleur de Notre Dame" (Massenet).
"The Swallows" (Puccini).
"Werther" (Massenet).
"Le Roi l'a dit" (Delibes).

Librettos of these are being issued in the usual way.

On the first Monday of each month, beginning with September, special chamber music concerts are to be given. These will not consist by any means entirely of contemporary or modern chamber music, but will include many of the best known and most popular works of the classical and romantic eras. They will be given in part by the best British chamber music organisations and partly by teams from other countries.

## THE WIRELESS MILITARY BAND

THOUGH several of its members have served with H.M. Forces, the Wireless Military Band has no connection with the Army; the name is used to mean that the instruments played are those in use in Service bands, and to distinguish it from brass bands and orchestras. Details of the combination are to be found elsewhere in this book,* showing that there are no strings—woodwind, brass, and percussion only.

But though the band, like many other civilian bands, particularly in the North, which use the name "Military," is thus like the bands of the fighting Services, it is unlike them in other respects. It plays, for instance, at the low pitch which is now almost universal for concert orchestras throughout Great Britain, while our Service bands still use the high pitch.

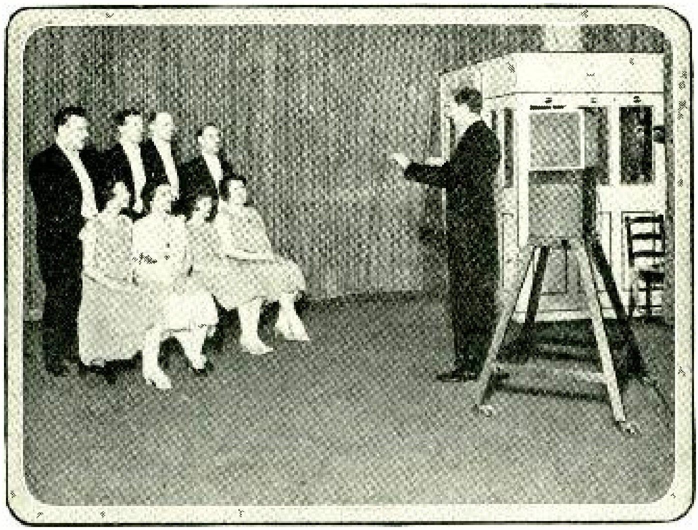
The members of the Wireless Military Band are among the best professional artists in London, and the majority have had long experience in England's foremost symphony orchestras, playing under the greatest conductors of the day. The band includes—to mention but a few of its players—Robert Murchie and Charles Stainer (flutes); R. A. Smith (E flat clarinet); J. Brand (oboe); Haydn Draper, G. Anderson, and A. N. Tschaikov (solo clarinets); W. Lear (alto saxophone); P. Draper (bassoon); E. Chapman (horn); Charles Leggett (solo cornet, Deputy Conductor and Secretary); B. Ashby (trombone); T. Thorpe (euphonium); F. Ash (bass); while the percussion is in the hands of F. Kennings and R. Franklin.

The Wireless Military Band can thus enter on its task with advantages such as few, if any, other bands have ever enjoyed. In its conductor, too, the band is singularly fortunate. Mr. B. Walton O'Donnell has a distinguished record of service, not only as a bandmaster, but also as composer, teacher, and examiner. In the very best sense of the word, he is a thorough musician.

In their infancy military bands were dependent on marches (chiefly imported from Germany) and dance music for a repertoire. Only gradually was this added to—largely by arrangements of popular works of all kinds for orchestra or

* See p. 159.

pianoforte—popular in the sense that they are now, or soon will be, well known to, and approved by, the ordinary music lover. These still form a large part of the band's programmes, but the repertoire is being steadily, if not yet very rapidly, enriched by music specially written for it by eminent composers. The B.B.C. has commissioned a number of such works. Orchestral pieces are also being regularly transcribed for the band, and to this task also distinguished musicians, the conductor of the band among them, are devoting their talents and knowledge.



THE WIRELESS SINGERS AND STANFORD ROBINSON

## THE WIRELESS SINGERS

THE Wireless Singers, a choir of eight (two sopranos, two altos, two tenors, two basses), are probably the most rehearsed body of singers in existence. Unlike other small choral organisations, they do not specialise in any particular type of work, but take part in every choral undertaking of the B.B.C., except that they do not now sing in revues. More often than not, they are only the nucleus of a much larger choir, but they sing by themselves in the Epilogues and in the studio services on Sunday evenings, under the name of the Wireless Choir, and their blend has become so excellent from constant practice that they are almost always thought by listeners to be a quartet. Four of them take it in turns with the other four to sing in the morning services. At one time and another they have taken part in everything from Plantation Songs to "The Dream of Gerontius," in which latter work they sang the semi-chorus.

A combination of singers of these attainments and versatility was not formed without a thorough knowledge of the capabilities of its members. Ever since 1923, when the B.B.C. first began to systematise its choral work, the various singers have been sorted and shuffled until an ideal team was found. The present organisation was founded in February 1927, and since then its personnel has not changed. One member—the youngest—was one of the original singers in 1923. Three of its members sing in the choir of St. Paul's Cathedral.

The Wireless Singers are a body of musicians whose artistic and technical ability is of the highest standard, and who, by constant practice together, have attained the object of all ensemble organisations—the blending of their separate individualities into a living whole.

| | | | |
|---|---|---|---|
| *Sopranos:* | Dorothy Burton | *Contraltos:* | Doris Owens |
| | Ethel Williams | | Gladys Winmill |
| *Tenors:* | Tom Purvis | *Basses:* | Stanley Riley |
| | John Collett | | Samuel Dyson |

# THE NATIONAL ORCHESTRA OF WALES

THE National Orchestra of Wales gave its inaugural concert on Thursday, 12th April, when some five hundred people were unable to gain admittance. As Cardiff has no concert-hall, it has no specialised concert-going public, and this attempt to establish a permanent orchestra in the capital of a nation renowned for its singers and for its love of music, was a venture which has splendidly justified itself.

The Orchestra has come to stay; the doubting Thomases have seen, and now they believe. The audience in the Museum has grown daily. Perhaps the generous nature of the gesture made success more possible than a timid policy would have done.

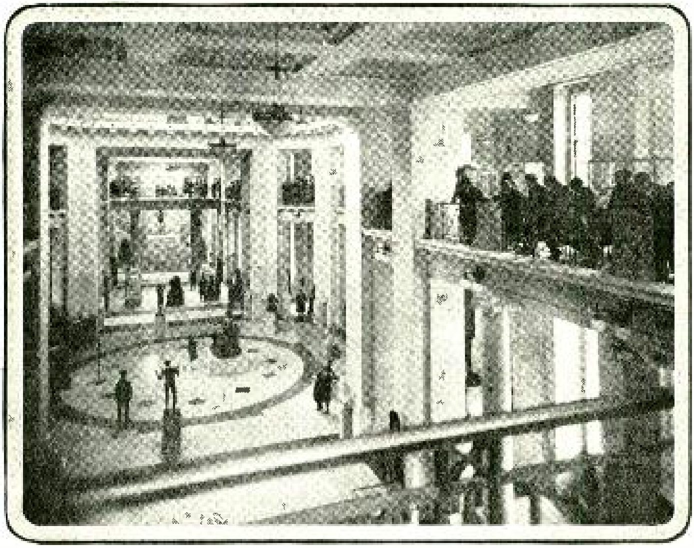
The scheme provided for four free concerts a week in the National Museum and a Symphony Concert and a Popular Concert each week in the City Hall. A scheme of this magnitude attracted widespread attention. It made people realise that something more than a number of concerts was provided, and that that something more was a first-class and varied musical education. Sir Henry Wood, who conducted the opening concert, once told a Cardiff journalist that he saw great possibilities before the Welsh people musically if they worked, "But," he added, "they are born lazy." C. Burwyn Rees writes on this criticism in *The South Wales News*, 16th April, 1928:—

"Uncomfortable, but true! We shall get no fulsome flattery from Sir Henry Wood, for which we should be thankful. We have had too much of it in the past. We have fed on it, and the result has been that we have come to believe it possible to inherit the world of art, or any other, without labour and sweat. Complacency is the twin-brother of laziness. And complacency is fatal to artistic work."

But Sir Henry gave an experience of his own which should prove an incentive to all budding Welsh instrumentalists. He related that when he started the Queen's Hall Orchestra more than thirty years ago, there was not a single Englishman in it, but that at the present time, in an orchestra of eighty-six, there are only two foreigners, and they are naturalised.

The National Orchestra of Wales has fifteen Welshmen in an orchestra of thirty. If the educative work of its concerts is made use of, we may hope to see an orchestra of Welshmen chosen, not because they have had preferential treatment, but because they are the best obtainable.

Cardiff is now in a unique position among the cities of Britain; for the co-operation of the City Council, the National Council of Music, the National Museum of Wales and the B.B.C. is a form of commercial activity different entirely from the customary mechanical routine by means of which a Municipal Orchestra is normally engaged.



*Topical*

THE NATIONAL MUSEUM OF WALES AT CARDIFF

*in which some of the National Orchestra of Wales's concerts take place*

# BANDS, ORCHESTRAS AND INSTRUMENTS

THE B.B.C. regularly broadcasts instrumental organisations of all shapes and sizes; and in these days of orchestral experiment, the different combinations are legion. To describe every combination of instruments that has ever broadcast would be a monumental work; but it is possible to indicate the groups into which the various combinations fall, and to give a *résumé* of the characteristics of each.

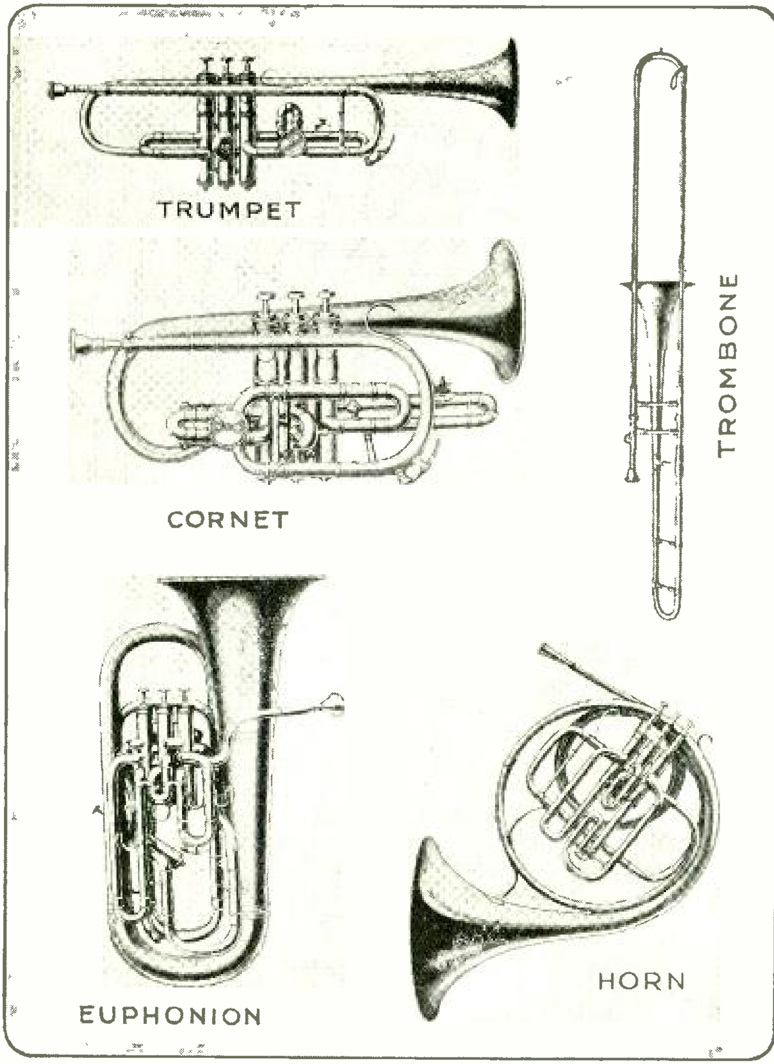
By far the most important of these organisations is the Symphony Orchestra, which for more than a hundred and fifty years has been the medium of expression of all that is most progressive and notable in music. Next in order of importance (and numbers) comes the Military Band, whose possibilities, purely musical—and non-military—though limited compared with those of the orchestra, are still extensive and comparatively unexplored as yet. As distinct again is the Brass Band, a combination whose resources and importance, though less than those of either of the foregoing, must by no means be overlooked. None of these has an absolutely stereotyped formation, either in concert hall or studio; but the groups of instruments used in each are constant, and a certain proportion between these groups is always roughly adhered to.

This is no longer the case when we come to the smaller combinations: dance bands, chamber-music combinations and light orchestras. Dance bands, at the moment, are more constant in their formation than the other two, but even they show considerable variation. A light orchestra may be anything from a very much condensed symphony orchestra to a piano trio; whereas modern chamber-music combinations are almost equally variable in numbers and composition. The only difference between the two is that the latter always play music specially written for the particular combination in question; whereas the former play condensed versions of orchestral and other works. One band—a sort of cross between a light orchestra and a dance band—has given a most interesting broadcast, performing the functions of the


*The above are reproduced from Messrs. Boosey & Co.'s catalogue. The representations are not strictly proportionate in size* one in the manner of the other, an achievement which opens up distinct possibilities.

In all the large combinations there is one group of instruments acting as a kind of backbone to the body as a whole. In an orchestra the backbone is the strings, in a Military Band the clarinets, and in a Brass Band the cornets. To vary the simile, these instruments supply the basic colour in the colour scheme, while the others give the high and low lights. By applying this simile, it may be seen why the orchestra has more technical resources than the Military Band, and the Military Band more than the Brass Band. The basic colour of the orchestra being the string tone, for contrasting lights it has three groups of instruments—woodwind, brass and percussion. The basic colour of the Military Band is supplied by the clarinets—woodwind instruments; there are no strings, and for contrast there is only brass and percussion. The Brass Band possesses neither strings nor wood wind; its basic tone is the cornet tone, and the only high light left is the percussion, except for more subtle differences of tone supplied by the soprano cornets and trombones. In each case the basic tone becomes less and less neutral, and the contrasting lights become less remote; it follows that less variety of tone is obtainable.

One may be excused for mentioning here a point which is sufficiently obvious to be very often overlooked. The object of large combinations of instruments is not to make a lot of noise, but to obtain variety of tone. Loudness in music is purely relative, depending on the volume of sound preceding the climax. One of the most thrilling climaxes in all music is that in Wagner's "Siegfried Idyll," which is scored for a tiny orchestra; the effect of loudness is produced by the extraordinarily adroit preparation of the climax and the rapture inherent in the music. If loudness was the only object of numbers, there would never be any point in broadcasting more than one instrument at a time, because the loudness of transmission depends entirely on amplification. It is the variety of colour provided by large instrumental organisations, which the works written for them demand for their faithful interpretation, that necessitate their use in broadcasting.




*The above are reproduced from Messrs. Boosey's & Co.'s catalogue.*
*The representations are not strictly proportionate in size*

## *THE SYMPHONY ORCHESTRA*

Now for the combinations themselves. First, the orchestra. The modern symphony orchestra is in all essentials the same as that for which Haydn wrote his symphonies. It has grown, of course, but has kept the proportion between the groups of instruments. A glance at Table A will show the dimensions of an ordinary metropolitan concert orchestra. Of course, some works require a larger orchestra than this, and some a smaller; but this is a fair average size. The number of strings is not absolutely constant; in England it is very often rather smaller. The London Wireless Orchestra is much smaller than this; its dimensions are set out in Table B. This orchestra suffices perfectly for light orchestral concerts, and is augmented as required for the performance of larger works. The very small number of strings used is due to the fact that the strings, being placed near the microphone, sound disproportionately loud, and fewer are therefore needed to balance the wind and percussion.

The woodwind instruments all have big or little brothers, with the same fingering but different pitch; and the players are often called upon to play these instruments during certain parts of the music. For instance, one of the flute players combines the *piccolo* (a little flute, sounding an octave higher), and perhaps the *bass flute* (which should really be called alto flute); one of the oboe players the *cor anglais* (alto oboe), and perhaps the *bass oboe;* one of the clarinettists the *bass clarinet*, and perhaps the small *E flat clarinet;* and one of the bassoonists the *double bassoon.* The figures given in the tables include these instruments.

In broadcasting, all these instruments do not come over at uniform strength. Assuming a given distance from the microphone, the strings broadcast normally; so do the clarinets and bassoons. The oboes broadcast subnormally, but with great purity of tone; and the flutes, brass, drums, and harp all broadcast supernormally. These differences in strength are rectified by distance from the microphone in the studio.

The largest orchestral broadcast ever undertaken by the B.B.C. was that of the "Gurrelieder" of Schönberg in January 1928. The orchestra used on this occasion numbered 147.

## TABLE A

### A Modern Symphony Orchestra

| | |
|---|---|
| Woodwind: | Percussion: |
| 3 Flutes | 1 Kettledrum Player |
| 3 Oboes | 2 Other Percussion |
| 3 Clarinets | 2 Harps |
| 3 Bassoons | |
| | Strings: |
| Brass: | 16 1st Violins |
| 4 Horns | 16 2nd Violins |
| 3 Trumpets | 12 Violas |
| 3 Trombones | 10 Violoncellos |
| 1 Tuba | 8 Basses |

90 Players

## TABLE B

### The Wireless Orchestra

| | |
|---|---|
| Woodwind: | Percussion: |
| 2 Flutes | 1 Drum |
| 2 Oboes | 1 Harp |
| 2 Clarinets | 1 Piano and celesta |
| 2 Bassoons | |
| | Strings: |
| Brass: | 6 1st Violins |
| 4 Horns | 4 2nd Violins |
| 2 Trumpets | 2 Violas |
| 3 Trombones | 2 Violoncellos |
| | 2 Basses |

36 Players

## TABLE C

### Sullivan Orchestra

| | |
|---|---|
| Woodwind: | Percussion: |
| 2 Flutes | 1 Percussion Player (no harp) |
| 1 Oboe | |
| 2 Clarinets | |
| 1 or 2 Bassoons | Strings: |
| | 6 1st Violins |
| Brass: | 4 2nd Violins |
| 2 Horns | 2 Violas |
| 2 Cornets | 2 Violoncellos |
| 2 or 3 Trombones | 2 Basses |

29–31 Players

## TABLE D

### The Wireless Military Band

| Woodwind: | Brass: |
|---|---|
| 2 Flutes | 2 Horns |
| 1 E flat Clarinet | 2 1st Cornets |
| 1 Oboe | 1 2nd Cornet |
| 3 Solo Clarinets | 3 Trombones |
| 2 Repiano Clarinets | 1 Euphonium |
| 2 2nd Clarinets | 2 Basses |
| 2 3rd Clarinets | |
| 1 Alto Saxophone | Percussion: |
| 1 Tenor Saxophone | 2 Percussion Players |
| 1 Bassoon | |

29 Players

## TABLE E

### Brass Band

| | |
|---|---|
| 1 E flat Soprano Cornet | 2 B flat Euphoniums |
| 8 B flat Cornets | 2 B flat Tenor Trombones |
| 1 B flat Flugel Horn | 1 G Bass Trombone |
| 3 E flat Tenor Horns | 2 E flat Basses |
| 2 B flat Baritones | 2 B flat Basses |

2 Percussion Players

26 Players

## TABLE F

### The B.B.C. Dance Orchestra

Piano combines Celesta

Tenor Banjo combines { Tenor Guitar, Spanish Guitar, Tenor Saxophone }

Drums combines Xylophone

Sousaphone combines Double Bass

1st (alto) Saxophone combines { Clarinet, Soprano Saxophone, Baritone Saxophone, Bass Clarinet }

2nd (alto) Saxophone combines { Clarinet, Soprano Saxophone, 2nd Violin }

3rd (tenor) Saxophone combines { Clarinet, Soprano Saxophone, 1st Violin }

1st Trumpet

2nd Trumpet combines 'Cello

Trombone combines Bass Saxophone

A specialised type of small symphonic orchestra is the Chamber Orchestra, which normally performs works specially written for itself. It may be described as a string orchestra with a small backing of wind instruments.

## *THE MILITARY BAND*

Next comes the Military Band. The constituent instruments of this body (and those of the Brass Band) have been determined, in the first place, partly by artistic considerations, and partly by expediency. A Military Band has to be able to play out of doors, and its members have to be able to march while playing. This puts stringed instruments out of court at once, and the band is necessarily composed of wind instruments and such percussion as is portable. As a matter of fact, in the scoring of symphonic works, and some light works (other than military marches), instruments not answering to this description are used; but they are accessories, not essentials. The character of the Military Band is determined by its permanent, not its incidental instruments. Military Bands formerly varied very much in size, and most works for this combination used to be so scored that they could not be played on a band of less than fifty players. As the actual size of bands varied, this uncertainty as to the size of the medium militated against the composition of important works for Military Bands, and, though some few exist, the Military Band repertoire of to-day contains an inordinately big proportion of arrangements of works for other combinations. Now, however, the Military Band is assuming a definite formation, and the minimum for effective performance is standardised at twenty-five players.

Table D shows the composition of the Wireless Military Band, which, it will be noticed, is slightly larger than the minimum above mentioned. The reader will note the preponderance of clarinets, corresponding to that of the strings in the orchestra. The clarinet is ideally fitted for its position in the band, as it combines a beautiful tone with great agility and a beautiful expressiveness in melody.

Owing to the construction of the instruments used, the Military Band plays most conveniently in flat keys. The main body of clarinets, for instance, is in B flat (*i.e.* if their parts are written and played in C, they sound in B flat), the cornets are in B flat, and so on.

### *BRASS BANDS*

The B.B.C. has no standing Brass Band, but broadcasts bands from outside fairly frequently. The formation of one of these is shown in Table E. It should be again emphasized that this is a combination whose possibilities are not yet fully exploited, and which would benefit from the more general attention of serious composers. Brass Bands, like Military Bands, play by preference in flat keys.

### *CHAMBER MUSIC*

The term Chamber Music, originally applied to music designed for performance in the home, has become loosely applied to music for comparatively small combinations of any type. The most usual Chamber Music combinations used to be a string quartet (two violins, one viola, one violoncello), perhaps with piano added, and a piano trio (piano, violin, violoncello), besides solo instruments with piano. To-day all sorts of combinations are used. To give an idea of the variety of these, three different combinations, all broadcast during the same concert last March, are detailed below.

1. Two flutes.
2. Two flutes, clarinet, piano.
3. Oboe, clarinet, violin, viola, double bass.

### *LIGHT ORCHESTRAS*

The different combinations which describe themselves as light orchestras are legion; but the function of a light orchestra is always the same, to represent a full orchestra on a very much reduced scale. This may be done, in different ways, by any number of instrumentalists from three to thirty. The dimensions of the old Savoy orchestra, on which the Gilbert and Sullivan operas were first performed, are given in Table C, but for broadcast purposes a light orchestra is usually between six and eight players. The actual instruments used vary; sometimes they are exclusively strings,

THE INSTRUMENTS OF A MODERN DANCE BAND *Stage Photo*
(*Jay Whidden's Band*)

sometimes they include wind and percussion; a piano is almost invariably included. The combinations are always made up with a view to obtaining the maximum of fullness and variety with the minimum of means.

## *THE DANCE BAND*

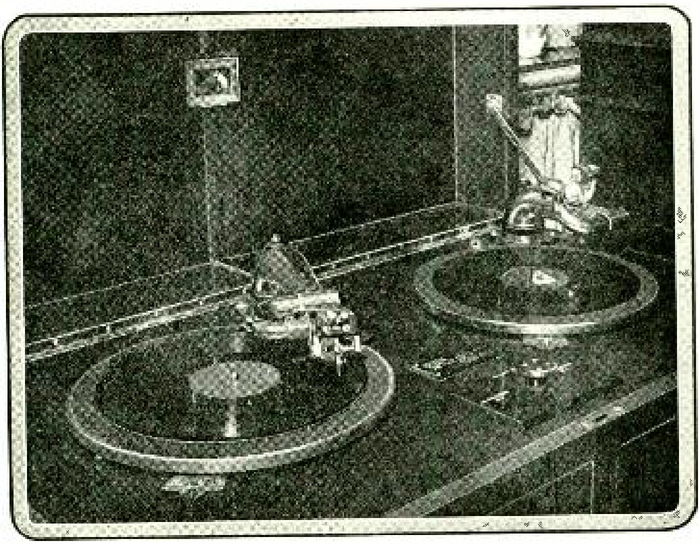
The modern dance band is about as far as it could be from the "harp and fiddles" of Dickens. The discreet tones suitable to the waltz and polka have given place to sounds of a more vigorous and rhythmic nature. Variety of tone, however, is obtainable in plenty in the modern dance band, as apart from the fact that some of the instrumentalists combine other instruments, an astute player can get so many different noises out of a trumpet or trombone that it is quite unrecognisable as the same instrument. The instruments in the B.B.C. Dance Orchestra, together with those which they combine, are given in Table F. The reader can estimate at a glance the enormous variety of tone obtainable from this combination.

F

## *THE STRING ORCHESTRA*

One combination, which stands quite by itself, has not yet been dealt with. This is the string orchestra, which, of course, consists simply of the strings of the normal orchestra. One might expect that this would be the dullest of all large combinations, being composed of instruments of only one tone quality; actually, it is the richest and most varied in effect. String-playing admits of infinite subtlety; and the absence of other instruments makes the listener more susceptible to slight differences in tone. Anyone who has heard Grieg's or Tschaikowsky's works for strings will appreciate this.

Every instrumental combination has a corporate individuality, just like a good football or cricket team. Each has been formed for definite purposes, either of art or expediency; and each achieves its end as a body. A really good instrumental combination is the highest of all musical achievements—a blending of separate individualities into a living whole.



THE GRAMOPHONE BROADCASTING CABINET, SHOWING THE MICROPHONIC PICK-UP DEVICE

# FOR GRAMOPHONE LOVERS

By Christopher Stone

DURING the last year a considerable development in the weekly broadcast of new gramophone records has been welcomed by listeners. The chief reason for this development is that gramophone recording by the electric process, *i.e.* through a microphone instead of through a horn, has made rapid advances, and that, by means of an electro-magnetic pick-up in the studio, it is possible to broadcast records with as great a fidelity as on the best gramophones, and with an added sonority and a reduction of surface noise. The transmission is still somewhat tentative, but the engineers at Savoy Hill, unless taken by surprise by a bad record, can generally reproduce records so successfully that the listener would imagine the orchestra or singer to be present at the moment in the studio.

The transmission (on Thursdays from 1 to 2 p.m.) of new gramophone records has been supplemented by morning transmissions from Daventry every day (except Saturdays and Sundays) from 11 a.m. to 12 noon, and in these programmes it is usual to include a complete classical work or else fragments from several works which have been recorded for the gramophone, and to vary the programme by the inclusion of such light records as have not found a place in any Thursday programme. On Tuesday evenings, in addition, a short recital is given between 6 and 7 p.m. (with a break for the Weather Forecast and General News Bulletin at 6.30). Since the writer is responsible for this programme, a few observations based on his experience may be worth making.

In the first place, it was soon obvious that pre-electric recordings must not be mixed with electric recordings. The old records, however pleasant they may sound on a gramophone specifically designed to play them, suffer severely in contrast with their more brilliant successors: not so much the voice as its instrumental accompaniment, which sounds terribly thin. Consequently the tendency has been to include only modern recordings in the programmes, with an occasional group of old-time favourites segregated into a programme of their own.

In the second place, it has been found that at 6 p.m. listeners, most of them after a hard day's work, want relaxation rather than elevation, and that programmes of a mixed and entertaining character are preferred to programmes of grand opera or classical works, however good the latter might be at a more opportune time. The playing of records asked for by listeners has therefore gradually superseded the more synthetic programmes with which the series started.

In the third place, it is impossible to ignore the very wide and keen interest taken in these recitals of gramophone records. Correspondence from all over the country brings acute criticism and encouraging appreciation; and if a record is a success it is encored by the unseen audience through the post. An increasing number of listeners are feeling the importance of supplementing the receiving set with a gramophone, so that memorable music heard on the former may be obtained in a more permanent form for repetition on the latter. And it is interesting to note that in recent years the recording companies have not been slow to make records of singers, orchestras, dance bands, etc., who have already proved their power to achieve popularity by wireless.

In this co-operation the B.B.C. is keenly interested. Not only does the broadcasting of some eighty records a week help listeners to choose the best records with the least trouble to themselves; but expert advice on the choice and care of gramophones is at the disposal of anyone who writes to ask for it. In other countries the risk of allowing this feature to degenerate into a form of mere advertisement for the recording companies might be considerable; but the B.B.C. maintains a completely unbiassed attitude—an attitude of austere balance, one might almost claim—which is the only guarantee of really good service to the public.

No wireless receiving apparatus, crystal or valve, may be installed or worked without a Post Office licence. Such licences may be obtained at any Post Office at which Money Order business is transacted, price 10*s*. Neglect to obtain a licence is likely to lead to prosecution.

# SOPRANO SINGING FOR WIRELESS

By Vivienne Chatterton

I HAVE been asked to imagine a young singer, trained for the concert platform, confronted with her first broadcasting engagement. What hints, based on my own experience of singing in the studio, will be most useful to her? I have found that songs for broadcasting require special treatment, both in their preparation and performance. I hope, therefore, the following hints may be of some assistance.

*Firstly.* Take warning. When you first sing in a draped studio your voice will seem about half its usual volume, and you will be tempted to force the tone. *Don't.* To mitigate this, practise singing with a finger in one ear—a trick which will enable you to hear your voice much as it will sound in the studio.

*Secondly.* See that your breathing is perfectly silent, for anything like a gasp for breath will transmit as a veritable hurricane.

*Thirdly.* Diction is tremendously important. Every consonant must be crisp and clear—especially at the end of a word—but this must not be exaggerated, or an uneasy sense of jerkiness will result.

*Fourthly.* Slow songs can be taken a little faster, and quick songs a little more slowly, providing the rhythm is very strictly maintained.

*Raphael*

VIVIENNE CHATTERTON

*Lastly.* Do not merely "vocalise," but concentrate on the message of your song.

The foregoing is a brief outline of "home-work." Now for studio technique.

Naturally no two voices are the same, but, as a general rule, a soprano should stand about six feet from the microphone, and sing slightly across, rather than directly into, the machine, and for every rising phrase from E flat taken more than mezzo-forte, should step back a further two or three feet. Certain songs lend themselves to what is called "intimate broadcasting"—that is, singing quite close to the microphone and never raising the tone above a mezzo-voce. Obviously this is not suitable to anything with a broad line or wide range of tone-colour. This is where experience alone can really help, and the beginner should not be too ambitious in her choice of items. Those very high notes which have been her crowning glory on the concert platform are most likely to be her undoing when broadcasting. If they "blast" the microphone, three things will probably result: the listener will be deafened, the engineer will swear, and the singer will not get another engagement! Be content at first, then, to choose songs of a simple character, flowing lines, and no great extremes of compass or light and shade. Be guided by the man in the control-box. Do not resent his criticism; he is your best friend. Finally, know your work so well that you will not be put off by flashing lights or any other signals that may be made to you during the actual transmission. Like the Boy Scout, make your motto "Be Prepared."

## NEW MUSICAL COMPOSITIONS

The B.B.C. is always ready to consider new music for broadcasting. Such music should be good enough to be worthy of performance on its own merits—and only works for orchestra and military band, or choral works, should be submitted. Scores (not parts) should be sent in. Chamber music, short instrumental pieces, and songs, as well as dance music and pieces, even if for orchestra, of a trifling nature, cannot well be used; the B.B.C. leaves the choice of all such items to artists, and such pieces have a better chance of performance if introduced direct to them.

## COMPOSING FOR WIRELESS

THE transmission of music is now so faithful that all music broadcasts more or less satisfactorily; but there are some combinations of instruments, and some types of music, that seem to be more naturally adapted to broadcasting than others.

A string quartet, or a string orchestra, being composed of instruments which all have the same tone-quality, always transmits well; so does a brass band, for the same reason, and an unaccompanied chorus. Orchestras and—in a less degree—military bands, being composed of groups of instruments of different qualities, are not quite so foolproof to broadcast; they can, and usually do, reproduce faultlessly, but they require constant care in balancing the strength of the various instruments. The same is true of most chamber-music combinations.

As to the type of music that is easiest to broadcast, classical music is more generally satisfactory than modern. This is chiefly due to the simple fact that only the best and purest classical music has survived, whereas modern music has not yet stood the test of time. But there can be no doubt that the more elementary harmonic system of the former is an advantage, as the microphone's natural reverberation, while enriching simple texture, tends to render the complex confused.

An essential in good broadcast music is a strong vein of melody. Melody—which really represents personality in music—is even more necessary in the studio than in the concert hall. The necessity is so far-reaching that contrapuntal music, the texture of which is a combination of melodies, is nearly always more satisfactory in transmission than large masses of harmony.

As broadcasting goes on, the technique of special composition for wireless will be explored more fully; but however thoroughly this art—in some aspects an entirely new one—is developed, the same root principles will always lie at the bottom of the best broadcast music: strong melody and simple texture.

Sybil Clay

"LONDON LISTENERS WILL HEAR SOME PIANO MUSIC"

# PIANO TECHNIQUE FOR WIRELESS

THE determining conditions of piano-playing for wireless, as opposed to concert performance, are mostly summed up in the sentence: "The microphone is never deceived." In the concert hall it is often possible to produce unusual and even beautiful effects by unorthodox means, even at the expense of perfect accuracy; for wireless the first essential is to play the notes, and to play them clean. This sounds like emphasising the obvious; but it is none the less a fact that a good many pianists whose work in the concert hall is unimpeachable have marred their early broadcast performances by inaccuracy and over-pedalling.

A broadcast pianist can obtain plenty of sensuously beautiful effects, but only on a basis of accurate and intelligent interpretation.

The paramount importance of accuracy and intelligence, and the secondary, though far from negligible, importance of sensuous beauty in broadcasting the piano, are not due to defects in transmission, for at its best piano transmission is perfect; they are simply due to the fact that the audience cannot see the pianist. It is only just beginning to be realised how much audiences at concerts listen with their eyes; and a concert pianist can, without the slightest affectation, help enormously by his outward demeanour in building up an atmosphere of mutual comprehension between himself and his audience. A broadcast pianist has to build up that atmosphere with his ten fingers. If he distracts his audience's attention by inaccuracy, or has not enough sense of shape to present what he is playing as a continuous whole, he obviously does not stand a chance of becoming *en rapport* with his audience. The subtler refinements of technique will, and indeed must, serve as adjuncts to his performance, but they cannot be primary essentials of it.

One technical point is worth mentioning. The piano never sustains tone at level intensity. Immediately after a note has been struck the tone drops to about half-strength, and gradually tails off to nothing. This is not very noticeable in a concert hall, but the microphone, never being deceived, transmits exactly what it gets from the piano. The result is that the pedal, if continued through different harmonics, does not add enough tone to enrich the general effect, but sustains enough notes to confuse the sound thoroughly; consequently those works which depend on sustained pedal effects for their proper interpretation are least suitable for broadcasting.

The ideal attributes of a broadcasting pianist are these: a clear, bright tone, a clean technique, and a first-class sense of shape and rhythm. Rigid economy in the use of the pedal is essential. With these attributes the more refinements and subtleties he can put into his playing the better; without them, no amount of mastery over detail will be of any use.

In short, though concert pianists cannot necessarily broadcast successfully, good broadcast playing embodies the essentials of good concert performance.

BELA BARTOK IN THE LONDON STUDIO

# ON LISTENING TO MUSIC

MUSIC, more than any other art, suffers from the indolence of its public. Literature and painting have a public which is always trying to see the artist's point of view, and to meet him half-way in an endeavour towards mutual comprehension; whereas the frequent practice of musical audiences is to sit in a state of very questionable attention and expect the music to do the rest. This far-too-common attitude is an unconscious tribute to the power of music; but it is bad for music, in that it prevents a composer's subtler points from being appreciated by the mass of his audience. In a concert hall a soloist may sometimes hold an audience, by his personal magnetism, in a really receptive condition; but with wireless, where there is nothing to see, this passive method of listening is hopeless for any music except that with the most obvious general appeal.

All music is written in some sort of form, and the form of a musical work corresponds to the plot of a novel or the composition of a picture. The texture of music, to carry on the latter simile, is its colouring or toning; some music, written for one instrument, is monochrome, other music is a mass of colour. In a word, although the actual medium of music is indefinite, its methods of composition are perfectly concrete and definite; and surely an appreciation of these cannot fail to bring a higher and subtler appreciation of the music itself.

It is comparatively easy, even for one who has never learnt music, to pick up some knowledge of the elements of composition, especially if he compares these with corresponding devices in other arts and applies this knowledge while listening. The first movement of a classical sonata is usually based on two subjects—the same framework as a novel, with a hero and heroine. A fugue is based on one subject; this might be compared to a biography. A set of variations on a theme might just as fairly be called "The Adventures of a Tune" as the stories about Sherlock Holmes are called "The Adventures of Sherlock Holmes." The parallel is exact in every case, even to the subsidiary musical matter corresponding to the subsidiary characters; and it is especially true in this sense, that both tunes and characters contain the material for development within themselves.

For those who have studied music, it is an excellent thing to listen with the music open before them. This is especially useful in the case of music for string quartet, a large part of the charm of which consists in the absolute equality in importance of the four instruments. To follow the evolution of music with one's eyes as well as one's ears is, to say the least of it, extraordinarily illuminating. No great knowledge of music is required to do it; the mere power to recognise the sort of thing a tune looks like on paper is enough to start with, and one's reading progresses by leaps and bounds if one forms the habit of following in the score.

Probably some of those who have read so far will say, "Why should we take all this trouble?" The answer is, "Because it is worth it." Supposing you had never taken the trouble to learn the rules of Association football, how much pleasure would you get from watching a Cup final? The old saw, that one must work for one's enjoyment, is as true of music as of football, or anything else. The lethargic and inattentive listener to music may get some pleasure from a little of it; but it is positive that he misses almost all the enormous amount of enjoyment that is really worth having.

## MUSICAL COMMITTEE

The Advisory Committee on Music was established early in 1925 with a very distinguished membership—Sir Hugh Allen, Sir Walford Davies, Dr. J. B. McEwen, Sir Landon Ronald, Professor Tovey of Edinburgh (who was later succeeded by Dr. Adrian Boult), Colonel J. C. Somerville and Dr. W. G. Whittaker of Newcastle-on-Tyne. The members hold quarterly meetings to discuss generally the musical side of the programmes.

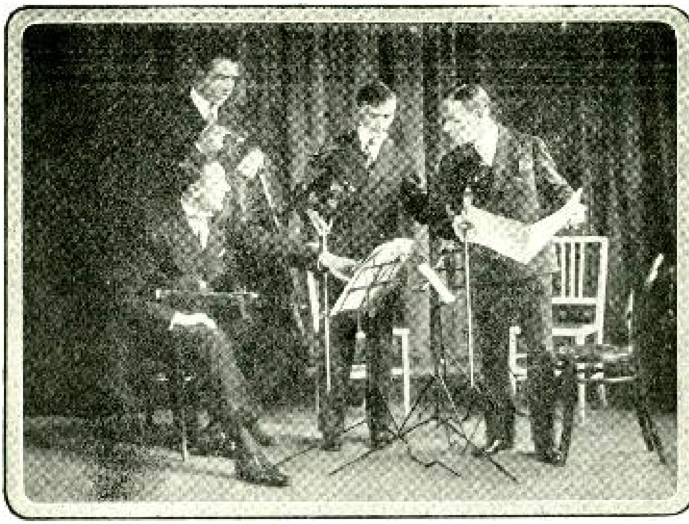
# ON LISTENING TO CHAMBER MUSIC

OF all the various scapegoats of broadcasting none is more continually the butt of complaint, of ribald jest, of unjust derision, than is Chamber Music. There was a time in the history of the microphone when every chamber concert broadcast brought a dozen letters of gentle reproof, if not of harsh censure; the listener is now more tolerant, or at least less moved to complaint.

Someone has said that Chamber Music, like vinegar, is an acquired taste. Rather, some would say, is it an acquired understanding. There are few men who have not in their souls a liking for a tune. Centuries ago men made up tunes as they worked or played, and sang them in time with their step or with their hammer—jolly good tunes too, wedded to healthy rhythms. From these two natural elements, which no one is so dull as not to appreciate, is music made. It can be tremendous, like the thunder of the volcano and the shrieking of the wind; as from a symphony orchestra, a fine band, a great organ or a deep-throated choir. It can be quieter, simpler, more lyrical and caressing, like the soft modulations of madrigal singers or the smooth weaving together of the tones of four violins.

Little did the first spinner of wool foresee of the future and the application of his craft. The thousands of kinds, qualities and shapes of cloth—good, bad and indifferent—have their beginnings in the weaving together, under and over, over and under, of single threads, with a pattern at first simple, then more and more complex. Music has grown similarly from the patterned weaving of strands of melody; and when those strands sound pleasant to our ears, we say we like the harmony, as one likes the ensemble of a colour scheme.

Hundreds of years ago, music-making was much more a general hobby than it is to-day; one of the chief delights of a jovial evening was the roisterous singing of the catches, and the joining in the chorus songs. The more sober singing of part-songs like glees and madrigals was widely indulged in, as is evidenced by the glorious literature of this music that the sixteenth and seventeenth centuries have left us. Similarly, family playing, as well as family singing, was



THE LONDON STRING QUARTET
*which broadcast on November 29th, 1927*

common; a group of friends would perform together for their mutual delight, in a "consort of viols," as the Dolmetsch family show us to-day in their Haslemere home.

These family gatherings, which were as common on the Continent as here, were the beginning of what is known as Chamber Music—music comprising a small number of equally important and interesting parts, intended originally for performance among friends in the confines of their own homes. It was therefore essentially *intimate* music—not concert music in the sense that some music is intended for public performance. But it contains so much that is beautiful—beautiful not only in its melodies but also in its shape, its structure, its "writing" (as the interweaving of the tunes is called) and the sound of its harmonies—that it is a pity not to give everyone the chance of hearing it. In these days, when few can spare the time and trouble to learn to play themselves, string quartets and other similar combinations rehearse the best of this "chamber" music in order to play it to their busy fellow-mortals in an hour of relaxation.

It is obvious, from its origin, that Chamber Music is essentially simple, with only a few "parts," and is comparatively quiet. It may be given by a violin and a piano only, or by three or four stringed instruments, with perhaps a flute or other wind instrument added; indeed there are endless varieties and mixtures possible to the composer, and the fact that he has to obtain all his effects with the greatest economy of means, and to give everyone an equally tuneful, interesting part to play, makes it a happy hunting-ground for the musicians of all ages and schools. But obviously we must not expect too much from music to which the wider palette of the full orchestra is denied, and in which tumultuous dynamics on the scale of the band or organ are impossible.

How, then, should one try to listen to Chamber Music? By imagining oneself present in the room with the few performers, as if overhearing friends playing music together. Try to be quiet and attentive all the time, and do not listen with just "half an ear," as one may perhaps to a music-hall song or a dance band. Listen to the twining together of the strands of music—how one friend plays a tune, which is taken up by his fellow, and then by another, and so on until they have all had it in turn; how it is tossed from one to another like a ball, to be flung and caught again and again; how the lines now run apart, now converge, and scatter harmoniously like the ribands on a maypole. Imagine at the end, as the last chord fades away, the players nodding to each other with a smile as if to say, "Jolly good fun, that!" or "That goes better every time!"

One last word. If you are still sceptical, pick and choose your programmes. Do not try yet to enjoy the Schönbergs and the Stravinskys. Look out for string quartets, trios and similar pieces by Purcell, Mozart, Haydn, Bach, Schubert, Beethoven. You will find their curving tunes beautiful, their rhythms jolly and bracing. Their slow movements, passing less quickly, afford better opportunities of "listening inside" the music, as it were—of hearing all the friends "doing their bit," instead of making a single tune run with a hazy background of just "other sound." What is more, you will discover that slow music is not necessarily sad music. So will you find that Chamber Music is friendly music provided by friendly people; and after a while even the "modern" concerts will not be without their joy for you.

MATHESON LANG AS MR. WU
*in the play broadcast on January 23rd, 1928*

# DRAMA & VARIETY

## THE PROBLEMS OF THE PRODUCER

"AFTER all, the actors don't have to learn their parts, so all they do is just read!" Thus say those who know little of the "behind-the-microphone" work which is done before a production is broadcast. Others who are less interested say, "The news comes on at nine o'clock," and they are very annoyed if it doesn't!

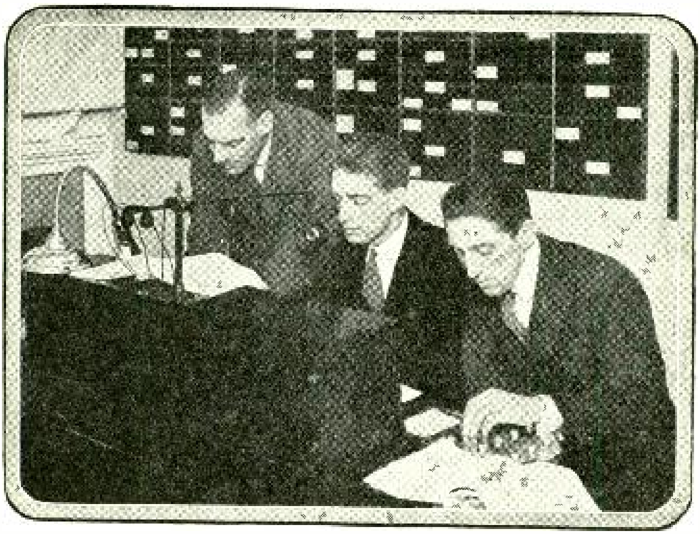
The production therefore must be timed accurately to play within a given number of minutes in order that the general programme schedule may not be disorganised. When it is realised that most of the long plays broadcast are written to run for some two and a half hours, and yet are usually transmitted in ninety minutes, it will be seen that careful cutting is necessary. The plot must be preserved intact and clear, and the character parts well balanced; yet nearly half the play must be cut out!

Once, however, the play has been prepared and timed as accurately as can be done before rehearsal, the actors, it may be argued, have only to *read* their parts. This sounds very simple, except to those who know play production! Those who have tried to make people play parts know, through bitter experience, that the average actor *will* speak lines just as you don't want him to do. He will usually accept position and gesture more or less easily, but it is rare to find the voice which is flexible enough, and the ear which is tuned delicately enough, to interpret inflection and tone as required by the producer. Eliminate position, gesture and action, and only the voice remains to work with: and thus we arrive at one, and only one, of the producer's difficult problems.

### *THE PROBLEM OF THE VOICE*

From the voice over the ether the listener must receive detailed interpretation of character and situation. Since the "flashing eye," "wrathful mien," and the like, are hidden, the tonal colours must paint the yellows of jealousy, the vermilions of violence, the sombre greys of sadness, and the joyous riot of bright splashes of gaiety. The voice colours must create the atmosphere, in order that the listener may create the necessary mental pictures which provide the boundaries of the action of the play. Henry Ward Beecher said, "The human voice is like an orchestra, it ranges high up, or it is as low as the lion's tone, and at every intermediate point it has some peculiar quality. It has in it the mother's whisper and the father's command. It has warning and alarm. It has sweetness. It glitters, though it is not seen, with all its sparkling fancies." But how many voices, to the wireless play-producer's distress, fall short of this desideratum! The slogan of the producer is "*Be natural*"; but how many players can appear natural when endeavouring to assume another personality; for that is the actor's part? Few actors are natural on the stage, and, in the theatre, distance and space bring the studied exaggeration to an apparently correct focus; but not so with the microphone. It magnifies these exaggerations and makes such studied effort resemble anything but normal, sane, human beings trying to express themselves.

These word rehearsals are trying affairs, both for the player and the producer. Constant repetitions of passages in the play are demanded: "better, but a little more depth here, a little more colour there—slower at this point and quicker at that—mark the rhythm slightly here, with a touch of lightness in that syllable"; and so on, usually ad nauseam. But it is vital to wireless production that extreme pains be taken in this direction, otherwise the interpretation will be dull



THE "MIXING ROOM": PRODUCERS AT WORK

and muddy, and the play will not hold your attention. The loud speaker fails both the listener and the B.B.C. if it does not convey the "realness" of the people of the play in tones which will not shatter the intimacy of your drawing-room.

Even when the producer is satisfied that he is getting the best he can from his artists, his work is by no means done. Just as leading characters on the stage, so must the leading characters in a wireless play stand out from the minor parts. Personality and "voice type" (not voice power) are first considered when selecting players, a most delicate and responsible task, and the relation of character to the microphone does the rest. These are the factors which have operated when you say, "That play was quite easy to follow, I was not confused at any time;" but it all takes time, appreciation of tone colours, and much experimenting.

The studio producer's life is not always a happy one. The actor of ability enters a broadcasting studio with the confidence of long acting experience, often to find that the microphone demands that he start learning nearly all over again. "Then why use actors?" The question has often been asked. It is because they have already developed, or are naturally gifted with, a sense of drama, the ability of character portrayal, and a voice trained in expression. To quote Beecher again, "There is nothing in man that he has in perfection till he has it by culture. *We acknowledge that in respect of everything but the voice.*" (The italics are ours.) By the use of actors of proved ability, the studio producer avoids starting his work with a double handicap.

### "*MIXING*" *STUDIOS*

The actual presentation of the production to the listener involves a series of rather complicated operations. The majority of long plays require several studios. When noise effects were first used they were made in the same studio as that from which the players spoke. Difficulties of balance immediately became apparent. Listeners complained that they could not hear the dialogue for noise. The obvious remedy was to operate the "noises" from another studio, and this was the first step towards what might be called "multiple studio production." The "noises" were given a home of their own. The producers of effects were given headphones to enable them to listen to the words of the players and to put in their effects at the right moment. The sounds from both studios were transmitted by lines to a central switchboard under the control of the senior producer, and he was thus enabled to "mix" them in the exact quantities required. The system was extended to all studios, and now the presentation of one production may involve the use of a number of studios separately housing orchestra, narrator, different groups of players, effects, etc.

It is a peculiar system for those taking part, as they may carry out their portion of the work without knowing what the others are doing, or hardly what the play is about, their "sound" entrances and exits being indicated by a system of warning lights.

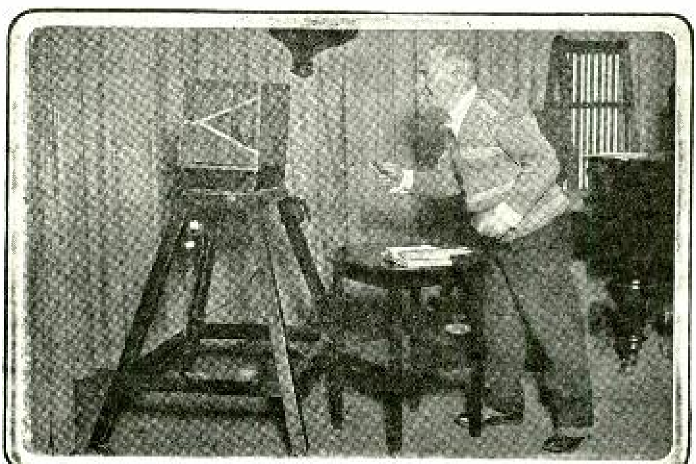
Broadcast productions are therefore not quite so simple and straightforward as listeners may be led to believe by the transmission of the finished article.

## MUSIC HALLS AND BROADCASTING

EVER since the B.B.C. has broadcast vaudeville programmes, its relations with music-hall artists have been growing more cordial; and the majority of the performers who first looked askance at the medium are now happy to broadcast. This favourable result has been achieved by several means.

In the first place, the B.B.C. often found that the artist actually did not like the microphone; it was cold and unresponsive to humour, unmoved by pathos, and appeared to resent eccentricities. The studio in which the artist worked at first was "dead" acoustically and characterised by a depressing lack of any approbation.

Now that variety artists are beginning to know by experience that humour does make the unseen listener laugh, and that pathos makes him weep, it has engendered in them a confidence in their own ability to broadcast successfully. Moreover, certain artists are supplied with audiences, whose



*Barratt's*

SIR HARRY LAUDER

*quite at home with the microphone*

visible and audible response assists them very greatly in the ultimate result. Perhaps in passing it should be mentioned that these audiences are not organised claques, but are called from a huge waiting list of listeners who have applied for permission to visit the studios.

Another factor which has won many artists over to broadcasting is the response they have received from the public by correspondence, and their warm reception when they have appeared afterwards in places where they were previously almost unknown.

Thus it is now established in the artist's mind that performances by wireless have a definitely favourable effect. For verification of this, witness the comprehensive list of members of the variety profession who have broadcast. Here are a few names which support the contention: Sir Harry Lauder, Bransby Williams, Talbot O'Farrell, Josephine Trix, the Houston Sisters, Julian Rose, A. W. Baskcomb, Neil Kenyon, Malcolm Scott, Gracie Fields, Ann Penn, Florence Smithson, Fred Duprez, and hundreds of others.

Despite the ever-growing volume of opinion in favour of broadcasting, co-operation between the B.B.C. and those who hold the destiny of the variety theatre in their hands is not as cordial and complete as it is hoped it will soon be. At the risk of argument, it may be said that while the B.B.C. bases its claims for complete co-operation on facts, the controllers of the variety artists seem to base their opposition upon points which appear to be theoretical or supposititious.

Their prevalent ideas seem to be: (1) that it does harm to the artist by making his material "stale," (2) that it reduces the value of the artist as a visible music-hall performer. For neither of these opinions can any sound foundation be discovered, as, in the first place, the B.B.C. does not insist on the artist using the same material for broadcasting as he uses in his theatre act; and secondly, the definite evidence of artists being more popular after having broadcast than they were before is incontrovertible. Many artists themselves offer proof which gives weight to this contention.

It is, however, sometimes further argued by managers of places of entertainment that broadcasting has an unfair advantage, inasmuch as it provides entertainment in the home which otherwise people would attend theatres to see. This claim may be dismissed, as it can hardly be seriously main-

A GROUP OF FAMOUS VARIETY ARTISTS IN THE LONDON STUDIO
*including George Graves, John Kirby, Teddy Brown, Paul England and Julian Rose*

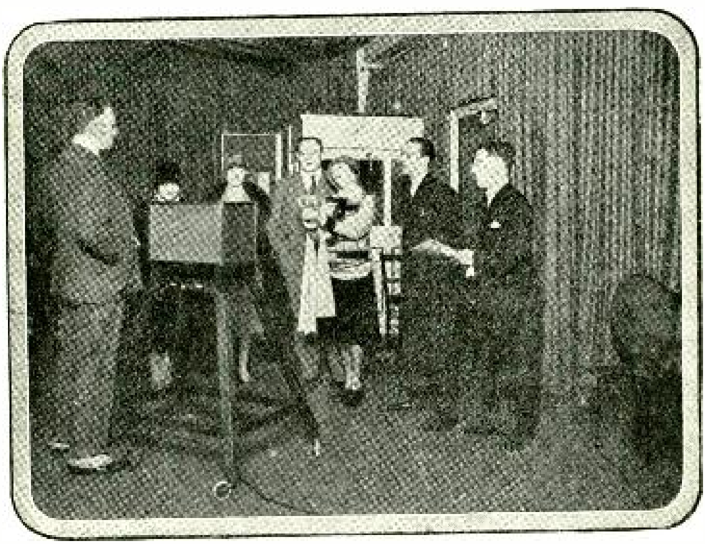
tained that wireless entertainment can ever take the place of visible entertainment. Also if artists are popular by wireless, human curiosity will almost compel listeners to go to see what their favourite is like.

In any case this last point has been definitely proved in several outstanding cases where the drawing power of the artist has been greater after becoming known by broadcast than it was beforehand; this fact has also been tacitly admitted by the managers themselves in considerably raising the salary of the artist for reappearances at their halls.

Closer co-operation between those catering for visible and invisible entertainment would be beneficial to both sides. It is hardly necessary to state that the Corporation has always been ready to offer or accept reasonable terms of co-operation with those great bodies of the outside entertainment world. Until such co-operation is an accomplished fact, the activities of the Corporation in the way of variety programmes must be more cramped than they otherwise would be.

The B.B.C.'s policy at the moment is to offer music-hall artists such work as is available for them when they are not bound by contract to other parties, or, to put it bluntly, when the artist is out of work. It is surely a dog-in-the-manger attitude that places obstacles in the way of this.

Further, with the artists now realising that broadcasting helps them fully as much as they help it, there is seldom great difficulty in securing first-class talent for vaudeville programmes. During the week in which this is written, there is a programme containing such popular and well-known names as Cicely Courtneidge, Leslie Henson, George Carney, and others of almost equal eminence. Listeners appreciate such appearances before the microphone, and show their appreciation by attending the productions in which the artists they admire are appearing.



ANDRÉ CHARLOT REHEARSING HIS ARTISTS

# "MY FRIEND MIKE"

By Will Hay

I HAVE known Mike a long time now: I have known him long enough to call him "friend"—even "old friend." I first met Mike in 1922, when he was living in a top-floor room; but he was an important personage just the same, and it was a great honour to speak to him.

He had no throne in those days—he just "hung around." I have even seen him reclining on a piano, listening to the music, and sometimes I have seen him *inside* the piano. I think he was a little deaf in his younger days. He seems to have outgrown it now, because sometimes, when I speak rather loudly to him, he moves away. I think he *must* be delicate, because he's always wrapped up in cotton wool. I'm *sure* he has a sore throat at times, because I have often heard him speak quite huskily.

WILL HAY, "THE SCHOOLMASTER COMEDIAN"
*who long ago proved himself a wireless favourite*

I like his throne. It is quite a tall one, on wheels, and it is screened so that although you can talk to Mike you can't *see* him.

He *must* be delicate, because they tell me the screen is put there to keep the dust away from him.

Mike is a very particular person. One can only speak to him at certain times, and whilst he is being spoken to, a lamp shines—a Red one; and his attendant stands by and listens too. This is because Mike is very particular. You must be on your best behaviour in front of Mike. You must not say naughty words or anything the least bit lurid. I suppose that is why the lamp is a Red one—just a reminder that Mike is particular.

And you must not cough in front of Mike. If you do it hurts his ear-drums. He *really is* delicate.

Oh, talking to Mike is quite an ordeal—at first; but when you know him better and you get used to his peculiarities it is quite a treat to talk to him. In fact, I have got so used to talking to him that I'm not a bit afraid of him now; but I always respect him, as he reminds me of a rich relation, because if I am nice to him I get such lovely presents from his attendants.

I remember once reading a story of a King who could not laugh, no matter what stories you told him. Mike is a bit like that. He never laughs at a funny story, and he doesn't like to hear the same story twice. I tried it once, but I think he must have complained to his attendants, because they asked me—oh, very nicely!—not to bore Mike.

Mike is a good friend to me. Whenever I tell him a funny story he immediately tells the story to everybody else exactly as I tell it to him, and he never takes any credit for it. He lets everybody know that *I* told him the story, and because he repeats my story so faithfully, all the people laugh, and they write letters to Mike's attendants telling them how funny they think I am, and they write to me, too, and tell me that Mike says I am very funny, and that they are going to see me perform whenever I visit their town.

That is why I like Mike. He always speaks well of me and never ill, and he introduces me to people to whom I should never have the chance of speaking but for MY FRIEND MIKE.

## PLAYS FOR BROADCASTING

The B.B.C. will be very glad to see original plays or sketches written on the lines indicated in the article on the opposite page. Every MS. will receive careful consideration by the Productions Department.

# WRITING PLAYS FOR BROADCASTING

DURING the past few years some six thousand plays submitted for broadcasting have been read by the play readers at the B.B.C. Day in and day out, manuscripts come in, and nearly all go out again through the post, with a note saying "We regret, etc."

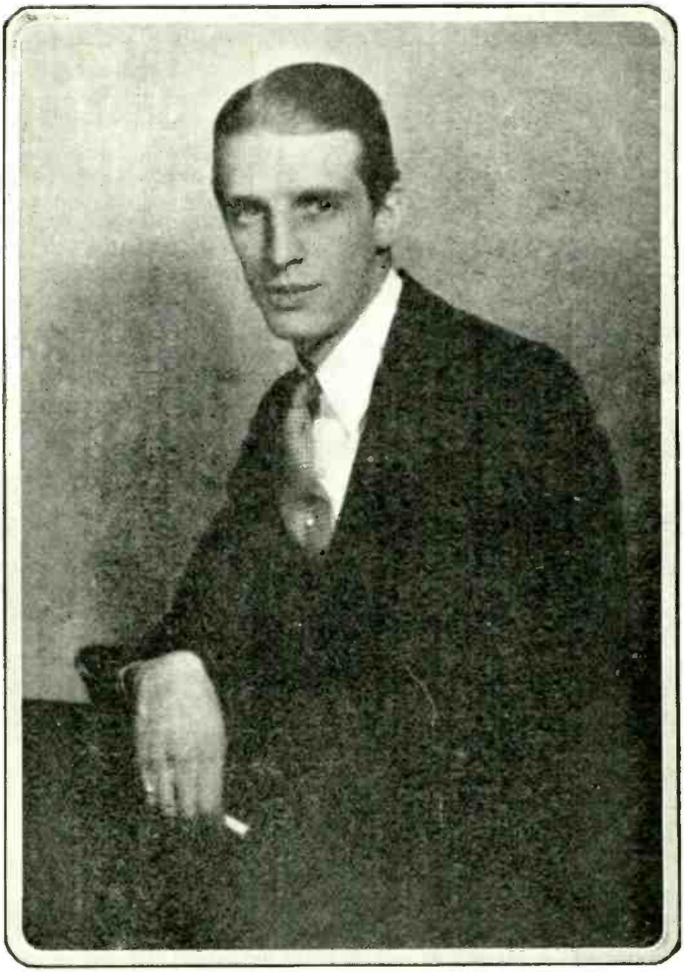
Most of these efforts have been rejected because the writers were the veriest tyros at writing. Before one can acquire the ability to write natural, easy and effective dialogue, much lead pencil is wasted and many tears are shed. Anyhow, it is far from being as easy as many hundreds of would-be wireless play-authors have thought. The way of the broadcast playwright is hard, for the microphone is a merciless instrument. Every unnatural phrase or sentence uttered by a wireless player is magnified into something approaching burlesque. The microphone demands an even more natural style than stage dialogue usually possesses.

Other plays which have been returned, despite the dialogue being well written, have been rejected on the various grounds of unsuitability of theme: too much horror, too partisanly controversial, too weak in plot, poor in dramatic construction, too limited in appeal—and many others because they were written for the stage and had been rejected by dozens of managers as being not good enough for production, and their last hope was the B.B.C.!

The listening public of Britain is too great an audience to be offered third-rate material with any expectation of escaping criticism. The aim of the B.B.C. is to provide listeners with first-class plays as far as humanly possible. By this is meant first class in the various branches—first-class tragedy, high comedy, low comedy and melodrama.

The real radio-drama form has not yet emerged from the group of praiseworthy attempts made by enthusiastic writers. The field is still open for original minds to add other lines to the bold strokes already drawn on the canvas which will at last show the form of the new "drama of the ether."

During the past years of broadcasting the plays which have been presented have been mostly written for the stage, and have been adapted slightly from their original form for purposes of entertainment by wireless. The quality of the



CECIL LEWIS

*formerly a member of the B.B.C. staff, who has written and adapted plays for broadcasting with considerable success* material selected from this prolific source has been of a high and tried order, and of proved merit from the theatrical point of view. They have usually been stage successes with hundreds of performances to their credit for some quality they possess; but however good they may be in quality, and however carefully the adapting is carried out, they are plays written to be acted by visible actors to an observing audience. *They are not radio plays.*

The authors of these plays have limited their work to such effectiveness as may be obtained by theatre and stage illusions, with lighting, costumes, movement, scenery setting, changing possibilities, etc. What should the aspiring radio author consider when attempting to write these plays for the ear? A few general observations can be offered, all of which may be disregarded when greater experience has laid down rules and standards, or when genius guides the pen.

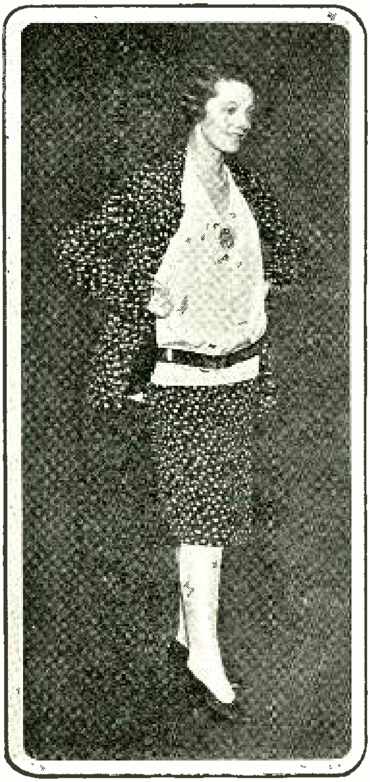
The task of the wireless play-writer differs from that of the stage author because, although in broadcasting limitations of inaudible "stage business" are very narrow, the limitations of action and *mise-en-scène* are bounded only by the imagination of the listener himself. The stage author deals in scenes and situations which can be presented to the eye. The wireless author may make use of practically any scene or situation which can be conceived by human thought and imagination. Moreover, changes from scene to scene, from situation to situation, are governed only by the rapidity with which thought is able to create and accept them. The ever-revolving stage of the imagination may be used profitably by the wireless playwright to offer a procession of scenes of kaleidoscopic variety and change.

It is a mistake to think that, as the wireless is a medium chiefly relying on words, words themselves are the material which authors of this new art must depend on for their effect. The words are only the means to an end. The mental reactions caused by the dialogue are far more important than the dialogue itself.

An even greater knowledge of human psychology than that possessed by the stage playwright is necessary to the author who will write a brilliant broadcast play. At present, the only criterion of success is the listener's reaction, for it is wrong to apply generally the standards governing stage plays.

### *A FEW HINTS*

*Don't confuse the listener*
by too many characters not differentiated, or not essential to your plot.



MISS GERTRUDE LAWRENCE
*the musical comedy star*

*Don't tire the listener*
by unnecessary detail or long, pointless speeches.

*Don't submit a play because* you *like it*,
but because you think, after careful consideration of your wide audience, that it will please and stimulate thousands.

*Don't meander;*
let the plot be direct and clear to the average thinking man or woman.

*Don't introduce characters without due warning of their coming*,
and don't make them talk for five minutes before we know who they are.

*Don't give any "business"*
to characters which is not indicated by dialogue.

*Don't use offensive plots.*
The B.B.C. knows it cannot please everybody at once, but it does *try* to offend nobody at any time.

*Don't be hampered*
by the stage limitations of presentation and change.

Finally, *listen to broadcast plays*, and hear what methods are used by writers and what the producers are able to do by use of devices for "fading" one scene into another, superimposition of voices and sounds, noise effects, etc. This study will prove informative.

# MUSICAL COMEDY

"CHARMING—such sweet dresses!" "Wasn't it priceless when he fell into the lake?" "Of course she can't sing, but she's so dainty." "Some dancer too!" "Rather a silly plot . . . gorgeous scenery." "Nothing much in the music, but what a chorus!" "Did you ever see anything quite so funny as that comedian's face?" "Topping show! . . ."

So said Mr. Smith and Mrs. Smith after seeing "The Girl in the 'Plane."

* * *

"This is dreadful!" "Wish that funny man would be funny!" "What a ghastly voice that woman's got!" "Why will they broadcast this bunkum?" "What *is* it?" . . . "Impossible!" "What?" "It's 'The Girl in the 'Plane.'" "There! They have ruined it! Why don't they get people who know how to sing? Don't you remember how good they *all* were when we saw it at the Frivolity?" "Yes—er—but it's the same cast!"

So said the same Mr. Smith and Mrs. Smith a year later on hearing a studio performance of the same successful musical comedy.

* * *

All of which is fiction, but it might well be fact, and more or less sums up the situation.

On the other hand, had our captious critics heard part of it broadcast from that same theatre, they would have realised that the show was worth seeing. Storms of applause, shrieks of laughter for no audible reason, the rhythmic tapping of dancing feet, and myriad intangible sounds would blend into an atmosphere that a studio performance does not create.

The microphone in his own den is impartial, but hypercritical, standing aloof from inarticulate beauty, shuddering at most leading ladies' top notes, unmoved by the expensive grimaces of famous comedians. Movement, colour, acrobatic dancers—the microphone cares for none of these things. He demands a clever libretto with music that matters, performed by brilliant people who can not only sing and act, but launch

A SCENE FROM THE ORIGINAL STAGE PRODUCTION OF "THE ARCADIANS"

their personalities on the ether without visible means of support. Copyright withholds much suitable material; the stage claims almost exclusively the services of outstanding ability.

Casting, selecting a team of musical comedy players, is the most difficult, and incidentally the most important, part of the B.B.C. producer's work. To him an artist's name suggests a voice, its pitch, characteristics, possibilities, and limitations. Before rehearsing a production he consults reference books containing detailed records of both actual broadcasts and studio auditions. From his list of suitable and available artists he must choose a voice-team capable of doing justice to the words and music. Each voice should convey a distinct individuality to the listener's mind. Unfortunately the microphone often delights in making youth sound middle-aged and vice versa, thus complicating the problem. However, if only all good singers could broadcast "lines" in a natural, unstilted manner, the casting would present fewer difficulties; but, for some obscure reason, many a singer handles dialogue as if it were written in a dead language. How often popular artists soar on the wings of song, only to crash on the spoken word! Scores of sopranos who can sing "I love you!" as if they meant it speak the same phrase as if dictating a weather report. The stage may camouflage such discrepancies; the microphone intensifies them.

Notwithstanding this difficulty, many very popular "shows" have been presented.

Among the most widely popular and successful broadcasts must be reckoned certain musical comedy performances. "The Arcadians," and "The Little Michus" (George Graves in his original part) may be cited, which, thanks to talented casts, tuneful music and brilliant "books," have provided entertainment of a most acceptable nature.

This means that certain qualities of musical comedy can be as affecting and as charming on the ether as on the stage. It is possible to transmit the sparkle, the gaiety, the irresponsible charm, without the adventitious aids of pink limelight, silver tissue and funny hats. Much depends upon the music, more upon the "book," more still upon the personality of the artists, and, further, it is occasionally discovered that an attractive stage personality is not always successful before the microphone.

As time goes on, authors and producers are learning more and more accurately to analyse the qualities of music, "book" and personality that can be successfully transmitted: but this takes time.

Something must be found to substitute for the silver tissue of the leading lady and the funny hat of the comedian. Patient, and possibly not always successful, experiment is demanded and is being given.

The time will come, if indeed, for many listeners, it is not already here, when the Mr. and Mrs. Smiths of the British Isles will lean back in their armchairs and listen once more to the "Girl in the 'Plane," disgruntled no longer, but wreathed in smiles of joy; for by that time she will be something more than the ghost of her theatrical self. She will have mastered the technique she is now struggling to acquire and will have learnt how to launch herself "on the air."

# PLAYS FROM THE THEATRE

THE list of the past year's theatrical broadcasts is not, perhaps, an imposing one in quantity. The truth is that the critical faculty in listeners is now developed to a degree that causes any technical blemishes in transmission to be keenly resented. This being so, the B.B.C. is increasingly reluctant to undertake theatrical broadcasts unless the nature of the performance, the artists taking part, or the general interest, be so great as to counterbalance the probability of imperfect transmission. A brief description of the technical problems and difficulties may prove interesting.

### *NON-MUSICAL PLAYS*

Owing to their construction and to the requirements of public performance, theatres, though varying in individual cases, are acoustically, and from the point of view of construction, the worst possible places from which to broadcast speech. This is due to the fact that it is impossible to place microphones sufficiently near the performers to avoid a pronounced echo effect, particularly where there is much movement on the stage. The result of this echo is frequently that the tone quality and expression of the speaker become distorted to listeners by wireless, more especially to those with poor sets. Another great difficulty is to obtain a proper vocal balance between individual performers; that is to say, to give listeners an impression equivalent to that received by the theatre audience in regard to the relative prominence of one voice over another.

To take an imaginary and extreme case; when Lord Dundreary makes his famous exit in the play "Our American Cousin," addressing *sotto voce* remarks to the mat which has caused his discomfiture, a microphone placed too near would make his voice sound as loud as that of a Hyde Park orator, even though to the ears of a person standing by the microphone it would come as a stage whisper.

In addition to the disadvantages mentioned, there is the added one, which applies with equal force to musical performances, that broadcasts are limited to half-hour excerpts. It is extremely difficult adequately but briefly to summarise the play beforehand in such a manner as to give the excerpt its proper context and enable listeners to trace the development of the plot during the broadcast.

Touching upon the subject of "effects," it may be stated, as a general principle, that for realistic microphone reproduction "noises off" require light sounds near the microphone, rather than the heavy and relatively distant noises necessary in a theatre, which come out blurred and often unidentifiable on a receiving set. This is why the B.B.C. does not care to broadcast extracts from theatrical "thrillers" which might otherwise appear suitable.

## *MUSICAL PLAYS*

Enough has been said to show that broadcasts of "straight" plays from theatres are not worth while. Many of the same difficulties exist in relaying musical plays, but are not as a rule insuperable. Curiously enough, it is much easier to get

BEHIND THE SCENES AT THE THEATRE

*George Grossmith, one of the B.B.C.'s programme advisers, broadcasting from his dressing-room* a satisfactory balance for a song or chorus than for a dialogue, more especially when those taking part come "down stage." There is the disadvantage, however, that the main microphones, being confined to the footlights, are apt to receive the orchestra out of balance, both as regards the individual group of instruments—string, woodwind, and percussion—and as between the artists and the orchestra. The long-sought privilege of a suspended microphone, which would be of the greatest help, has not yet proved a practical proposition to theatre managements. While a solution of all these difficulties is not at the moment apparent, there is some hope of effecting improvements.

Of actual excerpts, "Lady Luck," from the Carlton Theatre, was possibly the most successful technically. The set in use damped down the echo, and there was comparatively little movement about the stage. On the other hand, "Oh, Kay!", at His Majesty's, was one of the most difficult ever attempted. Five microphones were used, the most satisfactory proving to be one about twenty-five feet above the stage and facing downwards. There was practically no draping or furniture to break up the echo, and considerable movement took place over what is, in any case, an exceptionally large stage. Miss Gertrude Lawrence in her song "Someone to Watch over Me" had to occupy several different positions. Some strenuous moments were experienced during the six tests that were necessary, and even then the broadcast was not without blemish!

In general, then, listeners must expect fewer theatrical broadcasts in the future than in the past, but the B.B.C. will endeavour to broadcast parts of the more suitable and outstanding musical plays from time to time.

This article has insisted on the technical difficulties which have to be overcome, but it is not meant to suggest that all broadcasts from a theatre are imperfect. On the contrary, most listeners would agree that, for instance, opera from Covent Garden has been admirably transmitted and that the same may be said of many other relays of this kind. There can be no doubt that, given suitable material and the full co-operation of the managers of individual theatres, broadcasts from the stage are of value to the theatrical world and listeners alike.

# LEARNING TO DANCE BY WIRELESS

ONE of the most recent developments of broadcasting has been the inclusion in the programmes of dancing lessons. This is a plain sign of the times. Dancing, which, with the polka and barn-dance of the Victorian drawing-room, was looked upon as a polite diversion (compromising if not discreetly managed), has, with the Georgian Black Bottom and Baltimore, become something more than a diversion, something very little less than a passion.

If we count ballroom dancing as a form of exercise (no one who has charlestoned for a whole evening will deny this), it may be said that it has more devotees than any form of outdoor sport. Men who do not know one goal-post from another, and girls whose acquaintance with lawn tennis stops at the fact that it is played across a net, are as

SANTOS CASANI AND JOSÉ LENNARD

passionately critical of each other's dancing as was any Regency beau of his friends' behaviour. It may even be that the man and woman who win the dancing final at the Albert Hall are to-day more widely envied and honoured than any Tunney or Tilden.

Not to dance has become not to live. The qualifications for social success have varied with the years. Once it was whist; later they advertised, "Learn to play the banjo and get asked out!"; more recently it was supposed that no young man who could not play Mah Jong would ever rise to fame and fortune. Dancing has replaced these things as the social passport. The occasions on which your skill at whist or your virtuosity on the banjo was called in question were comparatively few—whereas to-day a man may be expected to dance at any time, anywhere. There has, therefore, been a wide and eager public for the broadcast dance lesson. Mr. Santos Casani, who has given the majority of these lessons, is an expert teacher, and his explanations of the 1928 Waltz, the Modern Fox-trot, the Yale Blues, and the Baltimore have been easy to follow. Though the newspapers and magazines have devoted many columns to articles on dancing, there is yet to be found an invisible master so efficient as the loud speaker. The wireless dancing master can instruct you while the B.B.C. Dance Orchestra plays for him. He anticipates his pupils' difficulties, and, once he has made them clear, can, in spirit, supervise their practice. "Now then," he says, "one—a long step with the right foot—two—a short step with the left and bring the feet together—one—two—keep the weight on that right foot—one—two——" The success of these lessons has largely depended on the skill of the teacher, who has evolved a technique which can be applied in the future to any new dance.

Obviously the wireless lesson can never supplant the actual teacher; but it can supplement the work of the hundreds of dance teachers in this country: and there is one great advantage of this kind of lesson—it can be taken in secret. Auntie of fifty and uncle of seventy, shy sister and bashful brother, who would shrink from performing the first painfully tentative steps in public, can lock the door on themselves and the loud speaker, and emerge, after three weeks, the insolent possessors of a perfect fox-trot and an almost professional waltz.

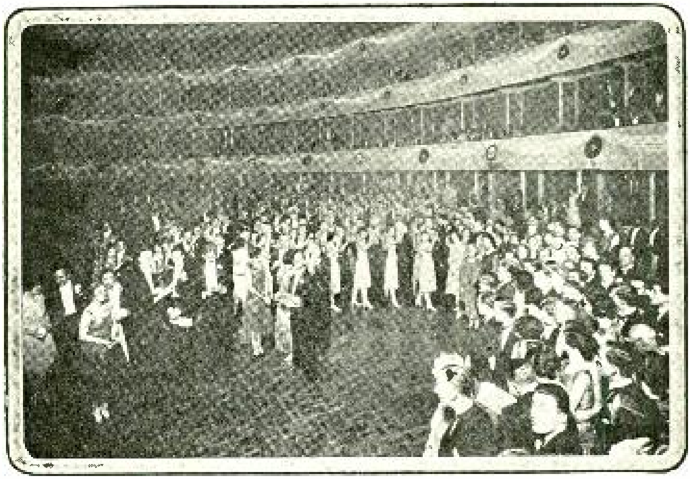
BEHIND CLOSED DOORS: UNCLE HERBERT LEARNS THE CHARLESTON

# THE B.B.C. DANCE ORCHESTRA

MODERN dance music has its enemies as well as its friends. To some people it seems cacophonous, monotonous, cheap, puerile, barbarous, bestial—there is no end to the terms of opprobrium in which they castigate it, usually under the rather misleading description of jazz. To others of us it is in a sense the voice of something very typical of ourselves and of this post-war age. The throbbing rhythms of fox-trot and Charleston, the haunting languor of tango and waltz, each in its own way appeals to something in us of which we are not at all ashamed. And the gripping charm of the tunes, the amazing ingenuity of the orchestration, and the impudent humour of the "effects" all make us feel that a modern dance orchestra is not one of the least marvellous products of our day.

That is why dance music has been from the first one of the most popular features of the broadcast programmes. Not merely with those people who want to dance to the loud speaker; because just as a first-class dance band can top the

JACK PAYNE AND THE B.B.C. DANCE ORCHESTRA



THE AMATEUR BALLROOM DANCING CHAMPIONSHIP AT THE ALBERT HALL, MUSIC FROM WHICH WAS BROADCAST ON JAN. 26TH, 1928

bill at any music hall, so the wireless dance music is often heard from houses where no one has ever "twinkled" or "hesitated" or "glided" or "dragged." It was, therefore, not only the "dance fans" amongst listeners who welcomed Jack Payne and his men when they came regularly into the programmes in March this year. Jack Payne himself was already known to them, for the Cecilians were one of the favourites amongst the bands whose music is broadcast from outside, and the evenings when London went over to the Hotel Cecil were always particularly enjoyable ones. But the B.B.C. Dance Orchestra, which he formed, and which he himself directs, has taken a sure and permanent place in the affections of listeners. The B.B.C. Dance Orchestra plays to the same audience more often than any other combination of its kind. In the big hotels and dance-clubs even the *habitués* come at the most two or three times a week; but every day, and usually several times a day, the wireless listener expects his own dance orchestra to be at its best. In this he is not often disappointed.*

* For the composition of dance bands, see the article on p. 152.

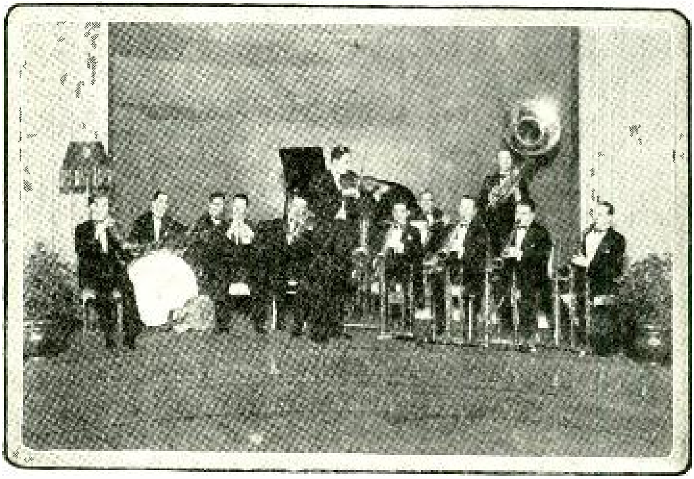
# DANCE BANDS, FROM OUTSIDE THE STUDIO

UP to November 1925 the only dance bands regularly broadcast from outside the studio were those from the Savoy Hotel on three days a week. Towards the end of 1925 it was considered that steps should be taken to introduce greater variety, with the result that in November of that year listeners were introduced by wireless to dance bands from the Kit-Cat Club, the Midnight Follies at the Hotel Metropole, and the Carlton, Piccadilly, and New Princes Hotels. Thereafter, fresh blood was introduced from time to time, and the number of transmissions increased from the original six to the twelve or thirteen which are now heard.

In this period practically all the well-known London bands have been included, with Isham Jones (Kit-Cat Club) and Lou Raderman (Embassy Club) as examples of American methods of the moment.

It may be interesting to listeners to know the names of these bands. They are Jay Whidden's (Midnight Follies and Carlton Hotel); Ray Starita's, one of Jack Hylton's many bands (Ambassador Club); Teddy Brown's and the Lyricals (Café de Paris); Bert Firman's (Carlton Hotel); Sydney Firman's (Cavour—before the days of the London Radio Dance Band); Jack Payne's and the Cecilians (Hotel Cecil); Jean Lensen's and Debroy Somers', latterly with Ramon Newton conducting (Ciro's Club); Jack Howard's, Leon Abbey's, and Herman Darewski's (Covent Garden and Olympia); Ronnie Munro's (Florida Club); George Fisher's (Kit-Cat Restaurant); Kettner's Five (Kettner's); Ambrose's (once of Embassy fame—now at the May Fair); Alfredo's and Hal Swain's (New Princes); Van Straten's and others (Riviera Club); Nat Lewin's (New Verrey's); Frank Ashworth's (Park Lane); and, of course, the Savoy Bands. Apart from the Savoy Bands, an unbroken record of three years' broadcasting has been achieved by one band only—Alfredo's.

The year 1927 saw the passing of the old Savoy Bands, and the arrival in their place on the floor and in the ether of the Orpheans, under Reggie Batten, Elizalde, with his curious and interesting orchestrations, and a new tango band.



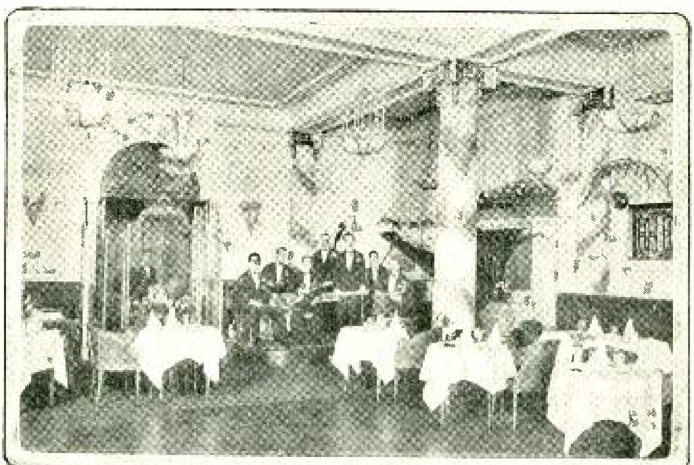
REGGIE BATTEN AND THE SAVOY ORPHEANS

With many listeners almost rabid in their antipathy to dance music, some compensation is derived from the fact that among the others there are a large number of real enthusiasts, who not only enjoy such entertainment for itself, but are particularly interested in the mechanics and technique of the bands. Some people maintain that there is a public which secretly harbours its own saxophone as it might a private still or a family skeleton, and the B.B.C. receives letters which enter deeply into technical details of alto, tenor and bass saxes., drums, sousaphones, and other explosive components of a complete dance band. This seems to imply considerable interest, and justifies the retention of so many different dance bands in the programmes.

Considering that dance music is relayed from places of entertainment where spirits are high, and that the microphone is, as it were, let loose in a ballroom, cases of members of the public having taken the opportunity of communicating with their listening friends have been almost negligible. It has happened, however, and therefore the accidental transmission of private conversation from the Savoy, which is an important incident in a recent play, is a distinct possibility.

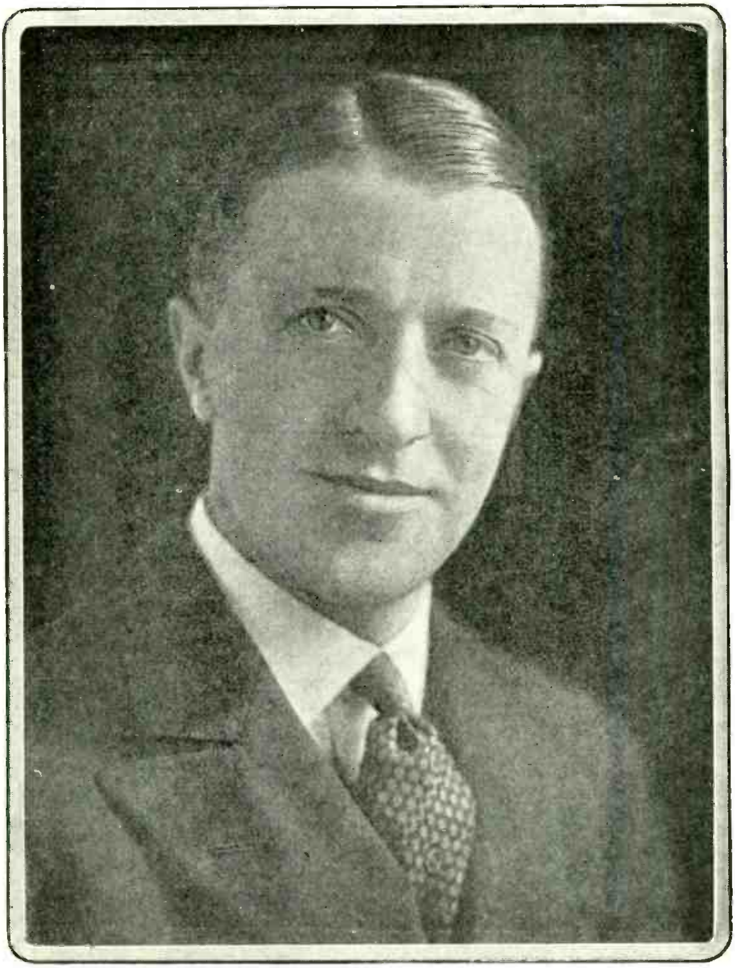
Whereas in 1925 dance bands in general showed no particular keenness to broadcast, 1927 and 1928 saw a radical change in the attitude of the proprietors and conductors, with the result that competition for regular broadcasts has become very keen, and there is now a long waiting list.

It is probable that fashion more swiftly affects the playing of dance music than any other type of music. Everyone who has listened regularly for the last three years will have marked these differences in style. There exists a method in which all is sacrificed to rhythm and arrangement, otherwise "hot" band-playing, but the present development tends, perhaps fortunately, to more melodious but highly rhythmic effects. But at any given period there is a great difference in the playing of different bands, which is an additional interest to dance-music enthusiasts. It is an interesting speculation as to whether the "hot" or other type of playing is likely to be predominant. Listeners by wireless are in the best position to judge, if not to influence the style of the future.



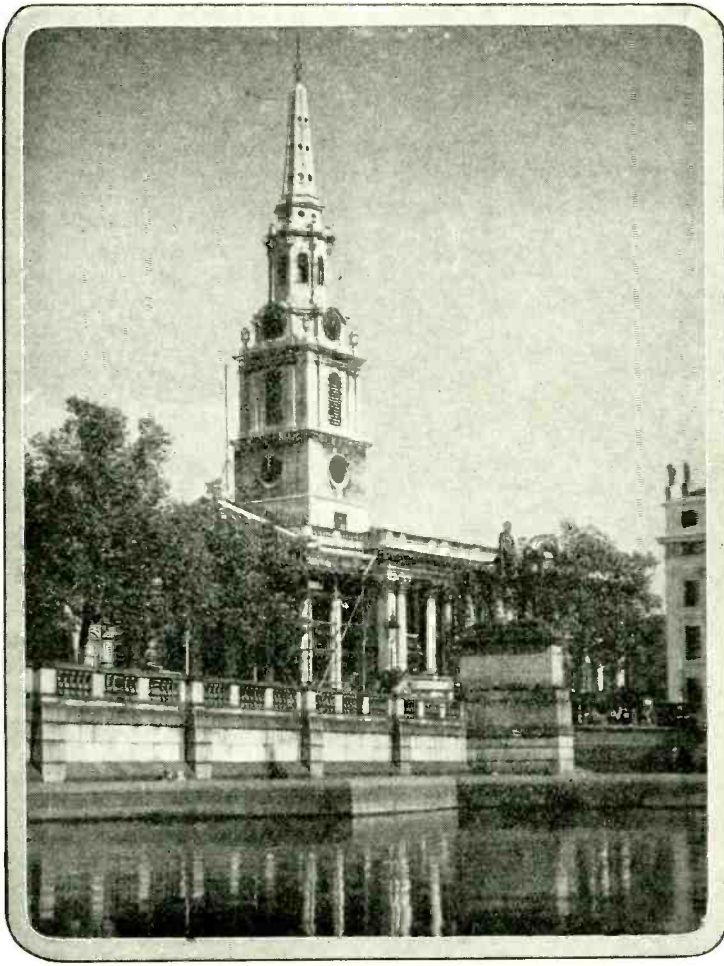
THE AMBASSADOR CLUB BAND *Raphael*

(*Conductor, Ray Starita*)

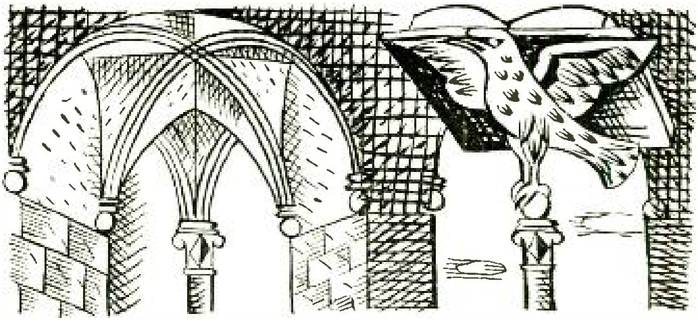


TOMMY HANDLEY

*a great wireless comedian*



"ST. MARTIN'S"



# RELIGION

## RELIGIOUS BROADCASTING

By the Rev. H. R. L. Sheppard, C.H., D.D.

A LARGE number of listeners are, quite naturally, not aware of recent and most happy developments in the religious work of the B.B.C.

It need hardly be pointed out that the Corporation is continuing and developing the original religious policy of not merely permitting but encouraging the Churches to give their message under the fairest possible conditions. The Churches, which have each and all received the same just and generous treatment, cannot but recognise with gratitude the time and thought that the B.B.C. has given to this side of broadcasting and the reverence with which its religious work has been undertaken. I cannot refrain here from a personal acknowledgment of the courtesy with which we who have been privileged to share in any way in the work of religious broadcasting have been treated by all who live and work and have their being at Savoy Hill. That overworked word "atmosphere" should be avoided if possible, but there is an atmosphere there which has enheartened many a timid speaker who has gone in fear and trembling to give his religious message to so vast a multitude.

The past year has seen considerable progress, and the manner in which several new ventures have been widely and gratefully acclaimed by the general public must have been gratifying to those responsible; it has also probably disconcerted that little company of people who have prophesied from the outset of broadcasting that the British public would have "no use for religion."

Those who would understand the religious situation to-day must realise that a lack of interest in Churches and Church affairs may be perfectly compatible with a genuine and sincere enthusiasm for Christianity. It is here that religious broadcasting has an opportunity which probably none of us even yet recognises. Undoubtedly the happiest of the new religious ventures is the daily service broadcast from Daventry. It was started as an experiment, suggested by correspondence in *The Radio Times*, but within a few days several thousand letters of appreciation were received, and it has now been adopted as a regular feature and is also broadcast from 2LO. The popularity of this new feature aroused considerable comment in the Press; the Editor of a certain anti-religious journal suggested that the figures of correspondence received were untrustworthy and unrepresentative, and invited his readers to send in their objections to the B.B.C. Less than twenty letters were received in response to his urgent appeal. This daily service, which is admirably varied in its comprehensiveness, is undoubtedly proving of inestimable assistance to countless people. I am sometimes a little impatient of the idea that it is a boon to invalids only, for I know many who love to have those few minutes of carefully directed daily prayer—some of them even while they carry on with household tasks.

Of the Sunday evening services, which are broadcast at an hour when the normal Sunday services are over, that on the fourth Sunday in every month is selected as important enough to be broadcast by all British Stations. Cathedrals and central churches of other denominations have increasingly welcomed the privilege thus afforded. On the second Sunday a service is broadcast from St. Martin-in-the-Fields, and the remaining Sundays are left available for Stations to arrange their own local services. The balance of denominations is not the chief consideration in the choice of preachers,

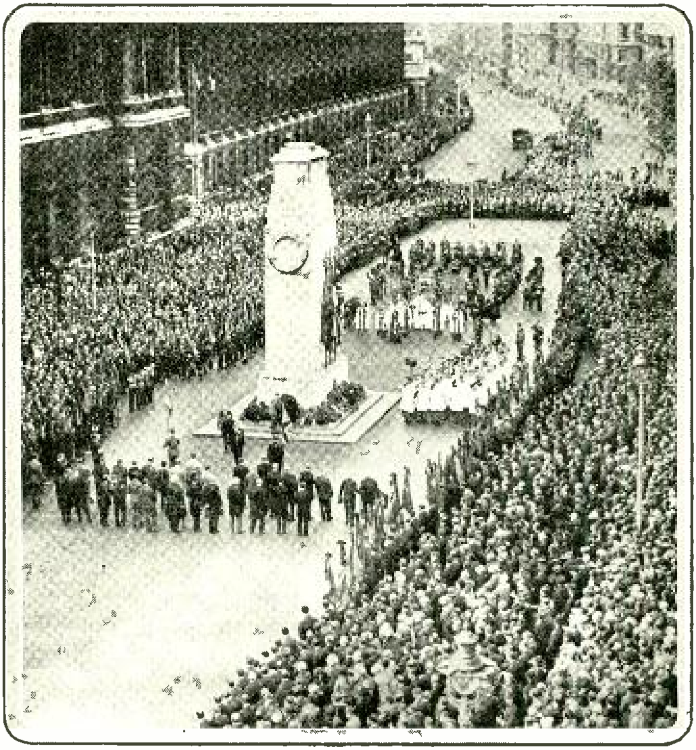
THE REV. H. R. L. SHEPPARD

but care is taken that there should be no great disproportion between the various Churches. The B.B.C. has consistently made its primary objective the presentation of those aspects of Christianity which unite rather than divide, and has invited those to speak whom it has come to recognise as best able to give such a message over the wireless. Other Sunday features are the increasingly appreciated Epilogue, the readings from the Old Testament on Sunday afternoons, and the broadcasting of a children's service once a month, as well as a talk on overseas work.

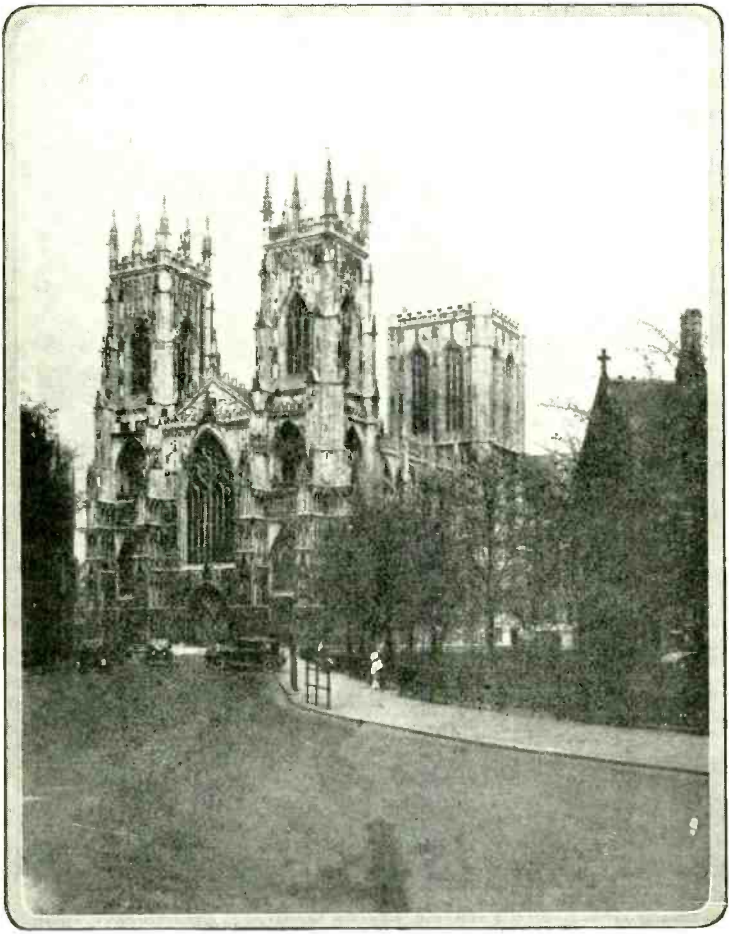
Nothing could be further from the truth than to suggest that the B.B.C. is attempting to preach a Gospel of its own, or that the presentation of simple Christianity that it tries to give is anything but comprehensive. Indeed, so comprehensive has been the policy of the B.B.C. that the removal of the ban on controversy in regard to religion creates a new position in theory rather than in practice. The responsibility remains with the B.B.C. to see that nothing is broadcast that is likely to provoke or offend large numbers of its Christian audience. It can safely be assumed that the policy of religious broadcasting has the support of the vast majority. This policy excludes sectarian propaganda or contentious argument. The Religious Advisory Committee still guides in the choice of speakers and in other questions of procedure in the sphere of religious activities.

Yet there are certain things that must be borne in mind as essential if the broadcasting of religion is to assist those who listen. The B.B.C. has an excellent pamphlet entitled, "Hints to Preachers," from which the following may well be quoted:—

"You are asked to remember that your vast audience is not a crowd or a congregation, but various individuals to whom you are speaking in the intimacy of their homes. This is the audience to be kept in mind. The tone of voice found to have most appeal is that of the intimate and sympathetic talk rather than that of the public address. The address should be framed on different lines from a public speech, and particularly so from an ordinary sermon. In effect, you must not take either the interest or the knowledge of your listeners for granted. It is, therefore, wise to introduce the address in a 'human' way, to treat it conversationally, and to avoid as far as possible technical terms not understood by the general listener. It should be remembered that listeners are able to stop listening at will, and thousands of them will 'switch off' their sets if the opening is unattractive."



THE BRITISH LEGION'S SERVICE AT THE CENOTAPH, WHITSUNDAY 1928



Photochrom.

YORK MINSTER, AFTER 1300 YEARS

## BROADCASTS FROM CATHEDRALS

IN the past year broadcasts from cathedrals have been continued with success. Probably the most outstanding of the year (and certainly the most complicated technically) was the Service of Thanksgiving for the 1300th Anniversary of York Minster on New Year's Eve. It included, for the first time, Big Peter, one of the largest bells in existence, striking midnight.

For this service nine microphones were used, and controlled from a central point, through three fade-units, by one engineer. Another engineer remained in constant touch with the London Control Room by telephone, while a third watched the amplifiers. The progress of the service was invisible to the operator, whose only knowledge had been obtained from preliminary rehearsals spread over the previous day. Processions over two routes, the bells, and the Archbishop's blessing outside the Minster, had to be included, and the necessary microphones energised in succession at exactly the right moment. The reader can obtain some idea of the area to be covered by microphones from the fact that nearly one and a quarter miles of twin cable had to be laid within the Minster itself. As an example of the detail work required, a special rehearsal even of the tapping of the Stone of Remembrance by the Archbishop of York was necessary, in order to reproduce the episode realistically via the microphone. After midnight the buglers from the local Depot, belonging to the 1st Battalion of the Border Regiment, just returned from duty in China, sounded a fanfare to announce the New Year. They had not played together for six weeks.

On Sunday April 22nd a service was successfully broadcast from Liverpool Cathedral. For this service seven groups of microphones were used with two fade units. Three microphones were specially arranged for the organ, but in slightly different positions from those occupied on former occasions, two being suspended at a height of 50 feet and one at 90 feet. In order to obtain a correct "mixture," different volumes of sound from each microphone were regulated by a fade unit. Long and careful testing was required before the proper balance was obtained, and

LORD HAIG'S FUNERAL

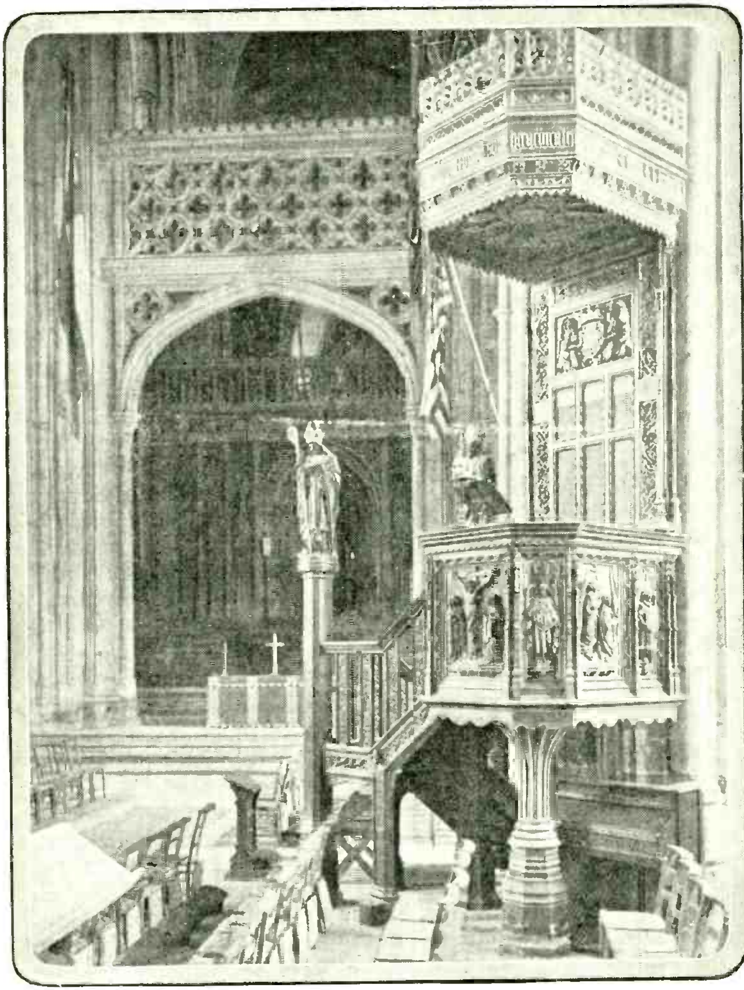
*The procession about to turn into Westminster Abbey* difficulties in connection with reflection effects from the temporary west wall overcome.

Listeners to the occasional broadcasts from Canterbury Cathedral probably do not appreciate the many difficulties experienced before the first transmission in overcoming undue resonance. The balance between organ and choir is now almost perfect, but was not achieved without considerable experimentation. Normally four microphones are used. There is permanent wiring only to the pulpit; the other extensions are installed as occasion demands.

A few notes in regard to Westminster Abbey may appropriately be included in this article. In order that evidence of broadcasting during the regular relay of Thursday Evensong should be practically invisible, the cables are laid under the ancient stone flags and in the mortar joints of the masonry to the control point in a room which has been set aside for the purpose close to the tomb of the Unknown Warrior. Four microphones are used. In addition to the Thursday services, the B.B.C. was privileged to broadcast the Memorial Service for Earl Haig on February 3rd. It has been the subject of comment from time to time that the broadcasts seem to possess something of the "atmosphere" acquired by the Abbey through generations of English history. This "atmosphere," indeed, is one of the most marked characteristics of Cathedral broadcasts in general.

## The Silent Fellowship

THE West of England and Wales have their separate Sports Bulletins; there are nights devoted to West Country programmes, and nights when special Welsh features are broadcast: but there is one feature which draws audiences from both sides of the Channel, and that is the Silent Fellowship on Sunday evenings. It is an interesting fact that the broadcast of the Lord's Prayer in Welsh is appreciated by English listeners nearly as much as by Welsh, and on some occasions when, owing to the lateness of the hour, this item has had to be omitted, protests have been sent even from English listeners. Last Christmas, in conjunction with *The Daily Express*, the Silent Fellowship gave a huge Carol-singing Festival in the open air, which was broadcast, and which was accompanied by the Band of H.M. Welsh Guards.



CANTERBURY CATHEDRAL

*Note the microphone on the pulpit lectern*

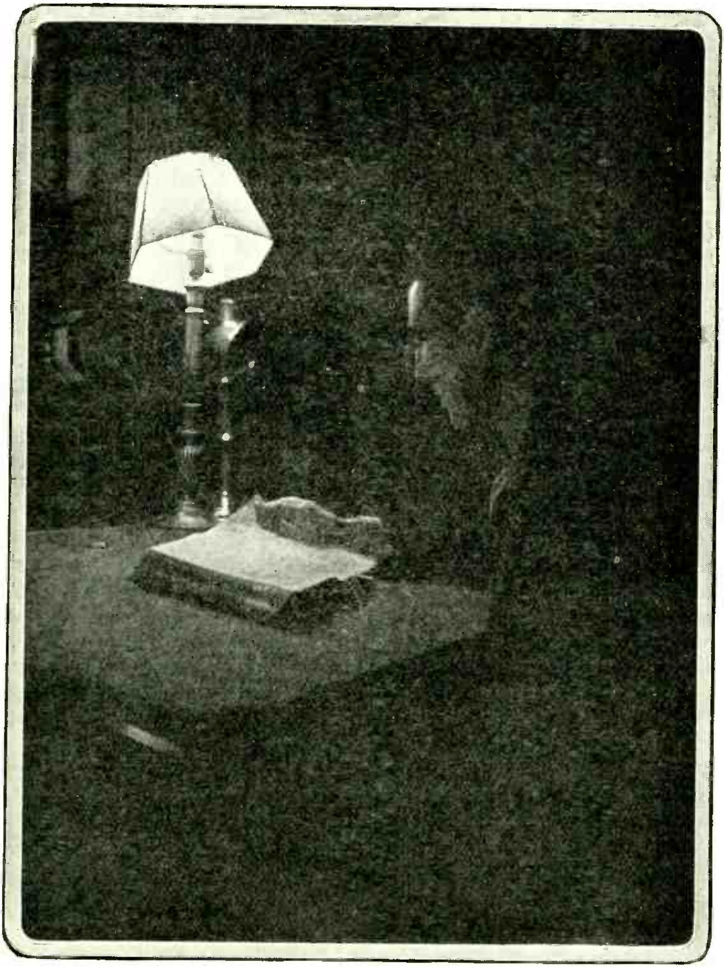
# THE DAILY SERVICE

THE B.B.C. has always been willing to satisfy the reasonable demands of large bodies of listeners, even if they constitute a minority of the whole number.

In the autumn of 1927 many requests for a daily service were received, particularly for the benefit of invalids. The movement was sponsored by Miss K. M. Cordeux, who wrote letters to the B.B.C. and to the Press, and set on foot a petition which was very largely signed. The B.B.C. thought it desirable to test the extent of the demand, and asked Miss Cordeux to write a letter to *The Radio Times* to invite support for her suggestion. There was a considerable response, but no agreement as to the most convenient time for the daily service. There was, indeed, a very remarkable divergence of opinion on this point. Almost every hour in the day from 9 a.m. to midnight had its supporters. The B.B.C. concluded that there was no possibility of arriving at agreement on this point by a plebiscite, and that the best plan would be to start a daily service at a time which suited existing programme arrangements, so that no one might feel deprived of anything they enjoyed at present. The time selected was 10.15 a.m., before the Daventry shipping forecast.

These broadcasts began on January 2nd, 1928, and in the first announcement regarding the daily service listeners were asked to state whether the time suited them. Within a week or two more than 7000 letters of appreciation were received, and the number has now grown to over 8000. There were very few protests or complaints. The daily service, which is conducted anonymously, is of very simple construction: a hymn, a few prayers, a psalm, a Bible-reading, another prayer, and a closing hymn—such is the normal type. It is evident that the listeners are by no means all invalids: a great number are working women, who find that they can spare a quarter of an hour in the morning with profit.

The service does not follow the liturgy of any Church, although a certain number of prayers are taken from the English Prayer Book. On Wednesdays and Saturdays, when no choir is available, the psalms are read and the service closes with a hymn or an organ voluntary, generally provided by a suitable gramophone record; but the form of service is by no means fixed.



## THE EPILOGUE

WHETHER it was something in the atmosphere of Sunday night, or whether it was merely the fact that the Sunday evening programme closed as early as 10.30 in old times, or whether it was a combination of these two motives that led to the first beginnings of the Epilogue, is uncertain, but old listeners will remember that the Sunday night programme frequently closed with something in the nature of a Sunday night thought, possibly a verse or two of poetry, or a solo of a religious character, or an extended good-night by the announcer.

It now takes a regular form, with one or two possible variations. The standard type of Epilogue is, hymn, Bible, hymn, all grouped round some central thought, which is chosen as appropriate to the season, whether the Church season or the season of the year. Thus during the season of Lent there was the following sequence of thoughts: "Dying —and behold we live!"; Exile; Persecution; Lowliness; Penitence; Betrayal, followed on Easter Day by Joy. The theme is sometimes suggested by the Epistle or Gospel for the day, though the Bible reading is seldom identical with either, or it may even spring from some event of the day or some problem which is agitating the newspapers. For the Epilogue, not being the subject of any printed announcement, is seldom composed more than two or three days before the Sunday on which it is given.

The central idea and the Bible-reading being settled, the hymns very often choose themselves. This would happen more often were it not necessary to avoid those which have already been sung in the evening broadcast Service. Frequently a psalm suggests itself—for example, it was obviously suitable to begin the "Lowliness" theme with "Lord, I am not high-minded." The chanting of the Wireless Choir is deservedly popular, whether we give whole-hearted approval to the new pointing or not. Sometimes an aria from some very well known oratorio is substituted for one or other of the hymns. This depends to some extent upon the resources available in the studio on the particular evening. From time to time, also, but very occasionally, some fine passage of secular poetry may suggest itself as specially appropriate. Lines from George Herbert, Milton and Shakespeare have been heard from the London studio, and the 5GB Epilogues frequently contain poetry.

A certain atmosphere of reticence and even mystery seems to enhance the effect of the Epilogue. Hence it is cut off and set apart from the evening concert. It is not announced and the names of the readers are not made public. The B.B.C. wishes it to be thus anonymous, and deprecates inquiries as to the persons taking part in it.

IN CHARING CROSS HOSPITAL

## BROADCAST CHARITY APPEALS

UNDER the old system the allocation of microphone-time for appeals was mainly dependent on the resource and initiative of individual Secretaries and Organisers, and there was little guarantee that the public charity evoked by broadcast appeals would flow into the most useful channels. There was at the end of 1927 a waiting list of causes long enough to fill two years, and requests were still coming in. For this reason the B.B.C. decided to invite the co-operation of experts to plan out the whole field and sort out the most deserving causes.

Accordingly, on the invitation of the Corporation, an Appeals Advisory Committee was formed.

As a definition of the scope of the Week's Good Cause the Committee agreed that in general appeals should be restricted to causes which concern themselves with the relief of distress, the preservation of life and health and the amelioration of social conditions.

While the time of the appeal is fixed and definite, from 8.45 to 8.50 every Sunday evening, the subjects and speakers vary as widely as the objects of charity permit. Among the most successful appeals have been such varying causes as the Central Fund for the Industrial Welfare of Tuberculous Persons (Spero Industries), which gained £3,200, the National Union of Limbless Ex-servicemen, £1,608, the Working Ladies' Guild, £1,550, the Salvation Army, £974, and Cecil Houses (Women's Public Lodging House Fund), £620. The speakers were in turn Lieut.-Col. Robert Loraine, Mr. Alec Rea, Lady Bertha Dawkins, General Booth and Mrs. Cecil Chesterton. Lord Knutsford, appealing on behalf of the London Hospital, more than trebled his result of five years ago, and obtained nearly £20,000. At Christmas, 1927, the Senior Announcer appealed from London only for the B.B.C. Fund for Children, and met with the gratifying response of £1,143, which sum was divided between five well-known children's organisations. During the year 1927 some £40,000 in all was subscribed by the public.

CAPTAIN SIR GEORGE WILKINS

*the Australian airman, who on June 13th, 1928, described to listeners his great flight over the North Pole*

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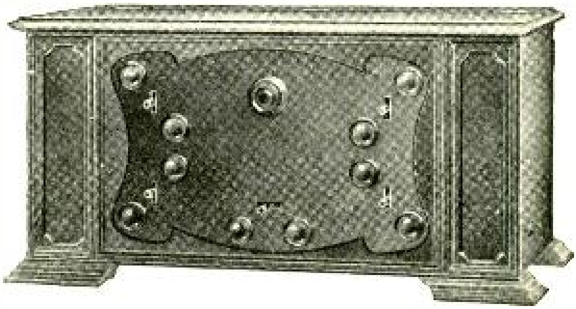

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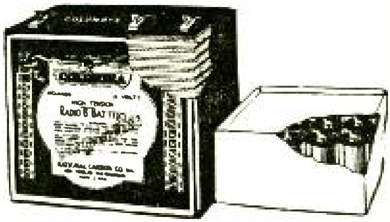

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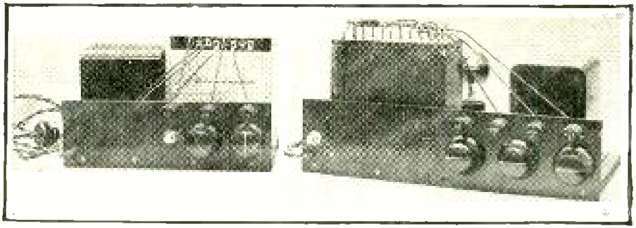

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(3). AIDS TO STUDY PAMPHLETS, also three times a year in the same months.

Any or all of these pamphlets may be bought separately, but for the convenience of listeners the B.B.C. has instituted a subscription scheme, full details of which will be found in any issue of the

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# GENERAL INDEX

which is obviously equal to the product of *wave-length* and *frequency*, *i.e.*,

$$\text{Wave-length (metres)} = \frac{300{,}000{,}000}{\text{Frequency (cycles per second)}}.$$

In an *oscillatory circuit*, its *natural wave-length* ($\lambda$) is given by $\lambda = 1{,}885\sqrt{LC}$, where $\lambda$ is in metres, L is the *inductance* of the circuit in *microhenries* and C is the *capacity* in *microfarads*.

WAVEMETER—An apparatus for measuring *wave-length*. The most general types are the *Buzzer wavemeter* and the *Heterodyne wavemeter*.

WAVE SHAPE—See *Wave Form*.

WAVE TRAP—A *rejector* or *acceptor* circuit used in some receiving sets in order to minimise the interference caused by an unwanted signal whose *frequency* is close to that of the signal it is desired to receive.

WEAK COUPLING—See *Loose Coupling*.

WET BATTERY—A term often used to denote an *accumulator* battery. Cf. *Dry Battery*.

WHEATSTONE BRIDGE—An instrument used for determining the electrical *resistance* of an apparatus by balancing it against another of known resistance.

WIPE OUT—The state of affairs that occurs in a valve receiving set employing *grid-leak rectification* when an exceptionally powerful signal, *e.g.*, an atmospheric, gives the *detector* grid such a high negative charge that the operation of the receiver is paralysed until the charge has had time to leak away through the *grid resistance* to earth.

WIPE-OUT AREA—The term given to the area very close to a transmitting station where the *signal strength* is so great that it is impossible, however selective the receiver, entirely to tune out the signal in favour of another and more distant one.

WIRED WIRELESS—A system of communication employing high-frequency currents in which the transmitter and receiver are very similar to those used for wireless communication, but in which the medium is not the ether but ordinary telephone or power cables. By varying the *frequency*, several communication channels can be established on the same pair of wires.

WIRELESS BEAM—See *Beam Wireless*.

WIRELESS LINK—An arrangement in which use is made of a *portable transmitter* for broadcasting purposes. The item is first radiated by the portable transmitter on a short wavelength, received by a receiving station and sent by telephone line to a distant transmitter from which it is again radiated.

WOOD'S METAL—A soft alloy of lead, tin, bismuth and cadmium which melts at 60° C.

WORK—Work is done when a force overcomes a resistance over a certain distance. When a current of one ampere flows through a resistance of one ohm, the potential difference necessary is one volt. The power in the circuit is one *watt* and the work done per second is one joule.

X—The usual symbol for *reactance*.

"X's"—Another name for *atmospherics*.

"X" STOPPER—An *acceptor* or *rejector* circuit incorporated in a wireless receiver to minimise interference due to atmospherics.

Z—The usual symbol for *impedance*.

ZERO POTENTIAL—See *Earth Potential*.

ZINCITE—An oxide of copper used together with *bornite* as a *crystal detector*. This combination is known as a "*Perikon detector*."

whose direction represents its direction in relation to other vector quantities. Vectors may be added or subtracted by the method of parallelogram of forces.

VELOCITY—Distance traversed in unit time. The term implies a given direction and in this sense has not the same meaning as "speed."

VELOCITY OF ELECTRIC OR ETHER WAVES—Electric or Ether *waves* travel through space with the same *velocity* as light (which is itself an *electro-magnetic wave*), about 300 million metres per second or 186,000 miles per second.

VERNIER CONDENSER—The name given to a *variable condenser* of small *capacity*, generally used in *parallel* with a larger *variable condenser* in order to give a fine adjustment. It may either be a separate unit or incorporated in the main condenser, which will then have two control knobs.

VOLT—The practical unit of electrical pressure. If one volt is applied across the ends of a resistance of one ohm, a current of one ampere will flow. See *Ohm's Law*.

VOLT-AMPERES—The product of the *voltage* and *current* in an alternating current circuit. This gives the apparent power in the circuit, and to obtain the *true power* the former has to be multiplied by the *power factor*.

VOLTAGE—A term meaning *electromotive force* or *potential difference* measured in *volts*.

VOLTAGE AMPLIFICATION—The ratio of the output *voltage* to the input *voltage* of an amplifier. In a three-electrode valve amplifier, the static voltage amplification or *amplification constant* is dependent upon the physical measurements and *internal impedance* of the valve, but the dynamic factor (*i.e.*, the voltage ratio actually obtained when the valve is used in an amplifying circuit) depends also upon the external *impedance* of the plate circuit and is always less than the static constant, gradually approaching that value as the external *impedance* is increased relatively to the total *impedance*. There are, however, other considerations which limit the value of the external *impedance*.

VOLTAGE AMPLIFICATION FACTOR—See *Amplification Constant*.

VOLTAGE DROP—Across a circuit or a piece of apparatus is the *E.M.F.* or *potential difference* that is used up in driving a current through the circuit or apparatus. By *Ohm's Law*, the voltage drop in a direct current circuit is the product of the *current* in *amperes* and the *resistance* in *ohms*. In an alternating current circuit, it is the product of *current* and *impedance*.

VOLTAGE MULTIPLIER—A fixed *resistance* which is connected in series with a *voltmeter* to decrease the sensitivity of the instrument and allow higher *voltages* to be read.

VOLTMETER—An instrument used for the measurement of *voltages*. It is connected directly across the voltage to be measured and has a high *resistance* permanently in series with it so that the *current* passing through the instrument may be limited to a small value. In the moving coil type, the *current* is passed through a coil which is free to rotate between the *poles* of a permanent horseshoe magnet. The coil tends to move so that its *flux* is at right angles to the magnet flux, thus for a given current the coil will take up a certain definite position and the pointer attached to it will indicate a certain voltage value on a scale. This type of instrument can only be used for the measurement of direct currents. In the cheaper and less accurate moving iron type, the coil carrying the current is fixed and is made to attract a pivoted iron disc to which the pointer is attached. Such an instrument will measure either direct or low-frequency alternating currents. There are other types, such as the *hot-wire instrument* for high-frequency measurements, but the moving coil and moving iron instruments are the most common. The working parts of an *ammeter* are similar, but the instrument is connected in series with the supply and the fixed resistance or "shunt" is connected in *parallel* with the instrument.

VULCANITE—See *Ebonite*.

WANDER PLUG—A brass plug connected to the end of a flexible wire to make connection with any one of a number of sockets in a *high-tension* dry battery or *grid battery*.

WATER-COOLED VALVE—A thermionic valve in which arrangement is made to cool the *anode* by circulating water round it.

WATT—A practical unit of electrical *power*, and equal to one joule per second. The watts in a D.C. circuit are equal to the product of the volts and amperes. In an A.C. circuit, this product gives the *apparent power*, which has to be multiplied by the *power factor* to give the *true power*.

WATTFUL CURRENT—That part of the current in an A.C. circuit which is in *phase* with the applied voltage, and which can therefore do useful work.

WATT-HOUR—The work done by a power of one watt in one hour. The commercial unit of electrical energy is the Board of Trade Unit which equal 1,000 watt-hours.

WATTLESS CURRENT OR WATTLESS COMPONENT—That part of the current in an A.C. circuit which is 90° out of phase with the applied voltage, and which therefore cannot do useful work.

WATTMETER—A meter for indicating directly the power in a circuit.

WAVES (ELECTRICAL)—A movement in the ether consisting of electric and magnetic forces alternating in direction, produced by electrical *oscillations* in a conductor. These disturbances spread outwards in the form of *electro-magnetic* or *ether waves* and travel at the speed of light, 300 million metres per second. Energy is conveyed by these waves. They are not perceptible directly to the ear, but can be made to be so by the aid of a suitable *detector*. See *Radiation*.

WAVE DISTORTION—See *Distortion*.

WAVE FORM—The shape of the curve obtained when values of an alternating quantity are plotted on a time base.

WAVE-LENGTH—The distance between the crests of two successive *waves*. All electro-magnetic waves travel with the same velocity (300 million metres per second) by the *Power Factor* of an alternating current circuit.

**TUNED ANODE**—A type of *intervalve coupling* used between two high-frequency amplifying valves in cascade, or between a high-frequency valve and the detector in a receiving set. An *oscillatory circuit* is connected in the *plate* circuit of the first valve and tuned to the frequency of the received signals. A *rejector* action is thus obtained and the high oscillating voltage set up across the inductance of the *oscillatory circuit* is passed on to the grid of the second valve by means of a *grid condenser*. Cf. *Resistance-capacity Coupling*.

**TUNED CIRCUIT**—An *oscillatory circuit* whose *resonant frequency* has been adjusted to a desired value.

**TUNED PLATE CIRCUIT**—See *Tuned Anode*.

**TUNER**—An arrangement of one or more *oscillatory circuits* whose *resonant frequencies* are easily variable to receive any desired signals or to give an *acceptor* or *rejector* action.

**TUNING**—The operation of adjusting a *tuned circuit* to give *resonance* at any desired *frequency*.

**TUNING COIL**—An *inductance coil*, either fixed or variable in value, used in a *Tuned Circuit*.

**TUNING CONDENSER**—A *variable* condenser used in a *Tuned Circuit*.

**TUNING-FORK**—A piece of steel designed to have a natural period of vibration of a definite *frequency*. By means of a *thermionic valve* circuit these vibrations can by maintained, and used as a frequence standard. See *Multi-vibrator*.

**TUNING INDUCTANCE**—See *Tuning Coil*.

**TUNING NOTE**—A *modulation* of the *carrier wave* of a broadcast transmitter with some form of continuous low-frequency note, so that listeners can tune in their receivers to the best advantage before the start of the actual programme. In some countries such a signal is radiated as an identification signal and is peculiar to a particular station.

**TWO-ELECTRODE VALVE OR DIODE**—A *thermionic valve* containing two *electrodes* only, a *plate* and a *filament*. The original form of the *thermionic valve* is still used for rectifying purposes, but largely replaced by the *three-electrode valve* for othre purposes.

**TWO PHASE**—An alternating current system having two distinct circuits carrying current, the *currents* and *E.M.F.'s* of these circuits differing in *phase* by 90°.

**TWO-POLE SWITCH OR DOUBLE-POLE SWITCH**—A switch which opens or closes both *poles* of a circuit at one operation. In a "single throw" switch this operation is done to one circuit only, in a "double throw" two circuits may be controlled alternately.

**TWO-WAY REPEATER**—See *Repeater*.

**UMBRELLA AERIAL**—An *aerial* arrangement consisting of a vertical centre pole from the top of which the aerial wires radiate symmetrically towards the ground.

**UNDAMPED OSCILLATIONS OR UNDAMPED WAVES**—A train of electrical *oscillations* or waves whose amplitude is constant. The basis of all *continuous wave* telegraphy and telephony transmission.

**UNIDIRECTIONAL**—A *current* flowing or a *voltage* acting in the same direction but not necessarily with a constant *amplitude*. See *Pulsating Current*.

**UNILATERAL CONDUCTIVITY**—The property possessed by certain apparatus of being able to pass a current in one direction only. The most important examples of such apparatus are the *thermionic valve* and the crystal, which are used in the process of *rectification*.

**UNIT (BOARD OF TRADE)**—The commercial unit of electrical energy equal to 1,000 watt-hours or one kilowatt-hour.

**UNIT POLE**—A *magnetic pole* which when placed at a distance of one centimetre from an equal *pole* exerts on it a force of one dyne.

**UNLOADED AERIAL**—One which has no added *inductance* or *capacity* and which will oscillate at its *natural wave-length* when energised from an outside source.

**ULTRA-SHORT WAVES**—See *Short Waves*.

**UNTUNED AERIAL OR APERIODIC AERIAL**—The *aerial circuit* of a receiving set which has not been specially *tuned* to the *frequency* of the incoming signal, an arrangement which is sometimes advantageous in the reception of short waves. The *aerial* is inductively coupled to the closed circuit *inductance* in the usual way.

**VACUUM**—A space entirely free from all matter.

**VACUUM TUBE**—A general name for all types of tubes or glass bulbs containing *electrodes* and from which all the gas has been exhausted.

**VACUUM VALVE**—A vacuum tube possessing *unilateral conductivity*, *e.g.*, the *two- or three-electrode thermionic valve*.

**VALVE**—See *Vacuum Valve*.

**VALVE AMPLIFIER**—See *Amplifier*.

**VALVE DETECTOR**—See *Detector Valve*.

**VALVE OSCILLATOR**—See *Oscillator*.

**VALVE RECEIVER**—A wireless receiver employing one or more *thermionic valves*.

**VARIABLE CONDENSER**—One whose *capacity* is easily altered and consisting generally of two sets of plates which can move relatively to each other. Cf. *Square Law Condenser*.

**VARIOCOUPLER**—An arrangement consisting of two *inductance* coils, which can be moved relatively to each other to vary the *inductive coupling* between them. Cf. *Variometer*.

**VARIOMETER**—A form of variable *inductance* consisting of two coils, one of which rotates within the other. The coils are connected in *series* and by altering the relative position of the coils the *magnetic fields* set up by the currents in them are made either to assist or to oppose each other. Thus the effective inductance value of the combination is continuously variable between these limits without any alteration being made to the actual amount of conductor in the circuit. In a well-designed unit, an inductance ratio of about 10 to 1 may be obtained.

**VECTOR**—A straight line whose length represents the magnitude of a quantity and facture of the filaments of some *dull-emitter valves*, the Tungsten filament being coated with thorium-oxide.

**THREE PHASE**—An alternating current system in which the current and voltage of each phase are quite distinct and the *phase* angle between any two phases is 120°.

**TIGHT COUPLING**—If two coils are placed so close together that most of the energy in one is transferred to the other by *induction*, they are said to be "tightly coupled"; that is to say, the mutual inductance between the coils is large in comparison with their *self-inductances*. Cf. *Loose Coupling*.

**TIME CONSTANT**—In a circuit containing *self-inductance*, any change in the value of current in the circuit will be opposed by a back E.M.F. which at any instant is proportional to the rate of change of current. Thus if a steady *voltage* is applied to such a circuit the *current* will not suddenly reach its maximum value of $\frac{E}{R}$, but will build up gradually, because the effective voltage at any instant will be the applied voltage minus the back voltage. The time taken to reach the maximum current value is called the "Time Constant" of the circuit and is equal to $\frac{L}{R}$ seconds in the case of a steady applied voltage, and $\frac{2L}{R}$ seconds where an oscillating voltage is connected across an *oscillating circuit*, R being the *resistance* in *ohms* and L the *inductance* in *henries* in each case.

**TIME PERIOD**—See *Period*.

**TIME SIGNAL**—The broadcast Greenwich Time Signal consists of six dot-seconds, the first at five seconds before the hour, and the sixth exactly at the hour.

**TONE**—The term applied to the sound heard in a telephone receiver when low-frequency *alternating* or *pulsating current* is passing through it.

**TONE SOURCE**—A calibrated apparatus capable of producing pure sine-wave low-frequency alternating currents of constant amplitude between the limits of audibility, *i.e.*, from about 25 to 12,000 cycles per second. The apparatus is largely used to obtain the characteristic curves of *low-frequency transformers*, *loud-speakers*, etc., by supplying an input of known frequency and amplitude from the Tone Source and measuring the output.

**TOROIDAL COIL**—An inductance coil wound on a ring-shaped core. The coil may be made self-supporting, in which case no core is necessary.

**TRANSFORMATION RATIO**—See *Ratio of Transformation*.

**TRANSFORMER**—An apparatus for changing the *voltage* of an alternating current supply. It consists essentially of two windings tightly coupled to one another, so that energy in the one may be transferred to the other by *electro-magnetic induction*. Power and low-frequency transformers have a laminated iron core, while those used for high-frequency work have a non-magnetic core. The action of a transformer depends upon the E.M.F. which is induced in the *secondary winding* by the magnetic flux that is set up in the core due to the current flowing in the *primary winding*. The value of this E.M.F. is proportional to the number of turns which are linked by the *magnetic flux*, and therefore the *secondary voltage* is proportional to the number of turns in the *secondary winding*, losses being neglected. If the secondary is open-circuited, the primary will act as an ordinary *choking coil* and the only current flowing in the primary will be that due to its high *impedance*. This is called the *magnetising* or *no-load current*. When the secondary is connected to the ends of a *non-inductive resistance* a current will flow which will tend to produce a flux in the opposite direction to that already existing in the core, thus momentarily reducing the primary *reactance*. This will cause an increased current to flow in the primary until a state of equilibrium is again reached. The secondary ampere-turns must be counterbalanced by an equal and opposite number of ampere-turns in the primary, and, neglecting losses, the power (*i.e.*, the product of current and voltage assuming unity *power factor*) in the primary circuit is equal to the power in the secondary circuit. That is to say, the ratio of *voltages* equals the ratio of turns and the inverse ratio of currents.

**TRANSMISSION UNIT**—A unit of gain or loss by which a measure of the ratio of input to output power, or vice versa, may be obtained on a logarithmic scale. The number of transmission units represented by the ratio of two powers $P_1$ and $P_2$ is given by the formula:

$$\text{T.U.} = 10 \log_{10} \frac{P_1}{P_2},$$

*e.g.* if $P_1 = 10{,}000$ and $P_2 = 1$

$$\frac{P_1}{P_2} = 10{,}000.$$

$$\text{Log}10\ \frac{P_1}{P_2} = \log_{10} 10{,}000 = 4{\cdot}0$$

$$\therefore 10 \log_{10} \frac{P_1}{P_2} = 40,$$

*i.e.* a power ratio of 10,000 to 1 = 40 Transmission Units. Cf. *Standard Cable*.

1 Transmission Unit = 0·9221 mile of Standard Cable.

**TRANSMITTER (WIRELESS)**—The apparatus used for radiating into space electric waves, which may represent either telegraphic or telephonic signals. It consists generally of some form of *oscillation generator*, the output of which is remotely controlled by a Morse key for the sending of telegraphic signals, or modulated by a *low-frequency* (speech) current for telephony.

**TRICKLE CHARGER** — An *accumulator* charger which is arranged to charge at a low rate, so that a *battery* which has been in use during the day can be left on charge all night, and thus be fully charged for subsequent use. The mechanical analogy is water trickling to fill a tank.

**TRIODE**—Another term for a *three-electrode valve*.

**TRUE POWER**—Is the *apparent power* (product of volts and amperes) multiplied the capacity of an exactly similar condenser with air as dielectric.

**SPECIFIC RESISTANCE** — The *resistance* between two faces of a one-centimetre cube of any material.

**SPEECH AMPLIFIER**—See *Low-frequency Amplifier*.

**SPREADER**—A pole or hoop, generally of wood, used for separating the parallel wires of an *aerial*.

**SQUARE LAW CONDENSER**—A *variable condenser* in which the angle of rotation is proportional to the square of the *capacity*, and thus proportional directly to the change in *wave-length*.

**STALLOY**—A silicon-steel largely used for the cores of *low-frequency transformers*.

**STANDARD CABLE**—In line-telephony transmission a mile of Standard Cable is a unit of loss or gain, by which a measure of the ratio of input to output power in a circuit can be obtained. Standard cable, therefore, is an artificial cable having certain definite constants of *inductance*, *resistance* and *capacity*, etc., per loop mile with which other cables can be compared for loss and their performance specified as so many Standard Mile units. 1 Standard Mile unit = 1·084 *Transmission Units*. See *Transmission Unit*.

**STANDING WAVES**—Waves of sound produced in a *studio* due to reflection from the walls or ceiling or from objects in the studio itself.

**STATIC CHARACTERISTIC**—A curve showing the relation between various steady *voltages* and *currents* of a *thermionic valve*. Cf. *Dynamic Characteristic*.

**STATICS**—See *Atmospherics*.

**STEP-DOWN TRANSFORMER**—A *transformer* in which the *secondary voltage* is lower than the *primary voltage*, and the *secondary current* higher than the *primary current*.

**STEP-UP TRANSFORMER**—A transformer in which the *secondary voltage* is higher than the *primary voltage*, and the *secondary current* lower than the *primary current*.

**STORAGE BATTERIES**—See *Accumulators*.

**STRAYS**—See *Atmospherics*.

**STUDIO**—A room in which broadcast items are performed, generally *draped* to reduce *reverberation* and *echo*.

**SUB-CONTROL**—A low-frequency amplifying circuit preceding the *modulation system* of a transmitter.

**SULPHATING**—A white deposit of lead sulphate that appears on the plates of an *accumulator* when it is left uncharged for a long period. The removal of this deposit requires special treatment.

**SUPERHETERODYNE RECEIVER**—One employing a special circuit relying on a *beat reception* arrangement. The selectivity of such a receiver is considerable.

**SUPERSONIC FREQUENCY**—A *frequency* which is just above the audible range.

**SUPER-REGENERATION**—A valve receiver, employing *regeneration* or *reaction*, becomes most sensitive just before the reaction coupling is tightened up to the point at which the receiver oscillates. At this point the losses in the circuits are nearly balanced by energy fed from the *high-tension battery*. Super-regeneration provides a method by which the *oscillations* generated in the receiver are interrupted at a *frequency* above the range of audibility, thus allowing the receiver to be worked at a point where its circuits possess virtually *negative resistance*, and thus great sensitivity is obtained. The practical operation of such a receiver is, however, not simple.

**T AERIAL**—One in which the vertical down lead is attached to the middle of the horizontal span.

**TELEPHONE**—The instrument that converts the electrical energy of the receiving set into sound energy. It consists essentially of a soft iron diaphragm supported close to the poles of an *electro-magnet*. The speech currents passing through the coils of the electro-magnet attract the diaphragm, causing vibrations in the air which are audible.

**TELEPHONE CONDENSER**—A small fixed *condenser* sometimes connected across a *telephone receiver* or *loud speaker* to assist in the bipassing of the *high-frequency currents*. It is not essential, as the *self-capacity* of the telephone winding itself is generally sufficient for the purpose.

**TELEPHONE TRANSFORMER**—A *transformer* whose primary *winding* is connected directly in the receiving circuit and whose *secondary* is connected to the *telephones*, thus isolating the telephone itself from direct electrical connection with the receiver.

**TELEPHONE TRANSMITTER**—A *transmitter* designed for the transmission of speech or music.

**TELEVISION**—A system, as yet in the experimental stage only, whereby a fixed or moving object is made visible at a distance by electrical means.

**THERMIONIC CURRENT**—The electronic current flowing between the *filament* and *anode* of a *thermionic valve*.

**THERMIONIC VALVE**—A *vacuum tube* containing two or more *electrodes*. The action of the valve depends upon the *electron emission* from a heated kathode, the *electrons* being attracted to the *anode* which is given a positive *potential* with respect to the *filament*. The valve can be made to act as a rectifier, high- or low-frequency *amplifier*, or a generator of electrical *oscillations*. It forms the basis of all modern wireless engineering.

**THERMIONIC VOLTMETER**—An instrument using a two- or three-*electrode valve* for the purpose of measuring small differences of *potential*.

**THERMO-AMMETER**—A type of *ammeter* suitable for the measurement of *high-frequency currents*. Its movement is dependent upon the heating effect of the current passing through a wire and its consequent extension in length. See *Hot-wire Ammeter*.

**THERMO-COUPLE**—A generator of *E.M.F.*, consisting of two dissimilar metals joined together, their junction being heated above the temperature of the rest of the circuit.

**THORIUM**—A rare metal used in the manustrength of the wanted signal to that of the interference which will determine the extent of this area. It has been found convenient to divide the area into four parts: (1) the *wipe-out area* in which the field strength is greater than 30 millivolts per metre, (2) "A" service area between 10 and 30, (3) "B" service area between 5 and 10, and (4) "C" service area between 2·5 and 5.

**SHOCK EXCITATION**—The forcing into *oscillation* of a tuned oscillatory circuit at its *natural frequency* due to a sudden energy impulse from an outside source.

**SHORT-CIRCUIT**—A connection having very low *resistance* made between two parts of a circuit. If this connection is made accidentally, then the current in the circuit, owing to the drop in the resistance, may rise to a very high value and do damage to the apparatus in that part of the circuit which is not short-circuited.

**SHORT WAVES**—The term usually applied to *wave-lengths* under 100 metres (*i.e.* frequencies of more than 3000 kc. per sec.). The term "ultra-short" is sometimes used to designate this waveband.

**SHORTENING CONDENSER**—A *condenser* connected in *series* with the *aerial* in order to reduce its *resonant frequency* to a value below its *natural frequency*.

**SHUNTED BUZZER**—A modified *buzzer* often used to energise a receiving circuit in order that the wave-length of the latter may be measured.

**SIDE-BANDS**—When a constant high-frequency *carrier wave* is modulated by a low-frequency speech component in order to transmit telephony, a number of high-frequency waves is produced, the values of which are above and below the actual *frequency* of the *carrier wave* itself. The frequency bands occupied by these waves are called "side bands." See *Modulation*.

**SIDE-BAND TELEPHONY**—A system of telephony transmission in which the *side-bands* only are transmitted and not the *carrier wave*. The *carrier wave* having been modulated and the *side-bands* produced, the carrier wave is eliminated and supplied again at the receiving end. In this system of transmission there is a considerable saving in power, the disadvantage being that unless a special receiver, which will supply the missing *carrier wave*, is used, the sounds that will be heard will be unintelligible.

**SIMULTANEOUS BROADCASTING**—A system whereby the programme of one broadcasting station may be transmitted simultaneously from a number of other broadcasting stations, connections between the stations being made by ordinary telephone lines. See *Repeater Stations*.

**SINE WAVE**—A *wave form* representing an alternating quantity which varies according to a sine law.

**SINGLE PHASE**—A system of alternating current electricity consisting of one *voltage* and one *current* passing through one pair of wires only.

**SINGLE WAVE-LENGTH WORKING**—The working of two or more broadcasting transmitters on the same *carrier wave frequency*. The congestion of the ether caused by the opening of an ever-increasing number of broadcasting transmitters, when only a limited number of channels is available for them, and the consequent mutual interference, have rendered single wave-length working very desirable. Experiment to achieve this is still proceeding in this and in other countries. The solution lies in terms of absolute stabilisation of the transmitters' carrier frequency, probably by means of a *tuning-fork* drive and a certain reduction in *service areas* due to interference patterns produced by the *carrier waves* and *side-bands*. The extent of such *mush areas* depends on the distance apart of the transmitters, and, in effect, the *service area* of each of two equal power transmitters, radiating the SAME programme, will be of the order of one quarter of the distance between them—with a maximum range at night of the order of 20 to 25 miles—this limit being imposed by the increase in received strength of the distant transmitter at night due to *fading*. With DIFFERENT programmes the range of the *service area* will be very much more restricted—being only of the order of ½ to 1 mile at night, irrespective of the powers used at the two transmitters.

**SKIP DISTANCE**—The distance between the point where the direct ray from a transmitting station becomes so attenuated as to be inaudible, and the point where the reflected or indirect ray strikes the earth's surface. The skip distance is a function of the *wave-length* employed and increases with a decrease in wave-length.

**SLAB COIL**—An *inductance* coil wound in a flat shape having the disadvantage of high *self-capacity*.

**SLIDE BACK**—An apparatus for indicating in the *control room* of a broadcasting station the presence of grid current (and hence distortion) in the modulation system of the transmitter.

**SMOOTHING CIRCUIT**—A circuit consisting of a number of *inductances* and *condensers* used for eliminating the ripple or *pulsating* component of a uni-directional current, such as that obtained from a *rectifier*. A smoothing circuit is generally required if the resulting D.C. supply is to be used for supplying *high tension* to a wireless receiver or transmitter.

**SOFT VALVE**—One which contains an excess of gas. Extremely efficient when used as a detector, but difficult to operate.

**SOLID-BACK MICROPHONE**—A type of microphone employing two carbon discs, one attached to the diaphragm and the other to the solid back of the instrument, with carbon granules between them. See *Microphone*.

**SPACE CHARGE**—A cloud of electrons given off from the *filament* of a *thermionic valve*, which impedes the free flow of electrons between the *filament* and the *anode*.

**SPACE CURRENT**—See *Plate Current*.

**SPECIFIC INDUCTIVE CAPACITY**—Of a material, is the ratio of the *capacity* of a *condenser* with that material as *dielectric* to

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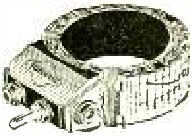

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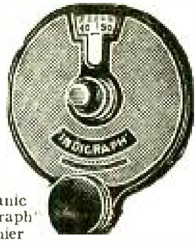

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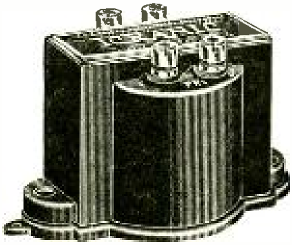

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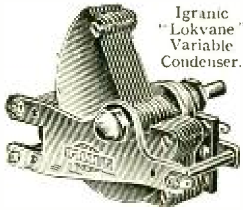

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RELUCTIVITY—The reciprocal of *permeability*.

REMOTE CONTROL—The operation of electrical apparatus at a distance, generally by means of a *relay*.

RE-RADIATION—When a valve receiver is adjusted with a tight *reaction* coupling, thus bringing the receiver nearly to the point of *self-oscillation*, the volume of the received signals is greatly increased and this increase will, to a certain extent, be re-radiated from the aerial of the receiver and will improve the signal strength in near-by receivers. If, however, the reaction is coupled too tightly the receiver will self-oscillate and cause interference. See *Reaction* and *Oscillation*.

REPEATER—A piece of apparatus placed in a long telephone line circuit in order to amplify the speech current before passing further along the line to a distant station. It consists generally of a *low-frequency amplifier* with suitable input and output transformers to match the incoming and outgoing lines. If it is desired to amplify speech currents passing in both directions at the same time, then a "two-way" repeater is used.

REPEATER STATION—One at which a number of *repeaters* is situated, and through which pass a large number of long-distance telephone lines. Such a station is used in broadcasting in connection with *Simultaneous Broadcasting*.

RESISTANCE—The opposition which an electric circuit offers to the passage of an electric current. The power wasted in a resistance appears as heat. In a homogeneous wire the resistance is directly proportional to the length and specific resistance, and inversely proportional to the area of cross section. The practical unit is the *ohm*. See *Ohm's Law*.

RESISTANCE-CAPACITY COUPLING—A method of coupling *three-electrode valves* together in cascade in a high- or low-frequency *amplifier*. A high *resistance* is placed in circuit with the *plate* of the valve, and the signal E.M.F. produces a varying *potential* at the plate end of this resistance and this is applied through a *grid condenser* to the *grid* of the next valve. This condenser is necessary to prevent the high-tension potential from affecting the second grid. In order that the negative charge on this grid may gradually leak away, a *grid leak* resistance is connected between the grid and the filament of the valve.

RESISTANCE-COUPLED AMPLIFIER—A high- or low-frequency *amplifier* employing *resistance-capacity coupling* between valves.

RESISTOR—A *resistance* generally of fixed value, often used in a filament circuit to reduce the *low-tension* voltage to a value suitable for the valve in use.

RESONANCE—Occurs in a circuit containing *inductance* and *capacity* when an alternating *potential*, whose *frequency* is equal to the *natural frequency* of the circuit, is applied to it. When this occurs the current is in *phase* with voltage and the inductive *reactance* is neutralised by the capacity *reactance*.

RESONANCE CURVE—Curve showing the relation between the current flowing in a circuit containing fixed values of inductance and capacity when a constant voltage of varying frequency is applied.

REVERBERATION—The continuation of a sound for a short period after the original sound has ceased, due to reflection from hard surfaces, *e.g.*, walls. Note the difference between reverberation and *echo*.

RHEOSTAT—A variable *resistance*.

SATURATION (MAGNETIC)—When a *magnetising force* is applied to a piece of iron the *flux density* in the iron will increase up to a point. When a further increase of *magnetising force* will not increase the *flux density*, the iron is then said to be saturated, and this point is called the "saturation point."

SATURATION CURRENT—As the *anode voltage* applied to a *three-electrode valve* is increased, the *anode current* also increases up to a point, when a further increase in *anode voltage* does not increase the *anode current*. This maximum value of current is called the "saturation current."

SCREENED TRIODES—A four-electrode valve having two grids, and designed to eliminate the *capacity coupling* between *electrodes*. Such a valve is particularly useful in a multi-stage *high-frequency amplifier*.

SCREENING—An arrangement to prevent one circuit carrying alternating current from affecting another adjacent to it. It generally consists of a sheet of metal (usually copper) placed between the two circuits.

SECONDARY BATTERY—A battery of secondary cells, the most common being the lead-acid type. These cells can be recharged when run down by having electricity pumped into them in the reverse direction.

SECONDARY CELL—See *Secondary Battery*.

SECONDARY CIRCUIT—See *Primary Circuit*.

SECONDARY WINDING—See *Primary Winding*.

SELECTIVITY—The power of being able to select one particular *wave-length* or *frequency* to the exclusion of others.

SELENIUM CELL—A *primary cell* whose *resistance* varies according to the intensity of the light falling upon it.

SELF-CAPACITY—The *capacity* that exists between different parts of the same piece of apparatus. For example, the self-capacity of an inductance coil is due to the capacity that exists between turns, and that of a three-electrode valve to the capacities between *filament*, *grid* and *anode*.

SELF-INDUCTANCE—If the current passing through a coil of wire is changed, a back E.M.F. is set up which tends to stop the change from taking place. This is due to the "self-inductance" of the coil and is analogous to mechanical inertia.

SELF-OSCILLATION—See *Oscillation*.

SERVICE AREA—Of a Broadcasting Station is the area in which listeners can be guaranteed a service, *i.e.*, an area in which the *field strength* of received signals from that station is such that satisfactory reception is assured. It is the ratio of the centage radiated of the total energy in the circuit is the radiation efficiency of that circuit. See *Aerial Resistance.*

RADIATION RESISTANCE (of an aerial)—That quantity expressed in ohms which when multiplied by the square of the value of *aerial current* in amperes gives the power in watts being radiated from the circuit in the form of electric *waves.* See *Aerial resistance.*

RADIO BEACON—A transmitting station situated near the coast, which sends out special telegraphic signals to assist the navigation of ships at sea.

RADIO-FREQUENCY—A frequency used for radio-transmission purposes. The range at present in use is from approximately 300,000,000 cycles per second down to about 12,000 cycles per second. Transmissions on the very high frequencies are still at an experimental stage only.

RADIO-FREQUENCY AMPLIFIER — See *High-frequency Amplifier.*

RADIO-FREQUENCY RESISTANCE — See *Aerial Resistance.*

RADIO-FREQUENCY TRANSFORMER—See *High-frequency Transformer.*

RADIO-GONIOMETER—A calibrated instrument used in the Bellini-Tosi system of *direction finding.*

RADIOTRON—Another name for an ordinary *three-electrode valve.*

RATIO OF TRANSFORMATION—The ratio of the primary to the secondary voltage of a *transformer* In the case of an iron-core transformer this ratio is approximately the same as the ratio of the turns in the two windings.

RAYLEIGH DISC—A small light metal disc, so arranged in the path of a sound wave in air that the angle through which the disc is reflected becomes a measure of air pressure due to the wave. Thus a method is given for the calibration of *microphones* and *loud speakers* in absolute terms, but practical difficulties render the method suitable for use only in the laboratory.

REACTANCE—The *resistance* offered to a current in an alternating circuit, due to the presence of *inductance* or *capacity* or both. See *Impedance.*

REACTION—An arrangement in a *three-electrode valve* circuit whereby the amplified currents in the *plate circuit* react on the *grid circuit,* thus compensating to any desired extent for the losses in that circuit. This is generally effected by means of a coil connected in the *plate circuit* of the valve, which is magnetically coupled to the grid coil. If this coupling is sufficiently tight then the transfer of energy is so great that the losses are completely overcome and the circuit is set into self-oscillation. In this case the circuit radiates energy, and if this occurs in a receiving circuit it is likely to interfere with near-by receivers. See *Oscillation.*

REACTION CONDENSER—A variable *condenser* connected between two points in the external circuit of a *thermionic valve* to control the amount of reaction in the circuit.

RECTIFICATION—The operation of converting an *alternating current* into a unidirectional *pulsating current.* This operation occurs in the detection of wireless signals, a *detector* or rectifying valve being used for the purpose. The term rectification is also used in heavy current work to indicate the operation of converting a low-frequency alternating current into a pulsating current, which is generally passed through a *smoothing circuit* in order to obtain a D.C. current without ripple. Either *half-wave rectification* or *full-wave rectification* may be employed.

RECTIFIED CURRENT — The current resulting from the process of *rectification.*

RECTIFIER—A piece of apparatus which performs the operation of *rectification.*

RECTIFYING DETECTOR—See *Detector.*

RECTIFYING VALVE—A *thermionic valve* capable of rectifying.

REFLECTION — (*a*) Of wireless waves. Electric waves travelling away from an aerial in an upward direction strike the *Heaviside Layer,* which refracts and partially reflects the waves to the surface of the earth. Thus at any point there may arrive two electric waves, one direct from the source and the other reflected from the Heaviside Layer. See *Fading.*

(*b*) On land-lines. The interference caused to speech-current frequencies when transmitted along long land-lines, generally due to incorrect terminal conditions or changes in the composition of the line along its length. Some of the frequencies are reflected back, producing nodes and loops of current and potential along the line.

REFLEX CIRCUIT—A valve circuit containing a high-frequency amplifying valve which acts as a low-frequency amplifying valve as well.

REGENERATION—See *Reaction.*

REGIONAL STATION—A high-power broadcasting station designed to serve a large area.

REINARTZ CIRCUIT—A valve circuit especially suitable for the reception of short waves.

REJECTOR CIRCUIT—A tuned *oscillatory circuit* consisting of an *inductance* and a *capacity,* the values of which are arranged so that the circuit offers a very high *impedance* to *oscillations* of a particular *frequency* which it is desired not to pass, and a low *impedance* to all other frequencies. Such an arrangement is used to obtain selectivity in a receiving set, the rejector circuit being tuned to the wave-length of the signal it is desired to receive.

RELAY—A device generally consisting of an *electro-magnet* and an armature which makes or breaks a local circuit when current is passed through the coils of the magnet. The coil current is generally small compared with the current in the local circuit.

RELAY STATION—A low-power broadcasting station which receives most of its programme material via a telephone line from a distant studio.

RELUCTANCE—The magnetic *resistance* offered to the passage of *magnetic flux* in a substance when a *magnetising force* is applied. Analogous to electrical *resistance.*

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in the winding. Whether the latter adds to the total magnetism or otherwise depends upon the direction of the magnetising current. By arranging that the value of permanent magnetism brings the iron on to the steep portion of the *magnetisation curve*, then a relatively small value of magnetising current in either direction will cause a large variation in *magnetic flux* in the core. A *telephone* makes use of this arrangement.

**POLARISED RELAY**—A *relay* in which a *polarised electro-magnet* arrangement is used. A soft iron armature is magnetised by a *permanent magnet* and one end is also under the influence of an electro-magnet. Thus this end will swing one way or the other according to the direction of the magnetising current flowing in the coils of the electro-magnet.

**POLARITY OF MAGNETS**—Every magnet has two poles, one at each extremity. The north pole tends to move towards the north magnetic pole and the south pole towards the south.

**POLE**—See *Polarity of Magnets, Positive Pole, Negative Pole.*

**POLYPHASE**—An alternating current system consisting of several *phases*, the currents in each *phase* having a certain definite and constant *phase difference* relatively to each other.

**PORTABLE TRANSMITTER**—A transmitter of low power and limited range which can easily be moved from place to place.

**POSITIVE ELECTRIFICATION**—The state of a body when it contains less than its normal number of *electrons*.

**POSITIVE POLE**—The *pole* that is at a higher *potential* relatively to the other (negative) pole in any piece of apparatus when considered from the point of view of the external circuit.

**POTENTIAL AND POTENTIAL DIFFERENCE**—The force tending to drive electricity from a point of higher potential to a point of lower potential. In current electricity, a potential difference may exist between the poles of a piece of apparatus, but the *electromotive force* generated by the apparatus will be slightly greater, the difference being lost in overcoming the internal resistance of the apparatus itself when a current flows. Potential difference is measured in *volts*.

**POTENTIALLY - OPERATED DEVICE**—A piece of apparatus whose operation is solely dependent upon changes of potential and not upon current. A three-electrode valve is an example of this, provided that the *grid* is always negative with respect to the *filament*, thus avoiding *grid current*.

**POTENTIOMETER**—If a *resistance* is connected across a source of *potential*, the potential across any part of that resistance will be proportional to the resistance of that part. Thus by means of tapping points, any fraction of the total potential is available. Such an arrangement is called a potentiometer, and is often used to obtain variable grid potentials by connecting it across the *filament battery*.

**POWER**—The rate of doing *Work*. Unit: one horse-power = 746 watts.

**POWER AMPLIFIER**—A *low-frequency amplifier* designed to handle without *distortion* relatively high power for working *loud speakers*.

**POWER FACTOR**—A number having a value less than unity by which the product of the *volts* and *amperes* in an alternating circuit must be multiplied to give the power in the circuit.

**POWER VALVE**—A *three-electrode valve* used in a *power amplifier*, and designed to handle a large output without *distortion*. To ensure this the plate current-grid voltage characteristic must be straight over as wide a range of grid voltage as possible.

**PRIMARY CELL**—A source of electrical energy, dependent upon the chemical action between two electrodes producing an *E.M.F.* Such a cell cannot be re-charged, as can a *secondary battery*.

**PRIMARY CIRCUIT**—The circuit which takes power from the source of supply and passes it on to the *secondary circuit*. The *voltage* may be stepped up or down during this transference of power from one circuit to another. See *Transformer*.

**PRIMARY WINDING**—See *Primary Circuit*.

**PROTON**—The smallest possible quantity of *positive electricity* existing in a free state.

**PULSATING CURRENT**—A current whose magnitude varies regularly, but whose direction remains constant.

**PUSH-PULL AMPLIFICATION**—A system of amplification employing two similar three-electrode valves per stage. The *grids* of the valves are fed from a single *secondary winding*, one end to each grid, and a centre tapping is connected to the common filament circuit. The two *plates* are connected one to each end of the output *transformer primary winding*, the H.T. being fed to the centre point of this winding.

**QUADRATURE**—See *Phase Angle*.

**QUANTITY OF ELECTRICITY**—In current electricity, quantity is measured by the product of the current flowing in a circuit and the time for which it flows. The unit is the coulomb, which is equal to one ampere flowing for one second, but the practical unit is the *ampere-hour* which equals 3,600 *coulombs*.

**R**—The usual symbol for *resistance*.

**RADIAN**—The angle subtended at the centre of a circle by an arc equal in length to the radius. The value of a radian is approximately 57·5°, $2\pi$ radians being equal to 360°.

**RADIATING CIRCUIT**—A circuit carrying a *high-frequency* current, which is capable of throwing out its energy in the form of electric *waves*. The amount of energy radiated is proportional to the *radiation resistance*. The *aerial circuit* is a radiating circuit.

**RADIATION**—The transference of energy from a physical circuit carrying *high-frequency* current into space in the form of electric *waves*, the medium through which the waves travel being the *ether*.

**RADIATION EFFICIENCY**—In a radiating circuit part of the energy is radiated in the form of electric *waves* and part is lost owing to the *resistance* of the circuit. The per-the inherent carbon hiss increases. Generally cured by shaking.

PANCAKE COIL—A flat *inductance* coil.

PARALLEL CONNECTION—If two or more pieces of apparatus are joined across a common voltage supply they are said to be in parallel, and the current flowing through each path is inversely proportional to the *resistance* of the path.

PARASITES—Another term for *atmospherics*.

P.D.—Potential Difference. Difference of electric pressure between two points of a circuit. See *Voltage*.

PEAK VALUE—The maximum value of an alternating quantity. The peak *voltage* reached in any circuit is an important quantity, as the components of the circuit must be designed to withstand this voltage and not merely the average voltage value.

PEANUT VALVE—A type of three-electrode receiving valve requiring low *filament current* and *anode voltage*. The dimensions of the valve are very small and it is therefore of use where space and small battery consumption are a consideration.

PERCENTAGE COUPLING—The *coefficient of coupling* between two circuits expressed as a percentage.

PERIKON DETECTOR—A *crystal detector* consisting of *zincite* and *bornite* in contact.

PERIOD—The time in seconds of one complete *cycle* of an alternating quantity.

PERIODICITY—See *Frequency*.

PERMANENT MAGNET—One which retains its magnetism for an indefinite time after it has been magnetised. Specially prepared steel is generally used. Heavy blows and heat will destroy the magnetism.

PERMEABILITY—The magnetic conductivity of a material, generally denoted by the symbol "$\mu$" and given numerically by the ratio of the *flux density* (B) in the material to the *magnetising force* (H) producing that flux density, *i.e.*, $\mu = B/H$. The permeability of air and all other non-magnetic materials is unity, but that of iron varies according to the purity of and heat treatment given to the iron. The quantity is of considerable importance in *inter-valve transformer* design.

PHASE ANGLE—When two things occur at the same time they are said to be in phase. If two alternating quantities do not pass through their maxima or minima at the same time one will lead relative to the other, and assuming the quantities are represented as rotating *vectors*, then the amount of lead (or lag looked at from the point of view of the other quantity) may be represented by the difference in angular displacement, the maximum, of course, being 360 degrees or $2\pi$ radians. The position and hence the value of either *vector* at any instant may be defined by its phase angle (remembering that 360 degrees represent a complete cycle) and the difference between the angles made by the two vectors is called the Phase Difference or Phase Displacement. If the *Periods* of the two vectors are the same, then the Phase Difference is constant. If a voltage *vector* leads or lags behind a current *vector* by exactly 90° (*i.e.*, $\pi/2$ radians) they are said to be "in quadrature." On a pure inductive load the current lags behind the voltage by 90°; on a capacitative load the current leads by 90°.

PHONE—Abbreviation for telephone.

PHOSPHOR BRONZE—An alloy of phosphorus, copper and tin, having greater tensile strength than pure copper and equally good electrical properties, and therefore largely used for *aerials*.

PITCH—In music there are various standard pitches for the tuning of musical instruments. In broadcasting a transmission is said to be "low pitched" or "high pitched" according to whether the lower or higher audio *frequencies* are present to a greater extent in the reproduction than in the original.

PLAIN AERIAL—An *aerial circuit* arrangement which is connected directly to the transmitting or receiving circuit without the use of any form of *loose coupling* or intermediate circuit. The tuning in such cases is liable to be flat.

PLATE—The usual name applied to the *anode* of a *thermionic valve*. It consists of a cylinder of metal (generally nickel, tungsten, molybdenum or copper) surrounding the *kathode* or *filament* and at a higher relative potential, which enables it to attract the negative *electrons* emitted from the *filament* and thus give rise to the *anode current*, *plate current* or *space current*.

PLATE BATTERY—See *High-tension Battery*.

PLATE CIRCUIT—That part of a circuit of a transmitter or receiver connected between the *plate* or *anode* of a valve and the source of high-tension supply.

PLATE CURRENT—The current flowing in the *Plate Circuit* and between the plate and filament in the valve. See *Plate*.

PLATE IMPEDANCE—The *internal impedance* of a *three-electrode valve*.

PLATE VOLTAGE—The positive voltage of the *plate* or *anode* relative to the negative end of the *filament*. See *Plate*.

PLUG—A device used in conjunction with a *jack* to allow of easy connection and disconnection between two portions of an electrical circuit. The contacts are formed by a central pin terminating in a tip and insulated from the other contact, which is in the form of a sleeve, and which fits over and is concentric with the central pin. Three contacts are sometimes provided by the addition of a small ring between the tip and the sleeve and insulated from both. See *Jack*.

PLUG-IN COIL—A convenient form of inductance coil, fitted with a plug and socket termination to facilitate quick coil changing. In order that the coil should always be fitted the same way round, it is provided with one plug and one socket which fit into one socket and one plug on the coil holder.

PLUG-IN TRANSFORMER—A *high-frequency transformer* in a form convenient for quick changing to another transformer to cover a different range of wave-lengths. The windings terminate in plugs which fit into sockets on the instrument.

POLARISED ELECTRO - MAGNET — One whose magnetism is partly permanent and partly due to a magnetising current flowing

resistance." This property is made use of in various ways to produce continuous electrical *oscillations*.

NEGATRON—A special type of *thermionic valve* having four *electrodes* and possessing the property of *negative resistance*.

NEON LAMP—A glass bulb containing two metal *electrodes* and filled with neon gas at a low pressure. When a sufficiently high *potential difference* is applied across the *electrodes* the negative electrode glows, owing to a discharge taking place through the gas. If a neon lamp is placed across the *condenser* forming part of the closed circuit of a *wavemeter*, a visible indication will be given when the current in the wavemeter circuit is a maximum, that is to say, when the circuit is in *resonance* with the radiating oscillating circuit whose wave-length it is desired to measure.

NEUTRAL WIRE—The wire at earth potential in a *three-phase* system of electric power distribution.

NEUTRODYNE RECEIVER—A receiver employing a special circuit to neutralise the inter-electrode capacity of the H.F. valves. In the *high-frequency amplifier* part of this receiver the stray capacity coupling between the valve *electrodes* is neutralised by a reverse capacity coupling between the grid and a suitable point in the anode circuit, thus overcoming the inherent tendency of a multi-stage high-frequency amplifier to burst into self-oscillation.

NICKEL IRON—An alloy of iron containing a percentage of nickel. Such iron is of particular use for the cores of *transformers*, as, due to its high *permeability*, a considerably larger primary *inductance* is obtained for a given number of turns in the *primary winding* than when ordinary iron is used. Thus a flatter frequency response characteristic can be obtained. See *Transformer*.

NIGHT EFFECT—A general term used to denote various phenomena which take place in wireless transmission after sunset. See *Fading* and *Reflection*.

NODON RECTIFIER—A form of chemical *rectifier*, having an aluminium *cathode* and a lead *anode* immersed in a solution of ammonium phosphate, and suitable for charging accumulators from alternating current mains.

NON-INDUCTIVE RESISTANCE—A *resistance* whose *inductance* is negligible. Such a resistance is useful when it is desired to alter the *damping* of an oscillatory circuit without altering the *natural frequency* of the circuit.

NOTE MAGNIFIER—See *Amplifier*.

OHM—The practical unit of *resistance*.

OHM'S LAW—One of the fundamental laws of current electricity, which states that in a circuit carrying a constant current, the value of this current is proportional to the *potential difference* across the circuit and inversely proportional to the *impedance* of the circuit. The practical units of *current*, *voltage* and *impedance* have been so chosen that a P.D. of one volt is required to force a current of one ampere through an impedance of one ohm. In other words—

$$\text{I (amperes)} = \frac{\text{E (volts)}}{\text{R (ohms)}}$$

OPEN CIRCUIT—A circuit which is not continuous and through which current cannot flow.

OPEN-CORE TRANSFORMER—A *transformer* in which the *magnetic circuit* consists partly of iron and partly of air. Owing to its bad *characteristic curve* an open-core transformer is never used in a *low-frequency amplifier*. Cf. *Closed-core Transformer*.

OSCILLATION CONSTANT OR RESONANCE CONSTANT—The *natural frequency* of a circuit depends upon the L.C. value of the circuit, and the product L.C. is called the Oscillation Constant.

OSCILLATION TRANSFORMER OR JIGGER—An air-core *transformer* used for transferring high-frequency *oscillations* from one circuit to another.

OSCILLATIONS—The high-frequency alternating current which flows round an *oscillatory circuit* which has been set in electrical vibration by an outside source of power. If the power supplied is sufficient to compensate for the resistance (heat) losses in the circuit, then the *oscillations* will be continuous or *undamped*, but if the resistance loss is greater, then the *oscillations* will gradually die away and are said to be *damped*. If the *reaction* coil of a receiving set is tightly coupled to the grid coil which may also be the aerial coil, then the transfer of power into the latter may be sufficient to overcome the losses in the circuit and sustain *continuous oscillations* which may be radiated from the aerial and cause interference to nearby receiving sets.

OSCILLATION VALVE—See *Valve*.

OSCILLATOR—An apparatus (generally an electrical circuit employing a three-electrode valve) for producing *oscillations*.

OSCILLATOR VALVE—The valve in a transmitting set or in certain types of receiving sets that produces continuous oscillations.

OSCILLATORY CIRCUIT—A circuit containing *inductance* and *capacity* which when supplied with energy from an outside source is set in electrical vibration and oscillates at its *natural frequency*. The *resistance* of the circuit must not be greater that a certain value, dependent upon the values of *inductance* and *capacity*, otherwise the *oscillations* will not be continuous. See *Damping*.

OSCILLATORY CURRENT—The current in an *oscillatory circuit*.

OSCILLOGRAPH—An instrument for showing the shape of waves of *alternating currents* and particularly used for the examination of high-frequency *oscillations*. The *Kathode Ray Oscillograph* is the most common type.

OUTSIDE BROADCAST—A broadcast item taking place at some point other than the *studio*.

PACKING—A trouble which occurs with microphones of the loose-contact carbon type when the granules settle into a heap. The instrument becomes less sensitive, and

MICROFARAD—One millionth of a farad.
MICROHENRY—One millionth of a henry.
MICROPHONE—With the advent of Broadcasting the term microphone is now applied to any instrument which will convert sound waves into electrical currents; whether it be a *carbon microphone* which depends for its action on the varying resistance of carbon granules under the variable air pressure produced by the sound waves, or a *magnetophone*, or a *condenser microphone*. These are the three most important types.
MICROPHONE AMPLIFIER—A low-frequency amplifier used in conjunction with a *microphone* and generally in its vicinity, to amplify the weak electrical currents given by the *microphone* to a desired amplitude.
MILLIAMPERE—The thousandth part of an *ampere*.
MIXING UNIT—See *Fade-unit*.
M.M.F.—Abbreviation for Magneto-motive Force.
MODULATION—If *continuous waves* have their amplitude varied at an *audio frequency*, they are said to be modulated by it. For true reproduction of the audio frequency at the wireless receiver, it is essential that the change of amplitude of the continuous waves (*carrier wave*) shall be a true copy of the *wave form* of the audio-frequency *oscillations* at all frequencies and amplitudes. If this be the case, the modulation is said to be "linear." See *Choke Control, Grid Control, Absorption Control*.
MODULATION METER—An apparatus for indicating the depth of *modulation* in a telephone transmitter.
MODULATOR SYSTEM—The part of a wireless telephone transmitter in which the audio-frequency *oscillations* are magnified and caused to modulate the carrier wave. See *Choke Control*.
MORSE CODE—An international code used for the telegraphic transmission of messages by wire or by wireless, consisting of different numbers and combinations of dots and dashes representing the letters of the alphabet.
MOTOR GENERATOR—A *generator* which is mechanically directly coupled to an electric motor by which it is driven.
MOVING COIL LOUD SPEAKER—A loud speaker the movement of which consists of a cylindrical coil of fine wire held between the poles of a *permanent* or *electromagnet*. Speech currents passing through the coil cause it to move in the *magnetic field*, thus setting up vibrations at speech frequencies in a conical diaphragm of stiff paper or similar material, the apex of which is attached to the coil. See *Baffle*.
MULTI-VIBRATOR—An instrument for producing continuous electrical *oscillations*, usually of an audible frequency, and very rich in *harmonics*. The *frequency* of the fundamental, and thus of the *harmonics*, is governed by the *capacity* and the *resistance* in the circuit, but is variable within limits, so that it can be brought into step with an outside source. Thus a standard of frequency (*e.g.* a valve maintained *tuning-fork*) can be made to regulate the fundamental frequency of a multivibrator. The *harmonics* are multiples of the fundamental, and *high frequencies* are thus produced as standard frequencies against which *wavemeters* can be calibrated.
MUSH—A form of *interference* emitted by *continuous wave* transmitting stations using an arc to generate the *C.W.*
MUSH AREA—If two broadcasting transmitters are synchronised so that their *carrier waves* are of exactly the same *frequency* and *phase*, it will be found that outside a certain limited radius from each of the transmitters bad quality reception will result. The area in which this takes place is called a mush area. Its extent depends on the distance apart of the transmitters and whether the same or different programmes are being transmitted. See *Single Wave-length Working*.
MUTUAL INDUCTANCE—If two *inductances* are coupled together so that a changing current in the primary winding produces an E.M.F. across the secondary winding, the two circuits are said to possess mutual inductance. See *Inductance* and *Coupling*, and cf. *Self-inductance*.

NATURAL CRYSTAL—A chemical compound in crystal form which possesses the property of being able to pass an electric current in one direction only, and which therefore may be used as a *detector* in receiving sets.
NATURAL FREQUENCY OR NATURAL PERIOD—The *frequency* or *period* at which a circuit containing *inductance* and *capacity* will naturally oscillate if set in electrical vibration. The natural frequency is given by the formula $f = \frac{1}{2\pi\sqrt{LC}}$ cycles per second, where L is the inductance in henries and C is the capacity in farads. At this frequency, the condition of *Resonance* occurs.
NATURAL TIME CONSTANT—See *Time Constant*.
NATURAL WAVE-LENGTH—The *wave-length* at which an *aerial* or a *tuned circuit* will most readily oscillate by virtue of its own *inductance* and *capacity*. The natural wave-length of an *inverted* L-type aerial is about four times its length.
NEGATIVE CHARGE—The quantity of static electricity of negative sign which is not neutralised by the positive electricity in a body when it is negatively electrified.
NEGATIVE ELECTRIFICATION—A body is said to be negatively electrified when it contains an excess of *electrons* or particles of negative electricity.
NEGATIVE POLE—A pole that is at a lower *potential* relatively to another, the positive pole. Electron currents always flow from the negative pole to the positive pole, but it is generally assumed that electricity flows from positive to negative.
NEGATIVE POTENTIAL—See *Potential*.
NEGATIVE RESISTANCE—If when the *potential difference* across a piece of apparatus falls, the current rises, then the apparatus is said to have a "negative

sisting of a glass jar coated inside and out with metal foil. It was invented at the University of Leyden.

**L.F.**—Abbreviation for low frequency.

**LINEAR AMPLIFICATION**—Amplification in which the output *voltages* at all values and *frequencies* are directly proportional to the input *voltages*.

**LINES OF FORCE**—A *magnetic* or *electric field* is said to consist of an infinite number of imaginary lines which are called lines of force, and the electric or magnetic force acts along these lines. The density of these lines, or the number per unit cross-sectional area, is said to be the measure of the strength of the field. See *Flux Density*.

**LOADING COIL**—An inductance connected in series with an *aerial* to increase the *wave-length* to which the aerial can be tuned with its existing *inductance* and *capacity*.

**LOCAL OSCILLATOR**—An *oscillator* arranged to produce *oscillations* "locally" to act as a separate *heterodyne* for heterodyne or *beat reception*.

**LOGARITHMIC DECREMENT**—A number indicating the *damping* of an *oscillatory circuit*. It is dependent upon the *resistance* of the circuit.

**LOGARITHMIC HORN**—A loud speaker or other horn the diameter of the aperture of which increases along its length in accordance with a logarithmic law of the type :

$$y = \log x.$$

**LOOP AERIAL**—An American term for *Frame Aerial*.

**LOOSE COUPLING**—Two inductances are said to be loosely coupled when they are so separated that the mutual *inductance* between them is small in comparison with their self-inductances.

**LOUD SPEAKER**—A loud-speaking *telephone*. For true reproduction of Broadcasting it is necessary to have a loud speaker capable of reproducing all *frequencies* from 30 to 10,000 cycles equally well. The original loud-speaking telephone does not do this. Loud speakers are now made in many diverse forms with this end in view.

**LOW FREQUENCY**—Frequencies up to about 12,000 cycles per second. Cf. *High Frequency* and see *Audio Frequency*.

**LOW - FREQUENCY AMPLIFIER**—See *Amplifier*.

**LOW-FREQUENCY TRANSFORMER**—See *Audio-frequency Transformer*.

**LOW-PASS FILTER**—A *filter* circuit which is so designed that it will pass all frequencies below a certain value.

**LOW POWER MODULATION**—See *Choke Control*.

**LOW TENSION**—The *voltage* applied to the *filament* of a *thermionic valve* as opposed to the high tension. Cf. *High Tension*.

**LOW-TENSION BATTERY**—The battery used to heat the *filament* of a *thermionic valve*. See "A" Battery.

**L.T.**—Abbreviation for low tension.

**MAINS UNIT**—An apparatus for supplying power to a wireless receiver from the electricity supply mains, either for *high tension*, *low tension*, *grid bias*, or all three. In all types a *filter circuit* for smoothing purposes is incorporated, and for use with alternating current mains some type of *rectifier* is also required.

**MAGNETIC CIRCUIT**—Refers to the path through the air or the iron core of a *transformer, choke*, etc., which provides a circuit for the *magnetic flux*. See *Reluctance*.

**MAGNETIC DETECTOR**—A *detector* which makes use of the *hysteresis* in an iron wire for rectifying high-frequency *oscillations* in a wireless receiver. It was first used by Marconi, and was used for many years, particularly in ship installations, on account of its reliability and robustness. It is, however, comparatively insensitive and now obsolete.

**MAGNETIC FIELD**—See *Electric Field*. (For "electric" read "magnetic.")

**MAGNETIC FLUX**—See *Flux Density*.

**MAGNETIC SCREEN**—A screen of magnetic material such as iron, generally in the form of a box, placed over a piece of apparatus to screen it from the effects of any *magnetic field* in the vicinity.

**MAGNETISATION CURVE**—A curve showing the relation between the *magnetising force* applied to a piece of iron and the resulting *flux density*.

**MAGNETISING FORCE OR MAGNETO-MOTIVE FORCE**—The force required to create a certain magnetic field. Analogous to *E.M.F.* in current electricity. See *Reluctance* and *Flux Density*.

**MAGNETO-MOTIVE FORCE**—In a *magnetic circuit* the M.M.F. may be compared to the *E.M.F.* in an electric circuit. The M.M.F. forces the magnetic flux through the *magnetic circuit* against the "*reluctance*" of the iron.

**MAGNETOPHONE**—A form of *microphone* in which the sound waves impinge on a light, flat coil of wire supported in a *magnetic field*. The coil moves in the field and thus has an A.C. generated in it. The magnetophone is relatively insensitive, and its output requires considerable amplification before signals of telephone strength are obtained.

**MAIN STATION**—A wireless telephony broadcasting station of medium power.

**MANSBRIDGE CONDENSER**—A form of fixed *condenser* particularly suited to give large capacities in a relatively small space. The *dielectric* consists of a strip of waxed paper which is coated on both sides with tinfoil to form the conductors. The whole strip is then rolled and pressed together.

**MAST**—A steel or wooden erection for supporting an *aerial*. Masts have been built to a height of about 900 feet.

**MEGGER**—An instrument for measuring high resistances.

**MEGOHM**—One million ohms.

**METAL RECTIFIER**—A *rectifier* which in its simplest form consists of two plates of different metals in contact, *e.g.* a plate of copper, with a coating of copper oxide, in contact with a plate of lead forms such a rectifier. By series parallel arrangements of connection, various currents and voltages may be dealt with. See *Rectification*.

**MFD.**—Abbreviation for Microfarad.

**MHO.**—The unit of *admittance*.

INDUCTANCE—A *conductor* is said to possess inductance if a current flowing through it causes a *magnetic field* to be set up round it. A straight wire therefore has inductance, but the value will be greatly increased if the conductor is wound in the form of a coil with the turns close together, so that the flux due to one turn will cut not only itself but also the neighbouring turns.

INDUCTIVE CAPACITY—See *Specific Inductive Capacity*.

INDUCTIVE COUPLING—*Coupling* between two circuits by virtue of *inductances* in the circuits. A changing current in the one winding will cause a varying *magnetic flux* in it which will cut the other, thus inducing an E.M.F. in the latter. See *Tight Coupling* and *Loose Coupling*.

INDUCTIVE RESISTANCE — A *resistance* which has *inductance* and thus has an *impedance* to alternating currents which is greater than its D.C. resistance.

INSULATION RESISTANCE—The resistance in megohms (millions of ohms) between two conductors or circuits which are insulated from each other.

INSULATOR—Any substance which offers an extremely high resistance to the passage of electric current through it, and which is therefore used to separate two circuits electrically from each other, or from earth.

INTER - ELECTRODE CAPACITY — The capacity between the *electrodes* of a *thermionic valve*. That between the *grid* and *anode* is appreciable in the majority of *triodes*, and gives a capacity coupling between the *grid circuit* and the *anode circuit*, thus causing the valve to generate *oscillations* if these two circuits are tuned to the same frequency. This capacity may be balanced out by suitable arrangements. See *Neutrodyne Receiver*.

INTERFERENCE—Unwanted signals in a wireless receiver due to any cause, *e.g.*, *atmospherics*, other transmitting stations, etc.

INTERFERENCE PATTERN. See *Mush Area*.

INTERNAL IMPEDANCE—Called also the "differential resistance" of a *thermionic valve*. The resistance referred to is that of the anode-filament circuit. It is given by the change of *anode voltage* divided by the change in *anode current*, the grid potential being kept constant. It will vary depending on the position on the *characteristic curve* at which it is measured. In general, it is measured over a small portion of the straight part of the curve.

INTERRUPTED C.W.—Abbreviated as I.C.W. A method of wireless telegraph transmission in which *C.W.* is used but is interrupted at an *audio frequency* so that it can be received on a wireless receiver without the use of *beat reception*.

INTERVALVE COUPLING—The components used to transfer *oscillations* from the *anode circuit* of one valve to the *grid circuit* of the following valve in a multi-stage *cascade* amplifier. It may be designed for radio or audio frequencies, and may be inductive (using a *transformer*), or capacitative (using condensers).

INTERVALVE TRANSFORMER—See *Intervalve Coupling*, *Amplifier*, and *Transformer*.

INVERTED L AERIAL—An aerial having a horizontal portion and a vertical down lead at one end.

IONISATION—When a gas is split up into minute particles carrying *positive* and *negative charges* of electricity, it is said to be ionised, and these particles are called ions. In such a state the gas becomes a conductor of electricity. Ionisation of a gas can be effected by applying a high *potential* across it.

JACK—A device used originally on telephone switchboards to allow connection to be made to a number of circuits by a plug having at least two concentric contacts. At the same time a number of separate contacts may be closed or opened in the jack to allow any desired switching arrangement. See *Plug*.

JAMMING—*Interference* with wanted wireless signals due to other wireless transmitters.

JIGGER—A *high-frequency transformer* used originally and so named by Marconi to couple the *aerial circuit* of a wireless transmitter to the circuit in which the *oscillations* are produced.

JUNCTION, THERMO-ELECTRIC OR VACUO —See *Thermo-couple*.

KATHODE—The *electrode* of a *thermionic valve* from which *electrons* are emitted. In general the kathode is the *filament*, and it is heated by the passage of a current through it.

KATHODE - RAY OSCILLOGRAPH—An *oscillograph* in which a stream of kathode rays (*electrons*) is made to impinge on a fluorescent screen which glows, at the spot on which they are focussed, under their influence. This kathode stream can be made to move to and fro at any desired frequency under the influence of electrostatic or electromagnetic forces, and the spot lengthens into a line of light on the screen. Two pairs of plates are mounted inside the bulb and are disposed at right angles to each other for connection to the alternating E.M.F. to be examined.

kc.—Abbreviation for kilocycle.

KILOCYCLE—One thousand cycles. Abbreviation k.C. A *frequency* of 1000 k.C. is equivalent to a wave-length of 300 metres.

KILOHERTZ—One thousand cycles per second.

KILOWATT—The practical unit of electrical power = 1000 watts.

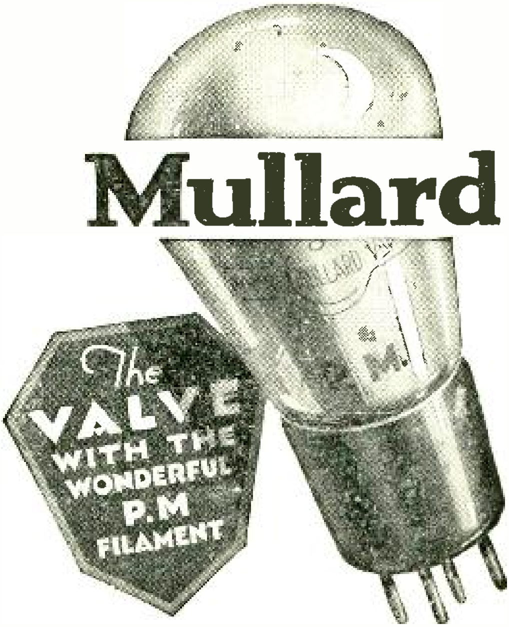
KILOWATT HOUR—The practical unit of electrical energy. See *Board of Trade Unit*.

kw.—Abbreviation for kilowatt.

LAMINATED CORE—An iron core used in *transformers*, chokes, etc. for use in *alternating-current* circuits, laminated or built up of thin sheets of iron, each sheet being insulated on one side by a coating of shellac varnish or other insulating material so that *resistance* will be offered to the passage of *eddy currents*. See *Transformer*.

LEVEL RAISER—Another term for a *Repeater*.

LEYDEN JAR—The original *condenser* con-




First of all it has a greater emission surface, in other words *there's more of it.* The remarkable length and thickness of the Mullard P.M. Filament is really amazing, and it results in a greater flow of electrons from the filament to the specially constructed plate. This increased flow is perfectly controlled by a grid designed in keeping with the Mullard Matched Electrode System of valve construction

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*ing current* to produce *harmonics* from which one is selected by suitable *filter circuits* and amplified. This process can be repeated any number of times within limits, if further multiplication of frequency is desired. A Frequency Doubler is an Harmonic Amplifier which selects the second harmonic.

**HEAVISIDE LAYER**—An upper layer of the atmosphere which is thought to exist and to vary in height from 60 to 150 miles above the earth's surface, and to become ionised by the sun's rays. Was originally postulated by Oliver Heaviside, and has since been held to account for *fading* of wireless signals and the transmission of short-wave wireless signals round the curvature of the earth. See *Reflection*.

**HENRY**—The unit of *inductance*.

**HERTZ**—A term sometimes used to designate frequency, meaning one cycle per second. Cf. *Kilohertz*.

**HERTZIAN WAVES**—Electromagnetic *waves* by which all wireless signalling is accomplished. They were called after Hertz, who first succeeded in producing them in 1888, but they were postulated by Clerk Maxwell, who gave mathematical proof of their existence in 1864.

**HETERODYNE INTERFERENCE**—Interference caused to broadcast reception by the *carrier wave* of an unwanted station beating with that of the wanted station, and giving an audible beat note in the receiver due to the two stations being on *wavelengths* or *frequencies* separated by too small an amount. It should be noted that two nearly equal and relatively low-powered stations as far apart as 1000 miles can produce an audible beat note even at a few miles from either.

**HETERODYNE RECEPTION**—A method of receiving C.W. wireless signals in which use is made of a local *oscillator* to "beat" with or "Heterodyne" the incoming C.W. See *Beat Reception*.

**HETERODYNE WAVEMETER**—A wavemeter using the heterodyne principle by generating oscillations of a known frequency which may be tuned to the oscillations whose frequency is to be measured. When the "beat" note is zero the two sets of oscillations have the same *frequency*.

**H.F.**—Abbreviation for *High Frequency*.

**HIGH FREQUENCY**—There is no definite dividing line between high- and low-frequency *oscillations*; but oscillations or alternating currents of frequencies up to about 12,000 are generally considered as low—or audio—frequencies, while those above this are spoken of as *Supersonic*, High or *Radio frequencies*.

**HIGH-FREQUENCY AMPLIFIER**—An amplifier which amplifies high or radio frequencies, *e.g.*, the incoming wireless signals before they are rectified. See *Amplifier*.

**HIGH-FREQUENCY CHOKE**—A choke which offers considerable *impedance* to *high-frequency* currents. See *Choke*.

**HIGH-FREQUENCY RESISTANCE** — See *Aerial Resistance*.

**HIGH-FREQUENCY TRANSFORMER**—A *transformer* for coupling together *high-frequency* circuits, *e.g.*, an intervalve transformer in a *high-frequency amplifier*. See *Transformer*.

**HIGH-PASS FILTER**—A filter circuit which is so designed that it will pass all *frequencies* above a certain value. See *Filter*.

**HIGH-POWER MODULATION**—See *Choke Control*.

**HIGH TENSION**—The voltage applied to the *anode* or plate of a *thermionic valve*. Cf. *Low Tension*.

**HIGH-TENSION BATTERY**—A battery of *dry cells* or *accumulators* used to give the high-tension voltage for a *triode*.

**HONEYCOMB COIL**—A coil for use as a *high-frequency inductance* wound so as to reduce its *self capacity*, and so named from its resemblance to a honeycomb in appearance.

**HORSE POWER**—The unit of mechanical power, equal to 33,000 foot-pounds per minute.

**HOT-WIRE AMMETER**—An *ammeter* for measuring alternating or direct currents. The current to be measured is passed through a wire, which it heats. The wire expands, and the expansion is measured by a pointer moving over a scale. The temperature and therefore the expansion of the wire is proportional to the square of the current. The instrument is calibrated directly in *amperes*. See *Ammeter*.

**H.T.**—Abbreviation for high tension.

**HYDROMETER**—An instrument for measuring the specific gravity of liquids. Used in particular for finding that of *accumulator* acid.

**HYSTERESIS**—If a *magnetising force* be applied to a piece of iron and increased or decreased, the magnetisation of the iron will lag behind the magnetising force. This effect is known as magnetic hysteresis.

**I.C.W.**—Abbreviation for Interrupted Continuous Waves.

**IMPEDANCE**—The opposition offered to an *alternating current* by a *resistance, inductance* or *capacity*, or a combination of the three. It is expressed in *Ohms* and is dependent on the *frequency* of the A.C. except in the case of a pure resistance. See *Resonance*.

**INDIRECTLY-HEATED CATHODE**—(of a *thermionic valve*). A *cathode* which is not heated directly by the passage of current through it, but by radiation from a heater placed in close proximity to it. This gives an equi-potential cathode, which improves the performance of the valve, and at the same time allows the heating current to be supplied through a transformer from alternating-current power mains unaccompanied by objectionable hum.

**IN PHASE**—See *Alternating Currents*.

**INDUCED E.M.F.**—If a *conductor* is moved in a *magnetic field*, or if the magnetic field changes in intensity so that the number of lines of magnetic force passing through the conductor is changed (either increased or decreased), then an *E.M.F.* will be induced across the ends of the conductor, its value depending on the rate of change of *magnetic flux* through the conductor.

of a *magnetic* or an *electric field*, and is stated as the number of lines of magnetic or electrostatic force per unit area of cross section of the field. Cf. *Permeability*.

**FOUR-ELECTRODE VALVE**—A *thermionic valve* having a kathode (filament), two *grids* and an *anode*. Sometimes called a tetrode. Cf. *Diode* and *Triode*.

**FRAME AERIAL**—An aerial, generally used for wireless reception, consisting of a number of turns of wire supported on a wooden frame of convenient shape. It has marked directional properties and is used on certain types of *direction finders*. See *Loop Aerial*.

**FREQUENCY**—The frequency of an alternating current is the number of complete *cycles* it passes through in one second. See *Alternating Current*. Frequencies are sometimes stated in Hertzs, where one Hertz = one cycle per second.

**FREQUENCY: AUDIO-, HIGH-, RADIO-, SUPERSONIC**—See under appropriate letters.

**FREQUENCY DOUBLER**—An apparatus or doubling the *frequency* of an *alternating current*. See *Harmonic Amplifier*.

**FULL-WAVE RECTIFICATION**—A system of *rectification* in which both half *cycles* of an *alternating current* are utilised.

**FUSE**—Usually in the form of a piece of wire included in an electric circuit as a protective device. On the current passing a certain value this piece of wire melts, thus breaking the circuit.

**GAIN**—The measure of the performance of a thermionic *repeater* generally stated as the number of miles of *standard cable* or the number of *transmission units* to which the amplification of the *repeater* is equivalent. See *Repeater*.

**GALENA**—A sulphide of lead used as a crystal detector in conjunction with a fine metal wire called a *cat's-whisker*.

**GALVANOMETER**—A sensitive electrical measuring instrument.

**GENERATOR**—A machine for converting mechanical energy into electrical energy. It may be either a *dynamo* or an *alternator*.

**GRAMOPHONE ATTACHMENT**—A device for converting directly the mechanical vibrations given by a record to a gramophone needle into electrical currents, which can be amplified and caused to work a loud speaker or to modulate a wireless telephone transmitter. For broadcast transmission of gramophone records this obviates the use of a gramophone soundbox and a microphone, with a consequent reduction in possibilities of *distortion*.

**GRID**—The third electrode in a thermionic *triode*, which controls the stream of *electrons* emitted by the filament. Mechanically it may have many forms, the normal being a spiral of wire.

**GRID BIAS**—The *voltage* applied to the *grid* of a thermionic *triode* to determine its *potential* with respect to the *filament*. To ensure that a *triode* shall work on the straight portion of its *static characteristic* a negative bias must be applied, the voltage being dependent on the characteristics of the valve.

**GRID CIRCUIT**—The circuit connected between the *grid* and *filament* of a thermionic *triode*.

**GRID CONDENSER**—A condenser, usually fixed in capacity, connected directly to the grid of a valve so that it is between the grid and the rest of the grid circuit. Cf. *Resistance-capacity Coupling*.

**GRID CONTROL**—A method of "controlling" the *high-frequency* oscillations delivered to the aerial in a wireless telephone transmitter, so that they vary in amplitude at the *low frequency* of *modulation*. The low-frequency E.M.F.'s, due to speech, are introduced into the *grid circuit* of the oscillator valve, thus varying the grid potential relatively to its normal potential, and superimposing the low frequency of modulation on the aerial current. Cf. *Choke Control* and *Absorption Control*.

**GRID CURRENT**—If the *grid* of a *triode* becomes positively charged with respect to the filament, some of the *electrons* leaving the *filament* will not pass the *grid* on their way to the *anode*, but will return through the grid circuit to the *filament*, thus producing grid current. Cf. *Grid Rectification*.

**GRID LEAK**—A high resistance connected either directly across a *grid condenser* or else from the *grid* to the *filament* of a *triode* in order to maintain the mean potential of the grid at any desired predetermined value, providing a path for any charge, which may accumulate on the grid, to leak away.

**GRID RECTIFICATION**—Sometimes called cumulative grid rectification. For this system of grid rectification *grid current* must be allowed to flow in the *triode*, and use is made of the curvature of the grid volt-grid current characteristic. During an incoming high-frequency oscillation, the grid of the valve receives a negative charge through a grid condenser, and this reduces the value of the anode current. The presence of a *grid leak* allows this *negative charge* to leak away, thus ensuring that the mean *potential* of the *grid* shall not become so negative as to stop the *grid current* flowing. See *Rectification*.

**GROUND**—An American term for "*earth*."

**HALF-WAVE RECTIFICATION**—A system of *rectification* in which only one half cycle of the alternating current is made use of. Cf. *Full-wave Rectification*.

**HARD VALVE**—A *thermionic valve* from which all the gas has been exhausted, particular care being taken that no gas is left even in the surface of metal parts in the valve. Cf. *Soft Valve*.

**HARMONICS**—*Frequencies* which are multiples of another frequency are said to be harmonics of it; thus a frequency of 50 cycles per second (or Hertz) has harmonics or frequencies of 100, 150, 200, etc., cycles, being twice, three times and four times the original frequency, and being called the second, third and fourth harmonic respectively.

**HARMONIC AMPLIFIER**—An apparatus for distorting the *wave form* of an *alternat-*

**DYNAMIC CHARACTERISTIC**—Curves, generally of a *thermionic valve*, showing the performance under working conditions when the values of *plate* and *grid voltages*, etc., may be varying simultaneously.

**DYNAMO**—A rotary machine which generates direct-current electricity.

**EARTH POTENTIAL**—The electrical *potential* of the earth is said to be zero and therefore connections made to the earth at various places will be at the same potential. It should be noted that if a large current is flowing through a lead connecting a wireless transmitter or receiver to earth, the potential of the earth terminal of the apparatus will only be zero if the resistance of the earth lead and connection is very low.

**EARTH SCREEN**—See *Counterpoise*.

**EBONITE**—A hard, black substance consisting of rubber treated with sulphur at high temperature. It is easily polished and has high insulating properties.

**ECHO**—The recurrence of a sound after an interval of time due to the original sound being reflected from a surface, *e.g.*, a bare wall.

**ECHO ROOM**—A room designed to produce *echoes*. In the broadcasting of certain musical items from a *studio*, an artificial echo is superimposed to obtain a more pleasing effect.

**EDDY CURRENTS**—If a piece of metal is placed in a varying *magnetic field*, currents will be induced in the metal. These are called "eddy currents." The higher the *frequency* of variation of the field, the larger will be the eddy currents. The metal will become heated by these currents, and thus energy will be dissipated.

**EFFECTS STUDIO**—A *studio* in which the noise effects incidental to a transmission are made. See *Mixing Unit*.

**ELECTRIC FIELD**—If a body becomes electrified, certain effects will be observable in its vicinity, such as the attraction or repulsion of other electrified bodies. The space in which these effects can be observed is said to be in the electric field of the body. The magnitude of these effects at a given distance is a measure of the strength of the field. Sometimes called Electrostatic Field.

**ELECTRODE**—A component part of a *vacuum valve*, or of a primary or secondary *battery*.

**ELECTROLYTE**—The liquid (generally dilute sulphuric acid) in a *secondary cell*.

**ELECTRO-MAGNET**—Soft iron becomes a magnet only in the presence of a *magnetic field*. If this field is provided by a current passing through a coil of wire wound round the soft iron, the latter is said to be an electro-magnet.

**ELECTRO-MAGNETIC WAVES**—See *Waves*.

**ELECTROMOTIVE FORCE**—(Abbreviated as E.M.F.) is electrical pressure or *voltage*. As, in the mechanical analogy, water is forced through a pipe by the "head" of water overcoming the resistance of friction in the pipe, so electrically the current is forced through the circuit by the E.M.F. overcoming the *resistance* of the wire.

**ELECTRON**—Thought to be the smallest particle of a substance which can exist as an entity. It is negatively charged electrically. See *Negative Charge*.

**E.M.F.**—Abbreviation for Electromotive Force.

**EMISSION**—The stream of *electrons* which is given off from the *filament* of a *thermionic valve*.

**ETHER**—For wave motion to be transmitted through space there is assumed to be an all-pervading medium through which it is transmitted. Ether is the name given to this assumed medium. See *Waves*.

**EXPONENTIAL HORN**—A loud speaker or other horn, the diameter of the aperture of which increases along its length in accordance with an exponential law of the type:

$$y = a\epsilon^{bx}.$$

**FADE UNIT OR MIXING UNIT**—A *potentiometer* arrangement placed in the input circuit of a microphone amplifier in order that the outputs of several microphones may be connected to the amplifier at will and at any desired strength.

**FADING**—The variation in strength of a signal received from a distant station assumed to be due to changes in the Heaviside Layer which cause (*a*) alteration of the angle of *reflection* or refraction of the indirect transmitted ray in an irregular manner, or (*b*) interference between the direct and the indirect (reflected or refracted) ray. See *Reflection*.

**FARAD**—The unit of *capacity*.

**FEED BACK**—See *Reaction*.

**FEEDER**—(in *high-frequency* circuits). An *air-line* loop employed to connect two high-frequency circuits remote from each other.

**FIELD STRENGTH**—The intensity of the *electric* and *magnetic field* due to a wireless transmitter at any point is called its field strength, which may be measured in millivolts induced in an *aerial* having an effective height of one metre, *i.e.*, field strength may be expressed in millivolts per metre.

**FILAMENT**—In a *thermionic valve* the filament is a fine wire which is heated by the passage of electric current. Generally this filament itself emits *electrons*, but in some valves it heats a cylinder which surrounds it closely, and the latter gives the *emission*.

**FILAMENT RESISTANCE**—A *resistance* included in the filament-heating battery circuit to limit the *voltage* across the *filament* to the correct value.

**FILTER**—An electrical filter is a circuit composed of *inductances* and *condensers* which will pass or prevent from passing certain frequencies. See also *Band-pass*, *High-pass*, and *Low-pass Filters*.

**FLAT TUNING**—A circuit is said to be flatly tuned if a large change in its resonant frequency (produced by changing its *inductance* or *capacity*) is accompanied by only a small change in the amplitude of the oscillatory current flowing in the circuit, the frequency of the applied voltage remaining constant. Cf. *Resonance*.

**FLEMING VALVE**—See *Diode*.

**FLUX DENSITY**—Is a measure of the strength forming a relatively good contact under the influence of *Hertzian waves*.

CONDENSER—The simplest form of condenser consists of two metal plates separated by an insulator, which is called the *dielectric*. It has *capacity* and will store electrical energy.

CONDENSER MICROPHONE—A *microphone* consisting of two plates of a *condenser*, whose distance apart is altered by the sound waves impinging upon one of them. The consequent variations in *capacity* are made to affect an external circuit where they can be amplified to any desired extent.

CONDUCTOR—A substance which offers a comparatively low resistance to the passage of electric currents through it.

CONTINUOUS CURRENT—Another term for *direct current*.

CONTINUOUS OSCILLATIONS OR WAVES—Undamped *oscillations* or *waves*, *i.e.*, the amplitude of successive cycles remains constant and does not diminish. Abbreviated as C.W. Cf. *Damped Oscillations*.

CONTROL ROOM—The " Nerve-centre " of a broadcasting station. In this room are situated the low-frequency amplifiers and associated apparatus by which the microphone currents are controlled, before they are passed on to the *modulation system* of the transmitter.

CONTROL SYSTEM—Of a wireless telephone transmitter is that part of the transmitter which modulates the high-frequency *oscillations*. See *Choke Control* and *Modulator System*.

CORRECTOR CIRCUIT—An arrangement of *inductances, capacities* and *resistances* which is placed in a long telephone line circuit to counterbalance any effect the line may have on the speech currents passing along it, owing to the attenuation not being constant at all frequencies. See *Repeater Station*.

COULOMB—*Quantity* of electricity given by one *ampere* flowing for one second. One *ampere-hour* = 3,600 coulombs.

COUNTERPOISE—An arrangement used in some wireless transmitters instead of an " earth " connection, consisting of a system of wires supported on short *masts* underneath an *aerial* and insulated from earth.

COUPLING—Two electrical circuits are said to be coupled when a change of *current* in one circuit produces an *E.M.F.* across the second circuit.

CRYSTAL—See *Natural Crystal*.

CRYSTAL DETECTOR—A form of *rectifier* of *alternating currents* which works by virtue of the contact between certain dissimilar *crystals*, only allowing *current* to pass in one direction.

CUMULATIVE GRID RECTIFICATION—See *Grid Rectification*.

CURRENT—The flow of electricity along a wire or other *conductor* from a point of high *potential* to a point of low *potential*. The unit of current is the ampere. Mechanical analogy is gallons of water per minute flowing through a pipe.

CUT OFF—The limits of *frequency* below or above which a *cable, air line, amplifier, microphone, loud speaker*, etc., ceases to transmit or reproduce.

CYCLE—See *Alternating Current*. One cycle per second is sometimes referred to as one Hertz.

DAMPED OSCILLATIONS OR WAVES—*Oscillations* or *waves* in which the amplitude of each successive *oscillation* or *wave* is smaller than that of the previous one. The amount by which each wave is smaller than the preceding wave depends upon the *logarithmic decrement* of the circuit. Cf. *Continuous Waves*.

DAMPING—The rate at which a train of oscillations dies away.

D.C.—Abbreviation for *direct current*.

D.C.C.—Double cotton covered (insulation of wire).

DETECTOR—In a wireless receiver is a device for rectifying the high-frequency oscillations. See *Rectification*.

DETECTOR VALVE—A *thermionic valve* used as a *detector* or *rectifier*. See *Anode Bend Rectification, Grid Rectification* and *Rectification*.

DIELECTRIC—A substance whose resistance to the passage of electric currents is extremely high. The insulator separating the plates of a *condenser*.

DIODE—A *thermionic valve* having only two electrodes, *i.e.*, a *kathode* (filament) and an *anode* (plate). The original Fleming valve was a diode.

DIRECT COUPLING—See *Auto-transformer*.

DIRECT CURRENT—Abbreviated as D.C., and sometimes referred to as continuous current. A current which flows in one direction only. Cf. *Alternating Current*.

DIRECTIONAL AERIAL—An aerial which will send out wireless *waves* in, or receive them from, one direction to a greater degree than other directions.

DIRECTION FINDER—A wireless receiver in which the directional properties of one or other forms of aerial are made use of to find the direction from which wireless signals are arriving.

DIS—Disconnection.

DISTORTION—A term used in telephony to indicate any deviation from the original *wave form* of the speech or music which may be brought about during any of the various changes which take place between the *microphone* and *loud speaker* or *telephones*.

DOWN LEAD—The wire which " leads down " from the elevated part of an aerial to the transmitting or receiving apparatus.

DRAPING—Material hung in a *studio* to decrease the *reverberation* and *echo*.

DRIVE CIRCUIT—An *oscillatory circuit* tuned to the same *frequency* as the main *oscillatory circuit* of a transmitter and coupled to it in such a manner that the latter is forced to generate *oscillations* of exactly the same frequency, thus preventing any slight wave change due to keying or heavy modulation.

DRY CELL—A *primary cell* in which the liquid *electrolyte* is replaced by a paste.

DULL EMITTER—A *thermionic valve* in which the *filament* gives its normal emission at a relatively low temperature, thus using only a little current and lighting up only to a dull red.

D.W.S.—Abbreviation for " Double Wound Silk " (the insulated covering of a wire).

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BEVERAGE AERIAL—An *aerial* whose length is several times the *wave-length* to be received, its height being only a few feet from the ground. It may be either connected to earth or left insulated at the free end. It has marked directional properties and gives a relatively large ratio of signal to *atmospherics*.

BINDING POST—An American term for a *terminal*.

BI-PASS CONDENSER—A fixed-capacity *condenser* of suitable value connected across an electrical circuit or part of it so that certain desired frequencies will pass through it in preference to passing through the part of the circuit across which it is connected.

BLASTING—Used in the electrical sense to indicate *distortion*, although originally brought into use from the sound produced in the loud speaker on particularly loud signals when such *distortion* was occurring. In the general case blasting is produced in a valve by overloading it so that it does not work without *grid current*.

BLOCKING CONDENSER—A fixed-capacity *condenser* of any suitable value connected in a circuit to stop direct current flowing, but to be conductive to A.C. of the desired frequencies.

BORNITE—Used as a *crystal detector* in conjunction with *zincite*. Bornite is a chemical compound of iron, sulphur and copper.

B.O.T. UNIT—Board of Trade Unit. One *kilowatt-hour*. See *Watt-hour*.

BRIDGE—An electrical circuit for the measurement of various electrical quantities. See *Wheatstone Bridge*.

BRIGHT EMITTER—A *thermionic valve* in which the *filament* gives its normal *emission* only when heated to a high temperature so that it glows brightly.

BUZZER—A piece of apparatus so called because it produces a buzzing sound, due to an armature vibrating.

BUZZER WAVEMETER—A *wavemeter* in which a buzzer is used to make the *wavemeter* act as a small wireless transmitter.

"C" BATTERY—Term used in America to denote the *grid-bias* battery.

CABLE—A telephone line or lines laid either direct in the ground or in earthenware ducts. The use of cables for trunk routes is rapidly increasing, owing to their greater immunity from interruption during bad weather. Where suitable routes are available, these circuits are used for *Simultaneous Broadcasting*.

CAPACITY—(of an accumulator or storage battery) is measured in *ampere-hours*, and indicates the number of *ampere-hours* the *cell* will give when fully charged. This *quantity* will depend on the discharge rate. In stating the capacity of a cell the manufacturers will also state the discharge rate. The capacity of an accumulator is sometimes stated on an ignition rate; this is double the actual capacity.

CAPACITY—(of a condenser or isolated body) is a measure of the charge (or quantity of electricity) it is capable of storing. If it holds a charge of one *coulomb* and the difference of *potential* between its plates is one *volt*, then the condenser is said to have a capacity of one farad. This is too large a unit for practical purposes. Therefore, the microfarad is more generally used, and is equal to one millionth of a farad.

CAPACITY COUPLING—Indicates that the coupling between two circuits is formed by a *condenser*. See *Coupling*.

CARBON MICROPHONE—See *Solid-back Microphone*.

CARRIER WAVE—The high-frequency *oscillations* emitted by a wireless telephone transmitter. These are modulated during telephony. The analogy is that the telephony (music, speech, etc.) is "carried" by the high-frequency *oscillations* from the transmitter to the receiver.

CASCADE—Pieces of electrical apparatus are said to be connected in cascade when the output of the first is connected to the input of the second, the output of the second to the input of the third, and so on.

CATHODE—See *Kathode*.

CAT'S-WHISKER—A fine wire used to make contact with a particular point of a *crystal* in a *crystal detector*.

CELL—See *Secondary Cell* and *Primary Cell*.

CHARACTERISTIC CURVE—See *Static Characteristic* and *Dynamic Characteristic*.

CHARGE—See *Capacity*.

CHECK RECEIVER—A wireless receiver installed in the *control room* of a broadcasting station to enable a constant check to be kept on the quality of the transmission.

CHOKE—A coil of wire which, although it may be of small D.C. *resistance*, will offer a high *impedance* to A.C., the *impedance* offered depending on the *frequency* of the A.C. If the choke is for use with A.C. of low frequency it will generally be wound on an iron core, whereas for use with high-frequency A.C. it will have an air core, *i.e.*, be wound on a former of non-magnetic material.

CHOKE CONTROL—A method of "controlling" the high-frequency *oscillations* delivered to the aerial in a wireless telephone transmitter, so that they vary in amplitude at the low frequency of modulation. A large iron-core choke is used in the common H.T. circuit to the modulator and oscillator valves. If the modulated output from the oscillator valves is delivered direct to the aerial, the modulation is said to be at high power. If the modulated output is passed through one or more magnifying stages before being delivered to the aerial, the modulation is said to be at low power. See *Modulation*. Cf. *Grid Control* and *Absorption Control*.

CLOSED-CORE TRANSFORMER—A *transformer* in which the iron core forms a continuous magnetic circuit, *i.e.*, it has no air gap. Cf. *Open-core Transformer*.

COEFFICIENT OF COUPLING—A percentage indicating the tightness or otherwise of the coupling between two circuits. See *Tight Coupling* and *Loose Coupling*.

COHERER—A *detector* used in early wireless experiments. It worked by virtue of the property of metal filings, which were only in imperfect contact, of cohering and audio-frequency amplifier. For other types of amplifier see under separate headings.

**ANODE**—The *plate* of a *thermionic valve*. See *Plate*.

**ANODE BATTERY**—Another name for *high-tension battery*.

**ANODE BEND RECTIFICATION**—Rectification using the bend (usually the lower one) in the anode current-grid volt characteristic of a *thermionic valve*. Cf. *Grid rectification*.

**ANODE CIRCUIT**—See *Plate Circuit*.

**ANODE CONVERTER**—A small rotary electric machine designed to run off an *accumulator* of about 6 to 12 volts, and to give an output voltage suitable for a high-tension supply to a *thermionic valve*.

**ANODE CURRENT**—See *Plate Current*.

**ANTENNA**—See *Aerial*.

**ATMOSPHERICS**—Electro-magnetic *waves* set up by flashes of lightning or other electrical disturbances in the atmosphere affect wireless receivers by producing irregular "grinding" or "grating" in the telephones or loud speaker. Also called X's, strays or static.

**ATTENUATION CONSTANT**—A constant determining the relationship between the *current* sent out along a given uniform length of line and the *current* received. Its value depends upon the ohmic *resistance*, *insulation resistance*, *capacity* and *inductance* of the line.

The formula connecting current sent out and current received is :

$$C_r = C_s \epsilon^{-\beta l}$$

where $C_r$ = current received,
$C_s$ = current sent,
$\epsilon$ = 2·7183 (base of Naperian logs),
$l$ = length of loop,
$\beta$ = attentuation constant

**ATTENUATION FACTOR**—A factor indicating the rate of reduction in amplitude of an *ether wave* as the distance from the point of origin increases. An empirical expression due to Austin for attenuation states that, in daylight, signal intensity is proportional to :

$$\frac{1}{d} \times \epsilon^{-\frac{0.0015}{\sqrt{\lambda}}d},$$

where $d$ = distance from transmitter in kilometres,
$\lambda$ = wave-length in kilometres.
$\epsilon$ = 2·7183.

**AUDIO-FREQUENCY TRANSFORMER**—A transformer which is used in an audio-frequency *amplifier*. It may be an input transformer (as from a telephone line), an intervalve transformer, or an output transformer (as to a loud speaker). It should be capable of dealing with all frequencies between 30 and 10,000 cycles per second so that none is favoured more than another, if it is used in a broadcasting receiver. It consists essentially of two separate windings on an iron core. See *Transformer*.

**AUDION**—Dr. Lee de Forest's first three-electrode *thermionic valve*. The term is still used in the U.S.A.

**AUTODYNE**—A *thermionic valve* incorporated in a circuit so that it generates oscillations due to grid and plate windings forming an *auto-transformer*.

**AUTO-TRANSFORMER** — A *transformer* either for radio or audio frequency in which the primary and secondary windings are formed by one and the same coil having three connections to it.

**"B" BATTERY**—An American term for a high-tension battery used to supply the *plate current* in a *thermionic valve*.

**BACK E.M.F.**—An *electromotive force* or *voltage* which acts in opposition to the flow of current in an electrical circuit.

**BAFFLE**—A screen of non-resonant material, generally wood, largely used in conjunction with cone-type loud speakers instead of a horn, to ensure the radiation of the very low audible frequencies. Also used in certain cases to alter the acoustics of broadcasting studios.

**BALANCED ARMATURE**—A type of movement frequently employed in *loud speakers* and *relays*, and consisting of a piece of soft iron (the armature) magnetically and mechanically balanced between the poles of a *permanent magnet*. *Alternating currents* passing through the operating winding upset this balance, causing the armature and the diaphragm or cone to which it may be attached to move.

**BALLAST TUBE**—An American term for *Barretter*.

**BAND-PASS FILTER**—A *filter* circuit which is so designed that it will only pass a particular band of frequencies. See *Filter*.

**BARRETTER**—An instrument for keeping constant the flow of *current* in a circuit irrespective of any change in *voltage* (within limits) across the circuit.

**BASKET COIL**—A coil generally used as an *inductance* in a wireless receiver formed by winding wire round an odd number of pins projecting radially from a central boss. Such a coil has the appearance of certain forms of basket work.

**BEAM WIRELESS**—A particular system of wireless transmission in which the *waves* are concentrated on the receiver in the form of a beam. An electrical reflector is used, and as this must be of large mechanical dimensions in comparison with the *wave-length*, beam transmission is in practice confined to short wave-lengths.

**BEAT RECEPTION**—A method of receiving continuous waves in which use is made of the Beat principle. It should be noted that the *beats* themselves are inaudible and must be rectified to produce combination tones which will be heard, and which are usually referred to as the beat frequency.

**BEATS**—If two *oscillations* or *alternating currents* of different frequencies are superimposed, a further set of *oscillations* will be produced. This set will have a changing amplitude and the *frequency* of the amplitude change will be equal to the difference in the two original frequencies. If the two original frequencies are near together, then the difference between the two will be small, and in this case the beats due to the change of amplitude will be of low frequency.

# GLOSSARY OF TECHNICAL TERMS

"A" BATTERY—An American term for the L.T. battery or *accumulator* used to heat the filaments of *thermionic valves*.

ABSORPTION CONTROL—A method of "controlling" the *high-frequency oscillations* delivered to the *aerial* in a wireless telephone transmitter, so that they vary in amplitude at the *low frequency* of *modulation*. The value of a *resistance* in the aerial circuit is made to vary in accordance with the low frequencies of the voice, thus modulating the amplitude of the high-frequency oscillations. The resistance usually takes the form of the *anode* circuit of a *three-electrode valve* in shunt, the resistance of the valve being varied by variations of its *grid potential* by means of a *microphone* placed in the circuit. Thus the valve absorbs a greater or less fraction of the power in the aerial circuit. Cf. *Choke Control* and *Grid Control*.

A.C.—An abbreviation for *Alternating Current*.

ACCEPTOR CIRCUIT—A tuned *oscillatory circuit*, having the opposite characteristics of a *rejector circuit*.

ACCUMULATOR—One or more *secondary cells* connected in *series* or in *parallel*. Cf. *"A" Battery*.

ACOUSTICS—The science of sound.

ACOUSTIC WAVES—Waves of sound. They may be transmitted through a gas (as air), a liquid (as water), or a solid, their speed depending on the density of the medium. Sound waves have a speed of 1090 feet per second in air at a temperature of 0° C. and a pressure of 30 ins. of mercury.

ADJUSTABLE CONDENSER—See *Condenser*.

ADMITTANCE—The admittance of a circuit is the reciprocal of its *impedance* or apparent resistance. It is measured in *mhos*.

AERIAL—A wire or wires supported at a height above the ground and insulated from it except for a connection to earth through the wireless transmitter or receiver. For special types of aerial see under separate headings.

AERIAL CIRCUIT—In a wireless transmitter or receiver, the circuit between aerial and earth through which the high-frequency *oscillations* pass.

AERIAL INSULATION—By this is meant the insulation of the aerial from its supports and thus from earth. The aerial wire itself may be, and generally is, bare.

AERIAL INSULATORS—Pieces of non-conducting material used for fastening the *aerial* wire to its supports. They are generally made of porcelain or glass.

AERIAL RESISTANCE—By this term is meant the *resistance* of the *aerial* to *high-frequency currents*. It may be split up into three parts: (1) *Radiation resistance*, (2) *Dielectric loss resistance* and (3) *Ohmic resistance* of the wire itself. Aerial resistance (effective resistance) varies with frequency, and an aerial is most efficient when (1) is large compared with (2) and (3). See *Radiation Resistance*.

AERIAL TUNING CONDENSER, INDUCTANCE OR COIL—A *condenser* or *inductance* (variable or fixed) connected in the aerial circuit of a transmitter or receiver to *tune* the *aerial* to a particular *frequency*.

AIR CONDENSER—A *condenser*, either fixed or variable, having air as a *dielectric*.

AIR LINE—A telephone line, generally of bare copper, supported above ground-level on insulators fixed to wooden or metal poles. Most of the telephone trunk routes in this country are air lines, and these lines are used for *Simultaneous Broadcasting*. Cf. *Cable*.

ALTERNATING CURRENT—Abbreviated as A.C.—is a current which flows in alternate directions in a circuit, *i.e.*, it starts in one direction from zero, increasing to a maximum, through which it passes, decreasing to zero again, and then increasing in the other direction to a maximum and again decreasing to zero. This complete sequence is called one *cycle*, and the number of complete cycles passed through in one second is called the *frequency* or *periodicity* of the A.C. When two alternating currents pass through zero at the same instant and have their maximum values in the same direction at the same instant, they are said to be "in phase."

An alternating current is measured by its effective or Root Mean Square (R.M.S.) value, which is the value in amperes of the direct current which would produce the same heating effect. For sine waves it is $\frac{1}{\sqrt{2}}$ or ·707 of the maximum or peak value of the A.C.

ALTERNATOR—A dynamo for producing *alternating currents*.

AMMETER—An instrument for measuring current in "*amperes*." Abbreviation for "ampere meter." See *Voltmeter*.

AMPERAGE—Means the current in *amperes*.

AMPERE—The practical unit of electric current.

AMPERE-HOUR—The unit of quantity of electricity. An accumulator is rated in ampere-hours, *i.e.*, according to the *quantity* of electricity it will store.

AMPERE METER—See *Ammeter*.

AMPLIFICATION FACTOR OR AMPLIFICATION CONSTANT—of a three-electrode *thermionic valve*, often designated the "M" value, is the maximum *voltage amplification* which the valve can give. It is the ratio of the change of *plate voltage* to change of *grid voltage* necessary to bring about the same change in *plate current*. See *Voltage Amplification*.

AMPLIFIER—An apparatus used to increase the strength of electrical oscillations. In a wireless receiver, amplification may take place before the high-frequency *oscillations* are rectified by the *detector* valve or crystal, and also after rectification. If before, the amplifier is called a high- or radio-frequency amplifier, and if after, it is called a low- or

## 19. *EQUIVALENT CIRCUITS*

In two circuits coupled by a transformer in which the number of turns in the secondary winding is $T$ times the number of primary turns, a resistance, inductance or capacity connected in the secondary circuit will be equivalent to a resistance, inductance or capacity respectively connected in the primary side of a value given by:—

(*a*) Resistance. $R_p = \frac{R_s}{T^2}$.

(*b*) Inductance. $L_p = \frac{L_s}{T^2}$.

(*c*) Capacity. $C_p = C_s T^2$,

where the suffix $P$ indicates a primary quantity, and $S$ a secondary quantity.

## 20. *MILE OF STANDARD CABLE AND TRANSMISSION UNIT*

(*a*) A mile of standard cable has the following constants:—

Resistance = 88 ohms per mile of loop.
Capacity = 0·054 micro-farad.
Inductance = 1 milli-henry.
Leakance = 1 micro-mho.

(*b*) Two powers, $P_1$ and $P_2$, differ by the number of transmission units given by:—

$$10 \log_{10} \frac{P_1}{P_2}.$$

(*c*) 1 transmission unit = 0·9221 mile of standard cable.

## 21. *LOW-FREQUENCY AMPLIFIERS*

(*a*) Theoretical voltage amplification per stage of a transformer-coupled amplifier is:—

$$\mu \frac{N_2}{N_1} \times \frac{X}{\sqrt{X^2 \times R_a^2}},$$

where $\mu$ = amplification factor of valve,
$N_2$ = number of secondary turns,
$N_1$ = number of primary turns,
$X$ = reactance of primary = $2\pi fL$,
$R_a$ = internal resistance of valve.

(*b*) The grid bias voltage required for a valve used as a low-frequency amplifier is given approximately by:—

$$\frac{\text{Value of high-tension voltage.}}{2 \times \text{magnification factor of valve}}.$$

(*f*) Capacity coupling. See Fig. 2. In this case:—

$$K = \frac{\sqrt{C_1 C_2}}{C}.$$

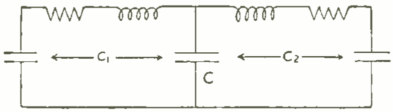



FIG. 2.

## 17. *AERIALS*

The natural wave-length of an aerial is approximately equal to four times its overall length.

The radiation resistance is given by:—

$$R_r = 1600 \frac{h^2}{\lambda^2},$$

where $h$ = mean effective height or radiation height. For an inverted L- or T-shaped aerial, this is approximately 0·6 to 0·7 of the maximum height.

$\lambda$ = wave-length.

$$\text{Power radiated} = I^2 R_r,$$

$$= I^2 \times 1600 \frac{h^2}{\lambda^2},$$

where $I$ = aerial current (amps.).

## 18. *SIGNAL STRENGTH*

The signal strength in daylight from a transmitting station is proportional to an attenuation factor:—

$$\frac{1}{d} \times \epsilon^{\frac{-0{\cdot}0015 d}{\sqrt{\lambda}}} \qquad \text{(L. W. Austin)}$$

where $d$ = distance from transmitter in kilometres,

$\lambda$ = wave-length in kilometres.

Received current is given by:—

$$I_r = I_s \times \frac{190 h\, h_r}{R\lambda} \times \frac{\epsilon^{\frac{-0{\cdot}0015 d}{\sqrt{\lambda}}}}{d},$$

where $I_s$ = transmitter aerial current,

$h_s$ = mean effective height of transmitting aerial,

$h_r$ = mean effective height of receiving aerial,

$R$ = resistance of receiving aerial in ohms.

16. *OSCILLATORY CIRCUITS*

(*a*) The wave-length of an oscillatory circuit $LC$ is given by:—

$$\lambda = 1885\sqrt{LC},$$

where $\lambda$ = wave-length in metres,
$L$ = inductance in micro-henries,
$C$ = capacity in micro-farads.

(*b*) The resonant frequency of an oscillatory circuit $LC$ is given by:—

$$f = \frac{1}{2\pi\sqrt{LC}},$$

where $f$ = frequency in cycles per second,
$L$ = inductance in henries,
$C$ = capacity in farads.

(*c*) If a voltage $V$ is applied to an oscillatory circuit $LC$, then:—

$$\text{circulating current } I_R = V\sqrt{\frac{C}{L}} \text{ (approx.)},$$

$$\text{supply current } I = V\frac{RC}{L},$$

where $R$ = resistance of the circuit in ohms.

(*d*) Coefficient of coupling. If two oscillatory circuits, $L_1C_1$ and $L_2C_2$, are tuned to the same frequency (*i.e.* $L_1C_1 = L_2C_2$), and are coupled together, then the coefficient of coupling between them is given by:—

$$K = \frac{M}{\sqrt{L_1L_2}},$$

where $M$ = coefficient of mutual induction.

Each circuit will, when coupled together, radiate two frequencies given by:—

$$f_1 = f \times \frac{1}{\sqrt{1+K}},$$

$$f_2 = f \times \frac{1}{\sqrt{1-K}},$$

where $f$ is the natural frequency of the circuits $L_1C_1$ and $L_2C_2$.

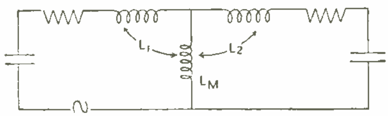



FIG. 1.

(*e*) Inductance coupling. The coefficient of coupling between the two parts of the circuit shown in Fig. 1 is:—

$$K = \frac{L_M}{\sqrt{L_1L_2}}.$$

14. *CAPACITY*

The capacity of a parallel metal plate condenser is given by:—

$$C \text{ (cms.)} = \frac{nkA}{4\pi d},$$

where $n$ = number of sheets of dielectric,
$k$ = specific inductive capacity of the dielectric. For air $k = 1$,
$A$ = area of one metal plate in square cms.,
$d$ = distance between the plates in cms.

If a voltage $V$ is required to charge a condenser of capacity $C$ with a quantity of electricity $Q$, then:—

$$Q = CV.$$

15. *FREQUENCY, VELOCITY AND WAVE-LENGTH*

The velocity of æther waves is 300 million metres per second.

Velocity = Frequency × Wave-length,

*i.e.* Wave-length (metres) = $\dfrac{\text{300 million}}{\text{Frequency (cycles per second)}}$,

1 cycle per second = 1 hertz.

A wave-length of 300 metres corresponds to a frequency of 1 million cycles per second.

| Frequency (kilocycles per second). | Wave-length (metres). | L.C. value (micro-henries and micro-farads). |
|---|---|---|
| 300,000 | 1 | 0·000000281 |
| 100,000 | 3 | 0·00000253 |
| 50,000 | 6 | 0·0000101 |
| 25,000 | 12 | 0·0000407 |
| 15,000 | 20 | 0·000113 |
| 10,000 | 30 | 0·000253 |
| 5,000 | 60 | 0·00101 |
| 3,000 | 100 | 0·00281 |
| 1,200 | 250 | 0·0176 |
| 1,000 | 300 | 0·0253 |
| 900 | 333·33 | 0·0313 |
| 800 | 375 | 0·0396 |
| 700 | 428·75 | 0·0519 |
| 600 | 500 | 0·0704 |
| 500 | 600 | 0·101 |
| 400 | 750 | 0·158 |
| 300 | 1,000 | 0·281 |
| 200 | 1,500 | 0·633 |
| 100 | 3,000 | 2·53 |
| 60 | 5,000 | 7·04 |
| 40 | 7,500 | 15·8 |
| 30 | 10,000 | 28·1 |
| 20 | 15,000 | 63·3 |
| 10 | 30,000 | 253 |

$$\frac{\text{R.M.S. value}}{\text{Average value}} = \text{Form Factor} = 1{\cdot}11 \text{ in the case of a sine wave.}$$

$$\text{Power Factor} = \frac{\text{True Power}}{\text{Apparent Power}} = \frac{EI\cos\phi}{EI}.$$

$$\text{True Power} = EI\cos\phi = I^2R\cos\phi.$$

## 13. *INDUCTANCE*

(*a*) The inductance of a single-layer close-wound coil wound on a cylindrical former is given by Nagaoka's formula, which is:—

$$L = \pi^2 d^2 n^2 l K,$$

where $d$ = diameter of coil in cms.,
$l$ = length of coil in cms.,
$n$ = number of turns per cm.,
$K$ = factor depending on the ratio of diameter to length of coil.

| $\frac{d}{l}$. | $K$. | $\frac{d}{l}$. | $K$. |
|---|---|---|---|
| 0·00 | 1·000 | 1·5 | 0·595 |
| 0·10 | 0·959 | 2·0 | 0·526 |
| 0·20 | 0·920 | 2·5 | 0·472 |
| 0·30 | 0·884 | 3·0 | 0·429 |
| 0·40 | 0·850 | 4·0 | 0·365 |
| 0·50 | 0·818 | 5·0 | 0·320 |
| 0·60 | 0·788 | 6·0 | 0·285 |
| 0·70 | 0·761 | 7·0 | 0·258 |
| 0·80 | 0·735 | 8·0 | 0·237 |
| 0·90 | 0·711 | 9·0 | 0·218 |
| 1·00 | 0·688 | 10·0 | 0·203 |

(*b*) The inductance of a multi-layer close-wound coil wound on a cylindrical former is given by Brooks and Turner's formula, which is:—

$$L = \frac{4\pi^2 a^2 N^2}{b + c + R} F_1 F_2,$$

where $a$ = mean radius of the winding,
$b$ = axial length of the coil,
$c$ = thickness of the winding,
$R$ = outer radius of the winding,
$N$ = total number of turns,

$$F_1 = \frac{10b + 12c + 2R}{10b + 10c + 1{\cdot}4R},$$

$$F_2 = 0{\cdot}5 \log_{10}\left(100 + \frac{14R}{2b + 3c}\right).$$

For a single-layer close-wound coil, the coil of maximum inductance from a given length of wire is given by the ratio:—

$$\frac{\text{Diameter}}{\text{Length}} = 2{\cdot}4.$$

9. *OHM'S LAW*

In a D.C. circuit: Current (amps.) $= \dfrac{\text{E.M.F. (volts)}}{\text{Resistance (ohms)}}$, *i.e.* $I = \dfrac{E}{R}$.

In an A.C. circuit: Current (amps.) $= \dfrac{\text{E.M.F. (volts)}}{\text{Impedance (ohms)}}$, *i.e.* $I = \dfrac{E}{Z}$.

Circuit containing Inductance ($L$) only: $I = \dfrac{E}{\omega L}$, where $\omega = 2\pi f$.

" " Capacity ($C$) only: $I = \omega CE$, where $\omega = 2\pi f$.

" " Resistance, Capacity and Inductance in series:—

$$I = \frac{E}{\sqrt{R^2 + \left(\omega L - \dfrac{1}{\omega C}\right)^2}}$$

where $\sqrt{R^2 + \left(\omega L - \dfrac{1}{\omega C}\right)^2} = \text{Impedance } Z$

and $\left(\omega L - \dfrac{1}{\omega C}\right) = \text{Reactance}$.

The angle of lag or lead is given by:—

$$\tan\phi = \frac{\text{Reactance}}{\text{Resistance}} = \frac{\left(\omega L - \dfrac{1}{\omega C}\right)}{R}$$

10. *MAGNETIC LAW EQUIVALENT TO OHM'S LAW*

$$\text{Magnetic Flux} = \frac{\text{Magneto-motive Force}}{\text{Reluctance}},$$

$$\textit{i.e. } \phi = \frac{\text{M.M.F.}}{S}$$

M.M.F. $= 0{\cdot}4\pi NI$,

where $N$ = number of turns on the solenoid,

$I$ = current in ampères.

11. *FLUX DENSITY AND PERMEABILITY OF IRON*

$$\text{Permeability} = \frac{\text{Flux density in iron}}{\text{Flux density in air}},$$

$$\textit{i.e. } \mu = \frac{B}{H}.$$

12. *POWER IN ELECTRICAL CIRCUITS*

*D.C. Circuits.*

Power (watts) = E.M.F. (volts) × Current (amps.),
*i.e.* $W = EI = I^2R$.

*A.C. Circuits.*

R.M.S. value $= \dfrac{1}{\sqrt{2}} \times$ maximum value.

6. *SPECIFIC RESISTANCE*

The specific resistance of a conductor is the resistance of a cm. cube between opposite faces.

| Conductor. | Specific resistance in microhms per cm. cube. |
|---|---|
| Copper . . . . . | 1·6 |
| Silver . . . . . | 1·6 |
| Tin . . . . . . | 10 |
| Mercury . . . . . | 94 |
| Platinum . . . . . | 9 |
| Phosphor bronze . . . . | 8 |
| Zinc . . . . . . | 6 |

7. *DIELECTRIC STRENGTHS*

| Material. | Volts per mm. |
|---|---|
| Glass . . . . . . | 8,000 |
| Paraffin . . . . . | 12,000 |
| Micanite . . . . . | 40,000 |
| Ebonite . . . . . | 30,000 |
| Porcelain . . . . . | 10,000 |
| Empire cloth . . . . | 10,000 |
| Presspahn . . . . . | 5,000 |

Two sharp points in air, 10 inches apart, will flash over at approximately 100,000 volts.

8. *RESISTANCES, CAPACITIES AND INDUCTANCES IN SERIES AND PARALLEL*

| Units. | Total in series. | Total in parallel. |
|---|---|---|
| Resistances: $r_1, r_2, r_3$ | $R = r_1 + r_2 + r_3$ | $R = \dfrac{1}{\dfrac{1}{r_1} + \dfrac{1}{r_2} + \dfrac{1}{r_3}}$ |
| Capacities: $c_1, c_2, c_3$ | $C = \dfrac{1}{\dfrac{1}{c_1} + \dfrac{1}{c_2} + \dfrac{1}{c_3}}$ | $C = c_1 + c_2 + c_3$ |
| Inductances: $l_1, l_2, l_3$ | $L = l_1 + l_2 + l_3$ | $L = \dfrac{1}{\dfrac{1}{l_1} + \dfrac{1}{l_2} + \dfrac{1}{l_3}}$ |

STANDARD COPPER CONDUCTORS

| No. and diameter of wires. | Area (sq. in.). | Ampères at I.E.E. standard. | Resistance (ohms per 1000 yds.). | Nearest old standard size. |
|---|---|---|---|---|
| 1/·036 | 0·0010 | 4·1 | 24·5 | 1/20 |
| 1/·044 | 0·0015 | 6·1 | 16·4 | 1/18 |
| 3/·029 | 0·0020 | 7·8 | 12·8 | 3/22 |
| 3/·036 | 0·0030 | 12 | 8·26 | 3/20 |
| 1/·064 | 0·0030 | 12·9 | 7·76 | 1/16 |
| 7/·029 | 0·0045 | 18·2 | 5·49 | 7/22 |
| 7/·036 | 0·0070 | 24 | 3·53 | 7/20 |
| 7/·044 | 0·0100 | 31 | 2·36 | 7/18 |
| 7/·052 | 0·0145 | 37 | 1·69 | 7/18 |
| 7/·064 | 0·0225 | 46 | 1·12 | 7/16 |
| 19/·044 | 0·0300 | 53 | 0·864 | 19/18 |
| 19/·052 | 0·0400 | 64 | 0·624 | 19/18 |
| 19/·064 | 0·0600 | 83 | 0·412 | 19/16 |
| 19/·072 | 0·0750 | 97 | 0·326 | 19/14 |
| 19/·083 | 0·100 | 118 | 0·245 | 19/14 |
| 37/·064 | 0·120 | 130 | 0·212 | 37/16 |
| 37/·072 | 0·150 | 152 | 0·167 | 37/14 |
| 37/·083 | 0·200 | 184 | 0·126 | 37/14 |
| 37/·093 | 0·250 | 214 | 0·100 | 37/12 |
| 37/·103 | 0·300 | 240 | 0·0818 | 37/12 |
| 61/·093 | 0·400 | 288 | 0·0608 | 61/12 |
| 61/·103 | 0·500 | 332 | 0·0496 | 61/12 |
| 91/·093 | 0·600 | 384 | 0·0408 | 91/12 |
| 91/·103 | 0·750 | 461 | 0·0333 | 91/12 |
| 127/·103 | 1·00 | 595 | 0·0238 | 127/12 |

## 5. *SPECIFIC INDUCTIVE CAPACITY*

The specific inductive capacity of a substance is the ratio of the capacity of a condenser with the substance as dielectric to the capacity of an air condenser of the same size.

| Substance. | Specific inductive capacity. |
|---|---|
| Plate Glass | 6–8 |
| Flint glass | 7–10 |
| Paraffin wax | 2 |
| India-rubber | 2–3 |
| Mica | 6 |
| Ebonite | 2·5 |
| Shellac | 3–3·5 |
| Porcelain | 4–6 |
| Insulating oil | 2–3 |
| Turpentine | 2·3 |
| Air | 1 |

## 3. *CONVERSION FACTORS*

| | |
|---|---|
| 1 inch | = 2·54 centimetres. |
| 1 foot | = 30·48 centimetres. |
| | = 0·3048 metre. |
| 1 yard | = 0·914 metre. |
| 1 mile | = 1609·3 metres. |
| 1 lb. | = 453·6 grammes. |
| 1 gallon | = 4·55 litres. |
| 1 B.Th.U. | = 0·252 calorie. |

## 4. *WIRE GAUGE AND STANDARD COPPER CONDUCTORS*

IMPERIAL STANDARD WIRE GAUGE

| No. | Diameter (ins.). | Sectional area (sq. ins.). | No. | Diameter (ins.). | Sectional area (sq. ins.). |
|---|---|---|---|---|---|
| 0 | 0·324 | 0·0824 | 26 | 0·018 | 0·000255 |
| 1 | 0·300 | 0·0707 | 27 | 0·016 | 0·000211 |
| 2 | 0·276 | 0·0598 | 28 | 0·015 | 0·000172 |
| 3 | 0·252 | 0·0500 | 29 | 0·014 | 0·000145 |
| 4 | 0·232 | 0·0423 | 30 | 0·012 | 0·000121 |
| 5 | 0·212 | 0·0353 | 31 | 0·0116 | 0·000106 |
| 6 | 0·192 | 0·0289 | 32 | 0·0108 | 0·0000916 |
| 7 | 0·176 | 0·0243 | 33 | 0·0100 | 0·0000785 |
| 8 | 0·160 | 0·0201 | 34 | 0·0092 | 0·0000665 |
| 9 | 0·144 | 0·0163 | 35 | 0·0084 | 0·0000554 |
| 10 | 0·128 | 0·0129 | 36 | 0·0076 | 0·0000454 |
| 11 | 0·116 | 0·0106 | 37 | 0·0068 | 0·0000363 |
| 12 | 0·104 | 0·00850 | 38 | 0·0060 | 0·0000283 |
| 13 | 0·092 | 0·00665 | 39 | 0·0052 | 0·0000212 |
| 14 | 0·080 | 0·00503 | 40 | 0·0048 | 0·0000181 |
| 15 | 0·072 | 0·00407 | 41 | 0·0044 | 0·0000152 |
| 16 | 0·064 | 0·00322 | 42 | 0·0040 | 0·0000126 |
| 17 | 0·056 | 0·00246 | 43 | 0·0036 | 0·0000102 |
| 18 | 0·048 | 0·00181 | 44 | 0·0032 | 0·0000080 |
| 19 | 0·040 | 0·00126 | 45 | 0·0028 | 0·0000062 |
| 20 | 0·036 | 0·00102 | 46 | 0·0024 | 0·0000045 |
| 21 | 0·032 | 0·000804 | 47 | 0·0020 | 0·0000031 |
| 22 | 0·028 | 0·000616 | 48 | 0·0016 | 0·0000020 |
| 23 | 0·024 | 0·000452 | 49 | 0·0012 | 0·00000113 |
| 24 | 0·022 | 0·000380 | 50 | 0·0010 | 0·000000785 |
| 25 | 0·020 | 0·000314 | | | |

# TECHNICAL TABLES AND FORMULÆ

1. *UNITS* (*fundamental*)

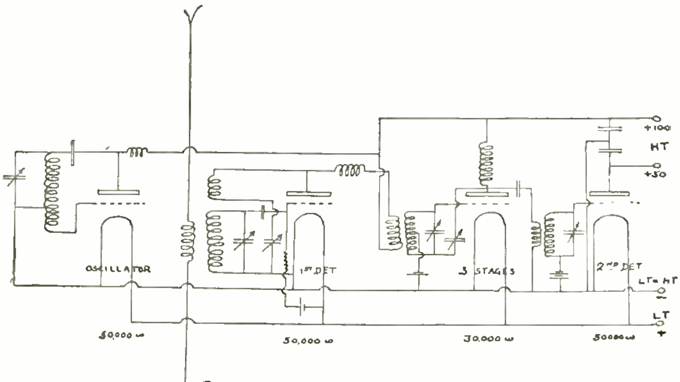
THE fundamental units, on which all practical units are based, are those of length, mass and time. In the C.G.S. System these are the centimetre, gramme and second respectively, and in the British System the foot, pound and second.

2. *UNITS* (*derived*)

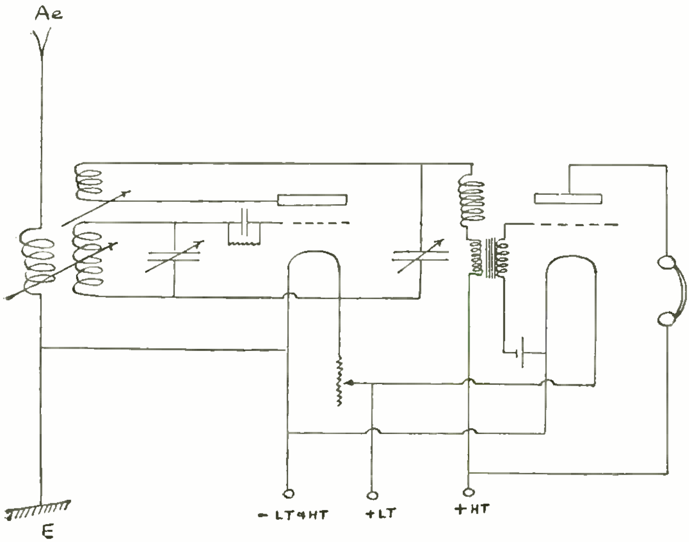
| Unit of | C.G.S. electro-magnetic unit. | C.G.S. electro-static unit. | Practical unit. | Sym-bol. |
|---|---|---|---|---|
| | | (approx.) | | |
| Current . | 10 ampères | $\frac{1}{3\times10^9}$ ampère | 1 ampère | *I* |
| Resistance . | $\frac{1}{10^9}$ ohm | $9\times10^{11}$ ohms | 1 ohm | *R* |
| Electromotive Force or Potential Difference | $\frac{1}{10^8}$ volt | $3\times10^2$ volts | 1 volt | *E* or *V* |
| Quantity . | 10 coulombs | $\frac{1}{3\times10^9}$ coulomb | 1 coulomb | *Q* |
| Energy . | 1 cm.-dyne = 1 erg $=\frac{1}{10^7}$ joule | $\frac{1}{10^7}$ joule | 1 joule | *W* |
| Power . . | $\frac{1}{10^7}$ watt = 1 erg per sec. | $\frac{1}{10^7}$ watt | 1 watt | *P* |
| Capacity . | $10^9$ farads | $\frac{1}{9\times10^{11}}$ farads | 1 farad | *C* |
| Inductance . | $\frac{1}{10^9}$ henry | $9\times10^{11}$ henry | 1 henry | *L* |

1 coulomb = 1 ampère for one second.
1 joule = 1 watt for one second.
= $10^7$ ergs.
= 0·7372 ft.-lb.
1 kilowatt = 1000 watts.
1 horse power = 746 watts.
= 33,000 ft.-lb. per minute.
= 550 ft. per second.
1 Board of Trade Unit = 1 kilowatt-hour.
= $36\times10^5$ joules.

# SHORT WAVE RECEIVERS



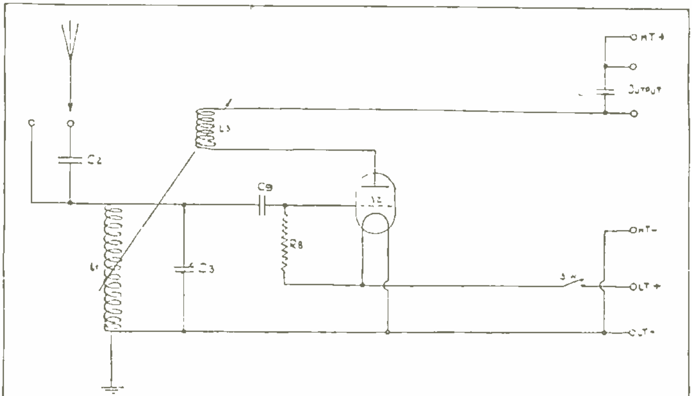

SUPERHETERODYNE SHORT WAVE RECEIVER




SIMPLE SHORT WAVE RECEIVER

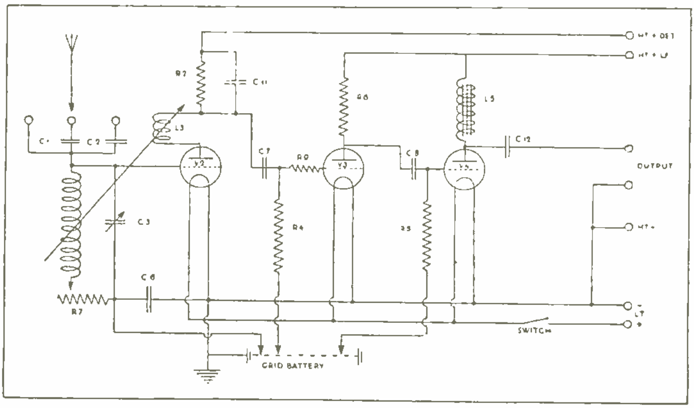
# SUGGESTED CIRCUITS FOR RECEIVERS

See also pp. 367–368 for diagrams of 2- and 4-valve receivers.




THEORETICAL CIRCUIT

ONE VALVE




THREE VALVE

# B.B.C. TIME SIGNAL CHART

## WEEK-DAY SERVICE

| Station. | 10.15 a.m. | 10.30 a.m. | 11.0 a.m. | Noon. | 1.0 p.m. | 2.30 p.m. | 3.0 p.m. | 4.0 p.m. | 5.15 p.m. | 6.0 p.m. | 6.30 p.m. | 7.0 p.m. | 9.0 p.m. | 10.0 p.m. | Conclusion of Programme. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2LO | **Big Ben** | | | **Big Ben** N.S. | Big Ben | **Big Ben** | Big Ben | | Big Ben | Big Ben | **G.T.S.** | Big Ben | G.T.S. | | Big Ben |
| 5XX | **Big Ben** | **G.T.S** | **Big Ben** N.S. | | Big Ben | Big Ben | Big Ben | **G.T.S.** | Big Ben | Big Ben | **G.T.S.** | Big Ben | G.T.S. | **G.T.S.** | Big Ben |
| 5GB | | | | | | | Big Ben | | | | **G.T.S.** | | | G.T.S. | Big Ben |
| Other Stations. | | | | | | | | | | | **G.T.S.** | Big Ben | G.T.S. | | Big Ben |

## SUNDAY SERVICE

| Station. | 10.30 a.m. | 3.30 p.m. | 4 p.m. | 8 p.m. | 9 p.m. | 10 p.m. |
|---|---|---|---|---|---|---|
| 2LO | | Big Ben | | Big Ben | **G.T.S.** | |
| 5XX | **G.T.S.** | Big Ben | **G.T.S.** | Big Ben | **G.T.S.** | **G.T.S.** |
| 5GB | | Big Ben | | Big Ben | **G.T.S.** | |
| Other Stations. | | Big Ben | | Big Ben | **G.T.S.** | |

*Reference.*—N.S. indicates Not Saturdays. Heavy type indicates Compulsory. Ordinary type indicates Optional.

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Mr. J. T. Mould (Igranic Electric Co., Ltd.).

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*Address*
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## BRITISH RADIO VALVE MANUFACTURERS' ASSOCIATION

*Secretary*
H. Howitt.

*Address*
59, Russell Square, London, W.C.1

## THE RADIO ASSOCIATION

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His Grace the Duke of Sutherland.

*Council*

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Lieut.-Col. C. L'Estrange Malone, F.R.Ae.S., M.P. (Vice-Chairman).

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S. Landman, M.A.
R. R. Pecorini, F.R.A.
A. W. Sharman, F.R.A.
A. J. V. Underwood, M.Sc., A.M.I.Chem.E.
E. J. Nock Winstone, F.R.A., A.M.I.E.E.

*Hon. Treasurer*

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*Hon. Secretary*

S. Landman, M.A.

*Hon. Technical Secretary*

E. J. Nock Winstone, F.R.A.

*Head Office*

22, Laurence Pountney Lane, London, E.C.4.

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*Vice-Chairman*

Sir Lawrence Weaver, K.B.E.

*General Secretary*

A. E. Parnell.

*Technical Secretary*

M. A. Hutchins, A.M.I.W.T.

*Address*

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A. Hambling, Associate I.R.E.
Capt. K. Hartridge.
R. J. Hibberd, Member I.R.E., F.R.S.A.
E. D. Ostermeyer.
J. F. Stanley.

*Address*

53, Victoria Street, London, S.W.1.
(Telephone: Victoria 4412.)

# THE RADIO CIRCLE

THE general purpose of the Radio Circle is twofold:

1. To link together those who arrange and broadcast Children's Hour programmes and those who listen to them.
2. To suggest and supervise the carrying out of plans whereby listeners may help children who are invalid, sick or otherwise in need of assistance.

## *MEMBERSHIP*

The Radio Circle consists of two sections:

1. The Junior, for listeners up to eighteen years of age.
2. The Senior, for listeners over eighteen years of age.

Membership is for one year only, but may be renewed. The annual subscription of ninepence is due on January 1st in each year, but newcomers may join the Circle at any time. The first subscription entitles the newly-joined member to a badge, which takes the form of an enamelled device, common to all Stations, with a special pendant for each local branch. Subsequent subscriptions entitle rejoining members to a calendar or some other token. Membership of the Junior Section gives the privilege of a broadcast birthday greeting. There are now no membership numbers. Applications for membership should include full name, full address, and, for the Junior Section, the day, month and year of birth. Some Stations have printed forms which are sent on request and facilitate registering. All applications should be accompanied by the subscription of ninepence.

## *DISPOSITION OF RADIO CIRCLE FUNDS*

The balance of the subscriptions (over and above the cost of the badge and postage) is paid into the local Radio Circle Funds, which are further increased in various ways, such as by the sale of "silver paper." Up to the end of last year the amount distributed by the London and Daventry Radio Circle had reached a total of (approximately) £1,000.

# B. B. C. ADDRESSES

*Headquarters*

| | |
|---|---|
| HEAD OFFICE . . . | Savoy Hill, London, W.C.2. |
| LONDON STATION STUDIOS AND OFFICES . . . . | " " " |
| DAVENTRY (5XX) STUDIOS AND OFFICES . | " " " |
| (TRANSMITTER . . . | Borough Hill, Daventry, Northants.) |
| DAVENTRY (5GB) STUDIOS AND OFFICES . | 282, Broad Street, Birmingham and also partly Savoy Hill. |
| (TRANSMITTER . . . | Borough Hill, Daventry.) |

*Provincial Stations*

| | |
|---|---|
| BELFAST . . . . | 31, Linenhall Street. |
| CARDIFF . . . . | 39, Park Place. |
| GLASGOW . . . . | 21, Blythswood Square. |
| MANCHESTER . . . . | Piccadilly (as from October 1st, 1928). |

ABERDEEN—
15, Belmont Street.

BOURNEMOUTH—
72, Holdenhurst Road.

DUNDEE—
1, Lochee Road.

EDINBURGH—
87, George Street.

HULL—
26 & 27, Bishop Lane.

LEEDS-BRADFORD—
Cabinet Chambers, Basinghall Street, Leeds.

NEWCASTLE—
54, New Bridge Street.

NOTTINGHAM—
4, Bridlesmith Gate.

PLYMOUTH—
Athenæum Chambers, Athenæum Lane.

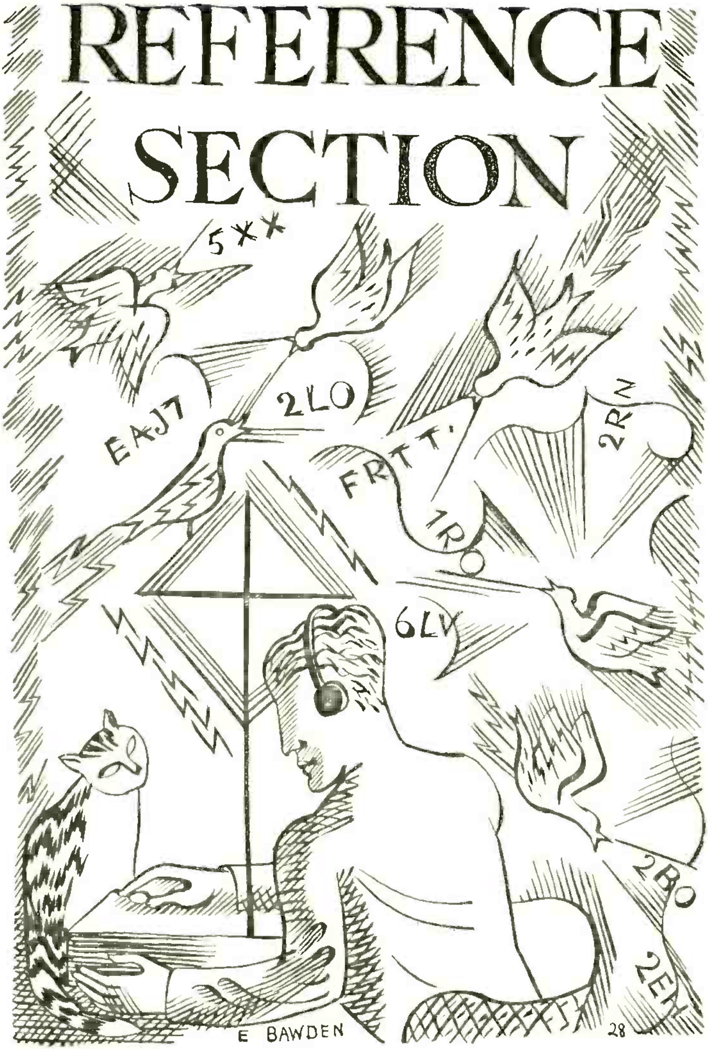
SHEFFIELD—
Castle Chambers, Castle Street.

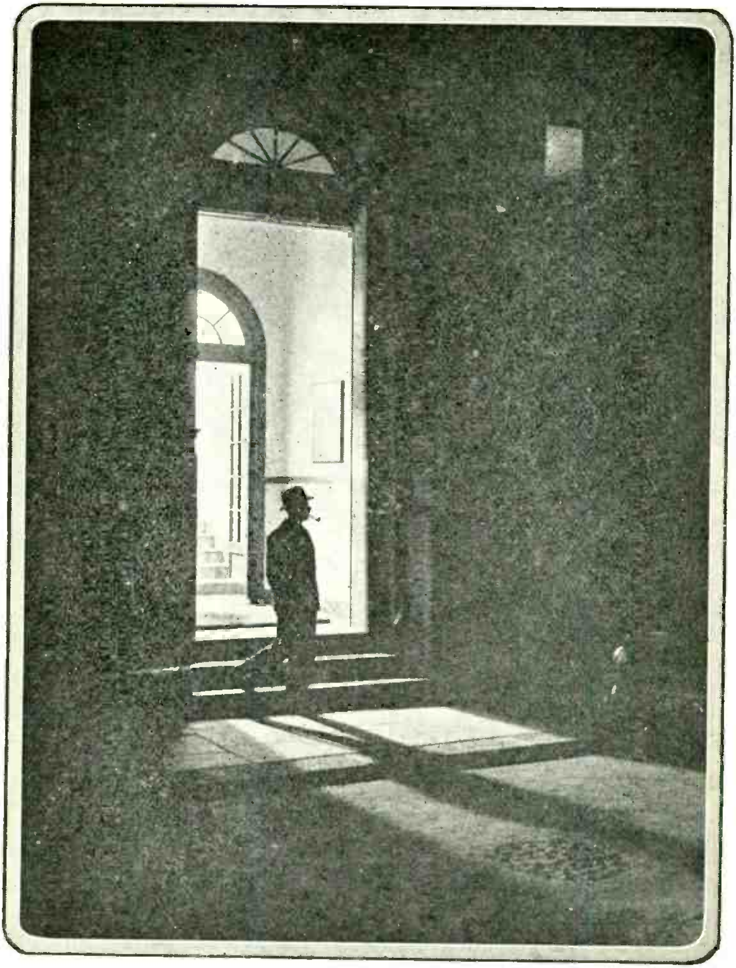
STOKE-ON-TRENT—
Majestic Buildings.

SWANSEA—
Oxford Buildings (Corner of Union Street & Oxford Street).

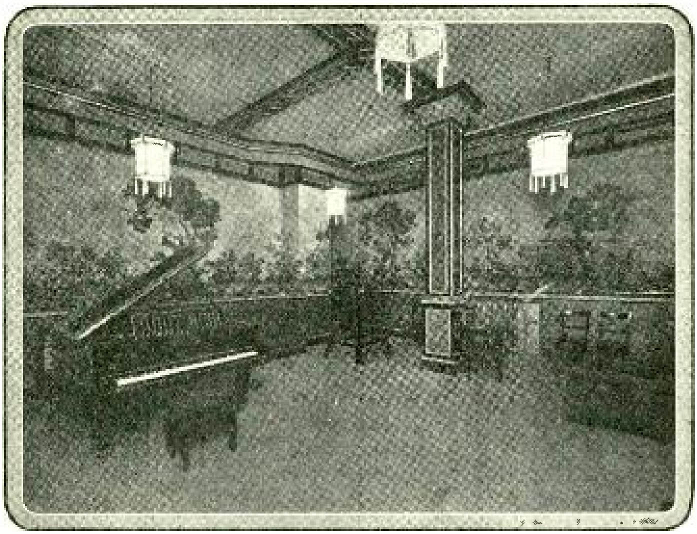
# MILESTONES IN BRITISH BROADCASTING

| | | |
|---|---|---|
| 1922. | 14th November. | London Station opened. |
| | 15th ,, | Birmingham and Manchester Stations opened. |
| | 24th December. | Newcastle Station opened. |
| 1923. | January. | Beginning of S.B. Transmissions. |
| | 8th January. | First relay of opera from Covent Garden (B.N.O.C.'s season). |
| | 13th February. | Cardiff Station opened. |
| | 6th March. | Glasgow Station opened. |
| | 28th September. | First issue of *The Radio Times*. |
| | 10th October. | Aberdeen Station opened. |
| | 17th ,, | Bournemouth Station opened. |
| | 16th November. | Sheffield (the first Relay Station) opened. |
| | December. | First land-line broadcast from the Continent (Paris). |
| 1924. | | Other stations opened during 1924. |
| | 22nd February. | First B.B.C. Outside Symphony Concert in the Central Hall, Westminster. |
| | 23rd April. | Broadcast of the King's Speech at the opening of the British Empire Exhibition. |
| | November. | One million licences in force. |
| | December. | Election addresses by political leaders. |
| 1925. | 6th April. | New Transmitter for 2LO in Oxford Street started. |
| | 17th May. | First publication of an opera libretto. |
| | 17th July | First issue of *World-Radio*. |
| | 27th ,, | High Power Station (5XX) at Daventry opened. |
| 1926. | April | Two millions licences in force. |
| | May. | General Strike News Service. |
| | 30th September. | First of the National Concerts at the Albert Hall. |
| 1927. | 1st January. | British Broadcasting Corporation instituted under Royal Charter. |
| | 5th June. | First broadcast from the Cenotaph (British Legion Service). |
| | 24th July. | Opening of the Menin Gate. First step in developing the link by land-line with the Continent. |
| | 13th August. | First broadcast from the Queen's Hall—Promenade Concert Series. |
| | 21st August. | Daventry Experimental Station (5GB) opened. |
| | 11th November. | Short-wave Station (5SW) at Chelmsford opened. |
| 1928. | February. | Formation of the National Orchestra of Wales. |
| | 5th March. | Ban on Controversy removed by the Post-master-General. |


REFERENCE SECTION
5XX
EAJ7
2LO
FRTT
2RN
1R
6LV
2BO
2EH
E BAWDEN
28



"GOOD-NIGHT, EVERYBODY, GOOD-NIGHT"



THE LATEST STUDIO AT SAVOY HILL, WITH DRAPING REPLACED BY WALLPAPER COVERING A LAYER OF FELT

the rehearsal with the scores of the works, and follows the conductor's interpretation as carefully as possible. At night he controls the output of the performance, also with the score, and his duty is to telescope the conductor's performance, with its dynamic range of 1 to 4000, into the limits of 500 to 3000, to return to our numerical example. By judiciously cutting down the volume of loud passages at appropriate places, he endeavours to have sufficient reserve to allow the climax of the work to stand out in sharp contrast to its context, and, by a reverse process, to convey the impression of a remote pianissimo against possibly mezzo-piano surroundings. It is only by such means that the light and shade of a work can be presented to the satisfaction of the majority of listeners, and the standard of musical transmission has certainly improved considerably since the inception of this method of control.

# THE PROBLEM OF CONTROL

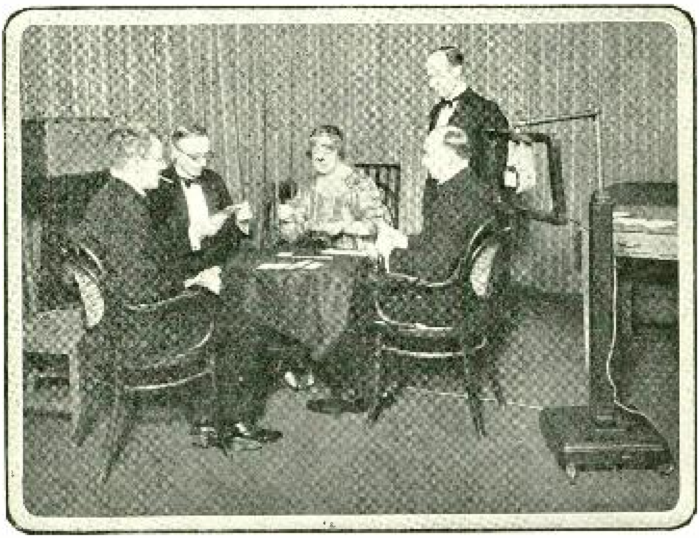
THE subject of control is one of the most controversial of all matters relating to broadcasting, and scarcely a day goes by without the inevitable question: Why must performances of musical works be controlled?—why can they not be transmitted exactly as they are performed in the studio? The answer is not far to seek.

Let us suppose that the potential dynamic range of a piece of orchestral music, for example, is numerically from 1 to 4000: that is to say, the volume of the softest pianissimo is one unit of sound, and that of the loudest fortissimo is 4000 units of sound. Were this piece to be transmitted exactly as performed, only a negligible number of listeners would get any result at all from the pianissimo passages or even piano passages, and of the fortissimo passages they would certainly receive much more than their sets could adequately cope with. Indeed, after a short time the transmitter itself would find its capacity overtaxed. Therefore the necessity for control is self-evident.

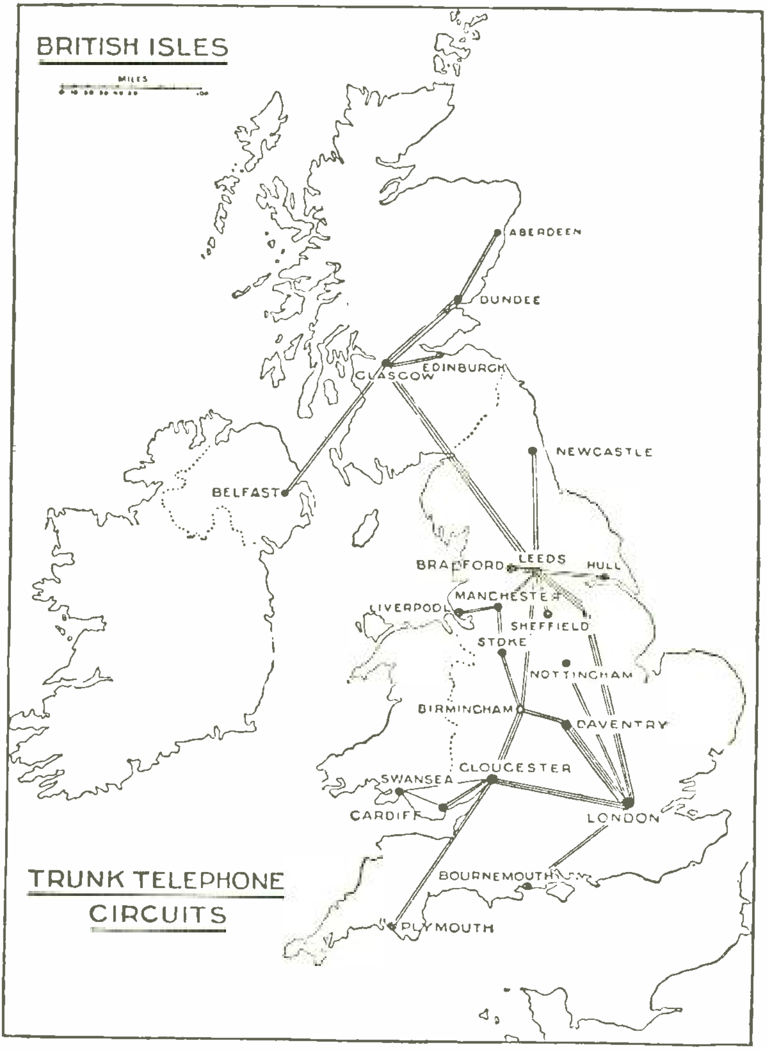
The second inevitable question on the subject enters here: The necessity for control having been established, why cannot the process be carried out automatically? Returning to our original example, let us assume that the average receiving set is not capable of reproducing any quiet passage with less than 500 units of sound, or any loud passage, without blasting, above 3000 units of sound. With an automatic control device, all piano passages would be brought up to the 500 level, and all loud passages cut down to the 3000 level without any discrimination whatsoever. In these circumstances, if the 500 level represented a mezzo-piano in the actual performance, this passage would come through to the listener with the same degree of loudness as the tiniest pianissimo, which might very easily have immediately preceded it, and there would be no contrast whatsoever between the two in reception. Similarly, all the fortissimo climaxes would be cut down to a level of moderate volume of sound, and would therefore be lost. It was to relieve an inartistic situation of this description that the process of musical control was evolved.

The musician who is to control an orchestral concert attends each of these places is a miniature "Repeater Station." At a Repeater Station various technical steps are taken to maintain or improve the quality and strength of the material being received from the station of origin, and to overcome any intermediate difficulties in the land lines. A great deal of expert technical work is involved in maintaining the quality of S.B. transmissions, often in the face of trouble arising from natural causes such as storms and atmospheric disturbances.

The trunk-lines normally used for S.B. between stations are permanently hired from the Post Office, and are selected lines particularly suited for the good transmission of speech and music. This involves a much higher standard of maintenance than is necessary for ordinary commercial speech, and has been made possible by the close attention given to the problem by the Post Office engineers in co-operation with the B.B.C. S.B. is not yet perfect, but improvements are still being made as better lines and improved methods of operation become available.



BRIDGE IN THE LONDON STUDIO (*November 4th, 1927*)



BRITISH ISLES
MILES
ABERDEEN
DUNDEE
EDINBURGH
GLASGOW
BELFAST
NEWCASTLE
BRADFORD
LEEDS
HULL
MANCHESTER
SHEFFIELD
LIVERPOOL
STOKE
NOTTINGHAM
BIRMINGHAM
DAVENTRY
GLOUCESTER
SWANSEA
CARDIFF
LONDON
BOURNEMOUTH
PLYMOUTH
TRUNK TELEPHONE
CIRCUITS

# S.B.—WHAT IS IT?

OPEN the B.B.C.'s official programme, as printed in *The Radio Times*, at any page, and on it you will notice that some programme item or other is "S.B. from . . ." There must be many listeners who either do not know what this means or have a very hazy idea of everything that is involved in the process which they recognise as "S.B."

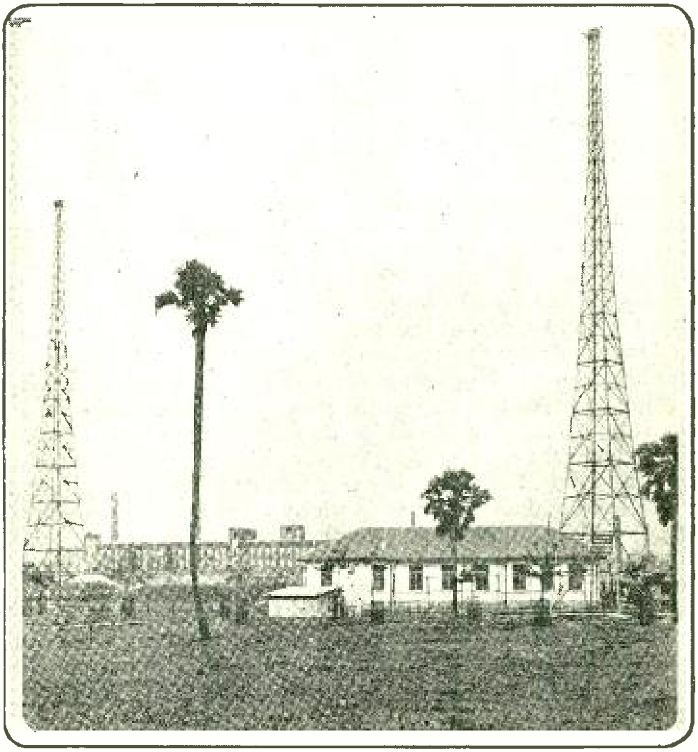
"S.B. from London" in any Station's programme means that the item is simultaneously broadcast both from that station's aerial and from that of the London Station where the broadcast is taking place.* Many items are "S.B. from all stations"; you may even find in some programmes the equivalent, but slovenly, phraseology "S.B. *to* all stations."

Now that the meaning of the letters is clear, it remains only to explain the process. To many people it seems, at first sight, surprising that it should be possible to bring the music of a concert in Glasgow hundreds of miles to London and broadcast it from there. There is nothing more novel in this than there is in talking over the telephone to a friend in Glasgow. The carrying of music or speech over telephone lines does not introduce any new principle into broadcasting; for on reflection it must be obvious to every listener that if the microphone is in one room (the studio) and the transmitter in another, the signals of speech or music have to be taken from the microphone to the transmitter on some kind of line, even though both are in the same building. It is, therefore, no extension of principle if the signals from the microphone have to be taken from Savoy Hill to the transmitter in Oxford Street, a mile or so away, or from, say, Aberdeen to London. The difference is only in degree, and the practical difficulty is merely to guarantee the same quality for two or three hundred miles of line as for one or two.

The diagram on the next page shows the telephone trunk-line connections used between all stations of the B.B.C. for S.B. work. It will be noticed that all the longer trunk-lines are routed through several intermediate points, and

* The word "relayed," *e.g.* "Hallé Concert relayed from Manchester" should, strictly, be used only when the station of origin (viz. Manchester) is not broadcasting the item itself.

of broadcast programmes, so that the time may not be far distant when a suitable circuit for broadcasting from, say, Vienna to London can be booked at short notice as easily as to-day a circuit can be booked between these cities for ordinary telephone conversation. In the interim, certain broadcasting organisations of Europe are actively co-operating with each other and their respective telephone administrations for the provision of suitable repeaters and correctors for use on selected lines in the immediate future.



THE BOMBAY STATION OF THE INDIAN BROADCASTING COMPANY

# BROADCASTING TO AND FROM THE CONTINENT BY LINE

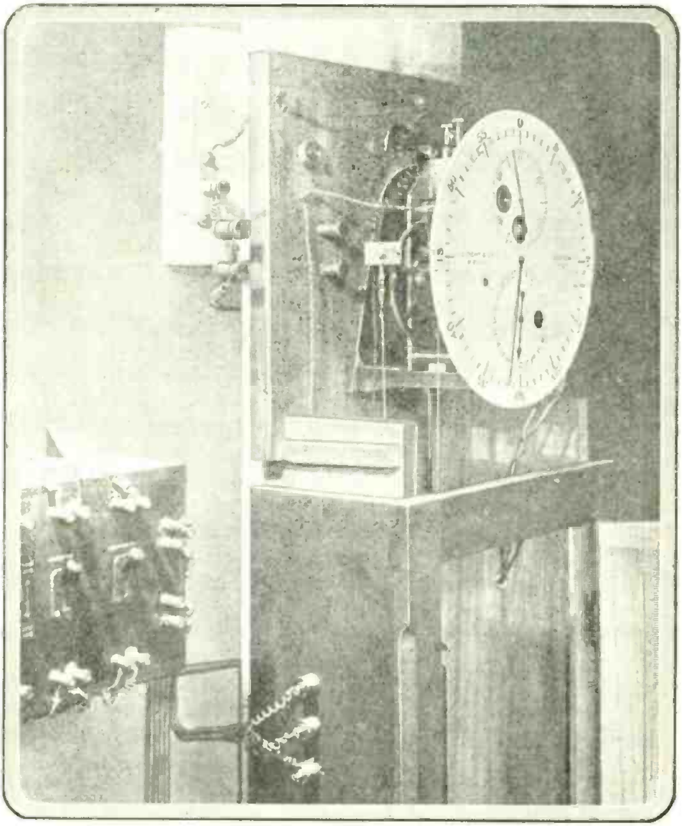
AT the date of publication of the *B.B.C. Handbook*, 1928, the first experiments were being carried out with a view to establishing a "line" link between the Continent and this country over which broadcast programmes could be transmitted, so that ultimately the Simultaneous Broadcast system of this country could be linked up to similar systems in other European countries, and international exchanges of programmes could take place. During the past year these experiments have developed so that during March a successful international exchange of programmes was effected between Cologne and London, the Brussels station also radiating the two programmes. Simultaneously, in Central and Eastern Europe experiments have been in progress, and broadcast programmes have been exchanged between Berlin, Prague, Vienna, Budapest and Warsaw.

Briefly, the realisation of successful transmission of music over long distances by line requires a telephone circuit which has been specially fitted with amplifiers and frequency correctors, so that equal transmission of all frequencies between about 30 and 5,000 or 6,000 cycles is ensured. In the ideal case frequencies up to 10,000 cycles should be included. The amplifiers must compensate for the loss incurred in transmission over the line and in the frequency correctors, so that the ratio of wanted signal to unwanted signal (line noise which is picked up en route) is never allowed to fall below a certain value. The reliability and freedom from interference which are demanded of the circuit have rendered it necessary to use underground cable circuits in which the copper conductors are small and the attenuation is relatively great. With such circuits it is necessary to instal an amplifier and a corrector at every forty to fifty miles (approximately).

The link to the Continent via Belgium has been tried out experimentally, and it is now being equipped with permanent repeaters which can be brought into use at short notice for broadcasting purposes.

It is to be hoped that the various telephone administrations in Europe will soon find it possible to equip the international cable circuits in their countries suitably for the transmission

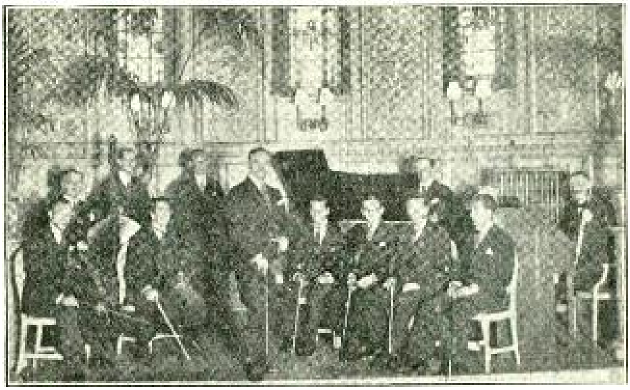
In all listening to foreign stations, the listener will find various B.B.C. publications absolutely indispensable. First and foremost the Corporation's official technical and foreign programme journal *World-Radio*, published weekly on Fridays, price 2*d*. (see article, p. 275). Mention should also be made of the Identification Panel Booklet, and *World-Radio's* Broadcasting Map of Europe.



THE CLOCK THAT GIVES GREENWICH MEAN TIME

Having chosen one of these, we may turn to the programme in order to get fuller details of the transmission. Let us suppose that Copenhagen Station is broadcasting a special opera, which is given by a well-known operatic company. We find that Copenhagen's wave-length is 337·4 metres (or 889 kilocycles, if, as we should be very wise to do, we work on a system of frequencies rather than wave-lengths). Now a reference to our graph—supposing that we have already calibrated a certain number of stations—will show us approximately the degree to which to turn our dial. Let us try. We may hear some orchestral music which requires a slight adjustment of the dial to come in very clearly. With luck this may be listened to uninterruptedly for some little time. It may, however, happen that the transmission is interfered with, if not spoilt, by Morse suddenly wakening to life on, or very near to, this wave-length. If we are interested in the transmission, let us not be discouraged by this, for a reference to *World-Radio* will show that Copenhagen has an alternative station—namely, Kalundborg—on a wave-length of 1153·8 metres. Another reference to our graph will show us where this station is to be found. Having discovered it, we should indeed be unfortunate if we found this also spoilt. It may, therefore, be taken as reasonably certain that we shall be able to hear a considerable part of Copenhagen's transmission on either the main station itself or its high-wave and high-power transmitter. As with Copenhagen, so with other stations.

In the course of our search for stations we are sure to come across other transmissions. How are we to identify these? Well, first of all there is our stand-by, the graph, to which, of course, will be added each new station we definitely identify in order to make it more complete and trustworthy. Then there is the identification signal which most stations possess. It may be either a metronome giving so many beats to the minute, or it may be, as in the case of Cologne, a musical peal of five bells; or, again, as in the case of Kattowitz, hammer strokes on an anvil to mark the industrial character of the country. It is almost inevitable that the searcher will hear frequently a station closing down with a well-known hymn tune, Haydn's "Austria." This is an unfailing sign of a German station, but since most of them use it, it does not identify the particular transmitter.



THE listening public have always been appreciative of good music programmes. In Ambrose and his Band, who broadcast from the Restaurant of the May Fair Hotel weekly, and in Frank Ashworth and his Band, who also broadcast once a week from the Restaurant des Ambassadeurs, Hotel Metropole, listeners have two excellent dance combinations, and from the number of letters received by the leaders of these Bands it can be safely said that they are very much appreciated.

For lovers of good music there are broadcast during lunch time once a week programmes from the Hotel Victoria—Colombo and his Orchestra, and from the Hotel Metropole—Mantovani and his Orchestra. This last named, although very young, is becoming very popular with listeners. He has broadcast music of his own composition.

Listeners who have heard and liked these Orchestras should take the opportunity of seeing and hearing them at the Hotels from which the broadcasts are given.

*Managing Director:*
FRANCIS TOWLE

# HOW TO LISTEN TO FOREIGN STATIONS

AT a first glance this subject might seem so simple as hardly to require an article to itself. But, in point of fact, it is not quite so simple as it appears, if by "listening to foreign stations" is meant—as it should mean—listening to them intelligently and with the maximum of artistic enjoyment. Of course there is another conception—namely, that of "pulling in" and identifying the greatest number of foreign transmissions. When this can be done without detriment to the reception of one's neighbours, it is a legitimate, if not altogether satisfying, enterprise. It is to be feared, however, that in most cases an expedition of this kind is attended by a certain amount of oscillation and consequent annoyance to others, since it is so frequently found that those who indulge in this form of wireless sport are insufficiently equipped with the amount of power in their sets which constitutes a margin of safety.

At this point it might be well to remark that short-wave listening is excluded for the moment from consideration, if only because it rarely happens that reception on the ultra-short waves is of good quality.

Let us assume the possession of a set which will give sufficient power and is made up of high-class components, and see what can be done with it in the way of bringing in more or less distant transmissions. In an enterprise of this kind we should be compared to a traveller undertaking a journey and requiring charts and guide-books in order that he may arrive with the least possible delay. Thus a full and trustworthy list of stations' wave-lengths is the first necessity; the detailed programmes of as many stations as possible is hardly less essential; and, thirdly, a carefully drawn graph will be of immense assistance to the distant listener, for thereby he will be able to estimate very nearly at which point on his tuning dial a given station should be found. It is indeed difficult to exaggerate the importance of this guide to listening.

Let us take *World-Radio* as our guide-book. We will first glance through the list of Continental Programme Events in order to see the outstanding features of the broadcast menu.

N 2

are several rays, too, some at this angle, some at that, so that the resultant disturbance, thousands of miles from the transmitter, is most inconstant, at one moment strong, then weak, and then strong again; changing all the while. This does not matter, provided enough energy gets through to work a relay for telegraphy, but it is a vital ban to good reproduction with telephony. Anything above a certain value of received energy is good enough for telegraphy; for good telephony constancy is required.

The problem with telephony or broadcasting, then, is to equalise this fading. Several methods have been proposed. In one when the signal gets strong relays act to cut down the strength beyond a point in the amplifying chain. These relays must act very quickly, and obviously fundamentally the fault has to be committed before it cures itself. This method, one would say, was most suitable for commercial telephony, but it is early days to condemn any scheme. The intention is merely to indicate possible difficulties.

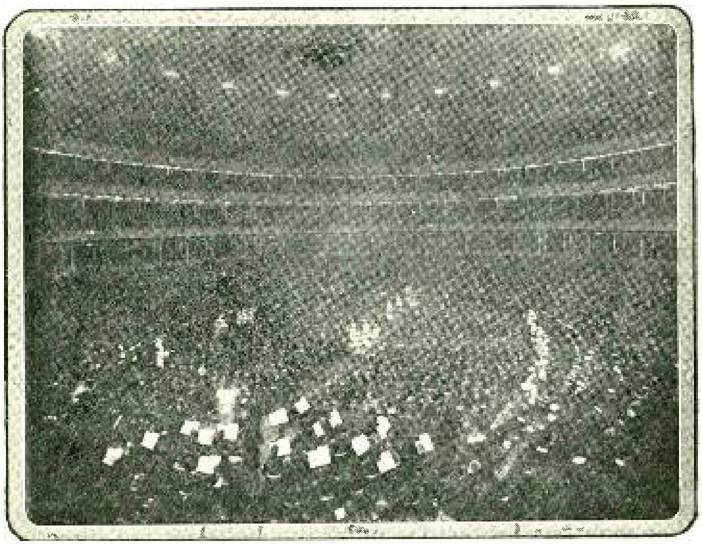
Another method attempts to overcome the trouble by combining together the reception of several receiving stations, because at points a few thousand yards apart the fading is different at any moment of time. The sun may on a cloudy day illuminate one point, but another be shadowed. But the clouds move, and the first point is shadowed while the other is illumined. Over a large area the amount of sunlight is the same (provided the cloud density keeps constant), and by combining illuminations and shadows a sensibly constant input of sunlight is achieved by combining the simultaneously illuminated and shadowed points. Analogously, the combination of several differently fading signals picks up the constant energy over an area. This is called spaced aerial reception. Experiments in spaced aerial reception are taking place by co-operation between the Marconi Company and the B.B.C., and already it can be stated that greatly improved reception is possible.

Meanwhile short-wave transmissions (as apart from receptions) cannot be improved except in obvious ways, and the haphazard erection of transmitters to blaze away into the ether may be effective for publicity, but does not directly help towards the solution of the problem, except in so far as they are worked in co-operation with distant receivers.

distances. The Marconi beam system uses short waves for *telegraph* services, and the practical application of theory has resulted in a system that makes long-distance wireless communication a serious rival to the cables, a condition of affairs never before existing when long waves were used.

It is naturally pertinent to ask, if so successful a communication can be achieved by these short waves bent down and conserved within the wireless whispering gallery between inner surface of the electrified layer and outer surface of the earth, why one broadcasting system should not be linked to another by this means.

The trouble is that the upper electrified layer, bending these rays inward again so as to throw them back on to the globular earth, does not act uniformly or constantly from minute to minute, second to second, day to day or season to season. The layer is not a well-polished mirror, but an uneasy cloud, breaking, twisting, and shifting every second. There



THE ALBERT HALL ON AN HISTORIC OCCASION

*when the Armistice Day Remembrance Festival was broadcast to the Empire*

# THE TECHNICAL ASPECTS OF WORLD BROADCASTING

IF it has been stated once it has been stated a hundred times that the B.B.C. realises to the full the potentialities involved in linking the broadcasting stations of the world to one microphone, but that it considers abortive attempts to forestall technical possibility to be prejudicial to the ideals involved. This re-statement is necessary, although it is gratifying to find that the continued variability of results has damped the ardour of those who wished to rush in where angels feared to tread.

Steady work has been going on, however, behind the scenes to find out if any minimum guarantees of service can be given.

The problem is simple to state, if difficult to solve. It is believed that when waves are radiated from an aerial energised by very high frequency currents, two rays are emitted, one parallel to the ground and one at an angle to it. The ground ray, coming in contact with all sorts of obstacles, eventually peters out—the more rapidly the shorter the wave. The "air" wave is not so impeded, but travels upwards until it hits an electrified layer which embraces the world some hundreds of miles above.

The effect of this layer is to bend the ray back to earth, whence it bounces off again, travels up to the layer again, and so girdles our globe, bouncing and bending, in one seventh of a second. The losses in energy of this indirect ray are less, and the bending power of the layer is greater, when the frequency of emission is higher or, put differently, indirect short waves can be most conveniently used for signalling to the maximum distances on the earth. There are other advantages in the use of short waves—as, for instance, there are not so many atmospheric disturbances to receivers tuned to short waves, and, further, short waves can be directed in a beam in one direction, just as the reflector of a car headlight throws a strong light in one direction rather than a weaker light (with the same energy) broadcast in all directions equally. Lastly, there are more channels of communication available with short waves than with long.

Thus the short wave, with its strong indirect ray, is the most convenient method of communicating over long constructive and useful way. Nevertheless they would doubtless have designed even better instruments if they had possessed scientific training in addition to their natural aptitude. However, practical engineering knowledge for this class of work is essential if the designer is responsible for the workshop processes used to produce the results of the experimental work.

Finally there are those who hold administrative positions on the engineering side of wireless concerns and those who are responsible for designing complete stations, etc. For work of this kind, in addition to general engineering training—preferably extending outside the limits of electrical engineering—an engineer should have spent some time on as many of the other activities connected with his particular organisation as possible. For example, although a good man on this work may not necessarily be a gifted research worker, he should at least be familiar with the difficulties met with in connection with the research work necessary to design the components of the transmitters and receivers he is handling.

If a youth who has just left school has made up his mind to devote his energies to wireless engineering, usually he does not know what exact type of work he will undertake eventually, and naturally he wants to know how to begin. In a case of this kind, undoubtedly the first thing for him to do is to obtain practical and theoretical training in electrical engineering. He should endeavour to obtain an engineering degree at one of the many Universities which confer such degrees, or he may work for the Associate Membership examination of the Institution of Electrical Engineers.

It is hardly necessary, perhaps, to emphasise that experience in a works and on a test-bed is essential whatever academic qualifications are obtained, and in some cases this practical experience is arranged by the Engineering College working in conjunction with a commercial firm. If he selects one of the colleges which includes a certain amount of wireless work as an alternative subject in its electrical engineering course, he will soon find out whether he really wishes to devote himself to the serious side of this work all his life.

# WIRELESS ENGINEERING AS A CAREER

THERE are comparatively few engineers engaged in wireless work to-day who started their careers with the definite idea of specialising in this type of work. Probably the majority of them have suffered little or no disadvantage from this fact, because wireless engineering is really only a highly specialised branch of electrical engineering. Most people engaged in a profession will argue that it is unwise to specialise before undergoing a general training.

Even wireless engineering has several sub-divisions. The largest class consists of wireless operators, either sea-going or on land. It is necessary for a wireless operator to pass an examination held by the Postmaster-General before he can go to sea in a British merchant ship. This examination is theoretical and practical, and of course includes a test of efficiency in the Morse code. Speaking very generally, it is not necessary for an operator to have received a complete training in electrical engineering, although the examination necessitates a certain amount of general electrical knowledge. On the other hand, if it is intended to go to sea for some years, and eventually to pass on to some other branch of the work, such as experimental work or design, it is most desirable to possess as much general engineering experience as possible.

The second class includes those engaged in research and design. A most valuable asset for the former is an aptitude for carrying out experiments of any kind in a methodical and useful way. It is not absolutely essential to be a trained electrical engineer, but a good research man with engineering knowledge will find himself at a considerable advantage in commercial employment over his colleague who has spent all his time in laboratories. A knowledge of how to use mathematics to solve practical problems is most desirable. A sound knowledge of fairly advanced physics is also most valuable.

There are, of course, a large number of people engaged purely on research and design work in connection with the manufacture of broadcast receivers. Many people have designed really excellent receivers without any very deep knowledge of the scientific principles involved, simply because they have the gift of carrying out experimental work in a the ordinary external adjusting handles. *It is not sufficient merely to switch off the set.*

Perhaps it might be well to remind listeners that it is advisable not to take a shock from a high-tension battery, especially where the voltage is considerably above 100 and where the accumulator type of battery is in use. It is always a sound plan to avoid taking a shock of any kind even from voltages below 100.

Finally it is most necessary to remind listeners that wireless is not responsible directly for any of the very few fatal accidents that have taken place. The primary cause has been faulty electric light fittings or gross carelessness or ignorance.

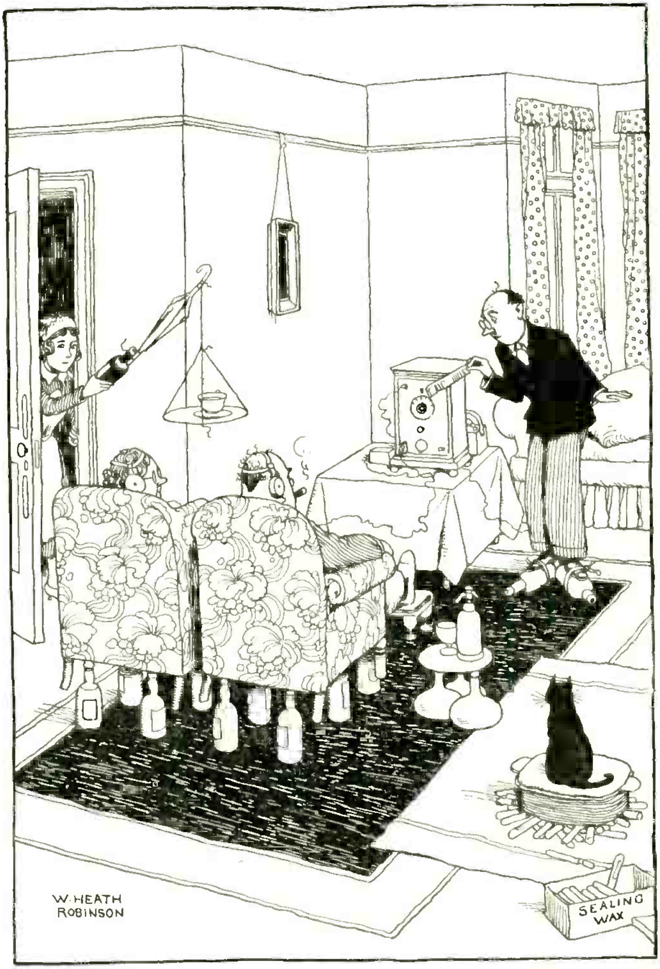
"THE MAN WHO BOASTS HE CAN GET TIMBUCTOO ON ONE-VALVE"

*Reproduced from the B.B.C. (free) pamphlet on Oscillation* are taken the risk is extremely slight. Most electric light mains have one wire connected to earth, therefore a shock will be received by any one who touches the other wire while simultaneously touching some metal object which is connected to earth. For example, imagine that an electric reading-lamp has become defective in such a way that the metal parts are in contact with the "live" wire of the supply mains. If now someone grasps a lamp in one hand and touches the earth lead of the wireless set with the other, a shock will be received: this also happens if he touches a water or gas pipe.

A shock may also be received in a similar but less direct way if a pair of defective head-phones is being worn in which the metal head-band is in contact with the earth lead via the flexible leads connected to the set. Of course if this happens it means that the insulation between the windings and the metal parts of the telephones has failed. It will be realised, however, that before an accident can occur in this way there must be two defective pieces of apparatus, one forming part of the wireless set, and the other part of the electric light installation. The best way to ensure that this will not happen is to call in an electrician whenever there is the slightest suspicion that anything is wrong with the electric light or power fittings. A further precaution is to connect a high-quality condenser in the earth lead, the capacity of which should be about 0·01 microfarad.

### *HIGH-TENSION UNITS*

When the current for the valves is obtained from the electric light mains, an instrument called a "mains unit" is connected to the supply, so that there will be either a direct or an indirect connection between the wireless set and the supply mains. Manufacturers supply directions with these units, and in the case of good designs all possible precautions are taken to prevent danger to the user. Listeners are advised to follow these instructions implicitly, and if any doubt is felt as to how the apparatus should be connected up, reference should be made at once to the manufacturer concerned. However, speaking generally, the important point to remember is that the plug should be removed from the supply before handling any part of the receiver or mains unit except




HOW TO AVOID ELECTRIC SHOCKS

*The art of insulation*

# HOW TO AVOID ELECTRIC SHOCKS

IT is quite natural that some listeners who have little or no scientific knowledge should be uneasy as to the possible danger to life and property which might arise from a broadcast receiver. Vague stories of peculiar happenings, especially in connection with lightning, are very common. The vast majority of these are incorrect, but the behaviour of lightning is not fully understood even by those who have made a special study of the subject.

### *LIGHTNING*

The first question which presents itself is, What precautions should be taken in connection with the possibility of lightning striking the aerial? Most aerials intended for broadcast reception are erected in such a way that many of the surrounding objects, such as chimneys and trees, are considerably higher than the aerial wire itself. In this case it is doubtful whether the existence of an aerial makes any difference whatever to the lightning risk, which, of course, is present to some extent under practically any conditions, whether a wireless set is installed or not.

If a very high aerial is used, especially in open, bare country, it should be constructed of heavy copper wire and erected with as few bends or turns as possible. The object of this is to make it as effective as possible as a lightning conductor. The earth connection should be particularly good, and should be of the earth-plate type with a large surface. Incidentally it is fortunate that all these precautions will actually improve reception considerably.

An attempt should never be made to use the set during a thunderstorm, and when not in use the aerial should be earthed by a switch mounted outside a window in such a way that the aerial wire runs to earth by the shortest possible route. There is a suitable type of two-way switch which in one position connects the aerial straight to earth and in the other to the aerial terminal of the set, leaving a spark gap between the aerial and earth. See illustration on p. 377.

### *ELECTRIC LIGHT MAINS*

With regard to electric shock from the mains, this may occur in two ways, but provided that reasonable precautions the set gradually gets less and less and you know that the low-tension accumulator is fully charged, then it is most probable that the high-tension battery is running down, and it should be renewed. If wet accumulators are used they will need to be recharged every month or so, but not so frequently as will the low-tension accumulator. As before mentioned, these small-capacity accumulators easily get into bad condition, and care should be taken to see that this does not happen. The grid battery needs renewing from time to time, and it is a good plan, if dry batteries are used for high tension, to renew the grid battery every time the high tension is renewed. A run-down grid battery will cause bad quality, and will also mean that more current will be taken from the high-tension battery, thus discharging this battery far quicker than would otherwise be the case. If crackling noises develop they are probably due to a loose connection somewhere in the set. Keep all terminals tight and keep the set clean. Crackling is sometimes caused by a run-down high-tension battery.

Valves occasionally burn out and other components sometimes give trouble, but these are comparatively rare occurrences, and unless one is an expert it is preferable to call in outside assistance if an obscure fault develops.

The maintenance of the set, therefore, practically reduces itself to keeping the high-tension and low-tension batteries in good condition, and if this is treated as a regular routine job, to be carried out at definite intervals, a good set can be relied upon to give satisfactory service.

NOTICE

The Identification Panels of foreign broadcasting stations which were printed in last year's issue of the Handbook are not included this year owing to the fact that the details connected with each Station are subject to frequent change and cannot be guaranteed as accurate for any length of time. Listeners who require accurate panels for all stations should buy the new revised and enlarged edition of the

WORLD-RADIO IDENTIFICATION PANEL BOOKLET

which is now on sale, price 1/-, and is obtainable from the B.B.C. Bookshop, Savoy Hill, London, W.C.2.

quality, but also the quality of all neighbouring receivers, and therefore it must be avoided at all costs. If your set seems to oscillate too easily, then there is probably something the matter with it. (See article on Oscillation.) Up to a certain point, bringing these two coils closer together, thus increasing reaction, increases the strength, but it should not be necessary for this to be done in order to get sufficient volume. If it is, then the set has not a sufficient factor of safety. That is to say, it has to be worked too near to its limit to give adequate volume.

It is bad practice to reduce the output volume by detuning the receiver. If the volume is too great, and if there is no proper volume control fitted, then the volume may be reduced by dimming the filament of the high-frequency valve, if there is one. This is, of course, possible only if a separate rheostat controls the filament current to this valve. Remember that it is good quality that you are seeking, and if you try to force the set too much, distortion will result.

### *MAINTENANCE*

A good wireless set does not want much attention, but one or two points must be given regular attention if consistently satisfactory results are to be obtained. These are quite simple and we will consider them separately.

The low-tension accumulator will require charging from time to time. The length of time that it will last will, of course, depend upon the amount that the set is used and the number and type of valves in the set. The condition of an accumulator can best be tested by means of a hydrometer, but if one is not available a rough test can be made by taking the voltage of each cell whilst the accumulator is being used. The voltage of each cell should not be allowed to drop below 1·8. It is desirable to have the accumulator recharged before it is completely run down; experience will show how often this will have to be done. A discharged accumulator should not be left in this state, but should be recharged immediately.

If a mains unit is used for high-tension supply no upkeep is necessary. If dry batteries are used they will need to be renewed every two or three months, according to the length of time the set has been used. If the volume obtainable from

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0—·12 volts
0—1·2 ,,
0—12 ,,
0—120 ,,
0—1,200 ,,

**Ohms from ·1 ohm to 1 megohm**

0—1,000 ohms
0—10,000 ,,
0—100,000 ,,
0—1,000,000 ,,


In purchasing an "AVOMETER" you are getting a British Standard 1st Grade production which will do the work of three separate instruments, at a price which is scarcely more than you would have to pay for one.

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**60 volts (reads 66)**
7/11
**100 volts (reads 108)**
12/11
**60 volts Super Power**
13/6
**9 volts Grid Bias**
1/6
**4½ volts Pocket Battery**
each 5d.
**4/6 a doz.**

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# LISSEN SECRET PROCESS BATTERY

**LISSEN LTD., 47-56 Friars Lane, Richmond, Surrey**
MANAGING DIRECTOR: THOMAS N. COLE

L387

tension battery should be connected first, and you should make sure that all the valve filaments light before the high-tension supply is connected. Slight adjustments of the grid bias potentials may be necessary to obtain the best results, but, generally speaking, the makers' instructions should be strictly followed.

Experiment should be made with the loud speaker position. You will find that certain positions are more satisfactory than others, because of the effect of the acoustics of the room.

If, after installing the set, the results are not satisfactory, then call in an expert to advise you. It is probable that you have done something wrong, and it is only fair to the set that it should have every chance to give of its best.

### *OPERATION*

If the set is bought ready-made there should accompany it a set of instructions giving details of operation. The first step is to insert the correct inductance coils. There will probably be two sets of coils supplied, one for tuning the set to London, Daventry 5GB and other medium-wave stations, and the other for tuning to Daventry 5XX, Radio Paris and the other long-wave stations.

The main operation to be performed is that of tuning the receiver to a given wave-length and adjusting the output volume, so that it is just sufficient for your needs. You will be able to find from *The Radio Times* or *World-Radio* the wave-length and frequency of the broadcasting station which it is desired to receive. You will then be able to choose the correct coils to tune to this wave-length, and, having inserted them in their proper holders, the control knobs of the variable condensers (or condenser, if there is only one tuned circuit) should be turned until the station is heard. The instruction book will probably give you a rough calibration of the condenser settings, but the precise settings will depend, to some extent, on your aerial arrangement.

During this tuning operation the reaction coil and the coil with which it is coupled should be kept wide apart. You will find that if these two coils are brought too close together the quality of reproduction will suffer, and eventually the set will oscillate. Now oscillation spoils not only your own good soldered joint should be made between the plate and the wire. If this arrangement is impossible, then the alternative is a good electrical connection to a main water-pipe.

The aerial should be connected direct to the earth lead when the set is not in use, to protect the set against lightning and stray electrical charges that may collect on the aerial. For this purpose an aerial-earth switch of the double-pole double-throw type (Fig. 3) should be used, the centre contacts being connected one to the aerial and one to the earth wire. The contacts at one end of the switch should be connected together by a short strip of wire, and the contacts of the other end should be connected one to the earth and one to the aerial terminal of the set.

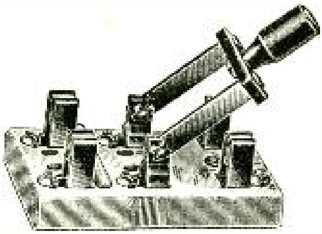

FIG. 3

Fig. 4 shows a good arrangement of an aerial-earth system.

When connecting up the set for the first time, the low-

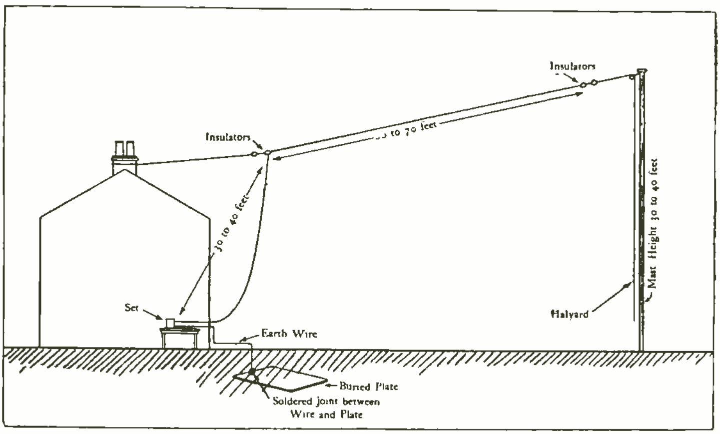


FIG. 4

### *AERIAL*

The aerial should consist of 100 feet of 7/22 copper wire (and let it be copper or a copper alloy, and nothing else), supported at its free end by a metal mast or scaffold pole about 30 feet high. There is no need to have a twin wire aerial, a single wire is quite satisfactory, and installation is simpler.

### *INSTALLATION*

An efficient aerial is an essential if satisfactory results are to be obtained from the set. This is especially so if you are situated on the fringe of the service area of the broadcasting station, because if the aerial is inefficient it will not be able to collect from the ether the comparatively weak electromagnetic impulses which, after detection and magnification, operate the loud speaker or telephones.

Now an efficient aerial implies that its height above ground should be as great as possible; it should be erected as far as possible from the walls and the roof of the house, and it should not be screened by neighbouring trees. The usual type is an inverted L shape. The total length of the horizontal portion and the down lead should not exceed 100 feet, and the latter should be kept well away from walls. Porcelain insulators are necessary to insulate the aerial from the halyards. It does not matter in which direction the aerial points, but if it is in close proximity to telephone or power lines, then, if possible, it should be at right angles to them. The broadcast licence limits the length of the aerial to 100 feet, but even if this were not so, there is no point in having an aerial very much longer for reception on the medium wave-lengths. Aerials receive 5 XX more efficiently if they are longer than 100 feet. In fact, if you are situated very close to a broadcasting station and wish to cut this station out in favour of one which is much weaker, then you would probably do better with a shorter aerial, thereby improving the selectivity of your set.

Aerial wire may be used for the earth lead, which should be as short as possible. The best sort of earth consists of a zinc or copper plate, about 3 feet square, buried 2 or 3 feet in the ground, as close as possible to the receiving set. A supplied with them, and these instructions should be followed. For a grid-leak detector from 60 to 100 volts are necessary, and for an anode-bend detector a higher voltage may be used, providing the necessary grid bias is employed. The high-frequency valve of Fig. 2 may be given the highest permissible voltage, which is generally from 120 to 150 volts, with suitable grid bias. For the low-frequency valves the highest possible value of high-tension voltage should be used, in order that the undistorted volume obtainable from the set may be a maximum. On the last low-frequency stage at least 150 volts should be used, with the correct grid bias. If this stage employs a very low impedance valve, then the high-tension current will be high, and if dry batteries or accumulators are used, it should be seen that these are big enough.

The low-tension battery is a simpler proposition, and should be two, four or six volts, according to the valves used. It should be of adequate capacity. For a two-valve set it should not be less than 30 ampere-hours, and for a four-valve set it should be at least 40 ampere-hours. If smaller batteries are used, the discharge period will be so short as to make it frequently necessary for the battery to be recharged. It is a good practice to have two low-tension batteries, so that while one is being used the other can be on charge.

The grid battery is a small, dry battery, and the voltage required will vary according to the type of valves used and the high-tension voltage. For the higher impedance class of valves in the low-frequency stages, and for average high-tension voltage, a 15-volt battery will probably be found to be sufficient, but the lower impedance valves require more grid negative, and probably a 36-volt battery will be necessary. The values of grid bias to be used are generally stated on the valve instruction sheets.

### *LOUD SPEAKER*

The best set possible will not give satisfaction if it has to work a poor loud speaker. Do not try to economise on the loud speaker. A perfect one should reproduce adequately over the whole range of audible frequencies. Choose your loud speaker, therefore, with care, but remember, however, that a good loud speaker will, if anything, show up the faults of a bad set even more than will an inferior loud speaker.*

* See also the article on Modern Loud Speakers on p. 334.

*Models range in Oak or Mahogany from* **£5 10s.** *to* **£25.** *Showrooms one minute from Victoria Station.*


MODEL C 12.

*Write for particulars, and of our "Woodroffe" type Gramophone Pick-up,* **£4 4s.**

# Tributes from the Press

**"Wireless World" dated April 15th, 1928, writes:—**

"Whether the 'Celestion' Loudspeaker was designed in accordance with theoretical principles or whether it just happened is immaterial; we gratefully accept it as THE EMBODIMENT OF ALL THAT IS BEST IN CONE LOUDSPEAKER REPRODUCTION.

"We have recently tested a Model C 12 in mahogany which sells at £7 10s. and note with satisfaction that the high class standard which the makers have set for themselves in the past is being maintained."

**"Popular Wireless" dated March 31st, 1928, writes:—**

"It is some time since we have experienced so much pleasure during a loudspeaker test and WE HAVE NO HESITATION IN SAYING THAT WE CONSIDER THIS 'CELESTION' A LONG WAY AHEAD OF ITS CLASS. Those of our readers who have the opportunity should endeavour to hear it in operation. We are sure they will agree with us when we say it is a revelation in what sound design and construction mean to such an instrument."

**"Celestion" is British Made Throughout.**

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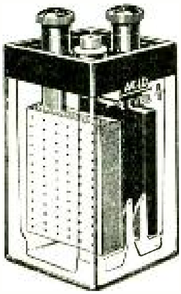
# L.T. BATTERIES FOR EVERY SET



**TYPE DTG.**

Voltage . . . 2 volts
Capacity . 20 amp. hrs.

**TYPE DFG.**

Voltage . . . 2 volts
Capacity . 45 amp. hrs.

**TYPE DHG.**

Voltage . . . 2 volts
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*These cells are also the best for electric bells.*

**EXIDE TRICKLE CHARGERS.**

For houses with A.C. electric supply we recommend a combination of Exide batteries and the new Exide Trickle Charger for H.T. and L.T.

*Write for leaflet No. 5011 describing these Chargers.*

**Exide "Mass" Type L.T. Cells,** as illustrated, types DTG, DFG and DHG, possess the special property of being able to stand for long periods without detriment, even when partially discharged. They are therefore particularly suitable for all sets using low-consumption valves.

They are the most durable and economical in existence, as no other range of cells will give so many burning hours per charge in relation to first cost.

Prices **4/6, 8/6** and **14/6** per 2-volt cell.

**Exide CZ Type** batteries are the standard L.T. type for the average multi-valve set and are capable of handling comparatively heavy currents for long periods.

Capacities range from 20 to 60 ampere hours.

These cells give steady current with absolute reliability at the lowest price consistent with a first-class job.

Prices **11/3** to **21/-** per 2-volt cell.

## Exide

## THE LONG LIFE BATTERY

*Obtainable from any Exide Service Agent or your Local Dealer.*

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*Advertisement of the Chloride Electrical Storage Co. Ltd., Clifton Junction, Manchester.*

of which it is capable, the magnification of the set is too great, and these valves may advantageously be replaced by others of lower magnification; the first low-frequency valve may now have an impedance of 6,000 to 12,000 ohms, and the second of not more than 4,000 ohms. This will allow the set to produce its maximum volume without distortion. It is not good practice to use a high-impedance valve in the first low-frequency stage and follow it by a very low-impedance valve in the second stage, because in such a case the first stage will not be capable of delivering to the second stage undistorted signals of sufficient volume to feed the second stage adequately. An increase in high-tension voltage will increase the undistorted volume of which a valve is capable, but it will not necessarily increase the over-all magnification.

### *BATTERIES*

Consider now the high-tension, low-tension and grid batteries. For high-tension supply there are three main alternatives—dry batteries, accumulator (wet) batteries and the electric mains. If there is no electric supply available, then, of course, the listener is limited to either dry batteries or accumulators. If dry batteries are used, they should be of large capacity, and they will need to be renewed every few months, while if accumulator batteries are used, these can be recharged when they are run down, and their life is several years, providing they are properly used and looked after. The proper maintenance of these small-capacity accumulators is most important.

If electric mains are available, then although the initial cost is comparatively high, the mains unit is probably the best solution of the high-tension problem. A unit designed to work from D.C. mains will cost less than one for A.C. mains, because in the former case it is not necessary to have rectifying valves or a transformer. As these units work from the public supply, they must conform to the local rules of the electricity undertaking, and therefore it is not desirable that any one not versed in electrical practice should attempt to make such a unit from components.

The values of high-tension voltage required for the various types of valves are generally given in the instruction sheets voltage that they require. Most valves now made have either two-, four- or six-volt filaments. There are one or two exceptions to this; for example, certain low-frequency "power" valves recently introduced require a filament voltage of $7\frac{1}{2}$ volts, but the main body of the valves now made fall into one of these three classes. The valves in each class are differentiated by their varying magnification factor and impedance (or, more correctly, differential resistance).

It is not within the scope of this article to explain these two terms, but the one varies approximately in proportion to the other, and for the purpose of defining the type of valve it is sufficient for our purpose to state its impedance.

Let us now consider what type of valves would be suitable for the sets shown in Figs. 1 and 2. The two-valve set requires one valve which is a good grid-leak detector and another which is a low-frequency power valve. The detector valve should be a high-magnification valve, with a correspondingly high impedance of, say, 20,000 ohms or more. The low-frequency power valve should have an impedance of from 6,000 to 12,000 ohms.

In the four-stage receiver we require a high-frequency valve, a detector valve and two low-frequency valves. The high-frequency valve should have a high magnification factor and an impedance of 15,000 to 30,000 ohms. The detector valve should also be a high-magnification valve suitable for anode-bend rectification. Now the choice of the low-frequency valves is rather more difficult, and it is necessary to find out what over-all magnification and what output volume are required from the set. It should be realised that the two terms are not synonymous, but that they are interdependent. As, in general, the magnification varies roughly in proportion to the impedance, then the greater the impedance of a valve the greater will be the magnification of which it is capable, but the volume it will be able to handle without distortion will be less.

Suppose now we put into the first low-frequency stage a valve with an impedance of 20,000 ohms, and in the second low-frequency stage one of 6,000 to 10,000 ohms. The set will then be capable of giving a certain undistorted volume. If, however, the volume which the set will produce with distortion is considerably greater than the undistorted volume

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across the terminals and your loud speaker will reveal a clarity of reproduction equalled only in the broadcasting studio itself. The "**TONER**" is a wonderful device that removes all the distortion and undesirable noises from any loud speaker or 'phones. Brings out those LOW NOTES and sweetens the high. The result of a long scientific research.

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# The "Goodness" of a Valve

| THE COMPLETE RANGE OF MAZDA NICKEL FILAMENT VALVES | | | | |
|---|---|---|---|---|
| Type* | Max. H.T. Volts | Ampl. Factor | Imp. | Slope |
| **Two Volts** | | | | |
| | | | ohms | |
| G.P. 210 | 120 | 13 | 14,000 | ·9 |
| H.F. 210 | 150 | 20 | 28,000 | ·7 |
| R.C. 210 | 150 | 50 | 180,000 | ·3 |
| L.F. 215 | 120 | 7 | 7,000 | 1·0 |
| P. 227 | 120 | 4 | 2,900 | 1·4 |
| **Four Volts** | | | | |
| G.P. 407 | 120 | 14 | 14,000 | 1·0 |
| H.F. 407 | 150 | 18 | 21,000 | ·85 |
| R.C. 407 | 150 | 40 | 100,000 | ·40 |
| L.F. 407 | 120 | 8 | 5,700 | 1·4 |
| P. 415 | 120 | 5·5 | 2,900 | 1·9 |
| **Six Volts** | | | | |
| G.P. 607 | 120 | 14 | 12,500 | 1·1 |
| H.F. 607 | 150 | 20 | 20,000 | 1·0 |
| R.C. 607 | 150 | 40 | 90,000 | ·45 |
| L.F. 607 | 120 | 9 | 5,300 | 1·7 |
| P. 615 | 120 | 6 | 2,600 | 2·3 |
| P.X. 650 | 200 | 3·5 | 1,750 | 2·0 |

| SPECIAL SUPER-POWER VALVE, 7·5 V. | | | | | |
|---|---|---|---|---|---|
| Type | Fil. Amps. | Max. H.T. Volts | Ampl. Factor | Imp. | Slope |
| B. 12 | 1·25 | 425 | 2·85 | 2,900 ohms | ·98 |

| RECTIFYING VALVE, 7·5 Volts | | | |
|---|---|---|---|
| Type | Fil. Amps. | Max. A.C. Input | Max. D.C. Load |
| R.H. 1 | 1·25 | 550 volts | 65 milliamps. |

The "goodness" of a valve is indicated by its mutual conductance or "slope" figure. Nickel filament valves have higher slope values than any other valves of corresponding types. They are, therefore, better valves. Mazda Nickel Filament Valves are designed and guaranteed by the largest and most up-to-date electrical research organisation in the world. Insist on Mazda Valves and be sure of your results.


* *The prefix letters indicate the purpose of a valve, and the figures which follow, the filament volts and amperes. For example:— L.F. 215 represents a 2 volt low frequency amplifying valve taking 0·15 ampere.*

*The British Thomson-Houston Co. Ltd.*

2961.

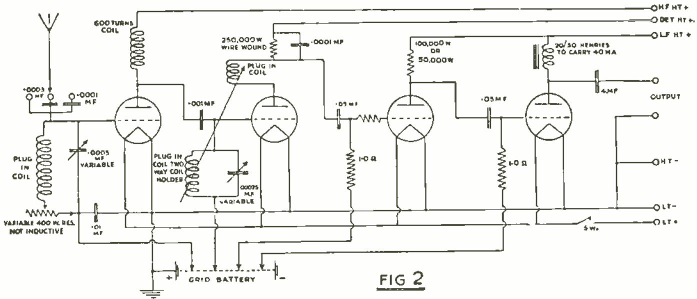



FIG 2

*Note.*—If the impedance of the valve used in the first low-frequency stage is about 20,000–30,000 ohms, then the anode resistance should be 100.000 ohms; if a lower impedance valve of 8,000–12,000 ohms is used then 50,000 ohms is high enough.

should be neatly arranged to avoid as far as possible the introduction of spurious capacity and reaction effects which would tend to make the receiver unstable in operation. Again it should be stated that home construction is not advised unless the constructor has some knowledge of wireless. A badly made set will be inefficient and will never give satisfaction either to the eye or to the ear.

## *ACCESSORIES*

The type of set having been settled, let us consider now the important question of accessories. Under this heading are the valves to be used, high-tension, low-tension and grid batteries, loud speaker and aerial and earth equipment.

## *VALVES*

If a set is bought complete the proper valves to use will be specified by the makers. If the set is home-constructed, then the choice of valves should be made carefully, because the proper working of the set depends to a large extent upon the correct types of valves performing their correct functions. There are so many different types of valves to be had nowadays that it is a little difficult even for the knowledgeable wireless enthusiast to make a choice. Firstly, they can be divided according to the filament (low-tension)

Sufficient information has now been given to enable a choice to be made in the type of set. If there is difficulty in making a final choice between two types, it is best to have the larger set, so that an adequate factor of safety may be assured—that is to say, the set will be able to receive at greater distances than normally required, thus avoiding the necessity of having constantly to work it at its limit.

If, having settled the number of valves, it is decided to construct the set at home, the circuit diagram and lay-out of the components must first be drawn out. Choose the simplest possible circuit consistent with good quality reproduction. Unless you are setting out to build a receiver specially capable of receiving from long distances, quality considerations should come first. It is extremely difficult to design a receiver that will be super-sensitive and at the same time give the best possible quality. Generally if one is aimed at the other must to some extent be sacrificed.

## *TYPICAL RECEIVERS*

Figs. 1 and 2 show a two-valve and a four-valve circuit respectively, each capable of giving good quality and at the same time being reasonably sensitive and selective.

It is not possible in this article to give detailed constructional details. Suffice it to say that only the best possible components should be used; the lay-out should be well thought out on paper before any work is done, and the wiring

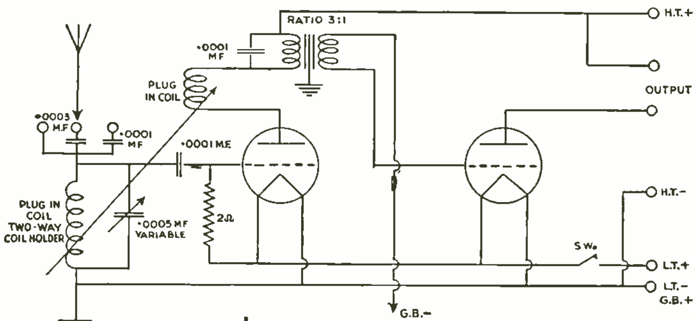
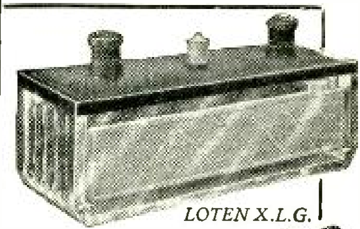



FIG I

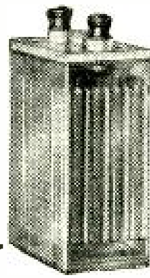
# Accumulators and Batteries

| CAPACITY (VOLTAGE 2V) | LOTEN X.G. TYPE | LOTEN X.L.G. TYPE | B W. TYPE |
|---|---|---|---|
| 10 amps. | 6/- | - | 8/- |
| 20 ,, | 8/6 | 10/6 | 10/- |
| 30 ,, | 10/6 | - | 12/- |
| 40 ,, | - | - | 14/- |
| 45 ,, | 13/6 | - | - |

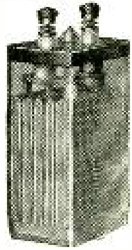
*The capacity of all Ediswan Accumulators is based on the 10 hr. rate.*



*LOTEN X.L.G.*



*B W. Accumulator*



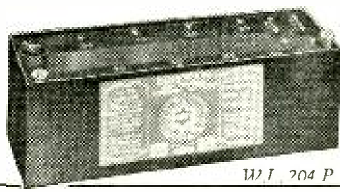
*LOTEN X.G.*

## DRY CHARGED BATTERIES

W.L. 104 P.—9 Volt Grid Bias Battery 18/6 per dozen.

W.L. 204 P.—60 Volts H.T. Battery with Grid Bias Tappings at end—10/- each.

*W.L. 104 P.*



*W.L. 204 P.*

# EDISWAN

THE EDISON SWAN ELECTRIC CO., LTD., 123/5 Queen Victoria St., London, E.C.4

no relation at all to the receiving set which is being used, but it so happens that a four-valve set (one high-frequency stage, one detector and two low-frequency stages) used in conjunction with a good outdoor aerial and on the outskirts of the service area is just sensitive enough to give adequate loud-speaker reproduction of the station. Thus the ranges given in the table for the four-valve set are, in fact, the limits of the service areas of the stations concerned.

### *FADING*

Before leaving this point there is another and most important difficulty which limits the service area of a station, and this is "fading." Outside the service area the ratio of wanted to unwanted signal does not remain constant. The wanted signal is liable to vary in strength, from almost nothing to a maximum, from minute to minute, and these variations are generally accompanied by severe distortion in quality. The mush or unwanted signal remains more or less constant. It would take too long to consider the reason for this here, but it is obvious that this phenomenon has to be taken into account in defining the limits of the service area.

Here is the table referred to on p. 360.

| Type of receiver. | Distance from main station. | Distance from relay station.* | Distance from Daventry 5 XX. | Approx. cost, including accessories. | Remarks. |
|---|---|---|---|---|---|
| Crystal . | 4 miles | $1\frac{1}{2}$ miles | 20 miles | £2— 4 | Including two pairs of head-phones. |
| One valve, with head-phones | 25 ,, | 3 ,, | 100 ,, | £5— 7 | Including two pairs of head-phones. |
| Two valves . (loud speaker) | 20 ,, | 2 ,, | 60 ,, | £10—15 | Including small loud speaker. |
| Three valves | 25 ,, | 3 ,, | 100 ,, | £17—23 | Including large loud speaker. |
| Four valves | 35 ,, | 3 ,, | Anywhere in the British Isles. | £20 and upwards | Including large loud speaker. |

* These ranges are limited by interference from other stations working on the same wave-length.

strength of signal may be greater at a given distance in one direction than it is at the same distance in another.

Now the range figures given apply to the direction where the rate of diminution of strength is greatest, that is to say, in some other directions the station may have a greater range, and it does not necessarily follow that if you are situated just outside the maximum range given for a particular station that reception from that station is going to be impossible. In such cases a local wireless dealer should be consulted, and he will advise as to what local reception conditions are like.

### *SERVICE AREA*

Before giving the table, a few more remarks about range will not be out of place. We have spoken about "really satisfactory results." Let us consider more precisely what is meant by this. When a broadcasting station is being received there is always to be heard a slight background noise or "mush," which is made up of atmospheric noises, interference from other stations (both broadcasting stations and telegraphy stations), noises due to the receiving set itself, etc. For real enjoyment of the programme it is essential that the strength of this mush should be negligible compared with the strength received from the broadcasting station—that is to say, it is the *ratio* of the strengths of what we want to receive and what we do not want to receive which is of prime importance. It has already been said that as the distance from the broadcasting station is increased, so the strength receivable at a point moving farther and farther away decreases. Now unfortunately the strength of the mush remains constant approximately. Thus as we travel away from the station this ratio gets more and more unsatisfactory, until a point is reached where the strength of mush is so great that it is impossible to enjoy the programme. Please note that at this point it does not matter what sort of receiving set is being used (neglecting for the moment the noises inherent in the set itself); it may have one or it may have ten valves, the ratio of mush to programme strength is still the same, and it is only in the area where this ratio is small that "really satisfactory results" can be obtained. Let us call this area the "service area of the station."

It is important to note that the service area of a station has

## *HOME CONSTRUCTION*

When it has been decided to instal a set, the question arises immediately as to whether it should be bought ready-made or home-constructed from components. The latter is generally the cheaper way, but it means that a certain amount of time will need to be spent in the making, and, further, some technical knowledge and skill in using tools are practically an essential. Without suggesting that home construction should be discouraged, it is well to remember that a wireless set is a delicate piece of apparatus, and in a set bought from a reputable manufacturer there is incorporated all his experience in the art of building high-class apparatus, which a newcomer to wireless could not possibly have had. Unless, therefore, the new listener feels confident in his ability to tackle the problem, it is probable that more satisfactory and reliable results will be obtained from a ready-made set.

## *PERFORMANCE OF SETS*

On the basis, therefore, of purchasing a complete set, and not components, let us consider what sort of set is necessary and what it is going to cost.

The simplest set of all is the crystal set, which requires no batteries or valves, but which is very limited in the results it will give. Such a set will give headphone reception up to the distances given in the table on p. 364, but however close it may be to any station, it will not operate a loud speaker without the addition of an amplifier.

Next in order of performance (and cost) is the one-valve set; then the two-, three- and four-valve sets, and so on up to the "super" sets, which may have eight to ten valves.

On p. 364 is a table which gives the approximate ranges up to which the various sets may be expected to give really satisfactory results. Some idea of cost is also given, but this will naturally vary considerably, according to the finish of the set, cabinet used, etc. A word of explanation is necessary concerning the range figures. The strength of signal from a broadcasting station decreases as the distance from it increases, and theoretically this diminution in strength is at the same rate in every direction. Owing, however, to geographical considerations, this is seldom the case, and the

# THE A.B.C. OF THE RECEIVING SET

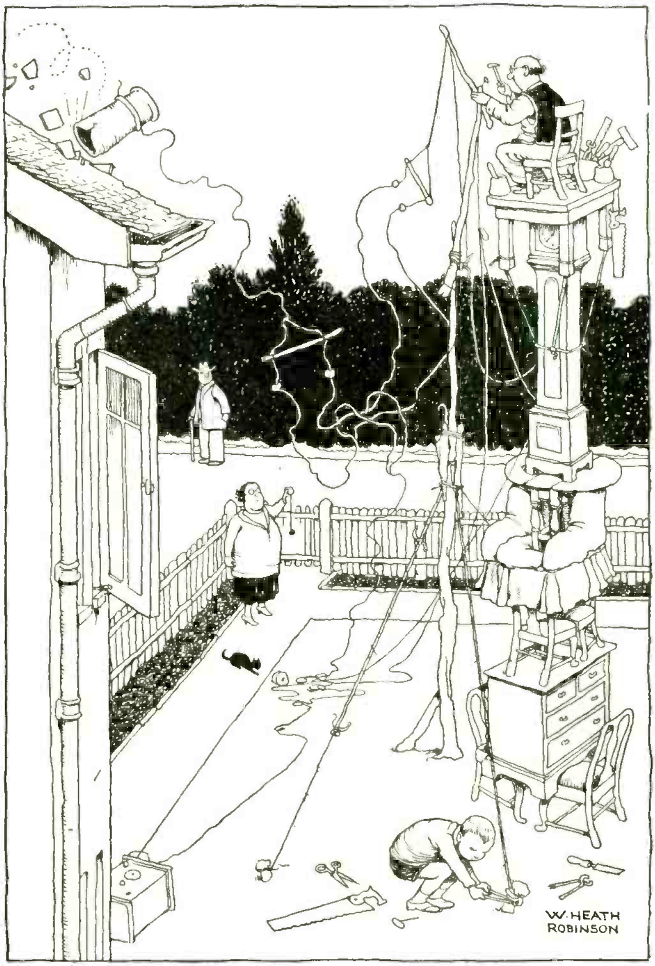
SOME of the technical articles in this Handbook imply that the reader has some previous knowledge of wireless. This article is intended for those who possess no such knowledge, nor as yet a receiving set, but who, realising what they are missing in not availing themselves of the broadcast service, wish to repair this omission as soon as possible. Further, judging by the inadequate sets and inefficient installations one sometimes sees, the information to be given may be of interest to those who, although already possessed of a set, are not obtaining from it the pleasure and good results that they should.

### *CHOICE OF SET*

Although there are more than two and a half million licences already issued, there are still newcomers to wireless at the rate of several thousand per month, and, with no technical knowledge to guide them, these potential listeners are seeking information as to what sort of set to buy, how much it will cost, how it should be installed, what performance may be expected and what to do to maintain it in first-class order.

Let no one be deterred from buying a set because of the apparent complexity and multiplicity of types, or because the set belonging to Mr. Blank next door gives hideous quality most of its time and never seems to keep in proper working order from one day to the next. Depending upon the distance from the nearest Broadcasting Station, it is an easy matter to choose a set suitable to one's requirements, and as for ensuring consistently good results, this is just a question of attending regularly to one or two simple tasks requiring practically no technical knowledge.

The design of sets has now advanced to a stage where there is no excuse for bad quality of reproduction. There is no worse advertisement for broadcasting than a receiving set emitting howls and discordant noises. It is irritating to every one and unfair treatment of the really good quality of the transmissions.




ERECTING AN AERIAL

smoothing circuit to any machine great care should again be taken to avoid the use of long connecting wires, and the condensers should be placed as near the brushes as possible. It probably will not suffice to connect the condensers across the armature terminals of a starter or controller which is situated some few yards from the machine.

It is unfortunately not possible to outline the various experiments which can be tried, owing to the wide variety of sources of interference. However, the B.B.C. is always pleased to offer any assistance it can by correspondence.

Where possible it is endeavoured to anticipate potential sources of interference and to suggest cures to their manufacturers, before they are produced in large quantities for distribution over the country. Some manufacturers of household apparatus are now prepared to fit anti-interference units to their machines for a small additional cost.

The B.B.C. is doing everything in its power to protect the listener from man-made static; and although this work may not be as spectacular or obvious to listeners as are some of the other activities of the Corporation, it might be remembered that the better it is done the less will the need for it be noticeable.

"SOME PEOPLE PRODUCE WHISTLING NOISES IN THEIR LOUD SPEAKERS TO AMUSE THEIR FRIENDS" possible, and ask him for his co-operation and assistance. The first step should be to convince the owner of the machine that it causes interference, and to ask him if he would care to communicate with the B.B.C. in case a cure can be suggested. It is possible that we can help by the suggestion of some inexpensive addition, such as condensers or earth bonding. If the B.B.C. is being consulted, full details of the machine should be given, such as make, type and horse-power, whether direct or alternating current, nature of load, etc.

It has been found in practice that a good electrical earth is the most practical means of improvement. Many machines are mounted on dry concrete beds, and only obtain their earths through the mains which feed them. A good earth contact can be made by clamping an earth lead under the head of a bolt as near as possible to a good earthing point, such as the conduit which carries the mains, and the shortest possible earth lead employed. Earth leads which are unnecessarily long or of poor conducting ability are practically useless, and copper strip or stranded wire should be used. Another common method is to connect two 4-microfarad condensers across the brushes, with the centre point earthed to the frame of the machine, as is shown in Fig. 2. Fuses are advisable on each side of the circuit as a protection against a breakdown in the insulation of either of the condensers. In fitting this

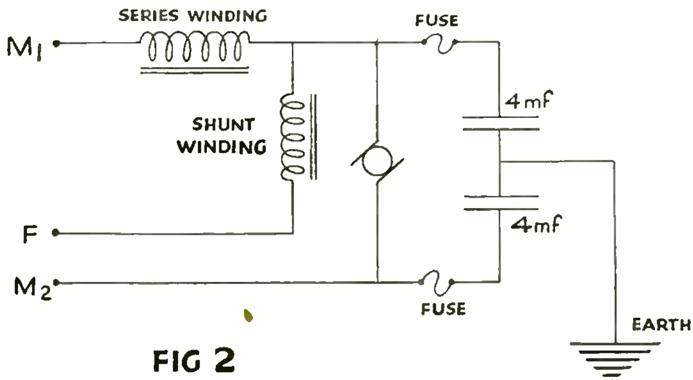



FIG 2

signal strength and should not be employed unless the receiver possesses ample high-frequency magnification.

4. If the receiver employs a choke or transformer output connection to distant loud speakers, the extension leads should be earthed on one side.

Probably it will be found that none of these suggestions produces an appreciable reduction in the extent to which the interference to any given broadcast transmission is present, and it will then be necessary to treat the source of interference itself. In some instances this, again, will be impracticable, as the disturbance may be due to electric tramways or some other machinery controlled by a large organisation. As far as is possible, the B.B.C. endeavours to assist in such cases by maintaining a working liaison and co-operation with the controlling authorities of such bodies, through which individual listener's complaints can be voiced, and experiments made as necessity arises.

Considering the case of tramway interference, for instance, it is believed that the bulk of the trouble is due to the somewhat intermittent nature of the running contact by which the tramcar obtains power from the overhead conductor. The tramway authorities can hardly be expected to make sweeping and expensive changes in the present methods of overhead collection solely for the benefit of the broadcast listeners who live near their routes. It is therefore necessary to find a device which will provide the tramway authorities with an economical working of their systems, besides causing an appreciable reduction in the interference to broadcast reception. Both the Post Office and the B.B.C. have been active in this search, and experiments have been carried out in England and abroad. The so far necessarily limited number of tests have given encouraging results, and they will be continued as soon as possible. A conversion to a new system of collection is now taking place in certain towns in England, where it will be available for test on a commercial rather than an experimental basis.

Of the other potential sources of disturbance probably the running of a near-by electric generator or motor is the most common. If this is believed to be the cause, we would advise the listener to approach its owner in the most friendly way

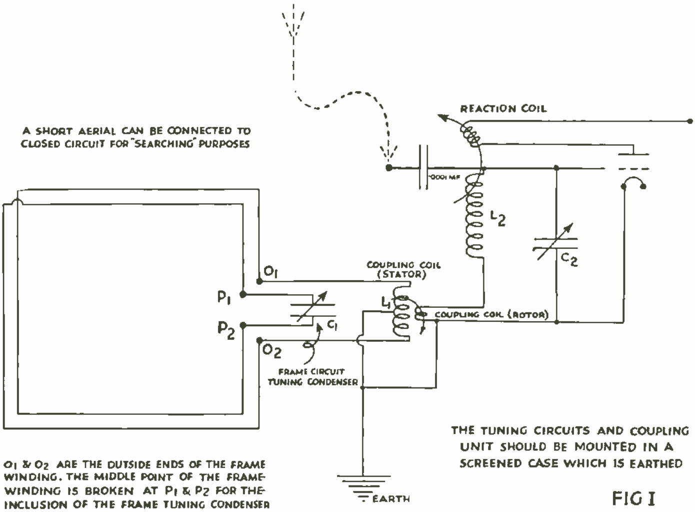


FIG I

similar manner the receiver circuits will resonate at the frequency to which they are tuned (the wave-length of the required broadcast programme) on receiving a shock or an impulse from the source of electrical interference.

Unfortunately there is little which the listener can do by alteration of his receiver to reduce the "interference level" caused by this shock excitation from electrical machinery. If, however, experiments are being tried we would suggest that:—

1. Reaction is not forced, or the receiver allowed to be anywhere near a state of oscillation.
2. A loosely coupled circuit with both the aerial and secondary circuit separately tuned is a possible means of reducing interference such as that which is caused by single sparks, as in the case of switch contacts, lift controllers, etc.
3. A frame aerial, with the centre point earthed as is shown in Fig. 1, is sometimes helpful. Such an aerial, however, will cause a considerable reduction in

# MAN-MADE STATIC

ONE of the more common types of interference which the listener can experience is that caused by the working of electrical machinery in the neighbourhood of his receiver. The noise which this makes is often similar to atmospherics, and has consequently been termed "Man-made Static."

It is not proposed, in this short article, to enumerate all the types of electrical machinery which can cause trouble, as such a list can be obtained from the B.B.C. if required. In general, it may be assumed that a spark at any electrical contact will indirectly cause some interference to a near-by wireless receiver, although whether the disturbance is a noticeable background to the broadcast programme depends on many factors, such as the signal strength of the broadcast programme or the proximity of the sparking contact to the receiver. In London, for instance, disturbance may not be noticeable on the local transmitter, 2LO, but will be sufficient to be audible when listening to either of the Daventry stations. As a simple experiment a listener can prove this for himself by testing the effect of switching on and off an electric lamp when listening to a number of stations of different strength. He will probably find that his loud speaker emits a "plop" or "scratch" louder in the case of the weak stations than it does when the local station is being received; or that the lights in the room in which the receiver is installed make a more noticeable disturbance than the lights in other parts of the house. Continuous sparking, such as that existing between the commutator and brushes of an electric motor, will cause a succession of impulses making a noisy background to reception. Unlike Morse or oscillation, this type of interference is not tuned to or near the wave-length of the receiver, but affects it by "shock excitation"; and is consequently only noticeable over comparatively short distances from its source As an analogy we can imagine that a bell or gong is being struck at the rate of, say, eight blows a second. The note given out by the bell is not the extremely bass note of four C's below middle C (sixteen cycles per second), but is the natural frequency or resonance note of the bell, which will be very considerably higher. In a

M

whether the trouble lies in his own receiver, and the B B.C. appeals to all complainants to obviate the risk of making a frivolous complaint by taking a little trouble in reading the pamphlet.

When making a complaint to the B.B.C., it should be borne in mind that a visit from the Post Office inspectors cannot take place in less than a week, and it is therefore useless to complain unless the interference is continuous and sufficiently frequent to allow a reasonable chance of its being present when the inspectors call. If this is the case, you are fully entitled to seek protection from the G.P.O., but should the oscillation only be present occasionally for short periods, it will serve your purpose better if you make a few inquiries locally. Many an oscillator has been silenced by a listener asking the suspect himself to assist him in tracing the offender.


SUSPECTED! FRIGIDITY ON THE 9.15

Having outlined the procedure, it may be of interest to listeners to know how it works in practice, and to state a few of the lessons which have been learnt in the handling of it.

The Post Office and the B.B.C. are extremely anxious to do all that is possible to concentrate their activities for the benefit of real, rather than waste them in the investigation of frivolous, complaints.

During the last four months the B.B.C. has received 2,935 complaints of oscillation, to the writers of which questionnaire forms, pamphlets, etc., were forwarded. 824 of these questionnaires were returned, filled in in a sufficiently satisfactory manner to enable them to be passed to the Post Office for investigation. The Post Office has not yet reported to the Corporation the result of its investigations into all these complaints, but the following figures give a summary of the reports which have been received. The oscillator has been located by the listener in 323 of the complaints received, and has been warned by the Post Office. Of the remaining 501 cases which have been investigated, the G.P.O. inspectors have located and silenced the oscillator in 149 cases, the licence being withdrawn if the interference was deliberate. No oscillation has been heard, despite repeated visits, in 61 instances. The complainant's own receiver has been found to be at fault on 41 occasions. The complainant has told the G.P.O. inspectors that the trouble is not serious in 59 instances, although no cancellation post card was forwarded, which would have saved the expense of the investigation.

The above figures, unfortunately, are not exactly an encouragement to the G.P.O. to enlarge its system of direction-finding vans and local inspectors—particularly those instances in which the fault has been found in the listener's own apparatus.

One of the questions on the questionnaire form is "Are you prepared to demonstrate that the cause of the disturbance complained of does not exist in your own apparatus?", and this has been answered in the affirmative in all those instances in which the fault has been found to be due to the complainant's own receiver. The Oscillation Pamphlet contains ample information by which a listener can verify

DETECTIVES LOCATING AN OSCILLATOR

for investigation or rejected, in which case Mr. X. will be given the reasons for its rejection or asked for further information. When the case is passed to the Post Office the share of the work which the B.B.C. undertakes is nearly completed.

It is not possible for the B.B.C. to send engineers to investigate the interference in the listener's immediate neighbourhood, as the authority to enter a suspect's house and examine his receiver is vested wholly in the Post Office. This authority is provided by Clause 5 on the back of every broadcasting licence.

The investigations on the site are carried out either by Post Office telephone engineers, who will probably examine every receiver in the complainant's immediate neighbourhood, or by means of direction-finding vans. In some cases many visits have to be made before the oscillation is heard, and consequently there is occasionally considerable delay before the result of the investigation is sent to the B.B.C.

# OSCILLATION

THE B.B.C. receives approximately 15,000 complaints of interference from oscillation in a year, and consequently it is thought that listeners may be interested to know the procedure by which those letters are handled.

In the first instance, it should be realised that this work is shared between the G.P.O. and the B.B.C., although the Postmaster-General is the final authority. The B.B.C. carries out all the correspondence work, obtaining all the necessary details concerning a complaint, and giving any technical advice that is needed by means of pamphlets and correspondence. The Corporation also obtains from the complainants the exact information which is required by the G.P.O. before inspectors can be sent to locate the culprit. When all the details are collected by the B.B.C. the whole complaint is handed to the Post Office officials, who ultimately report the result of their investigations to the B.B.C.

In order to trace the course of a complaint, let us assume that Mr. X. complains of oscillation. A questionnaire, bearing the number of the complaint, is sent to Mr. X., while details, such as the date on which the complaint is received and answered, are entered on a counterfoil. A copy of the Pamphlet on Oscillation is enclosed with the questionnaire, as tests which are suggested in the questionnaire are explained in the pamphlet. A post card of distinctive colour is enclosed, addressed to the B.B.C. and stating that the interference has ceased, so that the complaint can be cancelled with a minimum of trouble to Mr. X. should the remarks in the pamphlet provide a method of stopping the interference. If the oscillation ceases and a cancellation card is received, the date of the cancellation is entered on the counterfoil of the questionnaire and the matter is closed, pending a further complaint.

Assuming that the Oscillation Pamphlet does not enable Mr. X. to locate and silence the offender, it is hoped that he will answer the questions on the form and return it to the B.B.C. On its arrival at Savoy Hill it will be very carefully examined (as some of the questions are intended to catch frivolous complainants), and either passed to the G.P.O.

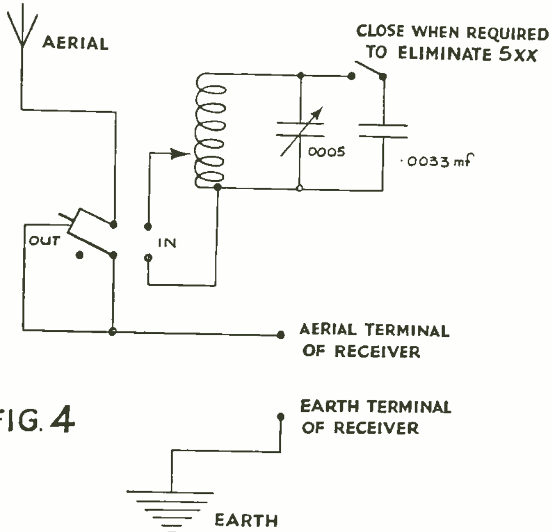



FIG. 4

the best type of fixed condenser with small tolerances in stated capacity, as the cheaper condensers are only guaranteed accurate to $\pm 15$ per cent. The easiest way to obtain a capacity of 0·0033 microfarad is to use two condensers of capacity 0·0003 microfarad and 0·003 microfarad connected in parallel. In general a wave-trap is not as satisfactory as a coupled circuit for the removal of Morse stations, such as ship stations of the "spark" type, owing to their flat tuning. If the wave-trap is not required in circuit when the local station is being received, it can be removed conveniently and efficiently by the employment of a double-pole switch, as is shown in Fig. 4. The B.B.C. will be pleased to hear from any reader who builds a wave-trap to this specification and finds it in any way unsatisfactory.

In view of any possible difficulty in obtaining a former of any one specified diameter, the correct number of turns, size of wire, and tapping positions are given in the following Table for a series of tubes of different diameters.

| Coil No. | Diameter in ins. | Length of Winding. | No. of Turns. | Size of Wire. | Wave-length Range when tuned with 0·0005 micro-farad Variable Condenser. | Taps at following Turns. |
|---|---|---|---|---|---|---|
| 1 | $3\frac{1}{2}$ | $2\frac{2}{5}$ | 54 | 20 D.C.C. | 130–635 | 4th, 8th, 13th, 23rd, 39th. |
| 2 | 3 | 3 | 62 | 20 ,, | 125–604 | 5th, 10th, 15th, 28th, 46th. |
| 3 | $2\frac{3}{4}$ | $2\frac{1}{2}$ | 62 | 22 ,, | 120–602 | 5th, 10th, 15th, 28th, 46th. |
| 4 | $2\frac{1}{2}$ | $2\frac{1}{8}$ | 68 | 24 ,, | 130–650 | 6th, 12th, 18th, 29th, 47th. |
| 5 | 2 | 2 | 76 | 24 D.S.C. | 130–625 | 6th, 12th, 18th, 31st, 48th. |

The range of wave-lengths over which the wave-trap will be effective is shown approximately by the figures given in the sixth column for each design of inductance, although these ranges may alter slightly according to the tapping point which has to be used.

The method of fixing the coil to the panel or base-board is left to the ingenuity of its constructor. One good way is to secure wooden cradles at each end of the former, which can be either glued or screwed to the base-board. Another is to insert a plug in one end of the former, which can be screwed on to the base-board. On no account should glue or other fixing solution be smeared over the winding, or in any other way should the winding be allowed to become moist. If old or damp wire is used, the finished coil should be dried out by placing it for some hours in a warm place.

In the event of this method of selectivity being required to eliminate Daventry 5XX in addition to medium wave-length stations (250 to 500 metres) the increase in wave-length can be achieved by switching in a 0·0033-microfarad fixed condenser in parallel with the 0·0005 variable condenser as required. It is advisable to ask the local dealer for

to wind the five appropriate turns over a thin piece of ebonite or wood, which can be made in one length as is shown in Fig. 3.

An alternative method is to raise the five turns with the point of a knife so that they can be bared without injury to the turns on either side.

The five tapping points need not be made off to a stud switch or other permanent fixing, as they are only of an experimental nature, in order that the listener may try the effect of connecting the aerial to each of the five positions. It is unfortunately not possible to simplify the construction of the wave-trap inductance by the specification of only one tapping point, as the optimum point of connection of the aerial to the coil will depend on the strength of the signals which it is desired to eliminate. If extremely strong signals are to be removed, it will be necessary to use tap No. 4 or 5, while if the unwanted signals are weaker, better results will be obtained by the use of tap No. 1, 2 or 3. The nearer the aerial can be connected to the end *B* of the inductance, the less will the inclusion of the wave-trap circuit affect the tuning and general orderly behaviour of the receiver.

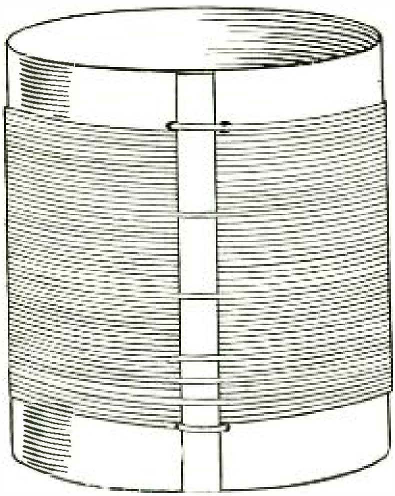


Fig. 3.

Once the best tapping point has been found by experiment, the aerial lead should be connected permanently, and no further use made of the other four tap positions.

The circular tube or former on which the wire is wound should be of any non-conducting material, such as paxolin, ebonite, cardboard (or even a glass bottle), but must on no account be of tin or other metal.

connecting the aerial to it at the most suitable tapping point (*P*) for the listener's particular receiving conditions.

The details for a satisfactory coil for a wave-trap are shown in Fig. 2.

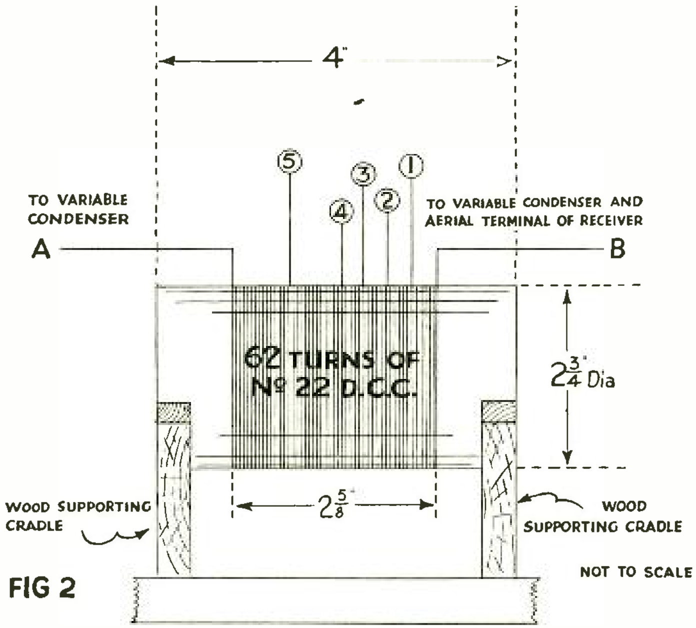



FIG 2

The two ends of the winding are brought out at *A* and *B*, and in addition five connections, or tapping points, are made to it, shown by the numbered leads 1, 2, 3, 4 and 5. In winding the inductance, great care should be taken to prevent the insulation or covering of the wire from being stripped or damaged, as the wave-trap will probably not work if the bare wire of two adjacent turns is allowed to touch, and the two turns become short-circuited. This precaution should be observed particularly when the tapping points are being soldered to the five positions on the inductance.

The most simple way of avoiding the possibility of this is

# A WAVE-TRAP

THE relative advantages of the coupled circuit and the wave-trap as a means of improving the selectivity of receivers have been explained on pp. 321–330 of this Handbook, and therefore this article will deal only with the design of a series wave-trap.

Wave-traps are of two types—series wave-traps or stopper circuits, which provide a path of high resistance to the unwanted wave-length, and acceptor circuits, which provide a path of extremely low resistance to earth.

We will consider only the series wave-trap, as it is more applicable to broadcast requirements, and is easier to operate than an acceptor circuit.

In Fig. 1 is shown a wave-trap circuit, connected in series with the aerial lead of a receiver. It will be seen that it consists only of an inductance and a variable condenser. When this circuit is tuned to the frequency which it is desired to eliminate, a path of high resistance exists only at that frequency between the aerial and the aerial terminal of the receiver. As the wave-trap circuit L.C. is only tuned to one frequency or wave-length, it can only oppose waves of that frequency, and therefore allows transmissions on all other wave-lengths to pass unhindered. It should be noticed that a wave-trap is an external addition to the receiver, and can be added without any alteration being made to the actual construction of the receiver.

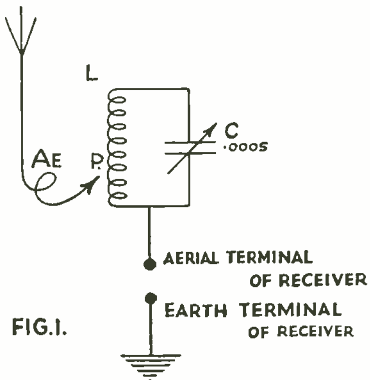



FIG.1.

If a listener is desirous of building a wave-trap himself, we would advise that he obtain a 0·0005-microfarad variable condenser from his local dealer, if possible with a vernier adjustment, as the tuning is likely to be extremely sharp. It will then only be necessary to wind the inductance coil ($L$) and to provide a means of

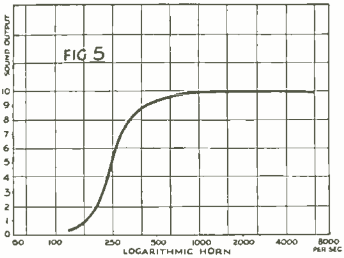
In commercial types, however, we find mechanical resonance at a low frequency and also a "breaking up" of the cone at high frequency, with characteristics as shown in Fig. 8. On the whole this type of loud speaker, even as it is now, marks an improvement when considered purely in regard to its frequency characteristic.

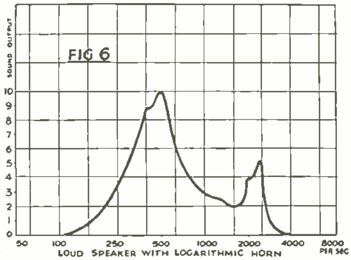
We thus see that the moving-coil type, either with or without a horn, has certain inherent advantages in producing a good frequency characteristic. In its usual form, with a baffle but no horn, it is moderately applicable to home use; the horn type is perfectly feasible for public address systems, for speaking films, etc., etc.

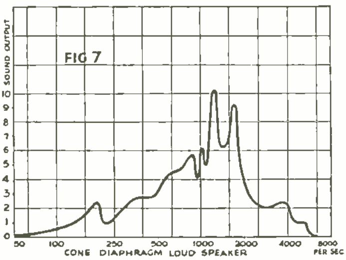
Turning now to the question of proportionality of output with input at any frequency, we again find the moving-coil type as presenting certain theoretical advantages, inasmuch as its movement need not be limited (within inches almost!) for bass reproduction—most iron diaphragm and reed movements limit the bass by rectification. It must be realised, however, that large movement is not necessary in absolute quantity, movement for pure bass need only be great in proportion to that for the high frequencies.

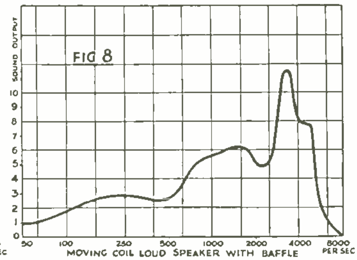
Lastly, the question of inertia in the movement. The writer is of the opinion that "mass control" (such as in moving-coil loud speakers as generally constructed) introduces a fundamental bar to perfect quality reproduction. The more highly developed ear of the musician resents the blurring or, as he would call it, lack of "attack" in some loud speakers, and more particularly in those where mass control is fundamental. Many really musical people prefer headphones to some loud speakers. The engineer will realise that mass control has therefore this fundamental disadvantage, that the inertia of the movement slurs the initial abrupt oncome of the orchestra's attack, losing much of beauty and crispness in the reproduction. The writer has, however, heard a loud speaker which, to musicians, is a revelation; as the revelation is susceptible of explanation by engineers, one might almost say that the dawn of a new era is brightening!

It is only fair to say that it would be impossible to predict what type of loud speaker will eventually be chosen as representing the best.



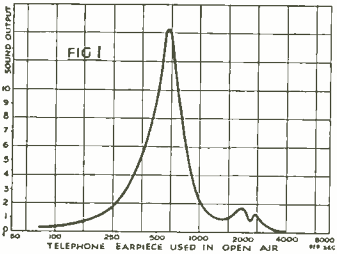



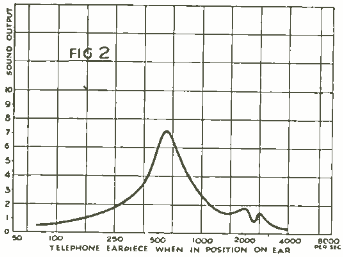



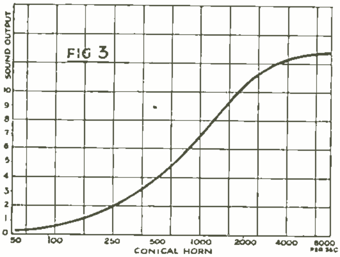



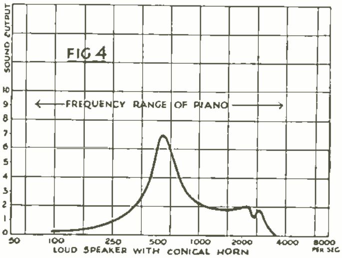

consisting of electro-magnets which attract iron armatures or reeds or diaphragms, and a fault in many of these movements is that they do not operate in proportion to the electrical input. That is one of the reasons why they are sometimes lacking in the low frequencies, as, to get out these low frequencies properly, a large movement (relative to that at high frequencies) of the diaphragm is necessary, and such movement is not always mechanically possible. The result is that what is called rectification is set up, resulting in the production of higher harmonics but not of the lower frequencies themselves.

Moving-coil loud speakers have extremely good frequency characteristics. The moving-coil loud speakers, as their name implies, contain no moving iron; instead a coil in a magnetic field moves an attached diaphragm in relation to the coil current. The relationship between sound output in one direction and input current to the coil can be made to approximate closely to the ideal of equal sound pressure output for equal current input.



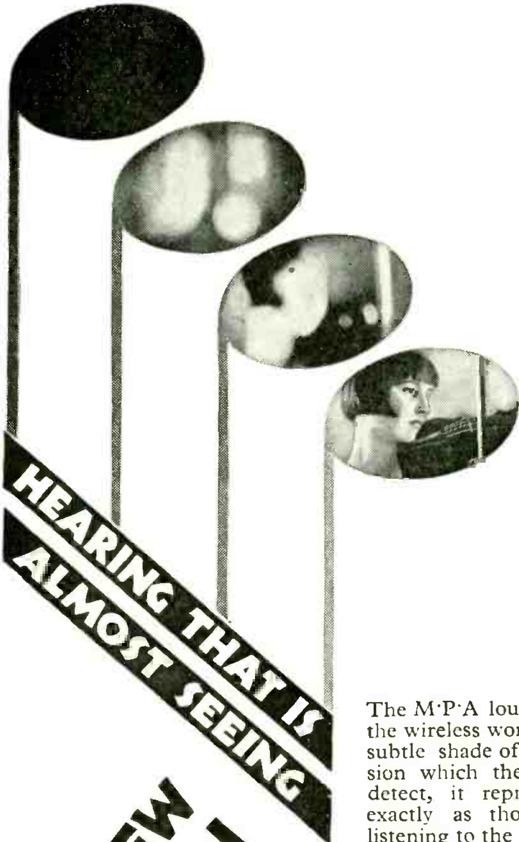




loud speaker, you must have the horn at least fifteen feet long and an electrical movement which is fairly free from resonance in the audible range of frequencies. Recently this type of loud speaker has been developed for special purposes. As a "home" product it is apt to be clumsy, and the twisting of the horn for compactness may introduce other troubles.

Loud-speaker designers have lately broken away from the horn to the large diaphragm type, in which sound is communicated to the air by means of a large diaphragm, which is operated by some form of electrical movement.

Some of these cones have particular resonances, which are introduced on purpose to remedy some defective part of the frequency curve. Fig. 5 is the curve of a good cone loud speaker, and it will be seen that the low frequencies have been introduced by means of a faked resonance point, round about 180 cycles, but even then this type of loud speaker gives out practically no pure tones for frequencies less than 120 cycles.

All these types of loud speakers have electrical movements

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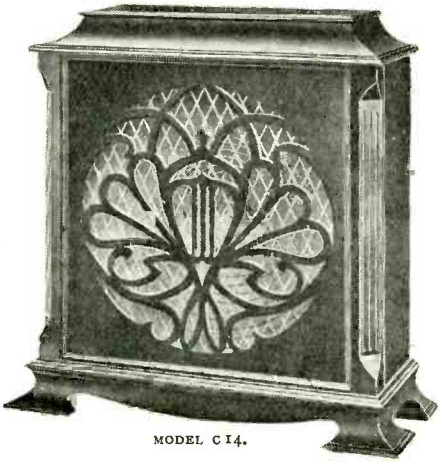

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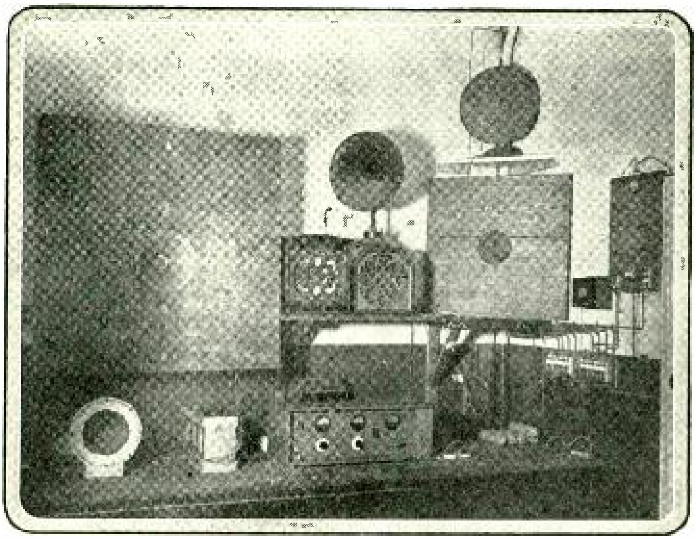
*Associated Company:* CONSTABLE-CELESTION CO., PARIS small chamber of the ear acts as a damping to the movement of the telephone diaphragm, and consequently reduces the violence of the resonance peak and makes the music sound much more natural. Naturalness in reproduction, on our basis, is synonymous with the treatment of all frequencies equally, which means that the frequency characteristic of the instrument is a straight line, having no resonance peaks to indicate that certain frequencies are favoured in comparison with others.

The first loud speaker was developed from the telephone ear-piece by placing a conical horn in front of the diaphragm of the receiver. This acted in two ways. First of all, it acted like a megaphone in concentrating the energy of sound coming from the diaphragm. Secondly, the air column of the cone acted as a damping and tended to reduce the effect of the resonance peak of the diaphragm. Fig. 1 shows the frequency characteristic for a telephone receiver when used in the open air, as, for instance, in the example with the phones laid on the table. When the ear-piece is placed against the ear, the peak is reduced and we get a curve as in Fig. 2. The way in which a conical horn of given length deals with various frequencies is shown in Fig. 3, and the combination of conical horn with telephone receiver gives the curve shown in Fig. 4.

The next development was that of a horn which would deal as far as possible equally with all frequencies. It was found that the logarithmic type of horn would do this, provided that it was sufficiently long. The logarithmic horn of the type used generally on ordinary size loud speakers of the present day is satisfactory for the medium and high frequencies, but fails in the low frequencies. It has an effect as shown in Fig. 5. The ordinary horn loud speaker usually combines a telephone ear-piece with the logarithmic horn with a few minor modifications which need not be mentioned here, and the result is to get a curve as in Fig. 6, which represents the performance of the average horn-type loud speaker.

It will be seen that this type of small horn loud speaker does not, in its present form, produce any pure tones below 170 cycles, which is the frequency of a note half an octave below middle C (256 cycles). To get a good result on a horn



A GROUP OF MODERN COMMERCIAL AND EXPERIMENTAL LOUD SPEAKERS

consider how loud speakers have developed and their present shortcomings.

The original sound-producing instrument was, of course, the telephone receiver, which in design differs, even at the present day, very little from the first Bell receiver. It consists of an iron diaphragm, fixed in front of an electro-magnetic system, the edges of the diaphragm being firmly clamped for mechanical reasons. The result of this is that the diaphragm has a very strong resonance of its own, and this resonance is bound to show up when the receiver is used for listening to speech or to music. You have only to take a pair of head-phones and connect them to the loud-speaker output of your set with a strong signal, and to lay the phones on the table, to hear what seems to be an almost continuous note of one frequency coming from the head-phones. This jarring note is the resonance frequency of the diaphragm. Directly, however, you put the telephone over your ears, the air in the

# MODERN LOUD SPEAKERS

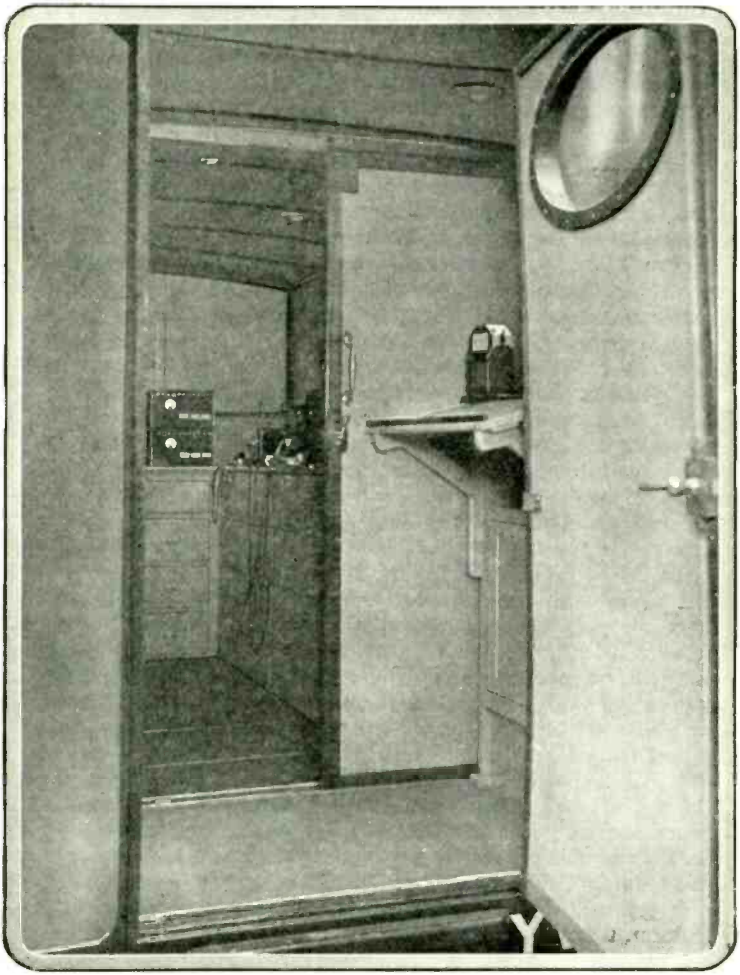
IT is generally admitted that the loud speaker is at the present moment the least perfect part of the whole broadcasting system. A year or two ago, before satisfactory measurements could be made of the performance of microphones and of loud speakers, these two components were always regarded with suspicion. Then it was only possible to make accurate measurements of the performance of amplifiers, transmitters and receivers because purely electrical circuits and electrical quantities were involved. Recently, however, more accurate methods of measurement have been evolved, and they show that the microphone as used at the present day is comparatively perfect as regards its frequency characteristic—that is to say, it deals with all frequencies of the musical scale fairly equally. The loud speaker, however, even in its best form, is far from perfect.

If we define exactly what we want in the perfect loud speaker, our requirements would be something as follows:—

For a given voltage supplied to the loud speaker, or alternatively, a given current passed through the loud speaker, we want the same output of sound pressure at a point, say, six feet away from the front of the loud speaker for all musical frequencies. In other words, we want this input energy created into an amount of sound energy which is the same for all the frequencies under consideration, measuring this energy, say, in a direction in front of the loud speaker. In the first case, we do not want to worry as to whether the distribution of sound round about the loud speaker is the same as that in front. This, however, comes as a later consideration when the perfect loud speaker as defined above has been evolved. Secondly, we want our loud speaker to operate in such a way that if the electrical input is increased in any proportion, so the sound pressure produced is also increased in the same proportion. Thirdly, we require immediate response to sudden, transient disturbances.

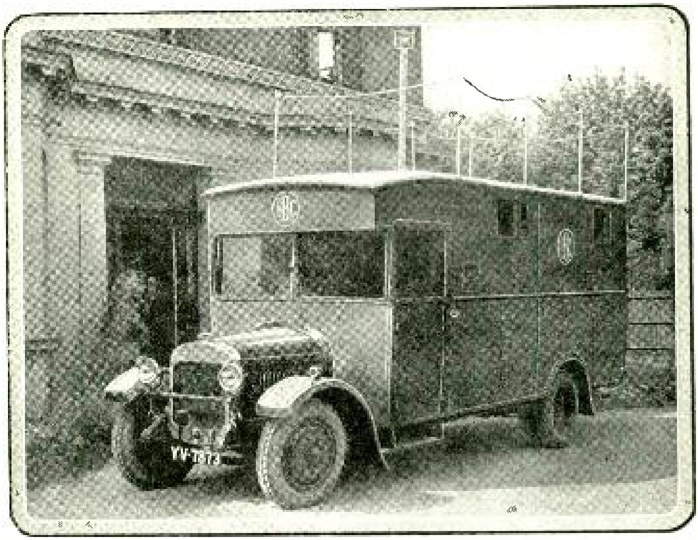
In search for best quality, we will not worry for the moment about purely material considerations such as cost and maintenance. We will also disregard for the moment the question of efficiency, important as it is in practice.

Having seen exactly what our requirements are, let us



INSIDE THE LORRY

*Note the microphone on the desk in the outer compartment. The interior is electrically lighted throughout, including a red signal light for the studio. A sliding door shuts off the engineer's room.*



# THE NEW LORRY FOR OUTSIDE BROADCASTS

The lorry has a studio compartment inside (shown on the opposite page) and facilities for erecting a microphone on the roof where broadcasting from a high viewpoint is desirable.

The internal arrangements include:—

Input for six lines and/or six external microphone points: controlled by a six-way control unit and switchboard, having twenty-two two-way control switches enabling the Engineer to:—

(*a*) use one or more microphones at a time;
(*b*) communicate by telephone with Savoy Hill and/or external microphones and/or from external microphones to Savoy Hill;
(*c*) change over from one P.O. line to another, or to reserve line;
(*d*) superimpose output of one or more microphones on to that of another.

The switchboard output passes to first- and second-stage amplifiers and then on via P.O. lines to Savoy Hill. Permanent lines are installed in the car studio.

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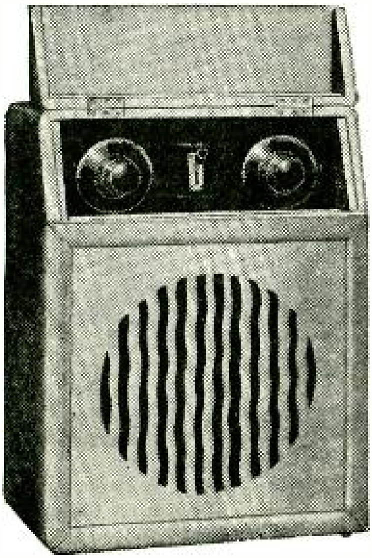

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rotating the coil *X* and observing whether the signals disappear entirely when this coil is exactly at right angles to coil *Y*.

### *MORSE INTERFERENCE*

This circuit is very effective where interference is being experienced from stations using the "spark" system. This includes the majority of ships. Most transmitters of this type may be regarded as radiating a large part, but not all, of their energy on their allotted frequency, which in the case of ships is 500 kilocycles (600 metres). The remaining energy is radiated on other frequencies in the neighbourhood of the main frequency, extending to many kilocycles on either side.

In the earlier types of "spark" transmitters a very considerable proportion of the energy is radiated on the neighbouring frequencies, which, of course, include a large portion of the frequency band allotted to broadcasting. It is for this reason that a series wave-trap is not entirely effective for cutting out interference of this kind, because, although it may reject signals within a comparatively narrow frequency band, it cannot reject frequencies widely separated from its resonant frequency. A circuit such as that shown in Fig. 3 will in most cases be more effective than a wave-trap in removing spark interference, but in practice it is usually found that the coupled circuit method is most effective. It has to be borne in mind that, however excellent the receiver may be, it is usually impossible to remove a strong spark station entirely. From what has been said above, it will be apparent that the reason for this is that a small portion of the energy from the latter is being transmitted actually on the wave-length to which the receiver is tuned, and the solution of this difficulty lies more with the offending transmitter than with the receiver. The same difficulty applies also to atmospheric disturbances, a severe atmospheric disturbance being in effect equivalent to a very powerful station many hundred times worse than the most flatly tuned of spark transmitters.

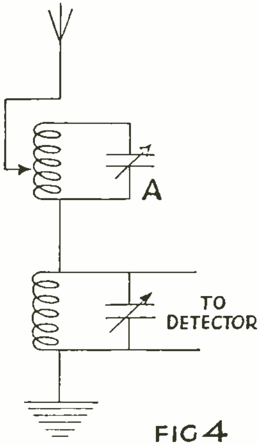



FIG 4

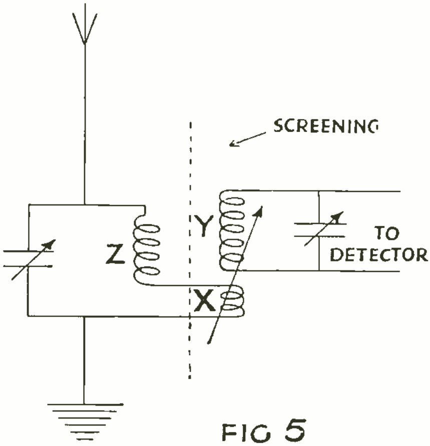
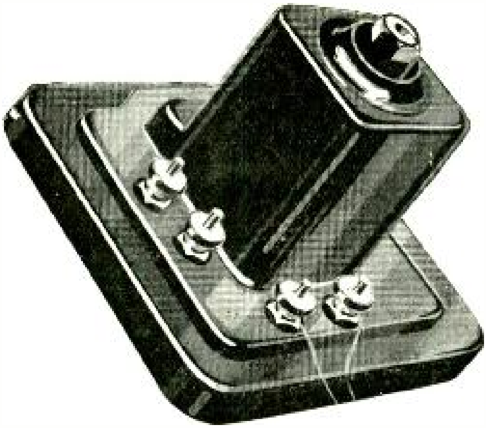



FIG 5

way as method 1, 2 or 4. The function of the circuit *A* is merely to reject one particular station without affecting the performance of the receiver itself. It will be evident that the great advantage of this method is that it does not tend to introduce distortion by making the tuning circuits of the receiver over-selective. It should be emphasised, however, that only one station is eliminated, and if two or three stations are causing interference, this circuit is not practicable. Full details of suitable windings, etc. for a wave-trap of this type are given on page 344.

Method 4 consists of a loosely coupled and separately tuned aerial circuit which is used less for broadcasting than any of the three circuits just described, although in the realm of commercial wireless it is very widely used. Its unpopularity amongst listeners is probably due to the fact that it is not very easy to adjust, and unless it is properly designed the results are disappointing. It is essential that the coil *Z* shall not transmit any signal to coil *Y* except through the variable coil *X*. The best way of obtaining this result in practice is to enclose each of the coils *Z* and *Y* in a separate copper screening box. It is quite a simple matter to test whether there is any spurious coupling, either electro-static or electro-magnetic, between the coils *Z* and *Y* (Fig. 5) by



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| Complete outfit for 2 rooms for any make of circuit, using All from the Mains set ... | 47/6 |

In each case, each additional room 7/6 extra.

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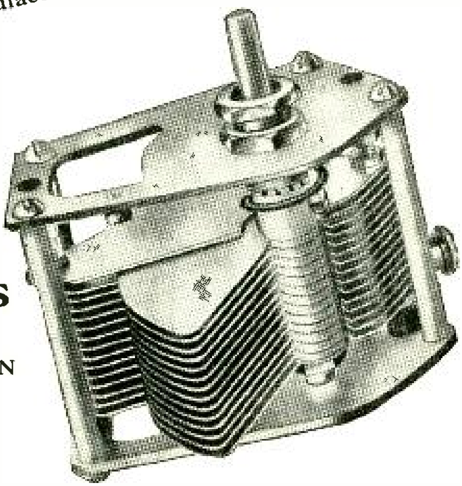

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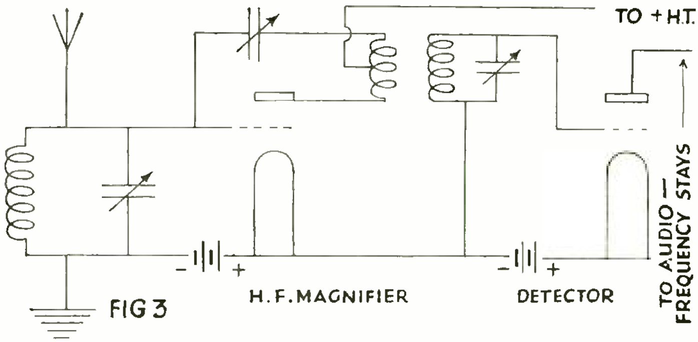


FIG 3

of an existing set, but it is only satisfactory for crystal sets and valve sets where there is a considerable amount of strength to spare. When the series condenser *K* is inserted in the aerial, it will, of course, be necessary to retune the condenser *K*1, and with crystal sets in particular it will be noticed that this will give weaker signals.

In the case of valve sets, the loss of strength will be small if reaction is increased slightly. However, it cannot be too strongly emphasised that too much reaction must not be used, or distortion will result, for the reasons explained above. The other circuits (B) and (C) shown in Fig. 2 give similar results to (A).

Method 2 is illustrated by Fig. 3, which shows one stage of high-frequency magnification using a high-frequency transformer with a neutrodyne connection. Where the signal strength is very great, it may be necessary to include in the aerial the series condenser shown in Fig. 2 (A).

This circuit gives a high degree of selectivity, but some distortion will result if more than a small amount of reaction is used. Even if no reaction is used, the same distortion will occur to some extent if the coils are wound to have an unusually low value of resistance.

Method 3 is probably the soundest method technically when the listener wishes to separate two strong stations such as 5XX and 5GB, or 5GB and the local station. It should be noted that the series wave-trap as shown in Fig. 4 does not actually increase the selectivity of the receiver in the same

This is rather more than is necessary for ordinary broadcast reception, because, as already mentioned, stations which are near together geographically are always given a greater separation than 20 kilocycles. However, for general broadcast purposes we must be certain of being able to separate easily two stations giving the same strength and working with a separation of about 100 kilocycles.

It is important to note that it must still be possible to separate the two stations when both are giving strong signals—that is to say, a strength exceeding 5 millivolts per metre, which corresponds to the minimum field strength for crystal reception under average conditions.

### *METHODS OF OBTAINING SELECTIVITY*

The question now arises, What is the best way to obtain this result? There are four outstanding methods, which are as follows:—

(1) One of the aerial circuits shown in Fig. 2.
(2) Tuned high-frequency magnification such as that shown in Fig. 3.
(3) A wave-trap, as shown in Fig. 4.
(4) A coupled circuit, as shown in Fig. 5.

Fig. 2 (A) shows the simplest way of increasing the selectivity

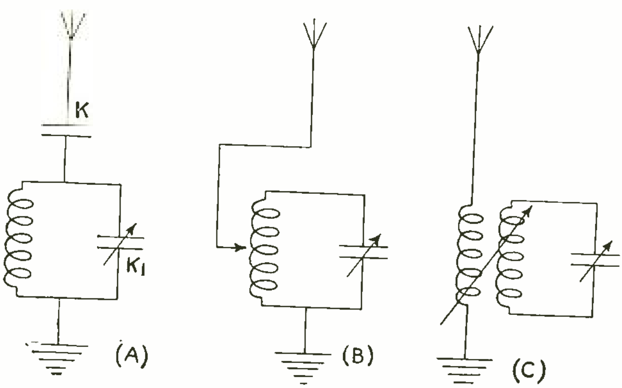


FIG 2

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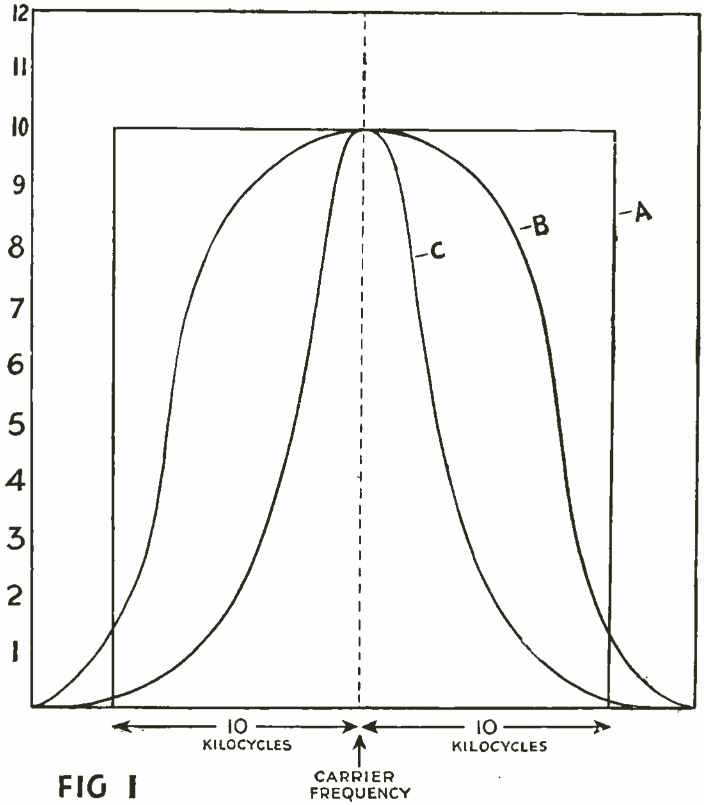



FIG I

similar to *B*, we should suffer slightly from what is called side-band cut-off, *i.e.* loss of the very high musical frequencies, but we should receive nothing from a station only about 20 kilocycles away from the station to which the receiver was tuned. This would be the case even when an unwanted station was comparable in strength with the wanted one.

Broadly speaking, this is the performance to be expected from a receiver having, say, two stages of selective-tuned high-frequency magnification or from a superheterodyne set.

For practical considerations we may assume that the side-band frequencies, as they are called, extend to 10,000 cycles per second on each side of the fundamental.

This means that the high-frequency circuits of the broadcast receiver must reproduce equally all frequencies up to 10,000 cycles higher and down to 10,000 cycles lower than the fundamental frequency of the transmitting station. Thus all frequencies within a 20-kilocycle band must be accepted, and all frequencies outside this band rejected.

Stations in Europe are spaced only 10 kilocycles apart, whereas, strictly speaking, they should be spaced 20 kilocycles apart if theoretical overlapping is to be avoided. By separating stations close together in frequency but far apart geographically, 10 kilocycles works in practice.

It should be mentioned here that in the design of a broadcast receiver not only do we wish to prevent interference from other broadcasting stations, but we also wish to cut out all other wireless stations, including "damped" wave stations using the spark method of transmission. The peculiar difficulties introduced by transmitters of this type will be referred to later.

Pictorially these requirements are shown in Fig. 1, where the curves show the response of a tuning circuit when the frequency is varied. The "curve" marked *A* shows a theoretically perfect performance, assuming that musical frequencies up to 10,000 p.p.s. are to be included. The curve marked *B* shows roughly the compromise which usually has to be accepted if a high degree of selectivity is required. The curve marked *C* shows the effect of using a circuit which is too selective, and it will be seen that a frequency separated by about 5,000 cycles from the fundamental—that is to say, a musical note of 5,000 cycles—is reproduced at about one-fifth the strength as compared with a note of say 500 cycles per second. In practice this condition will give hollow and excessively rounded quality, and the higher frequencies such as "S" sounds will be absent altogether. Most listeners will be familiar with this effect, as it always occurs when an excessive amount of reaction is used. Thus, although a moderate amount of reaction improves the sensitivity and selectivity of a circuit, too much produces distortion.

If now we could produce a receiver with a tuning curve

# SELECTIVITY OF RECEIVERS

WHEN a wireless receiver is tuned to a particular station the amount of inductance and capacity in the tuning circuits is so arranged that they respond more readily to electrical vibrations of a certain frequency than to any others.

If a tuning circuit has to respond to a certain frequency, the total amount of inductance and capacity present in the circuit must always be equal to a definite figure, but the proportion of inductance to capacity may be varied.

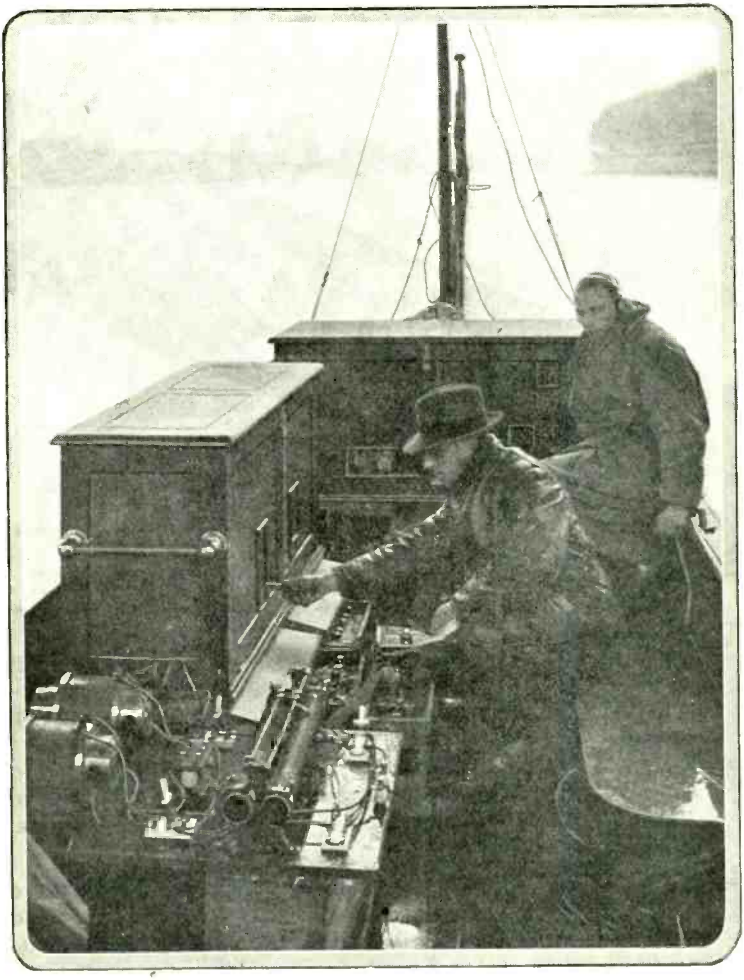
This means that if we have a circuit tuned to a certain frequency we can, if we choose, increase the amount of inductance and decrease the capacity in such a way that the circuit still remains tuned to the original frequency.

Although a tuned circuit responds more readily to vibrations at its own natural frequency, it does not mean that in practice it will not respond at all to vibrations of other frequencies. The extent to which it responds to its own natural frequency as compared with other frequencies depends on the ratio of the inductance of the circuit to its resistance, which determines the selectivity of the circuit.

If, therefore, we have two coils, both possessing the same amount of inductance, but one having twice the resistance of the other, each will require the same amount of capacity to tune it to a certain frequency, but the circuit containing the larger amount of resistance will respond less to the resonant frequency, and, therefore, the degree of response to unwanted frequencies will be greater in proportion. In "low loss" coils the resistance is less as compared with other coils of the same size. Sometimes the amount of resistance is specified at a certain frequency; the frequency being mentioned because the resistance is not the same at all frequencies.

### *THE NECESSITY FOR SELECTIVITY*

We now come to the question, To what extent should a broadcast receiver be selective? First of all, it is necessary to point out that a broadcasting station does not transmit one frequency only, but includes a small band of frequencies on either side of its fundamental or carrier wave-frequency.



THE TECHNICAL APPARATUS USED IN THE B.B.C.'S LAUNCH AT THE 'VARSITY BOAT RACE

effect is to introduce some additional instability due to the low-frequency valves magnifying to some extent the high-frequency potentials. It is therefore necessary to take great care to prevent high frequencies from entering the low-frequency circuits. The commonest form of prevention is the use of a by-pass condenser. If this condenser is made sufficiently large to by-pass efficiently the high frequencies (particularly on longer waves such as 5XX), the high audio frequencies are also by-passed. It is therefore preferable to design a filter circuit which passes equally all the audio frequencies but by-passes and stops all high frequencies. Another method is to insert a resistance as close as possible to the grid of each low-frequency valve. The value of the resistance may be of the order of 20,000 ohms, and must be non-capacitative. The latter method is due to Captain H. J. Round.

Transformer coupling is rather more efficient than resistance coupling in preventing high frequencies from entering the low-frequency amplifier.

### *POWER SUPPLY*

For reasonable volume at least 200 volts at 25 milliamperes are required for the power valve, whilst the remainder of the valves may take another 5 to 10 milliamperes. For really good volume 300 or more volts at 20 or more milliamperes are required. This usually means battery eliminators or accumulator high tension. Where battery eliminators are used, it is advisable to use very large condensers on the output side of the unit to avoid low-frequency reaction. Where two-electrode detectors are used, the detector high tension is not supplied from the eliminator; this reduces considerably the possibility of low-frequency reaction. A push-pull output circuit has a similar result, as no low-frequency current need pass back through the eliminator circuit.

### *CHOKE COUPLING*

Choke coupling has the advantage over resistance coupling that the voltage at the anode is practically that of the battery. Its chief disadvantage lies in the falling off of reactance at low frequencies. If the reactance falls to a value comparable with that of the valve resistance, the amplification will be reduced. As a rough rule, the reactance of the choke should be two to three times the valve resistance at the lowest frequency it is required to amplify.

Choke coupling is, therefore, not very good with high-resistance valves. A 50,000-ohm valve would require a reactance of 150,000 ohms. This at 30 p.p.s. would be 800 henries approximately.

### *TRANSFORMER COUPLING*

This has the advantage over choke coupling that the anode voltage is practically that of the battery, plus the advantage of step-up, thus increasing not only the magnification, but also the factor of safety and consequent freedom from distortion. Therefore where it is known that a transformer has the required performance, it is advantageous to use it. Transformer design has considerably improved during the last few years, so that transformers having good frequency characteristics are now on the market and may be safely used. Many bad transformers are still on the market, however, and only those which have a guaranteed performance which satisfies the requirements of the receiver should be used.

Trouble is frequently encountered in receiver design due to the presence of high-frequency E.M.F.'s in the low-frequency circuits. The effect is to reduce the factor of safety of the low-frequency circuits. For instance, if the grid negative to a particular stage of low-frequency amplification is, say, 6 volts, and the maximum peak value of low-frequency potential normally applied to the grid is 5 volts, no grid current will occur. If there is, say, 2 volts of high-frequency potential superimposed upon the grid, then the maximum value of potential on the grid will be 7 volts; as this exceeds the grid negative, grid current may occur, and so cause distortion. Similarly in regard to the non-linear portion of the grid voltage anode current characteristics. A further

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*Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2* design a resistance capacity unit having a perfect performance as regards frequency characteristic. In general, the anode resistance is made 3 to 5 times the valve resistance. The following grid leak should have about 5 to 10 times the resistance of the anode resistance. The coupling condenser should be sufficiently large to pass the lowest frequency without reduction. The capacity of the condenser should be nearly inversely proportional to the resistance of the grid leak. For a grid leak of 100,000 ohms the condenser should be 0·1 to 0·5 microfarad for really good results. Too large a condenser is sometimes a disadvantage, particularly when using high-tension battery eliminators. It is frequently said erroneously that too large intervalve condensers have bad effects, due to the large time constant, CR, of the condenser leak circuit. It is a fact that due to this cause Resistance Capacity is inherently bad for transients. This is not the case, however, if the condensers are sufficiently large. The object of the condenser is to insulate the anode of one valve from the grid of the next, as regards steady PD's, but not as regards changing PD's. It is required that the grid shall follow instantly any changes in PD at the anode of the preceding valve. For this to occur the PD and therefore the charge between the plates of the condenser should remain constant, while the PD between both plates and earth varies simultaneously. In order that this may happen the condenser must have large capacity. Any change in characteristic of an amplifier due to very large condensers usually arises from the presence of reaction in the amplifier.

Resistance capacity coupling has the disadvantage that the voltage at the anode is considerably less than the applied high-tension voltage due to the drop of voltage in the anode resistance; consequently the output available is considerably less than would be the case were there no anode resistance. It is important to have an ample factor of safety in a resistance capacity coupled circuit. Bad results with resistance capacity units are frequently caused by overloading. When using resistance capacity coupling immediately before the output valve it is advisable to use a low-resistance valve in order to supply sufficient input to the power valve grid without distortion.

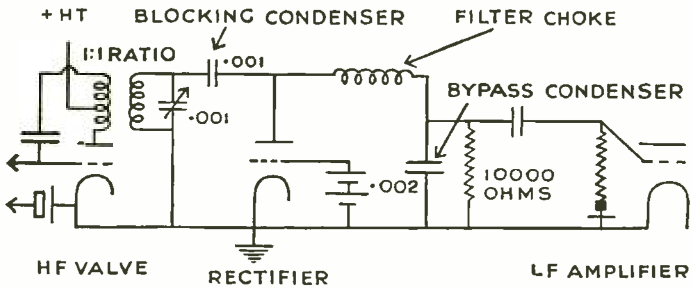



Fig. 2.

is neutralised by a positive bias on a third electrode can be made linear over certain limits. When arranged as in Fig. 2, the curve of rectified current against input (high-frequency) potential is substantially straight up to about 2 milliamperes. It is convenient, therefore, to arrange the mean rectified current between 0·5 and 1·0 milliampere. The detector is rather insensitive, requiring 9·0 R.M.S. volts to produce 1·0 milliampere rectified current. This means that a semi-power stage of high-frequency magnification must precede the detector, such as a valve having a resistance of 8000 ohms with 120 to 150 volts high tension and suitable grid bias.

Another method is to use a four-electrode valve, the first grid acting as space charge, the outer grid and anode acting as a grid-leak detector. Considerable care has to be taken, however, in choice of valves and correct values of resistance, etc.

## *LOW-FREQUENCY AMPLIFICATION*

Present-day circuits seldom use more than two low-frequency stages following the detector unless considerable power is required. We have to consider the coupling between detector and first low-frequency valve, and between first low-frequency and the output or power valve. For intervalve couplings we have to choose between resistance capacity, choke capacity and transformer. It is a simple matter to be too complicated for the ordinary listener. It is clear that tuning to either of the two maxima will give bad quality. The circuit has uses, however, as a simple band-pass filter in an intermediate amplifier circuit for a super-heterodyne receiver.

In high-frequency magnification using ordinary circuits it must not be forgotten that the resonance curve of a cascade of circuits is the product of the individual resonance curves, *i.e.*, if a 10-kC. side-band frequency is reduced 10 per cent. by one tuned circuit, then it will be reduced 20 per cent. by two and 30 per cent. approx. by three such circuits in cascade.

## *DETECTORS*

The grid leak detector is undoubtedly the most sensitive type, but unfortunately it gives both amplitude and frequency distortion. The effect is well known, and does not need discussion here.

The anode bend detector is considerably better than the grid leak; in fact, for medium values of modulation of the carrier it is nearly distortionless, but for high values of modulation (the present trend of development is towards high values of modulation), it is not very good. It is necessary in anode bend rectification to choose valves carefully. Grid current must be avoided, for reasons given when discussing high-frequency circuits; therefore a valve must be chosen which can be arranged to work on the sharpest part of the bend in the characteristic curve, and yet have sufficient grid negative to ensure that grid current never occurs. High impedance valves are usually the best anode bend detectors.

Crystal detectors can be arranged to have linear characteristics, but are not generally used, as valve detectors are more sensitive. It is important with crystal detectors—in fact, with all two-electrode detectors—that the output (low-frequency) circuit should have a high impedance at all audio frequencies in relation to the detector impedance, unless the output circuit has zero phase angle (pure resistance), otherwise distortion will occur at frequencies where the impedance is low and the phase angle large.

A form of two-electrode detector* in which the space charge

* This detector is popularly known in Britain as the "Kirkifier."

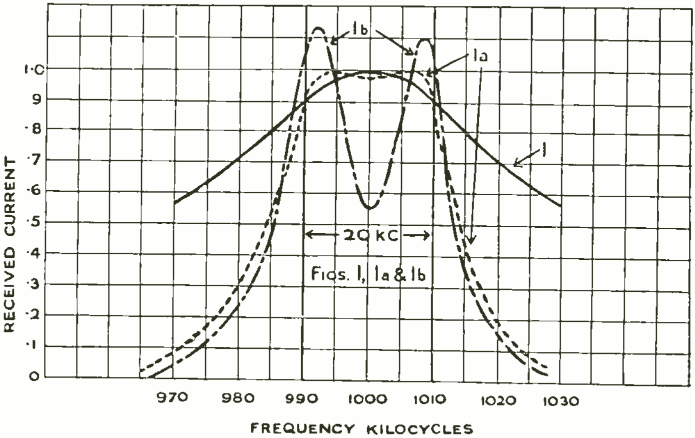



FIG. 1

coupled together to the correct degree. If this is not done, the resonance curve will not be symmetrical about the carrier frequency. Ganging the two condensers presents some difficulty. Further, for perfect results, the coupling must be proportional to wave-length.*

It is possible to produce the resonance curve shown in Fig. 1 (1*b*) by reducing the resistance in the secondary circuit. Some experiments were carried out by the Development Department of the B.B.C. during 1927 to find out whether this effect could be made use of in correcting for the resonance curve of a sharply tuned aerial circuit. It was found a simple matter to produce the effect over any one small band of frequencies; but to do this over a wide band of frequencies proved a very difficult proposition. The experiment was discontinued owing to pressure of other work and because results did not appear potentially encouraging. An interesting point was brought to light, however—that, even with ganged condensers, in tuning such a circuit one does not tune for maximum signal strength, as this occurs at either of the two resonance peaks of the circuit, the correct point of tune being between the two maxima. It is thought that this will

* This circuit is in use at 5GB as one of the interstage circuits.

a current in that circuit to change from one amplitude to another. In wireless telephony the carrier wave changes its amplitude at frequencies varying from 30 to 10,000 cycles per second. The high-frequency circuits must therefore be designed so that the current in them may change as quickly as 10,000 times per second without reduction in the amplitude of such changes. A circuit which fails to reproduce such rapid changes is described as "cutting off side-bands."

Side-bands are produced by the process of modulation, and are waves having frequencies equal to the sum or difference of the modulation and carrier frequencies. For instance, if a carrier of 1000 kC. is modulated by a frequency of 10 kC., the two side-bands will have frequencies of 1010 and 990 kC. respectively. In order to reproduce the modulation frequency of 10 kC., the high-frequency circuits must be able to respond equally to the carrier and the two side-bands (the 10 kC. side-bands are the extreme practical limits). This can be achieved in two ways. One method relies on so proportioning the capacity inductance and total effective resistance of the circuit that the resonance curve is substantially flat over a band of 20 kC. The following equation gives the ratio of current in a tuned circuit at some side-band frequency to the current at the resonant frequency. Let $f_0$ be the resonant frequency and $f_1$ the other frequency, $L$ the inductance, $R$ the total effective resistance and $r$ the ratio; then

$$r = 1 \Bigg/ \sqrt{1 + \left[\frac{2\pi f_0 L\left(\frac{f_1}{f_0} - \frac{f_0}{f_1}\right)}{R}\right]^2}$$

A resonance curve for a circuit where $r$ is 0·9 for $f_1 - f_0 = 10{,}000$ is shown in Fig. 1(1). The values are $L = 195$ microhenries, $R = 50$ ohms, $f_0 = 10^6$, $f_1 = 1{\cdot}01 \times 10^6$. Another method is to use a coupled circuit with the value of coupling and damping so adjusted that the resultant resonance curve is flat over the required band. (See Fig. 1(1*a*).) The great advantage of this type of circuit is that it can be made flat over the required band of frequencies, but cuts off sharply at each side of the band. Its disadvantages are that it is necessary that both circuits must be exactly in tune. They must be tuned with very loose coupling, and then the circuits

# HIGH-QUALITY RECEIVERS

A PERFECT receiver is one which produces no distortion in its electrical circuits. To produce such a receiver is no easy matter, particularly when it is also necessary to make it both efficient and selective.

Distortion is of two kinds: amplitude distortion and frequency distortion. The former is the failure of any piece of apparatus to respond equally at all amplitudes, and results in the production of harmonics and combination tones. The latter is the failure of a piece of apparatus to respond equally at all frequencies up to 10,000 cycles per second.

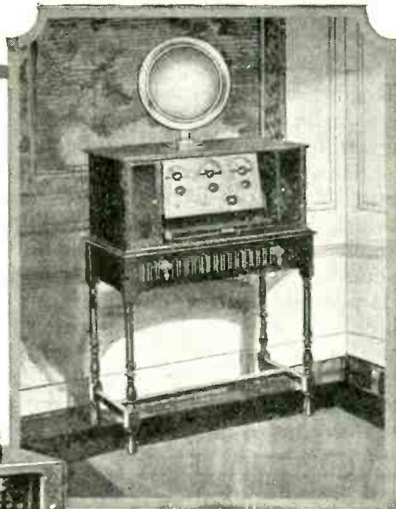
All circuits in a receiver may give rise to both types of distortion. The circuits in a receiver are

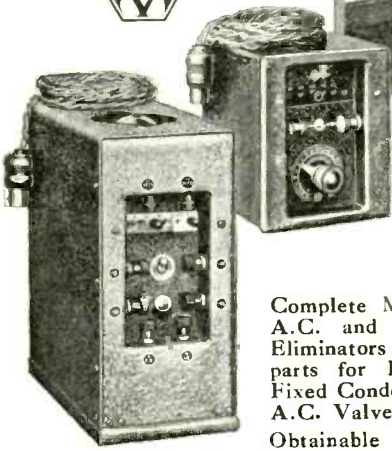
(1) The high-frequency circuits (including valves).
(2) The detector circuits (including valves).
(3) The low-frequency circuits (including valves).

## *HIGH-FREQUENCY CIRCUITS*

Amplitude distortion may occur in high-frequency magnifying valves as well as in low-frequency magnifying valves, due to the presence of grid current or to working over curved portions of the characteristic. If grid current is permitted, it has the effect of damping the circuit associated with the valve in which grid current occurs. Damping varies amplification, and as grid current is not proportional to voltage, the damping will vary with amplitude. When working over non-linear portions of the characteristic, the amplification varies with amplitude, and again distortion results. Grid current should always be avoided; the practice of varying the stability or amplification of a receiver by varying the positive potential applied to the high-frequency grids is not good. Where any but very small amplitudes are being dealt with, the valve should be chosen to suit the conditions under which it is intended to work. It must not be forgotten that during modulation the carrier wave may rise to twice its normal amplitude; therefore the circuits must be designed to deal with double the carrier amplitude.

Frequency distortion may occur through badly designed high-frequency circuits. The less the resistance or damping in a high-frequency circuit, the longer time does it take for





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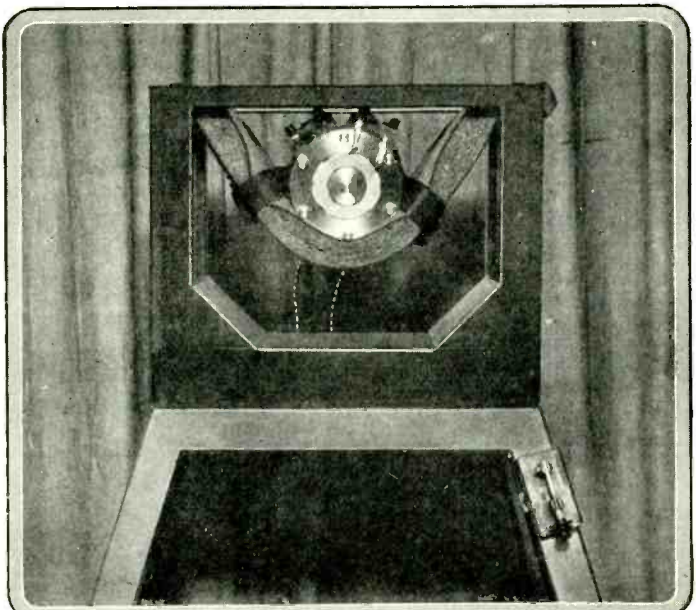
Recent experiments have been directed towards improving yet a different type of microphone, known as the condenser microphone, which has only been used occasionally in British broadcasting. In this microphone the diaphragm is a stretched metal sheet and is held close to a fixed metal plate. Its motion, due to sound waves striking it, causes variations of capacity in the condenser formed between the plates, which can be converted into variations of current or voltage as required. It is possible that certain methods of using this microphone which are now being developed may produce a result even superior to that given by the type of carbon microphone in use at the present time, and if this could be done, the final result should not be very far from perfection in terms of the five necessary qualities which have been enumerated above.



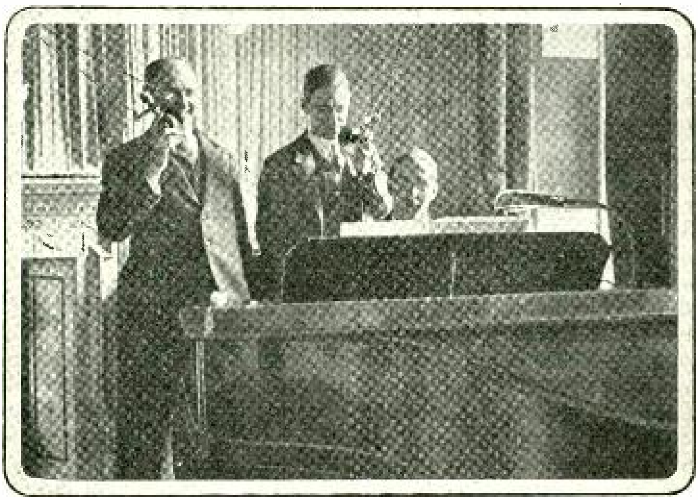
THE MAGNETOPHONE

*For a long time the standard microphone for all B.B.C. stations, but now not widely used*

*TYPES OF MICROPHONE*

Let us consider the types of microphone which have been used since broadcasting commenced. Originally use was made of the carbon microphone of the solid-back type. The type is somewhat similar to the ordinary Post Office telephone mouthpiece. These resistance microphones operate in virtue of the fact that change of pressure on the diaphragm sets up a corresponding change of resistance in the electrical circuit. They had very many faults, and were replaced by a special type of microphone (which was called the double-button carbon type) having a stretched diaphragm. This was the first type that could be called a high-quality microphone. After this type was evolved, the question of carbon microphones was put aside for some considerable time, while other types were being tried out. Subsequently the type used by the B.B.C.'s stations was of the electro-dynamic type called the magnetophone, in which the diaphragm itself consisted of a flat coil of very fine wire suspended very lightly on cotton-wool in a strong magnetic field. The variation of sound pressures on the diaphragm set up electrical currents in the coil due to electro-magnetic induction. These currents were then amplified by valve amplifiers until they reached a strength sufficient to operate the broadcasting transmitter. The microphone gave good results in its time, but it was very insensitive and had by no means a perfect frequency characteristic.

The magnetophone has partly been superseded by quite a different type of carbon microphone, in which there is no appreciable diaphragm as such, but the sound pressures act on a layer of very fine carbon granules, causing a movement in them which sets up a variation of electrical resistance. This microphone has a practically ideal frequency characteristic, dealing as it does with all the frequencies used in transmission of music, from the very low tones of the big drum and double-bass to the highest harmonics of the violin and clarinet. It is a particularly sensitive type of microphone, very easy to use and to instal in the studio or for an outside broadcast, but it suffers from the usual characteristic of carbon microphones in having a continuous hiss background which is often noticeable in transmission.



IN THE EARLIEST DAYS: RUDIMENTARY MICROPHONES OF THE TELEPHONE TYPE, ONE FOR EACH SINGER

bring the strength of music to a value sufficient to operate the broadcasting transmitter. This, then, is an advantage, because it is always desirable to use as small an amount of valve amplification as possible. Unfortunately it normally happens in practice that the better a microphone as regards its frequency characteristic and linearity, the weaker is its output, and therefore the more the amplification required.

Fifthly and finally, there is the important requisite of ease of installation, maintenance and portability. This is certainly a very important point, as the efficiency of a broadcasting service depends very largely on the reliability of apparatus that is used; and, furthermore, it is essential to have a microphone for outside broadcast work which is portable and quickly set into action for any particular broadcast.

Usually we find that we must make a compromise as regards these five qualities, and sacrifice one quality with regard to another.

for intelligible transmission of speech over a telephone system, it would be of very little use for broadcasting purposes, as it covers only a small part of the range of frequencies necessary for the transmission of music and natural speech.

The type of microphone which is used for broadcasting is a much more specialised piece of apparatus. It has rigidly to fulfil certain conditions, while other conditions must also be satisfied as far as possible.

### *REQUISITES OF A GOOD MICROPHONE*

These are as follows:—

First of all the microphone must have a good frequency characteristic. This means that the microphone should be equally responsive for all the sound frequencies that have to be dealt with in broadcasting. Generally we state the necessary range of frequencies to be from 25 cycles per second (which means a little more than an octave below the lowest note on the piano) right through to 10,000 cycles per second (which represents the frequency a little more than an octave above the highest note on the piano).

Secondly, the microphone must have what is called "linearity" for the range of sound pressures dealt with. This means that if the strength of sound in front of the microphone is doubled, then the electrical output taken from the microphone to the broadcasting transmitter must also be doubled, and similarly for any proportion within the range of sound pressures with which the microphone is likely to deal—that is to say, from zero pressure, corresponding to silence, to, say, sound pressure due to a symphony orchestra playing "*fff*."

These first two qualities are absolutely essential for a broadcasting microphone, so that the transmission of music may be identical with what the microphone itself picks up.

Thirdly, the microphone must be free from inherent noise or hiss likely to form a background to the programme that is being transmitted. Some microphones are noiseless, but other types of microphone have a continual hiss background which may be quite noticeable in passages of weak music or in announcing, when the announcer speaks too softly or too far away from the microphone.

The fourth requisite is sensitivity. The more sensitive a microphone is, the less amplification will have to be used to

# THE PERFORMANCE OF MICROPHONES

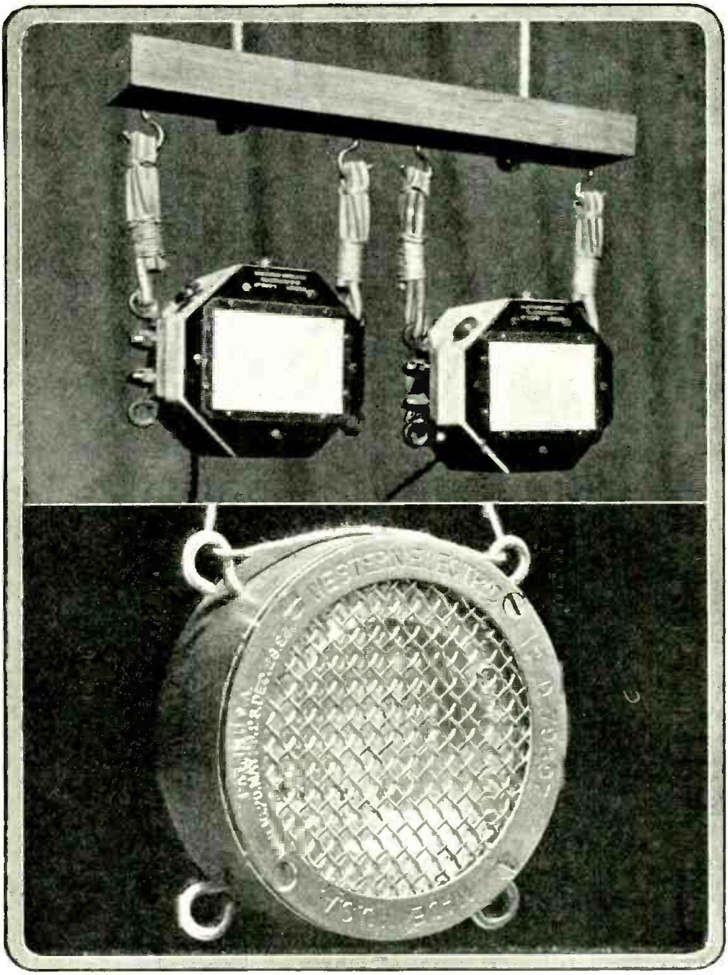
THE microphone is one of the most vital pieces of electrical apparatus in the whole of the broadcasting system. Its function is to pick up sound and to convert it into electrical currents so that these can be dealt with by the broadcasting transmitter and passed on to the broadcasting receiver.

Most people only know the microphone as an object looking rather like a meat-safe standing on four legs, but it is, as a matter of fact, a highly specialised piece of apparatus, which has been developed after years of study and experiment.

The purpose of the microphone is to convert sound, which consists of pressure vibrations in the air, into corresponding electrical vibrations in an electric circuit. This conversion is generally carried out in two operations, which take place simultaneously. First of all the sound-wave, which consists of a varying pressure in the air, impinges on a surface in the instrument (usually known as the diaphragm) which is capable of slight movement. The variation of air pressure on this diaphragm causes it to move to and fro in a manner corresponding to the backwards and forwards movement of the particles in the air—that is, corresponding to the original sound. The second operation is that in which the diaphragm, by its movement, causes a corresponding change in some property of an electrical circuit; thus the diaphragm may be one plate of a condenser, which produces variations in capacity, or it may be part of an inductive electro-magnetic system, or, lastly, it may make, for instance, granules of carbon vary their electrical resistance. In each case variation of current takes place by diaphragm movement.

Thus in studying microphones we must study two things: first of all, the question of the diaphragm and its mechanical movement; secondly, the nature of the method in which this movement sets up the electrical changes which we desire. Different types of microphones exhibit certain properties of their own, which can be traced to the way in which the two above-mentioned operations are carried out.

The type of microphone most familiar to the public is that which is fixed on top of the ordinary Post Office telephone candlestick. Although this type of microphone is adequate



TWO MODERN TYPES OF MICROPHONE

*Above, carbon microphones as used by the B.B.C. Below, the condenser microphone*

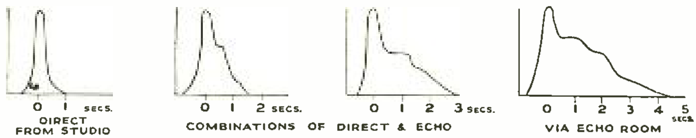



**Figure 3**

**HOW AN IMPULSE OF SOUND DIES AWAY FOR VARIOUS POSITIONS OF THE ECHO CONTROL HANDLE**

portions of direct and echo music is carried out by means of a small rotating handle situated in the control room, the turning of which can give music as it sounds originally in the studio, or the echo alone of such music, or any combination of the two. This means that it is possible to make music sound as if it is being produced in the studio, or in a large room, or in a corridor, or in a hall, or in a cathedral. The curves in Fig. 3 show the result of picking up an impulse of sound—say a beat on the big drum in a studio—and how it emerges from the studio alone, or via the echo room alone, or in a combination of the two. It will be seen that the corresponding reverberation effect is very similar to that obtained in taking a record of, say, beating a drum in a hall or in a cathedral.

This method of using the echo room is the first step towards providing a satisfactory variable echo effect to suit particular items as they are broadcast, and to give in each case the greatest pleasure acoustically to the listener.

The problem is not entirely solved by the use of such methods. For the time being it is possible to give the effect of any general type to any particular transmission. It is even possible in some cases to imitate certain halls and to make the listener believe that he has listened actually to the orchestra playing in these halls. But experimental work is now being carried out which it is hoped will lead eventually to the broadcasting engineer being able to take any transmission in the studio, and to give just that remarkable effect which will compel listeners to be enthusiastic, and enable them to receive real pleasure from items which, when transmitted ordinarily, would make little appeal to them.

to give the effect of a concert hall. The difficulty is overcome by the use of an echo room, where echo is manufactured from the original music and added to it to give the desired result.

Fig. 2 shows the scheme of connections by means of which this result is obtained. The music which is being produced in the studio is picked up on the microphone M1 and is conveyed into two separate channels. One of these channels passes direct to the main control room, and if you listen on this channel you hear the music exactly as it sounds in the studio. The second channel passes to a loud speaker in an echo room (a room which may be some distance away from the studio) having bare walls and ceiling and floor, forming hard reflecting surfaces, so that any sounds set up inside it take several seconds to die away.

This loud speaker, therefore, creates in this room an echo formed from the original music on account of excessive and continuous reflections from the walls of the room. The microphone M2 in this echo room picks up this reverberating sound, passes it to the control room, where it is added in any desired amount to the "direct" music. The control of pro-

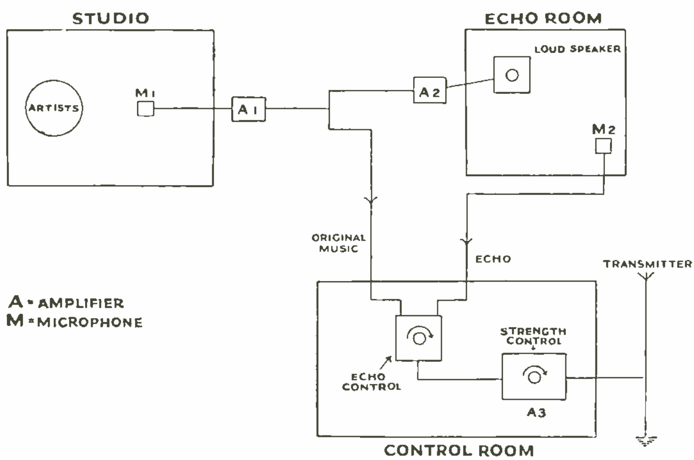



Figure 2
ECHO ROOM ARRANGEMENTS

enable them to hear best, or, in other words, which give them the chance of obtaining the greatest pleasure at a concert. Even if the orchestra and performance are good, the conditions of hearing have a profound effect one way or another upon the audience. One could take a parallel case in that of public speaking at a political meeting in a hall. If the acoustics of the hall are bad, then however eloquent the speaker, the result may lead to irritation on the part of the audience.

This modification of sound to which we have referred is a prolongation of every sound produced, due to reflection backwards and forwards between the walls. The scientific term for this is reverberation, which is measured as the length of time a sound impulse takes to die away sensibly to zero in the

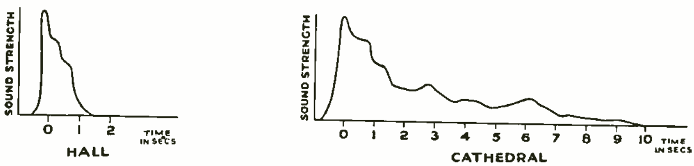


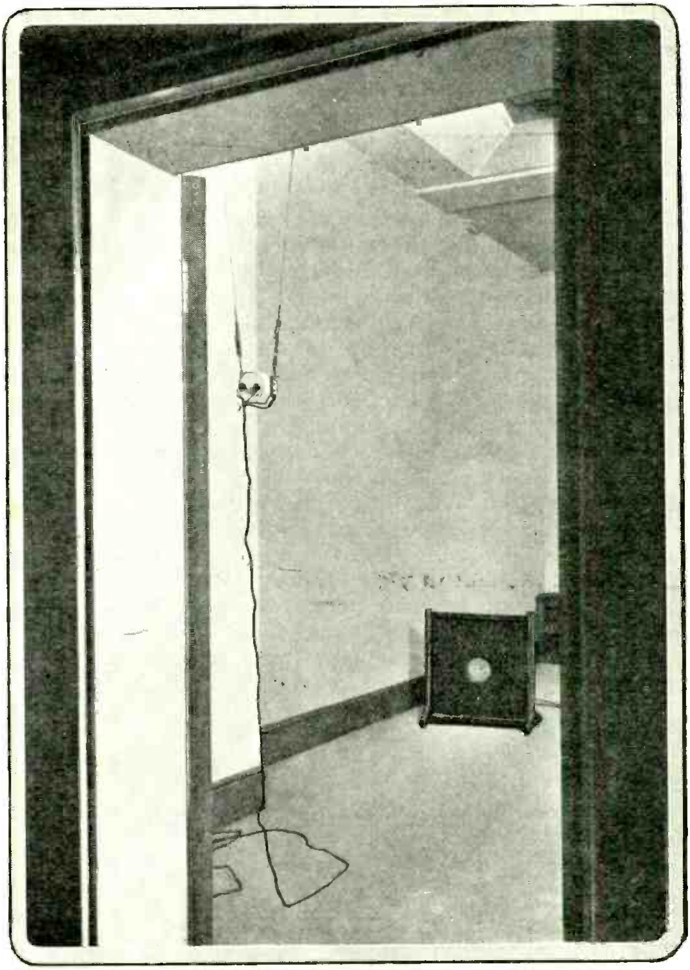

**Figure I**
**REVERBERATION IN HALLS & CATHEDRALS**

hall in question. Different halls have different reverberation periods; a small hall may have a period of only one second, whereas some cathedrals have periods of up to twelve seconds. Fig. 1 shows how a sound impulse, set up say by beating a drum, dies away in a hall or in a cathedral.

## *ARTIFICIAL ECHO*

The B.B.C. attempts to give listeners with every type of transmission that particular acoustic effect which pleases most. It is firmly believed that such a result can be obtained by careful preparation; lack of care in this respect, however, will mar even a perfect performance.

In the first place, an improvement in any transmission may be obtained by giving certain echo effects on that transmission, and it was shown in last year's Handbook that in a studio performance the studio itself is not capable of giving the desired effect, being in itself a room, and therefore unable



THE ECHO ROOM, SHOWING THE MICROPHONE (HANGING) AND THE LOUD SPEAKER WHICH FEEDS IT

# ARTIFICIAL ECHO

THE majority of broadcast transmissions take place in the broadcasting studio, and it is, therefore, the object of the engineer to make his studio transmissions as pleasing as possible to the average listener.

### *STUDIO ACOUSTICS*

The problems of studio acoustics must therefore be carefully studied, and in doing this one is always faced with the difficulty of carrying out satisfactorily the measurement of the various physical quantities involved. Accurate measurement of sound has always been rather a neglected subject, but during the last five years its development has been rapid on account of its increasing importance. In the early days of broadcasting the acoustics of studios were examined rather by "hit and miss" methods, which were apt to be expensive, as any alterations in construction and design necessitated the spending of a good deal of money. The subject was therefore somewhat neglected. Recently more scientific methods have been applied, and the problems of sound in connection with the broadcasting studio have been gradually worked out, always with the end in view of giving listeners the greatest possible enjoyment of particular items by suiting the acoustic conditions to them. There is no doubt at all that each type of transmission requires a particular form of acoustic environment to give the maximum enjoyment.

The development of the design of studios was discussed in the Handbook of 1928, and it was shown there that the great difficulty in transmitting various musical items from a studio arises in trying to avoid the effect which is associated with transmission taking place from a room. Actually this effect is the right one to have in only a very few cases.

### *CONCERT HALLS*

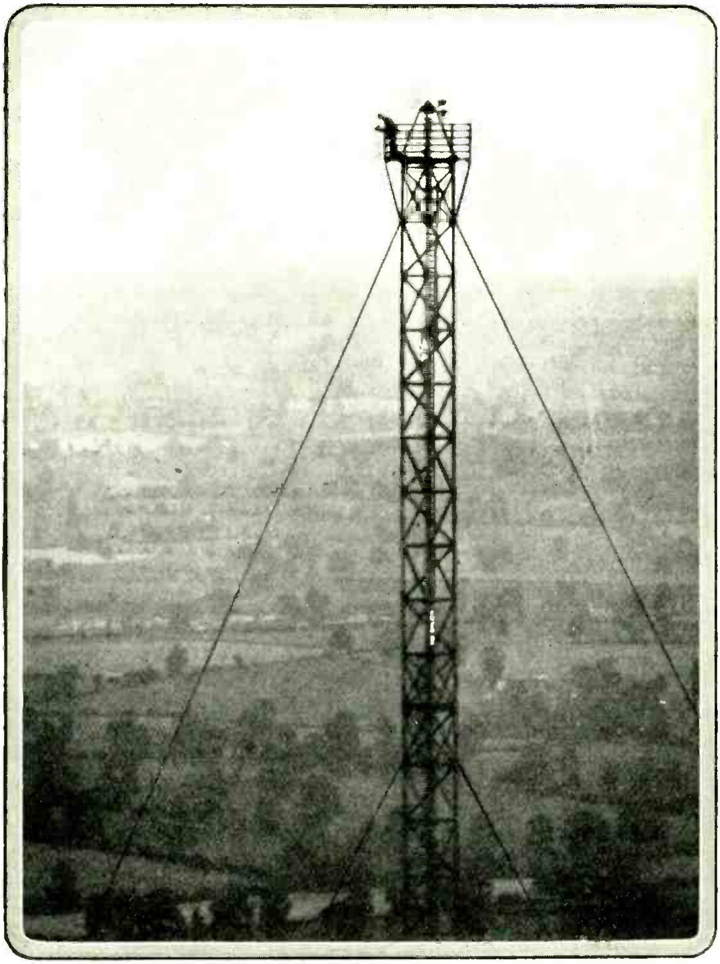
An orchestra sounds best in a good hall. The development of music and the development of listening to music are closely linked up with the development of the design of the concert-hall. Concert-goers find the best halls and the best orchestras, and if at all critical make their choice accordingly. Furthermore, they find the seats in the halls to which they go which electrical energy are used per year. At the other end of the scale, a Relay Station requires only 3 kilowatts to work it. The power in the aerial at Daventry (5XX) is 25 kilowatts, London 2 kilowatts, other Main Stations 1 kilowatt, and Relay Stations 0·12 kilowatt. The power picked up by a receiving set depends, of course, on its distance from the transmitting station. Except when it is very close to the station, the power is a few microwatts only.

The most expensive items in the maintenance of the equipment are valve replacements. An air-cooled glass transmitting valve costs anything from £6 to £30, according to its size, while the big water-cooled valves used at Daventry cost approximately £80 each. Valve breakages and failures, therefore, are an expensive matter, as the scrap value of the valve is negligible. The lives of the valves vary. Air-cooled glass valves have an average life of 1,000 hours, while the water-cooled valves generally have a longer life and frequently last for 2,000 hours. There is a valve in use at Daventry (5XX) that has been in use since the opening of the station and has a life of over 11,000 hours.

A big station naturally costs more to run than a small station, but it serves a greater area, and therefore an interesting method of comparison between the efficiencies of the service given by each station is to compare the cost per year per unit of population, based on the population of the service area of the station. These figures are necessarily approximate, because the number of listeners to any station cannot be computed accurately. Careful calculation shows that the Daventry (5XX) transmitter costs about ¼*d.* per year per unit of population served; Manchester about the same; Glasgow, Cardiff and Liverpool about ½*d.*, while some of the Relay Stations, having a restricted service area, cost as much as 3*d.* per year per unit of population.

MAINTENANCE FIGURES, 1927

| | |
|---|---|
| Total of hours of transmission . . . | 65,299 |
| Aggregate length of breakdowns . . . . | 19·6 |
| Percentage of breakdowns . . . . . | ·003 |



"MAINTENANCE" MEANS STEEPLEJACKING AT TIMES

*Repairing the tackle at the top of a 500-ft. mast at Daventry* nection, insulation that looks doubtful, and many other things, are all shown up by careful examination before the programme starts.

The worst kind of breakdown is when the cause is not obvious. Most listeners have at one time or another been confronted with a receiving set which, although apparently in perfect order, just won't work! Imagine the thoughts of an engineer in front of a large transmitter which is suffering from a similar complaint! He is not comforted by the fact that the resumption of the entertainment of thousands of listeners is dependent on his efforts, and that the world-famous artist waiting in the distant studio is getting impatient!

Coming now to actual figures, the hours of transmission from all stations have steadily grown from 46,215 hours in 1925 to 65,299 hours in 1927. By the careful study—and elimination, where possible—of the causes of the frequent breakdowns in the early days, the breakdown percentage was reduced to 0·09 per cent. in 1925, 0·07 per cent. in 1926, and still further reduced to 0·03 per cent. in 1927. This last figure means that in 65,299 hours of transmission the breakdowns totalled only 19 hours 36 minutes, and assuming 3,000 hours' transmission per year, the average breakdown period of each station was 54 minutes, approximately two-thirds of this time being due to valve failures. The 1927 figures do not include either the hours of transmissions or the breakdowns of the Daventry experimental station 5GB and the Birmingham Station 5IT, which latter was replaced by 5GB in August 1927, as this service has been essentially experimental. The programme hours of these stations during the year were 2,997, so that the total 1927 figure was 68,296 hours.

The power used at most broadcasting stations (with the exception, that is, of 5GB and 5XX) is relatively small. Those listeners who imagine that there are massive generators working at high power in Oxford Street would be doomed to disappointment if they were to see the actual equipment. The total power input to the London Station, including power required for battery charging, does not exceed 30 kilowatts, while the power required to run the 5XX transmitter (excluding auxiliary services) is approximately 150 kilowatts. At Daventry over a million units of

# SOME MAINTENANCE FIGURES

THE extent and efficiency of a technical service can usually be judged by an examination of statistics and figures relating to it. Admittedly it is sometimes possible by improper presentation to mislead the reader and give a false impression of performance, but when one is dealing with plain statements of facts, and most of these facts are of a technical nature, then the working conditions can be shown accurately by figures, which should give the results over as long a period as possible.

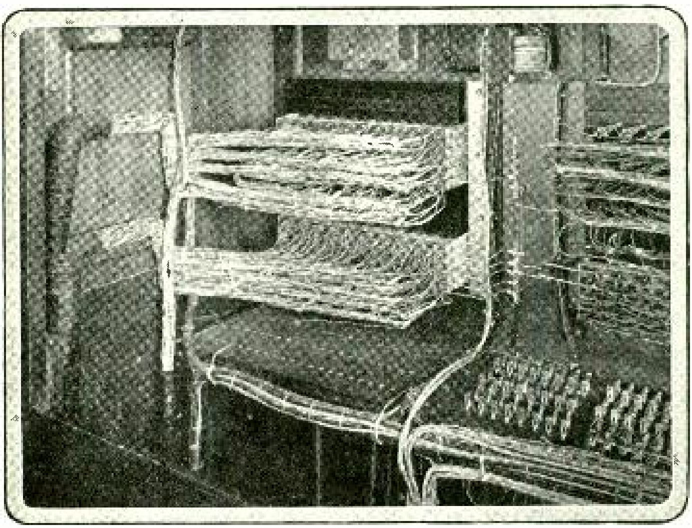
The purpose of this short article is to give some idea of the working conditions of the broadcast service, as far as the engineering side is concerned. There are twenty-two broadcast transmitters under the control of the B.B.C., each giving a regular programme service, and, in addition, two complete transmitters which act as stand-by plants. One of these is the old 2LO transmitter at Marconi House and the other the 5IT transmitter at Birmingham, which acts as a stand-by to the Daventry experimental station, 5GB. Both of these are ready to work at a moment's notice should serious and prolonged trouble occur at the respective parent stations.

Naturally the most important matter in the running of these stations is the continuity of the service and reduction to a minimum of time lost in involuntary shut-downs. A wireless transmitter is a complicated piece of electrical equipment, and there are many components that are liable to become faulty and cause a breakdown. The failure of any part, however small and relatively unimportant, nearly always means the stoppage of the whole transmitter. Certain components, notably valves, are specially liable to failure without warning, and the changing to a spare inevitably means time lost. All stations are equipped, therefore, with a very full stock of spares, and everything is done to facilitate rapid changes. For example, to change an air-cooled valve, such as is used on the London transmitter, does not take more than thirty seconds, although the big water-cooled valves used at Daventry may require several minutes to replace.

The utmost trouble is taken to avoid breakdowns by trying to find weaknesses in the transmitter during the cleaning and testing time before transmissions. A weak joint, a loose con-varies if one travels round a station at a distance of, say, thirty miles. If a new site gave a diagram as good as this it would be considered satisfactory, although it is by no means circular, but if the diagram were that shown in Fig. 2, then it would indicate either that there was something wrong with the aerial system used at the transmitter or that there was severe local screening in certain directions.

Fig. 3 gives the strength from 5GB as it stands to-day at every point on a circle with a radius of 40 miles. It will be noticed that this is somewhat irregular, and the irregularities are due principally to the presence of the 5XX masts, which are 500 feet high, and therefore exert a considerable influence.

The B.B.C. has carried out a great deal of experimental work in connection with the aerial system in order to improve the symmetry of radiation from this station, and the result given in the diagram may be considered good for any site where there are high masts in the immediate vicinity.



ONE ASPECT OF "MAINTENANCE": THOUSANDS OF WIRING CONNECTIONS HAVE TO BE INSPECTED AND KEPT INTACT

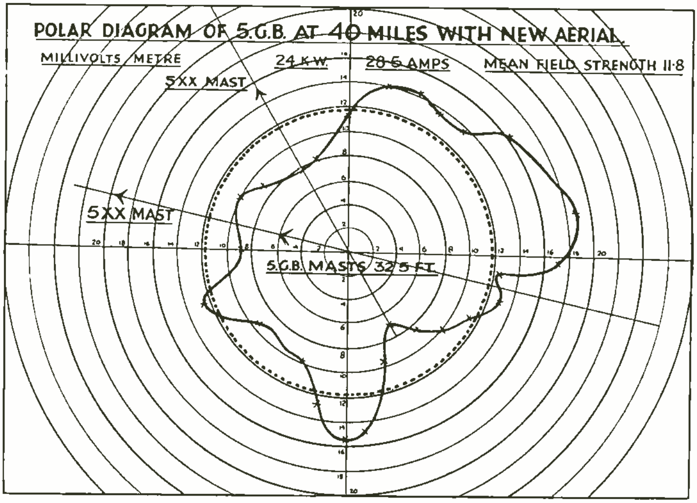



FIG. 3.

Since this is a measure of what exists in the atmosphere—or, strictly speaking, in the ether—it obviously has nothing to do with the sensitivity or type of the receiver used. Actually the receiver which forms part of this equipment is of the supersonic heterodyne type with a frame aerial, but this is merely a matter of convenience, and a different type of receiver could be used if so desired.

It may be of interest to listeners to consider what results will be obtained in practice with, say, 1, 5 or 10 millivolts per metre, working within the normal broadcast band of frequencies. It is impossible to lay down hard-and-fast rules, because the results as heard on a loud speaker will depend on the technical excellence of the receiver, but considering an average valve receiver, the minimum field strength for reliable service is about 2½ millivolts per metre. For a crystal set 5 millivolts per metre is sufficient if a good aerial can be erected, but in towns where the aerial and earth conditions are usually bad, 10 millivolts per metre are necessary. Fig. 1 is a diagram showing roughly the way in which field strength not entirely for this reason that the masts are sometimes insulated from the ground by pedestals of porcelain or some other insulating material, and the stay wires are broken up by insulators into short lengths. Despite these precautions, there may still be some local absorption, and when a new station is being planned it is necessary to make sure that there is no local feature close to the station which seriously affects radiation in any particular direction.

Clearly it is undesirable to wait until the station is built before taking steps to find out whether this is the case or not. To carry out the preliminary tests the B.B.C. uses a lorry and a light van, each equipped with special apparatus for the purpose. The former is fitted with a transmitter which obtains power from a generator driven by the lorry engine, and is capable of radiating about the same power as 2LO.

Since it is only necessary to measure the strength of the carrier wave in order to determine the performance of a station in any particular district, this transmitter is not fitted with modulating valves, and therefore cannot send out speech or music. Everything necessary for this transmitter is carried by the lorry itself, including the masts, which can be erected or dismantled in a few minutes.

The light van referred to above is fitted with apparatus to measure what is termed "field strength" at any point. "Field strength" is merely the scientific expression for the strength of the broadcast available at that particular point, and it is expressed as a number of millivolts per metre.

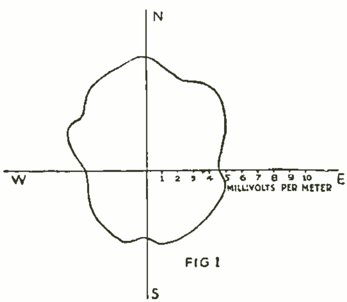


FIG 1

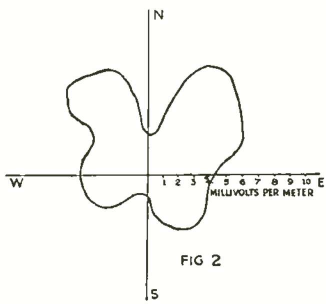


FIG 2

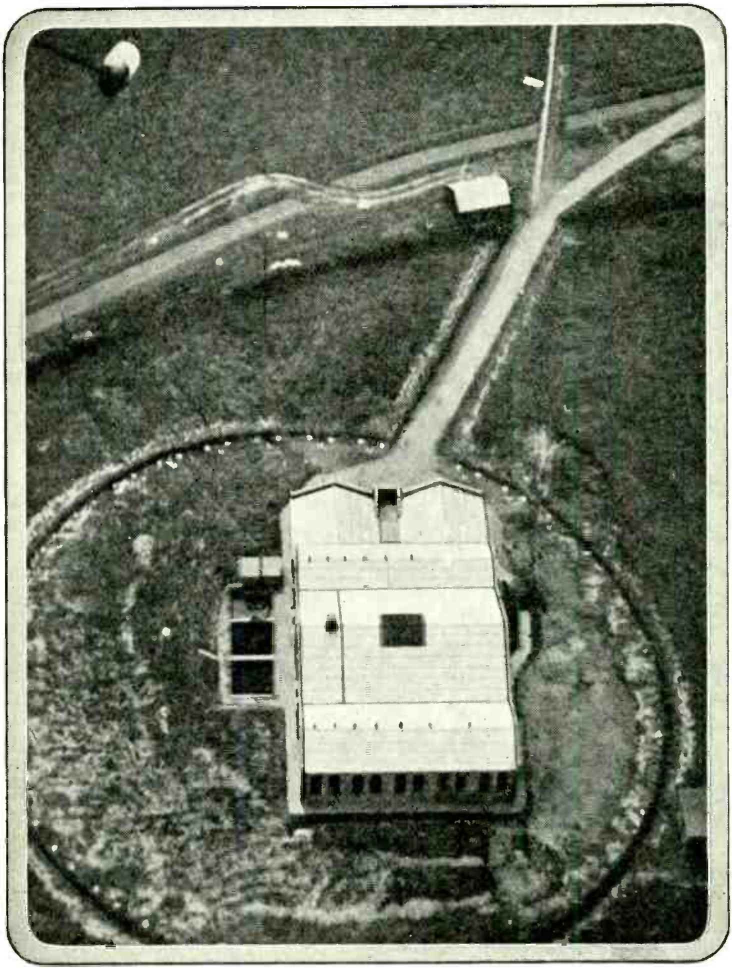
# MEASURING THE PERFORMANCE OF A BROADCASTING STATION

OFTEN when one visits a friend who lives at the same distance from the local broadcasting station one is struck by the fact that his reception is either much stronger or weaker even when the receivers are in each case identical. Assuming that both receivers are in good working order, many people think, quite naturally, that the discrepancy is merely due to a difference in the efficiency of the two aerials. It is true, of course, that in practice two ordinary aerials are never quite equal in performance, nevertheless if a portable set with a frame aerial is tried in different districts it will be found that the strength of reception varies appreciably, although the distance from the broadcasting station is the same in every case.

This may be due to the fact that the absorption of the radiated energy in some directions is not the same as in others, or it may be that the transmitter does not send out the same energy equally in all directions. Usually there is a combination of both effects which may diminish or accentuate each other in any particular direction.

Obviously as one goes away from a station the strength will get less, and the rate at which this happens can be accurately forecasted if travelling over water or very flat country. However, when the country is hilly or wooded the falling off—or attenuation, as it is called—of the strength of the signal is uncertain and ceases to obey a fixed law. At the same time, most broadcasting stations do not transmit equally in all directions. This may be due to a variety of causes, such as the screening effect of hills or neighbouring tall buildings, especially if the latter contain a large quantity of metal. This difficulty is experienced in New York, owing to the steel-framed skyscrapers. An example of where the effect is obtained intentionally is afforded by the Marconi beam telegraph stations, where a system of wires is erected in such a way as to project nearly all the energy in one direction only.

As its name implies, a broadcasting station has to transmit in all directions, so that every possible precaution must be taken to obtain symmetrical radiation. It is mainly, although



DAVENTRY'S "EARTH" CIRCLE

direct-current generators the effect is worse than when supplied by rectifiers. It is also argued that the rectifiers cannot supply more than a certain current, whereas the direct-current machine has better regulation. With many valves in parallel, however, one fails to see that this argument is applicable, since the faulty valve in parallel with twenty others can take on flash-over twenty times its normal power—enough to destroy it and to maintain the arc indefinitely. The most sensible method of elimination of the trouble external to the valve would appear to be the connection of a resistance in series with each valve, so that the voltage developed across the valve cannot, on flash-over, persist. The practical carrying out of this idea is, however, difficult. Another way to eliminate the trouble is to use voltages below those which give the best operating conditions. The only real cure is to design the valve itself to be "hard" and free from the trouble. This is a matter one can leave, one hopes with confidence, to valve designers.

## *FEEDERS*

The final point to note is that considerable headway has been made in feeding high-frequency currents from transmitter to aerial over considerable distances. An efficient aerial is one which stands well away from buildings and above its own earth —the latter well constructed to give small loss. If the aerial has to be led in to the building containing the transmitter, this ideal cannot be realised. The modern aerial is built hundreds of feet away from the building, and the high-frequency currents are fed to it by a two-wire feeder connected to high-frequency transformers at either end. At 5GB the aerial is about 400 feet from the building. The losses in the feeder are negligible.

## *CONCLUSION*

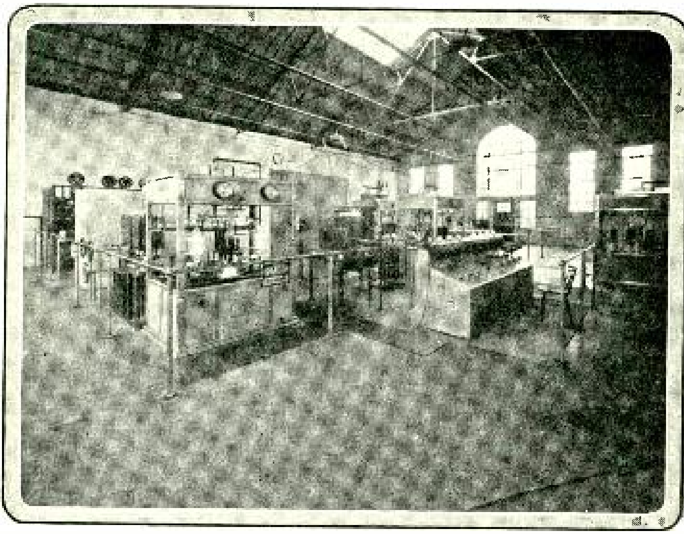
After several years' research, particularly concentrated during 1927 and 1928, we feel, thanks to theoretical calculation and practical experience with 5GB, in a position to build the Regional Stations so that they shall represent the best in broadcast transmitter design. They will, it is hoped, not be considered even obsolescent for several years to come.

generator. It can, however, be done, and in the Post Office wireless station at Hillmorton, Rugby, there are direct-current generators capable of supplying 18,000 volts if necessary. At the Carnarvon station there are two 10,000-volt generators of 150 kilowatts output. The broadcasting station 5GB, at Daventry, uses direct-current generators, two 10,000-volts 45-kilowatt machines running in parallel.

The B.B.C. has decided to equip new stations with direct-current generators because they represent so substantial an economy. Undoubtedly it is time direct-current generation was more widely adopted, as it is more economical in both running and maintenance costs.

### *VALVE FLASH-OVER*

A continuous trouble present in all high-power stations using water-cooled valves is known as valve flash-over or "Rocky Point" effect. This effect has been the subject of continuous investigations by many wireless engineers, but so far the root of the trouble has not been found, and the effect is in practice only minimised by extravagant palliatives external to the valves. If a valve oscillation generator has its output modulated by abrupt interruption (telegraphy) or by sinusoidal modulations (telephony and broadcasting), it is found that, with reasonably high voltages, flash-over may take place suddenly in the valve. This interrupts the service, strains the power supply and damages the valves. It is thought that a small spot hotter than the rest may develop on the anode of the water-cooled valve, and this causes re-emission of electrons which ionises the ever-present residue of gas, making a sudden path of flame between anode and earth which is only quenched by the destruction of the valve or cessation of the power supply due to an overload breaker releasing connection to the generator. The effect on one valve is the more damaging, as there is a proportionately greater power supply in relation to the power taken by one valve, *i.e.*, several valves in parallel are worse than a few. So far the only partial cure for this trouble is to limit the power supply either to all valves in common, or to each valve, so that, on flash-over taking place, the power available is less than that required to maintain the arc, which thereupon vanishes. It is argued that where the power is supplied from



WHAT A TRANSMITTER LOOKS LIKE
*Daventry 5XX, High Power, Long Wave*

mains) into the type required to feed the anodes of the valves. The transmitter requires direct current at 10,000 volts. For a 30-kilowatt station about 180-kilowatt power must be drawn from the mains for the transmitter alone.

A conventional method of obtaining 10,000 volts direct current is by using alternating current raised to 10,000 R.M.S. volts through a static transformer, and rectifying (by diodes) and smoothing the output from this transformer to give a sensibly direct-current high-voltage supply. A second method is to make the mains power drive a motor generator, with an output of 10,000 volts direct current.

The efficiency of conversion from a rectifier is between 60 and 70 per cent. and from a motor generator 83 per cent. Valve replacements for rectifiers represent a considerable maintenance cost. This at once shows that there is a considerable economy in using a motor generator. It is not easy to produce 10,000 volts direct current from a low or modulation frequency) is constant, while the mean high-frequency grid voltage is varied according to the impressed modulation. For this reason the efficiency of the main oscillation generator must be less with the low-power than with the high-power modulation, but there are no high-power control valves to absorb power. As a matter of fact, there is no superiority in either method with regard to power economy, as shown in the table on p. 283, copied from Captain Eckersley's paper previously mentioned. The figures are based on a 10-kilowatt station (this meaning 10 kilowatts in the aerial).

The technical direction of the B.B.C. has decided in future to use low-power modulation. The reasons for this decision are given below, and are again copied from Captain Eckersley's paper:—

(1) The low-power modulation system has a better frequency characteristic.

(2) The low-power modulation system has a greater factor of safety and greater stability, since the voltages never rise above those that may be continuously applied. Incidentally, this enables the static characteristic to be studied at leisure.

(3) The low-power modulation system requires to deal at high power with a frequency gamut of from 1·04 : 1 to 1·02 : 1 (using medium waves), while the high-power modulation system has to deal with a frequency gamut of 200 : 1 at high power.

(4) The efficiencies of power conversion are sensibly equal.

(5) The low-power modulation system is probably more flexible in changing from the state of linear to non-linear modulation, when this, by accident, may occur.

It is interesting to observe that the latest American stations use high-power choke control, showing that there is no reason to think that the older method is obsolete.

*CONVERSION OF POWER FOR TRANSMITTERS*

There are two ways, in general, of converting the electric power generated by the Diesel engines (or public supply high-frequency magnifier, until raised to the required value. This does away with a control system designed to handle high power. The method is called low-power choke modulation.

HIGH-POWER CHOKE-MODULATION TRANSMITTER.

| Circuit. | Efficiency. Per cent. | Power Taken. Kilowatts. |
|---|---|---|
| High-frequency magnifiers . . | 70 | 14 |
| Drive . . . . . . . | — | 2 |
| Control valves, high-tension . . | — | 16·8 |
| Sub-control valves, high-tension . . | — | 1 |
| Valve filaments (7 water-cooled valves; 20 volts, 50 amperes) . . . | — | 7 |
| Miscellaneous valves . . . . | — | 0·2 |
| | | 41·0 |

Power conversion efficiency $\frac{10}{41} = 24\cdot5$ per cent.

LOW-POWER CHOKE MODULATION.

| Circuit. | Efficiency. Per cent. | Power Taken. Kilowatts. |
|---|---|---|
| Final power amplifier . . . . | 32 | 31·3 |
| First power amplifier, 1·5-kilowatt output . . . . . . . | 20 | 2·5 |
| Modulation amplifier, 100-watt output | 70 | 0·1 |
| Modulators, etc. . . . . . | — | 0·4 |
| Master oscillator . . . . . | — | 0·2 |
| Separator . . . . . . | — | 0·2 |
| Power amplifier filaments . . . | — | 3·0 |
| First power amplifier filaments . . | — | 1·0 |
| Other filaments . . . . . | — | 0·4 |
| | | 39·1 |

Power conversion efficiency $= \frac{10}{39\cdot1} = 25\cdot5$ per cent.

In high-power modulation the anodes of the final high-frequency magnifying valves have applied to them a voltage which varies according to the voltages of modulation; in low-power modulation the anode voltage (with regard to

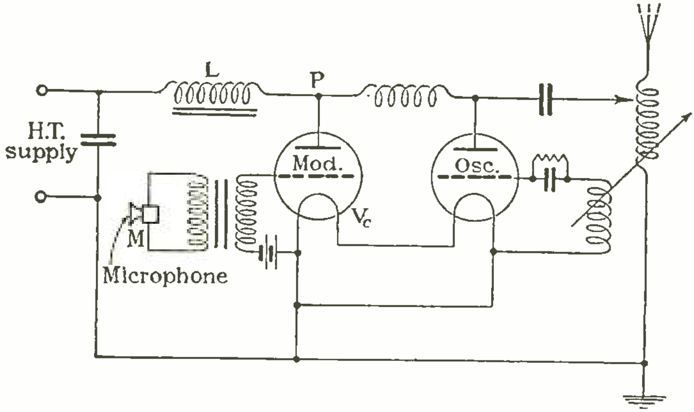



FIG. 1.

tarily absorbed wholly by the control valves or at the next moment wholly by the oscillation generator. The voltage on the control valve grids determines whether they absorb or reject power. In the static state equal power is (theoretically) taken by control and oscillation generator valves.

Another way of looking at the circuit (theoretically illustrated in Fig. 1) is to realise that the voltage of the point *P*, thanks to the inductive action of the choke (a resistance would theoretically act in principle in the same way), varies sympathetically with the voltage applied to the control valve grids. This means that the power supplied to the oscillation generator must vary in sympathy with the applied voltages of modulation.

There are two ways in which choke modulation may be used to control the intensity of the aerial oscillations. In the first (the commonest) the circuit is basically the same as in Fig. 1, and the control valves deal with a power equal to the power expended in the main oscillation generator. Thus if the oscillation generator deals with 10 kw., then 10 kw. must be lost at the anodes of the control valves. This is called high-power choke modulation.

In the second method the oscillations are modulated at low power (perhaps 1 kilowatt) and then magnified, by a

# PROGRESS IN TRANSMITTER DESIGN

AN exhaustive study of transmitters for broadcasting has been lately undertaken by the B.B.C. engineers. The reader, if interested in the matter, will find it dealt with very fully in a paper dated 1st February, 1927, and read before the Institution of Electrical Engineers by Captain P. P. Eckersley.

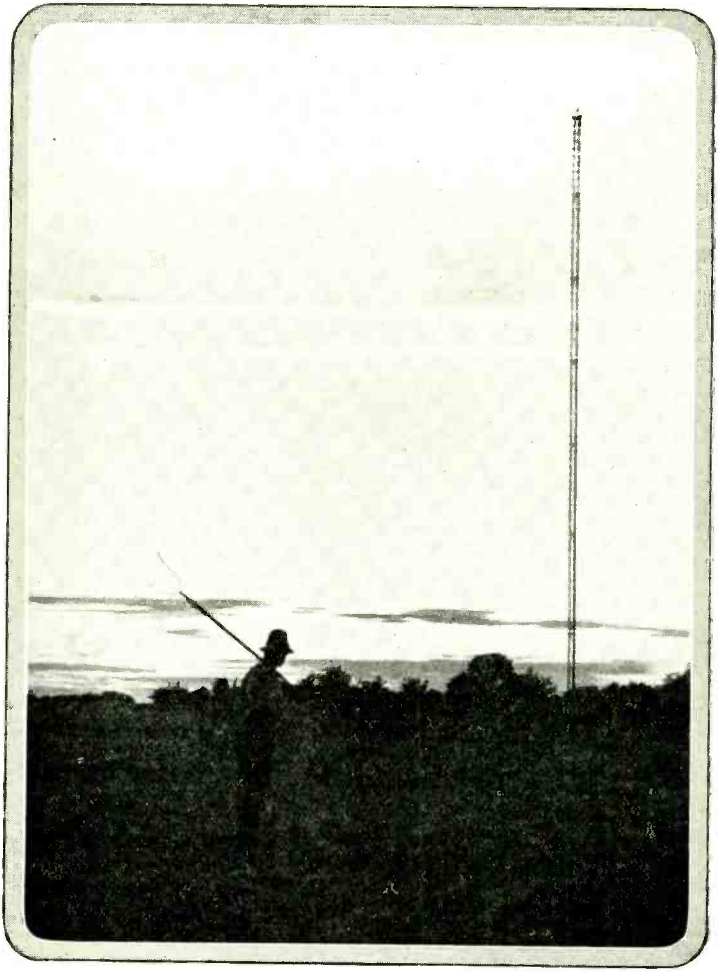
It is attempted here to summarise conclusions arrived at in that paper and present them in more concise form for readers of the *B.B.C. Handbook*.

### *METHODS OF CONTROL*

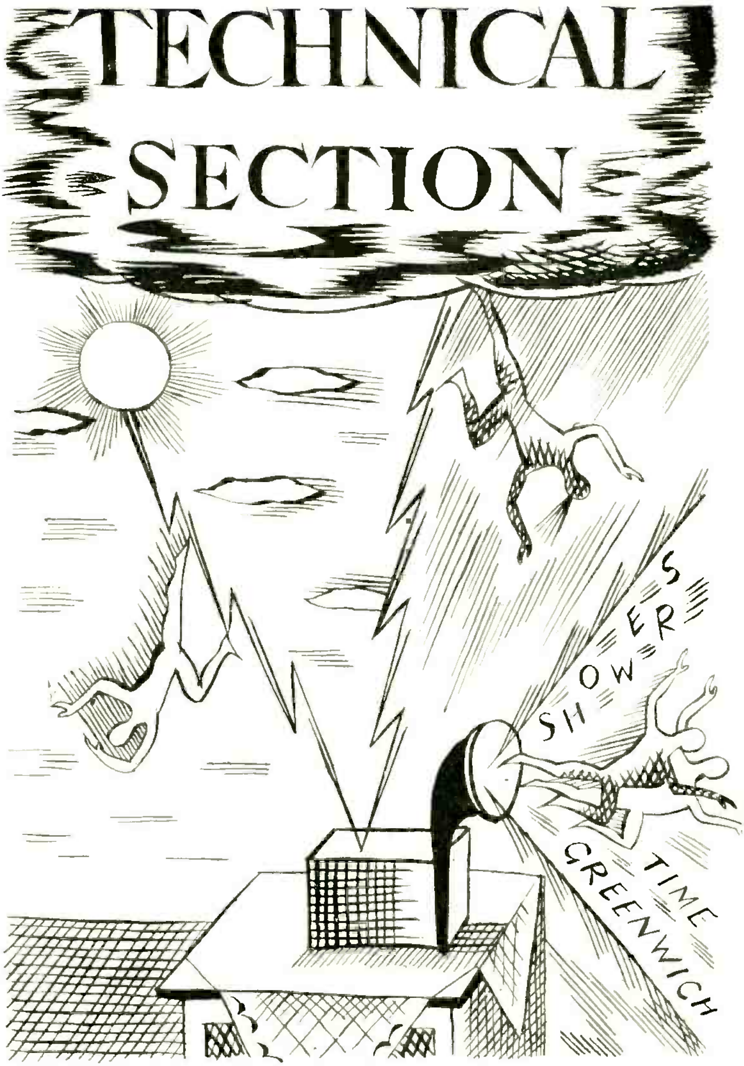
The object before the designer of a broadcasting transmitter is to arrange an apparatus to produce radio frequency currents which can be fully and faithfully modulated by the audio frequencies produced by the action of sound on the microphone. If the modulating currents are increased and decreased, then the high-frequency currents must be modulated proportionately, and if equal modulating currents from 50 to 10,000 vibrations a second are applied, the high-frequency currents must be equally modulated at all or any of these frequencies.

A method known as choke modulation has received wide acceptance in Britain, America and on the Continent. The only system not based on choke modulation is used by the German Telefunken Company. In the German system the grid circuit of some part of the oscillation generator contains a modulating valve, and the alteration of its impedance makes corresponding alterations in the output oscillations. The writer, while acknowledging the successful performance of German transmitters, has good authority for stating that the result has only been arrived at after considerable difficulty, and even then maximum modulation is achieved at the expense of perfect quality. The value of choke control lies in its inherent simplicity and stability.

Choke modulation relies essentially upon applying the power to both modulating valves and oscillation generator through a highly inductive choke. The low-frequency voltages of modulation are applied to the grids of the modulating valves. With a constant power input, power may be momen-



DAVENTRY AT SUNSET


TECHNICAL SECTION
SHOWERS
GREENWICH TIME

the programmes of outside concerts have been sold to listeners generally, but difficulties of distribution usually make this course undesirable.

### *TALKS PAMPHLETS*

These originated in the rather tentative distribution, to listeners who asked for them, of syllabuses of the organised series of school broadcasts and adult talks as arranged for a given term or session. The syllabuses grew in circulation and in bulk, and were followed by, occasional at first and then regular, issues of pamphlets dealing separately with particular subjects, Sir Walford Davies' music manual being one of the earliest. At present about fifty school and thirty adult pamphlets are issued in the course of the year. All the pamphlets that are suitable for the purpose are liberally illustrated, some of the historical and geographical pamphlets being of the greatest pictorial interest. The textual matter in some consists merely of synopses; in others, particularly the adult ones, the reading matter is connected: all of them contain questions for discussion and suggestions for reading.

### *TECHNICAL PUBLICATIONS*

These are issued from time to time in the interests of better reception and as a supplement to the work of the B.B.C.'s Technical Journal *World-Radio*. In the latter connection *World-Radio's* Map of Europe and its booklet of "Identification Panels of Foreign Stations" deserve mention. Two pamphlets of the greatest interest to every listener are those on "Oscillation" and "The Maintenance of Receiving Sets," copies of which should be in every listener's home. These two pamphlets are issued *free* by the B.B.C., and can be obtained from any station or from most wireless dealers.

### *BOOKS*

Apart from this Handbook, the B.B.C. has issued one or two books, details of which will be found in the advertisement pages. All of them are published at the cheapest price consistent with good printing and general serviceability, and the listener will find them both interesting and useful.

# B.B.C. BOOKS AND PAMPHLETS

THIS article can best be of service by pointing out the great practical value to the serious listener of these printed companions to the broadcasts of talks and music. The books and pamphlets deal with a great variety of subjects, with anything, in fact, that may from time to time be chosen as the subject of broadcasting; they can be divided, however, roughly into three categories: pamphlets connected with music, talks, and technical matters.

### *MUSICAL PUBLICATIONS*

The musical pamphlets came first historically, the publication of the librettos of operas being the forerunner of other pamphlets designed to help the listener and increase his enjoyment of the actual broadcast. The first libretto of a broadcast opera was issued at Manchester Station in May 1925, and had a circulation of 2500 copies. The practice was adopted in London in 1926, and librettos have been issued monthly, more or less regularly, ever since, the present average circulation of each being about 100,000 copies. It would not be an exaggeration to say that listening with the libretto revolutionises the appreciation of opera. In performances in public theatres, such as Covent Garden, even if the opera is sung in English, it is often impossible for the audience to hear half the words of the choruses, quartets, and concerted numbers, while even in the solos a great deal is inevitably missed. Studio conditions increase the difficulties as regards choruses and concerted numbers, but all these difficulties are resolved by the aid which the eye gives to the ear when the listener follows the opera with the libretto. It is hard for a person who is used to listening to opera as a rather hazy, wordless affair, in which the changes in the dramatic tone of the music are the chief indication of the plot, to realise the transformation which the libretto effects—the opera suddenly appears as a dramatic musical play with a plot, detailed scenes, and words, which, though sung, are absolutely clear. Opera takes on a human as well as a musical interest.

Concert programmes to the number of nearly a hundred a year are another form of musical publication, but one that does not normally affect the listener. On special occasions time, articles and views which reflected the B.B.C.'s official technical policy. In this connection attention may be called to the series of articles by Captain Eckersley entitled "Technical Considerations," and also to the recent articles dealing with the new Regional Scheme of British Stations.

One of the principal features of *World-Radio* referred to above is entitled "Which Station Was That?" This takes the form of a service to those very numerous listeners who hear transmissions which they are unable to identify. Every such question which is accompanied by sufficient information is answered either as a free query in the columns of the paper, or by post on payment of sixpence for each query.

During the last twelve months *World-Radio* has published a number of special issues dealing particularly with certain countries, notably the larger Dominions and the United States of America. These numbers are amply illustrated, and contain full information not only of the broadcasting activities of the countries concerned, but also of their interests in general.

It is felt that for listeners to foreign transmissions some acquaintance, at least, with the principal European languages is extremely desirable, if not necessary. With a view to encourage listeners to acquire some knowledge of these languages, as well as for the benefit of those who desire to follow closely the broadcast language talks, *World-Radio* publishes, each week, a special "Broadcasting and Languages" section, in which are printed not only the text of the foreign talk to be broadcast the following week—in order that it may be intelligently followed—but also a series of Grammar Aids and Hints.

Foreign Travel articles, illustrated with suitable photographs, are also a constant feature of the paper, since it is felt that the encouragement of listeners' interests in foreign countries makes for that international understanding which broadcasting in general has done so much in the past, and will do so much in the future, to bring about.


THE NEW COVER DESIGN, NOW SO FAMILIAR ON THE BOOKSTALLS

## "WORLD-RADIO"

THIS is the title of the B.B.C.'s official technical and foreign journal. It was founded as *The Radio Supplement* in July 1925 for the purpose of providing British listeners who desired to receive transmissions of foreign stations with the official programmes of those stations in a detailed and yet handy form. It also sought to print such information as would keep British listeners informed of the progress of broadcasting throughout the world. The title was changed in June 1926 to *World-Radio*, which better describes its scope than did its earlier name.

From time to time fresh features have been added as the demand seemed to arise, such as the Table of Stations in Order of Wave-lengths, Station Identification Panels, the "Which Station Was That?" service, and the weekly list of Continental Programme Events. With the growth of interest in short waves, it has been found necessary to include a list of stations working on wave-lengths under one hundred metres.

Since it has been the policy of *The Radio Times* from its foundation to include no technical matters, *World-Radio* offered an admirable vehicle for conveying to listeners authentic information of this character and, from time to already the era is passing in which broadcasting was regarded as a sensational toy, in which the listener listened indiscriminately until he was bored.

*The Radio Times* also tells the listener *what the other listener thinks*. Its correspondence columns enable the humblest in the land to disagree with either its own writers, the B.B.C. or any correspondent. It has pointed the way to a great popular understanding and enjoyment of music by reducing musical criticism, explanation, and illustration to their simplest form, by unabashedly translating foreign titles of musical pieces and making familiar the English versions of those titles (few realise how great a barrier to musical appreciation these conventional foreign trappings have been, how in the past the 75 per cent. of our population which did not understand any language but its own was deterred from listening to classical music by the feeling that concealed behind such titles must be something beyond its understanding). The reprints of broadcast talks have made available in permanent form much spoken matter of value and interest; they have proved to the sceptical how wide and brilliant is the field covered by the microphone. The programme pages seek to clothe the bare bones of mere items with a covering of notes and pictures, to provide, where possible, a background, however slight, to every hour of broadcasting. It welcomes ideas from any of its readers and gladly adopts them where practicable. It is doubtful whether any paper has been so "sub-edited" by its readers. Most of the recent modifications in make-up, etc., have sprung from suggestions contained in listeners' letters.

THE B.B.C.'S PROGRAMME LETTER-BAG

| 1923 | 1924 | 1925 |
|---|---|---|
| 16,000 | 20,000 | 25,000 |

| 1926 | 1927 |
|---|---|
| 30,000 | 60,000 |

The above figures refer to letters of comment or inquiry only.

## "THE RADIO TIMES"

IN the expressed opinion of many of the experts of Fleet Street, the rise of *The Radio Times* is one of the romances of journalism. "But, of course," they add, "it has the monopoly of the B.B.C. news and programmes!"—as though that accounted for everything.

Those who know how *The Radio Times* is growing, week by week, are aware that, whatever may have been the case during the early years of the paper, this monopoly (so called) is to-day in no sense an exclusive reason for one of the largest circulations in the country. The growth of this circulation during the past two years has, in fact, been in directly inverse ratio to the strict application of the "monopoly." Whereas to-day the Press is able to publish each day the full programme of the B.B.C. and is amply supplied with news of programmes to come, *The Radio Times* has, since the last issue of this Handbook, taken a further great step forward. Even granted an increase in the number of licences, it is far more popular to-day than it was in the days when its monopoly was delicately nursed.

Why is this? you ask. Why do more than a million listeners buy *The Radio Times* each week? Here is the answer—a simple one. Because it is "the listener's own paper," with the special purpose of informing, amusing, and interesting *him*. Whereas the daily newspaper caters for the needs of the broadcasting enthusiast in a bare half-column gone astray among a hundred or so other columns devoted to the interests of the racing fraternity, the amateur politician, the sensationalist and so on, *The Radio Times* concentrates upon broadcasting alone. Its purpose is to give news of broadcasting, to arouse interest in the development of broadcasting, to follow up the work of broadcasting, to throw light upon the organisation of broadcasting.

Whereas the ordinary newspaper regards wireless notes as a necessary but unimportant feature, *The Radio Times* is written and edited by men who have watched the growth of broadcasting, who know the medium by experience, who are keenly alive to the limitless possibilities of its future. Their work has been to fire several million listeners with their own enthusiasm and vision. Happily they are gaining ground, for

# COPYRIGHT LIMITATIONS

IT is within the power of any owner of copyright to decide on the means by which his work is to be presented to the public and to withhold at will his permission for any particular form of representation. That listeners will have missed from past programmes very few names of note is an indication that authors and composers in general have taken kindly to the new medium, but there are still a number of works which are not available.

In music perhaps the most important are the Gilbert and Sullivan operas, from which not even a single song may be broadcast. At one time the restriction was complete to the illogical extent that the B.B.C. could not do what was being done by good, bad and indifferent bands and orchestras all over the country—namely, perform selections from the operas. Now, however, these selections may be broadcast, and it is anticipated that no great length of time will elapse before substantial portions of the operas themselves will be heard.

Musical plays generally have always been difficult to obtain, but the attitude of owners of such works is changing slowly and the position is gradually getting easier.

The name of Kipling will have been missed by many, and it is a matter of extreme regret that listeners are not able to hear poems and extracts from the prose works of this essentially British writer. A. E. Housman, the author of "A Shropshire Lad," has made a decision like that of Kipling, but his poems, although they may not be read, can be heard from time to time in excellent musical settings by well-known composers.

Where stage plays are concerned there are various difficulties, one of which is caused by the division of performing rights into Provincial and London rights, with the consequence that managers cannot always agree as to the desirability or otherwise of a play being broadcast. Certain authors will allow their one-act plays to be broadcast, but not those of full length, and there are still some, including Sir J. M. Barrie, who withhold all their plays. Not long ago G. Bernard Shaw and Henry Arthur Jones were among them, but the ranks are slowly thinning, and it is to be hoped that in time the B.B.C. will be unrestricted in the presentation of the very best works of past and present writers and composers.

# HOME AND GARDEN

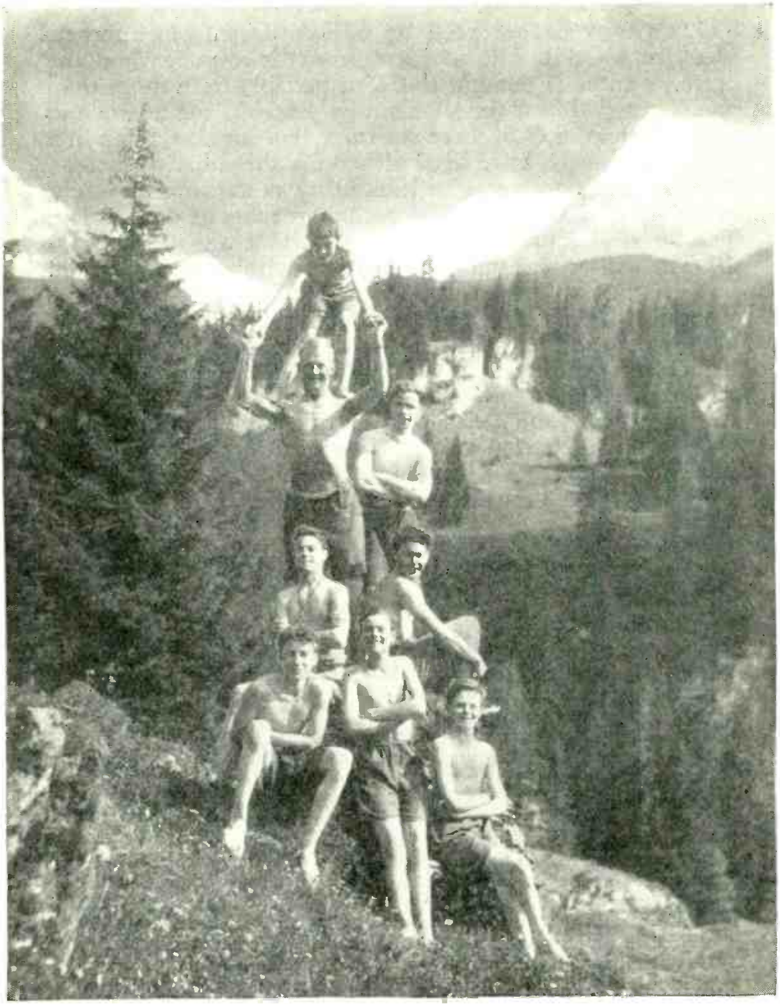
WHEN the present series of talks to housewives began, the first question was: What sort of talks will be most appreciated, practical or theoretical? To judge from correspondence, the answer seems to be overwhelmingly in favour of the practical talk, whether it be on cooking, clothes, or household management generally. In arranging these talks the object has been two-fold: firstly, to provide listeners with something rather out of the beaten track; each speaker has, therefore, a particular and personal method of her own, and is chosen for that reason; secondly, to provide useful advice for the many listeners, both in town and country, who would be glad to know both of economical dishes and also of the least wasteful methods of buying food and of furnishing and equipping their homes.

The listeners to household talks come from all walks of life. Curiously enough, a number of letters come from men.

There are also letters, written often in a hand which shows the writer to be unaccustomed to the use of pen and ink, which ask for copies of the recipe because "the baby cried," or "the children came in from school," or "a neighbour knocked at the wrong moment" and listening was interrupted. That is one very real drawback to the usefulness of these household talks. Unless every word is heard and understood, some vital ingredient, or the crucial point of the new method, may be lost in the few seconds while attention is diverted. Then, again, it is not always easy to remember a long list of ingredients, or a complicated way of mixing, and many people who are not accustomed to writing find it difficult to take down from dictation, however slow it may be.

Listeners will, however, be interested to hear that the B.B.C. has recently issued an illustrated booklet * containing a large number of recipes and hints broadcast in 1927, as well as many extracts from Mrs. Cran's talks on gardening, and talks on food values, dressmaking, interior decoration, etc., which have been broadcast from time to time.

* "Home, Health and Garden." Price 1*s*. Postage 3*d*.



NOTTINGHAM PIT BOYS SUN BATHING IN THE ALPS

*An illustration from the book "Home, Health and Garden"*

S.O.S.'s may be accepted by one country from another. Messages could thus be broadcast from the country where the person wanted is thought to be, or possibly from more than one country almost simultaneously. Even in the absence of such a system, S.O.S. messages from this country, often in a foreign language, have been picked up abroad with success. The following story may be interesting as showing in what a roundabout way a message sometimes reaches its destination. The son of a skipper on a Lowestoft drifter was dangerously ill. The drifter was known to carry a wireless receiving set, but was not able to pick up a cablegram. It was decided, therefore, to broadcast a message asking the skipper to return home at once. Owing to the fact that their nets were being hauled in at the moment the message was broadcast, no one on the drifter heard it. Two Englishmen, however, living in Antwerp heard the message and made a note of the number of the drifter. Next morning, when walking along the quayside, they noticed this particular drifter lying alongside. In a very short time the skipper was on his way back to his son.

## S.O.S. RULES

In view of the greatly increasing number of S.O.S. messages that the B.B.C. is asked to broadcast, listeners are reminded of the rules and procedure which must be adhered to, careful attention to which will save a great deal of time and trouble to all concerned.

The B.B.C. will broadcast messages requesting relatives or friends to go to a sick person only when the Hospital Authority or the Medical Attendant certifies that the patient is *dangerously ill*, and *if all other means of communication have failed.*

In no case can an S.O.S. be broadcast requesting the attendance of relatives, etc., *after* death has occurred.

Originators of S.O.S. calls would help considerably if they would let their nearest Station know if the S.O.S. has been successful or not.

S.O.S. calls for "missing" people cannot be broadcast unless the B.B.C. is directly requested to do so, in the case of London or Daventry, by New Scotland Yard, and, in the case of provincial Stations, by the Chief Constable of the district in which the Station is situated.

No S.O.S. can be put out regarding lost animals or property.

# S.O.S. MESSAGES

THE heading of this article might well be "The Romance of Broadcasting." The wireless S.O.S. service beyond doubt strikes the imagination more vividly and more poignantly than any other side of broadcasting: and its importance justifies some account of its methods and results.

Apart from those which are given out at irregular times, owing to exceptional urgency, S.O.S.'s are broadcast as a rule immediately before the News Bulletins. They fall mainly under two headings: (1) calls for relatives of persons who are dangerously ill, and (2) calls at the request of the police for missing persons or witnesses of an accident.

Considerable success has attended the broadcasting of S.O.S. calls, the average of successful messages last year being in the neighbourhood of 43 per cent., against 38 per cent. in 1926. If the cases of dangerous illness were taken alone, the percentage of successes would be considerably higher, those broadcast from London reaching nearly 56 per cent. The police messages naturally bring down the average, because their own machinery has failed before they enlist the help of the B.B.C. 802 messages were broadcast during the year.

The problem of rules presented itself at the very outset of the S.O.S. broadcast service. Was the B.B.C. to undertake the combined service of a personal column of a newspaper and of a lost property office on a universal and grandiose scale; or was it to confine itself to cases of the most stringent necessity? Consideration of the public interest and pressure of space soon compelled a decision in favour of the latter, confined, in the interpretation, to matters of life and death and requests from the police. See rules, p. 269.

### *INTERNATIONAL S.O.S. MESSAGES*

What may prove to be an interesting development in the S.O.S. service was discussed in private in the early part of the year by the Union Internationale de Radiophonie in Geneva. The Union is now considering, on the suggestion of the B.B.C., whether some general system can be evolved whereby countries may agree on some form of rules so that station, the announcer no doubt reads "Forecast for the next eight months, hot and dry. Umbrellas may be safely rolled," and forgets the existence of weather till the next rains arrive.

The past year has seen several innovations, notably the monthly weather summaries and the short summary of the day's weather which precedes the 9 p.m. weather forecast. Another step taken recently, following a request from a Jersey listener, is the mention in the weather forecasts of the Channel Islands whenever conditions there differ materially from those in the South of England.

In the last year the weather forecasts have, on several occasions, been of more than usual interest and service, notably during the great snow blizzard at Christmas and the floods which followed. Though it may have been but Job's comfort to hear that further falls were expected when beleaguered by snowdrifts, or that more rain was imminent when the retreat from the bedrooms to the attics had already begun, yet nothing is worse than uncertainty, and the wireless alone was capable of breaking the silence when newspapers and the post were but memories of civilisation.

## WEATHER FORECASTS

| | |
|---|---|
| 10.30. | Daventry 5XX. Weather Forecast for ships and farmers. Read twice—first at natural speed, second time at longhand dictation speed. |
| 6.30. | General Weather Forecast. |
| 9.0. | General Weather Forecast, including a summary of the day's weather. |
| 9.30. | Daventry 5XX. Weather Forecast for ships only. |
| 10.0. | Daventry Experimental 5GB. General Weather Forecast, including a summary of the day's weather. |

In addition:—

Gale Warnings are broadcast at 1 p.m., 4 p.m., and 6.30 p.m., as and when received from the Meteorological Office.

A General Summary of the preceding month's weather is given on the 1st of each month before the General Weather Forecasts.

# WIRELESS WEATHER FORECASTS

THE Weather Forecast is one of those rare things that no one would willingly miss, but from which an uncertain pleasure is to be derived. For it is a melancholy fact that the official weather prophet is a man of gloom. It is rarely that he unconditionally pronounces in favour of a spell of sunshine; and he certainly lacks the enthusiasm of the fabled barometer, which once caused its owner to hurl it into the rain, with the words "Go out and see for yourself." His favourite slogan, of course, is "Further outlook, unsettled," and it is this glorious uncertainty that is responsible for the peculiar charm of our island climate and scenery. We are better off, anyhow, than El Riyadh, for instance, which is somewhere in Arabia, and where there can be no weather forecast, as there is never any change of weather to forecast. At Nairobi, moreover, where there is also a broadcasting

# "AT THE MICROPHONE"

## AN ANNOUNCER'S IMPRESSIONS

"I WOULD rather go through forty first nights than do this," a well-known actress remarked to me the other day in the studio. "It makes me *so* nervous. But of course *you* are never nervous, you get so used to it."

"Well, I get plenty of practice," I replied. "But you are quite wrong about my never being nervous: there are times when I am very nervous indeed. You see, although we take great care to prepare the programme beforehand, every night is a first night for the announcer, as no two successive programmes are alike. When I first began I felt exactly as you do now—the kind of everything-that-you-say-will-be-taken-down-as-evidence-against-you feeling—but I soon got over this, and found the best way was to treat the microphone as if it were a human being, and I am convinced that being friendly and natural is the keynote of good broadcasting."

Of course, it is not easy to be natural before the microphone, but I feel sure that with practice and determination you can be perfectly natural, but it takes time. A good tip is to think of one particular home or individual, and forget all about the rest: it is fatal to think of the millions of people who may be listening to you ; it is wrong psychologically, and only leads to anxiety, which is just what you want to avoid.

But although I do not find it difficult to be natural before the microphone in normal circumstances, there are times when it becomes very difficult—for example, when facing an audience in the studio, or when, reading the news at sight (as is frequently the case), you come across some horrible foreign names—particularly those of the Chinese variety.

Personally I prefer to be absolutely *alone* in the studio, and then I am really happy; but unfortunately this is seldom possible. To be in a happy frame of mind when announcing is a great asset, because the slightest trace of anxiety is at once discernible by the listener, and although there may be all kinds of worries, they must be kept in the background.

I have countless experiences of this kind—lines to provincial stations broken down, bad timing, artists failing to appear, choir failing to turn up for a studio service—all these emergencies have to be dealt with, but *without* passing on to the listener any suspicion of being ruffled.

beautiful in a hall only too often fails to pass the microphone test. A second hearing is allowed, for nervousness can play havoc with ability, and even hardened performers are often unable to face the microphone without a qualm. Talkers particularly can be enormously helped by a few words of expert advice on inflection and the pitch of the voice, and a special list of hints is sent to all of them who pass the test.

Some, of course—in particular those with a taste for novelty—thoroughly enjoy the whole affair; in fact, in early days there was reason to believe that many people without the faintest hope of ever bursting into the broadcast programmes came for auditions for the fun of the thing and nothing more. But the "auditor" who had spent weary hours listening to their efforts would at least reap his reward now and again, when a John Henry or a Clapham and Dwyer came into his net, or when he got a letter such as that of the gentleman who said: "I must also thank you for the kind way you received me; you must make many friends there."

ON A LIGHTSHIP IN THE BRISTOL CHANNEL.

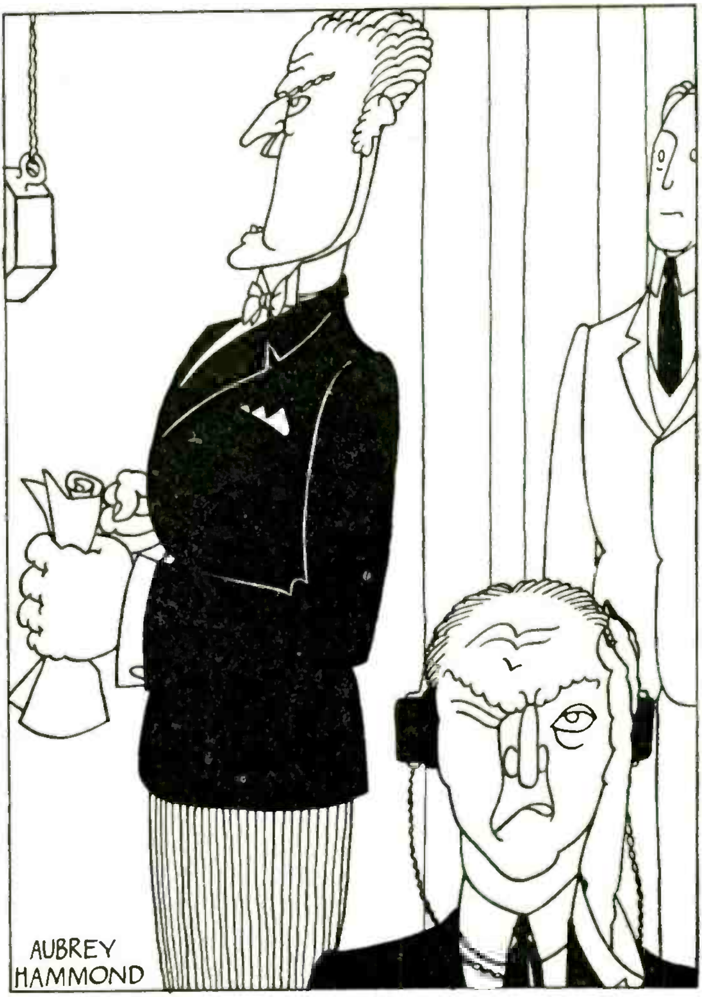
# AUDITIONS

A FEW years ago "auditions" implied, to most of those who had personal experience of them, uncomfortable quarters of an hour in cold, empty rooms, where bored men thumped worn-out pianos, whilst hard-eyed managers looked scornfully on. Now an increasing number of people have quite a different experience.

The B.B.C. gives incomparably more auditions than any single producing organisation on this side of Hollywood, and it has acquired a technique of giving them that provides the candidate who has "got the goods" with a fair chance of delivering them, whilst sparing the feelings of the failures as far as may be. Every week a stream of aspirants passes through the audition studios of Savoy Hill, to say nothing of the local Stations of the B.B.C. At one time the Music Department alone gave 120 auditions a week. That number has been cut down by two-thirds, but the stream, if reduced, shows no sign of drying up, and Talks, Dramatic and Variety auditions add to the total. Obviously some members of the staff must have acquired a considerable practical experience of handling the artistic temperament with tact.

The actual procedure to be followed by those who want to have their talents tried out does not vary much, whether it is a musical, dramatic, or variety audition, or a speaking-voice test. The applicant turns up at Savoy Hill at the appointed time, duly armed, as the case may be, with his or her roll of music, trombone, box of throat lozenges, or script. She (for it is as likely to be she as he) is rescued from a waiting-room which is itself a considerable improvement on the dentist's, although the same premonitory symptoms are doubtless often experienced in them both, and taken into a studio where a blue light over the door signifies to the initiate that the microphone is "alive," though a closed circuit only is being used. This means that sounds from the studio pass through the microphone and so to the Control Room, but instead of being broadcast they are merely passed back on the wires to a pair of headphones in the studio itself.

It is on these headphones that a tactful member of the staff listens to the test, for the microphone has its own exigencies, and a voice or an instrument that might be




"A TACTFUL MEMBER OF THE STAFF LISTENS TO THE TEST" occur; but that has no effect on broadcasting, and is not comparable with the steady and watchful stream of comment that keeps the drama, the cinema and the concert-room in touch with the public. Once again, this is very strange.

For criticism is an almost necessary tonic in art and an indispensable condition of the health of any enterprise which proposes to deal out education or entertainment to the public. Its value is something greater than that of the individual critic's opinion. The individual critic's ideas and standards are pooled and applied individually to the material which is to be judged. There have been one or two honourable exceptions to the rule of neglect which I am challenging. Mr. Ernest Newman, the doyen of English musical criticism, as well as the most scholarly and conscientious of critics, whose services to music in this country have never been adequately recognised, has not neglected to keep a watchful eye on the music that is broadcast, and here and there others less eminent have seen their opportunity and duty in this matter—but only spasmodically.

My own idea is that the B.B.C. should provide in London, either in the theatre district or in Fleet Street itself, a listening-parlour or quiet, restful room, furnished with comfortable chairs, where the reception of the broadcast programmes would be of the highest quality obtainable. The critic who wished to comment or judge what was being done would then be sure that he was hearing it at its best. If he listens on his own set at home (such being the unsatisfactory condition of the technical business of wireless reception) he may get a distorted rendering of the music. That is of no use, and no critic worth his salt would consent to criticise anything unless he knew that the quality he had to judge was not marred by some accident in transmission or reception. But whatever means be adopted to carry it out, the end to which I am drawing attention is surely one that should be very carefully considered by those who conduct newspapers or reviews. The audience for broadcast entertainment has already far outstripped in size any other audience in the world; and I suggest that it is time that what it listens to should be the subject of reasonable, sympathetic, austere, and constructive criticism.

he does not want. The Press draws a certain amount of attention to forthcoming events: that is to say, it is alive to the news value of broadcasting; but it has not yet discovered its æsthetic value as a subject for critical treatment.

Now this seems very strange. Politics, music, racing, football—all these, being matters in which a large public is interested, receive the most careful and well-informed critical treatment in the Press; expert writers criticise what is going on in these worlds, and express their views in a highly critical manner. A public lecture receives a paragraph of notice; a small concert in a London hall which may attract five hundred people (three hundred of whom may have paid for their seats) will receive a weighed and considered notice by an expert music critic. A concert in the Queen's Hall conducted by, let us say, Sir Henry Wood or some eminent foreign conductor, performed before an audience which may even run into thousands, will receive due and detailed critical notice; the same concert by the same conductor, given in the broadcasting studio and played to millions, instead of hundreds or thousands, will receive no notice at all. The visible and physical effect of the assembly of a few hundred people in a hall seems to constitute a claim on the public notice; the vast contact between the artist and millions of scattered listeners, because invisible and spiritual, receives no notice at all. Again, this seems to me very strange.

It is not only music; the spoken word is a tremendous and increasing influence in broadcasting. The talk of an attractive speaker for ten or twenty minutes to the individual listener seated in his arm-chair is a far more intimate, telling and memorable thing than a lecture delivered from a platform. It is happening, not once, but many times a day; but no daily or weekly article appears commenting, challenging, praising or discussing the stream of influence that is thus being exerted on the public mind. In the invisible ether is growing up a new form and technique—that of radio drama. But do the dramatic critics, who have their columns to write about the doings of what are very local theatres, seem even conscious of, or take an interest in, the struggles and experiments by means of which the infancy of this art is being nurtured? Sometimes, because of the personality of the speaker, or for some other reason, an isolated comment will

# BROADCASTING IN THE PRESS

By Filson Young

WHATEVER else may be said about it, the daily Press of Great Britain cannot generally be accused of lack of enterprise, or neglect of opportunities to direct the illuminating beams of its intelligence on any subject that interests a very large public. Yet I venture to say that there is one subject which it consistently and almost universally neglects—I mean the neglect of broadcasting as a matter of public criticism.

This may seem a rather startling view to express in the light of the fact that when one opens any daily paper, one finds notes on broadcasting, as well as a very considerable space devoted to the publication of the broadcasting programmes from various stations. Many papers also devote articles regularly to wireless matters apart from programmes, and give people a certain amount of advice about the construction and maintenance of sets.

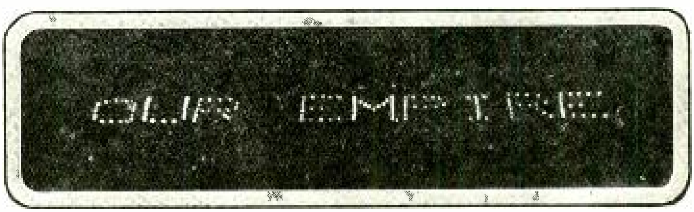
All that is admirable, but it is not what I mean. Quite apart from the provision of entertainment, and the furnishing of millions of homes with a new kind of toy, something has happened which is affecting the spiritual, intellectual and artistic outlook of the country; is happening every day of the year, every hour, almost every minute from ten o'clock in the morning till midnight. This whole river of entertainment information and influence is flowing, by ever-broadening reaches and ever-branching channels, into the life of the country. What it carries on its stream, the very nature and quality of its irrigating waters—these are not only of tremendous importance, but also of tremendous interest to millions of people. But so far the Press, with very rare and distinguished exceptions, has not chosen to deal critically with, or to take any steady or really informed interest in, the programmes that are daily and nightly broadcast. It is true that every now and then the Press opens its columns to letters from the general public expressing approval or disapproval. But these letters do not constitute criticism; they express an almost childish sense of satisfaction when the writer gets what he wants, and displeasure if he happens to listen to something

# THE BROADCAST NEWS BULLETINS

MOST of the material for the General News Bulletins is provided by the news agencies (Reuters, Press Association, Exchange Telegraph and Central News), who reserve their copyright. The Bulletins, which are given from all stations at 6.30, from all stations except 5GB at 9, and from 5GB at 10, aim to give a simple, clear, comprehensive and accurate account of what is happening throughout the world. The style and spirit may follow the dispassionate model of the daily summary of news published by *The Times* newspaper, but there is no expression of opinion or editorial comment in the journalistic sense. Sensationalism is avoided, unsavoury items are excluded. There is no betting news. Under the present agreement news items received from the agencies may be broadcast only between the hours of 6.30 p.m. and 2 a.m.

There is another important auxiliary source of news. Information and announcements may be accepted from Government Departments and other public authorities independently of the news agencies. Liaison has been established with about one hundred official and semi-official bodies for the double purpose of securing supplementary information and of verifying occasional doubtful paragraphs in the news.

A special service of Parliamentary news was recently undertaken by Reuters for the exclusive use of the B.B.C.



TORCHLIGHT LETTERS AT THE ALDERSHOT TATTOO

MR. VERNON BARTLETT

*Whose weekly talks on "The Way of the World" are a successful feature of the programmes* at day-schools. There are hosts of other people listening too, thousands of adults among them.

One of the most difficult problems for the Children's Hour is to ascertain the real tastes of the children. Many hundreds of letters reach the B.B.C. every week from the children, most of them written in childish handwriting, but it is impossible to say how many of these are prompted by adult taste, or even dictated by parental preferences. Certainly the children themselves are keen enough.

One of the features of 1927–1928 has been a reconstruction of the Radio Circle on the principle of an annual subscription instead of a vague, indeterminate life membership. This was found necessary. It was impossible to carry on an immense register containing thousands of names, many of which were necessarily dead entries. The new system involves an annual subscription of ninepence, for which new members receive a badge, others a card or calendar. (For rules, see p. 408.)

As regards the general tendency of programmes, there is little to be said. As was indicated above, experience has made possible the provision of better and more coherent programmes and the shaping of the various items of one afternoon into a connected whole with a feature heading. There is also a growing recognition that the conversational links between one item and another need not always be humorous or take the form of repartee, though cheerful conversation is necessary to provide the requisite air of informality and friendliness.

In the nature of things it is impossible for every Children's Hour to be equally successful. There are peaks of successful attainment in this branch as in others. But on the whole it would seem that the most popular Children's Hour is that in which good items are balanced with first-rate team-work among the familiar voices of the hour. The childish audience differs from the adult in one respect. They are not greatly impressed by great names. Prima donnas sometimes leave them cold, while they scream with delight at the familiar antics of a favourite uncle. The B.B.C. is very far from claiming perfection for this or any other branch of its activities; but as time goes on, it feels a little nearer to a true judgment of what children really like, and can reconcile this with its own standards of what is thought good.

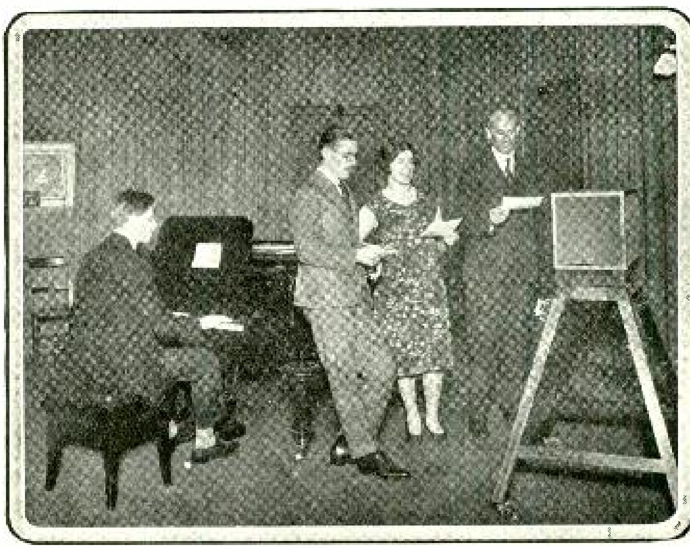
# THE CHILDREN'S HOUR

ALL things tend by usage to stiffen into a routine. Long ago the Children's Hour was the happy inspiration of one of the founders of broadcasting, who constituted himself an "uncle" and amused the children with fun and frolic for half an hour or so. It has now been running for nearly six years in this country without a break, except on Sundays. Necessarily it has lost something in spontaneity. It can no longer be left to the chance inspiration of the moment, because, in reality, though they may not realise it, people are demanding a higher standard of technical accomplishment. It is now a small programme complete in itself, though a programme of a very special character suited to a particular type of audience, young in years or in mind.

The majority of those who criticise it do so because they are not in sympathy with the aims and objects of the Children's Hour, or because they have forgotten what it was like to be children, or, in rarer cases, because their own children do not seem to appreciate it. Their own children may be examples of what is called the "modern child." The "modern child" is probably a rather rare and abnormal product of a few exceptional modern homes. There always were and always will be precocious children, who at the age of ten have attained the mental stature of fourteen. Boarding-school boys in particular grow up precociously, and if they are not really little men at ten or twelve they have to pretend to be. It is quite useless to expect the spirited product of the modern Preparatory School to listen to anything labelled as specially designed for children. His whole aim in life is to be and appear to be a man. Fairy tales are not for him. He likes to hear about the latest in aeroplane engines, but he would much rather see one. In short, this type of young man is not a natural listener at all. It is difficult to tie him down by headphones or loud speaker to a single spot for ten minutes on end.

The Children's Hour continues to try from time to time to angle for the interest of children of every age, size, shape and sex, but its main audience consists of children of nine, ten, and eleven, living at home with their parents and taught is sure of sympathetic response to any emotional appeal, and he may be tempted by the glowing feel of it to expand and exploit it. Happily the air on Savoy Hill is not too rarefied: close at hand are two vast hotels full of hustling Americans; before it flows the water of Thames and the trams of the Embankment. The roar of Strand traffic is never quite silent in its offices. Motors hoot and grind their brakes, river steamers blow their sirens. The glow of the electric signs is an antidote to sentimentalism. But, above all, in the confraternity of Savoy Hill there is humour. In its lifts and on its staircases the poet rubs shoulders with the soubrette, the Archdeacon with the football specialist, the actor with the engineer, the Punch-and-Judy man with Mr. Filson Young.

Glass houses, indeed! Every schoolboy knows how the poet Æschylus met his death. For those who are not yet schoolboys it might be explained that an eagle dropped a tortoise on his head. Even so an apple from an aeroplane might spoil the brain of a millionaire. Let no one throw a stone!



THE CHILDREN'S HOUR—READING THE BIRTHDAY LIST

DEAR MADAM,

We thank you for your kind letter of . . . We beg to assure you that no personal reference to your mother was intended by the preacher. The expression "born in sin" is an ecclesiastical term. At the same time we wish to apologise for any distress occasioned by the misunderstanding, and thank you for your interest in writing. . . .

Sometimes the world presents itself like that to Savoy Hill—as a world of weird people, mishearing, misunderstanding and mistaking everything on extraordinary receiving sets that mangle the finest transmissions. But at other times the listener wears a very different aspect. He is a critic armed at all points, skilled in the highest degree in all the arts, knowing how to pronounce the name of every village in Britain and abroad, since collectively he has been born and bred in each. At such moments the pundit on Savoy Hill shrinks into a small, shivering figure, entirely defenceless; no armour, hardly any clothes; living in a glass house which at any moment may become a target.

But, methinks, on the whole the listener is a person to be loved, not feared. He does respond marvellously when something is done well that calls for response. Sir Walford Davies' post-bag is embarrassingly delightful. So is that of the Children's Hour. The room devoted to that organisation is never empty of the wild flowers of the season, and is stacked with tin-foil collected for the hospitals. From time to time as one goes about the country on holiday or in the cause of business one meets the Good Listener in the flesh. He or she has made a friend of the B.B.C., and has let its ministers provide entertainment and solace for lonely hours. Perhaps he has made a hobby of putting names to voices—a practice officially disowned by the B.B.C., but rather gratifying to the speaker, who finds some ancient utterance treasured in the memory of a listener whom he has never seen. Often the Good Listener is a shy person, doubly glad of a friend who can make no demands for mutual confidences. The daily service has unlocked the lips of many such lonely people: to that unknown speaker they feel they can reveal everything.

But for the man behind the microphone there are dangers in these intimate relations with the unseen. Up to a point he

| | *Appreciations* | *Criticisms* |
|---|---|---|
| H.R.H. the Prince of Wales . | 69 | 1 |
| John Henry . . . . . | 15 | 5 |
| Archbishop of Canterbury . | 9 | 14 |
| Mabel Constanduros . . | 22 | 0 |
| League of Nations . . . | 1 | 1 |
| E. V. Knox . . . . . | 0 | 1 |
| Father Ronald Knox . . | 44 | 84 |
| Total weekly letters . . . | 3067 | 108 |

What can one make of that? It is as inconclusive as an argument in the train. What *does* the fellow care for? Then, if one quotes correspondence as being the only possible guide, one is instantly told that the person who writes letters is *ipso facto* a freak, a crank or at least an abnormal person, since normal people do not write letters to strangers. The truth of that dogma is unproved. Most people surely have an occasional urge to tell the Railway how dirty its seats are, or the Member of Parliament how he is misrepresenting the unanimous views of his constituents, or to ask the Editor why he doesn't give proper space to poultry-keeping, or to challenge the Vicar to say straight out whether he believes in a Personal Devil or not. Most people are potential correspondents, but—most people are lazy. Nothing they don't have to do gets done by them. But when wrath rises high enough, when it boils, when there is a real head of steam, then laziness is no bar to letter-writing. Most of the programme correspondence of the B.B.C. is written by people who begin by saying that they have never had cause to complain before, but really——

Sir,

I have been a contented listener for three years, and have not written to complain before. But really, Sir, when I hear a Christian minister as good as tell me that my poor mother was a wicked woman, as was the case last Sunday night, I felt it only right to protest, etc. . . .

Whereto the B.B.C., humbly and gratefully:

# MISCELLANEOUS

## ON LIVING IN GLASS HOUSES

OFTEN the listener has wondered what kind of secret pundits design the B.B.C. programmes. What immortal hand or eye dared frame this dread cacophony? Why do they never give what is wanted when it is wanted? Why do they keep putting on that awful ——; and why do they not let us hear the delightful ——?

Has it ever occurred to this wonderer that he is being equally wondered at and wondered about by the pundits of Savoy Hill? What is the listener like and what does he like? There is a veil that separates the two ends of the wireless chain. Occasionally, indeed, the listener writes to the newspapers to complain of Savoy Hill, and then as a rule a number of other listeners rally round and say the opposite in letters which the Editor may or may not choose to print. And there are many listeners who write to the B.B.C. about it. There is every reason to believe that these letters are read carefully, answered politely, docketed and tabulated, so that the B.B.C. may ultimately have helpful statistics such as these:—


"WHEN WRATH RISES HIGH ENOUGH"

on a limited number of well-chosen words and has a good deal of practice in hearing those words used, and in using them over and over again in all kinds of different combinations. In the early stages the learner should be content to listen, and then again to listen, articulating aloud or mentally what he hears. Most beginners make the fatal mistake of trying to frame their thoughts in the foreign language before they have perfectly memorised any speech-material. Often, of course, the teacher, in his eagerness to get his pupils on, is responsible for their linguistic failures. He expects them to answer his questions before they have observed correctly what is being said. The students cannot listen calmly, because their attention is divided; all the while the teacher is speaking, they are thinking of the answer they will be asked to give in a moment or two. This preoccupation makes them nervous, and they fail to acquire, at the very beginning, this *correct observation* which is the most important thing of all for the language-learner.

Listeners to elementary broadcast talks in foreign languages are in the fortunate position of knowing that they will not be called upon to answer questions; they have nothing to do but keep their minds alert so as to listen and observe correctly; thus they will cultivate the proper mental attitude required, the mental attitude of the listening child.

## NOTE

Series of talks in other foreign languages, such as Spanish, German, and Italian, are broadcast from time to time as well as M. Stéphan's lessons in French. Details of these will be found in the B.B.C.'s official programmes and a special section is devoted to them each week in *World-Radio.*

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presented with the right material, and nothing but the right material.

In the early stages the student should refrain from grammatical analysis and concentrate on acquiring habits of speech. Let us take the following French sentence: "Il ne me l'a pas encore dit." Such a sentence presents no particular difficulty to the learner if he considers it as a whole, as a succession of sounds and syllables. But the meaning of that sentence is no easy matter if the student starts to memorise the words one by one, and studies the grammatical rules that govern the order of the words in the sentence. The whole of the above sentence must therefore be considered as a unit, and memorised as such; and before the student can be said to have perfectly memorised that unit he must be able to do two things: (1) On hearing the succession of sounds and syllables which form that unit of speech, the student must recognise it by ear, and succeed in reproducing it in its entirety, and that with a single effort, irrespective of what the meaning might be. (2) Not only that: on hearing such a series of sounds, the learner must be able to form immediately a definite association between the group of sounds heard and the meaning for which the group stands. When we are committing to memory words or word-groups, we must not train our visual powers alone, but we must articulate the speech-material to be remembered, either aloud or mentally. This latter process, which is known as "inner articulation," is the one we use whenever we listen or read intelligently. What we call "to listen" means, among other things, silent articulation, feeble and rudimentary movements of our vocal organs. As H. Palmer puts it, "When we listen or read with understanding, when we are thinking to ourselves, we articulate mentally, our speech-muscles, without necessarily moving, are stimulated by the nerves communicating with the speech-centre of our brain."

Whatever aim we have in view in studying a language, it all comes back to this: proficiency in using a language depends exclusively on the amount of speech-material we have mastered, on the number of phrases and sentences we have perfectly memorised. In the opinion of the foremost authorities on methods of language teaching, the best results are attained if the learner concentrates, in the first instance,

# ON LEARNING FOREIGN LANGUAGES

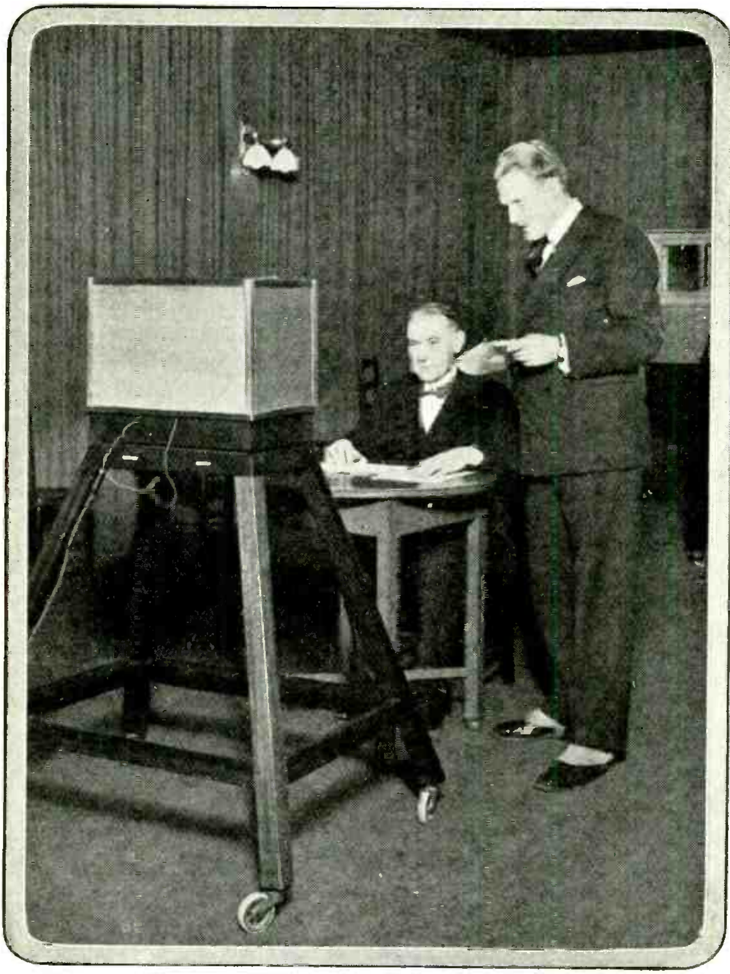
By Monsieur E. M. Stéphan

IN writing this article, all I propose to do is to discuss with my readers some of the most important principles of language study.

I think it can be stated at the outset, that the majority of people who learn languages are first and foremost concerned with mastering a means for everyday intercourse. Their primary aim is not to become intimately acquainted with the literature, history and general culture of the nations whose languages they have set out to learn; but rather to be able to converse fluently and accurately in French, German, Italian, etc. as the case may be.

To achieve this end there is no better or surer method, at the beginning, at any rate, than the conversation or oral method; because through this method, better than through any other, the student will re-educate his power for language study. We all know how strong that power is in young children, and how quickly, owing to lack of practice, that power is lost.

Why do we, in early childhood, acquire so easily a facility for speaking our mother-tongue, or a foreign tongue, for that matter? Because we depend entirely upon the oral method, and because our capacities for memorising and habit-forming are extremely great. Learning to speak a language, just as young children do, is undoubtedly the quickest way of learning to read and to write it. But what, in the last analysis, is meant by learning a language? Learning a language means nothing else than assimilating language-material; in other words, assimilating sounds and sound-attributes, viz. intonation, length, stress, as well as words and word-groups, meaning, grammar; in a word, all that goes to make up a language. This, as it has often been said, can only be done by a series of acts of memorising. And let me remind my readers that, as long as they try to memorise isolated words, they will make but very little progress. A student of foreign languages should cultivate the habit of memorising groups of words, that is to say, phrases and sentences; this way lies the path of rapid progress, provided, naturally, that the student is



M. STÉPHAN BROADCASTING

*The chief Announcer is standing by his side* concerned only with questions of pronunciation, and the standard of pronunciation adopted by its official speakers is regarded more and more, both within these islands and abroad, as a standard of accuracy to be aimed at. This is a weight of responsibility that the B.B.C. very wisely declines to take upon its shoulders unaided, calling to its support the expert opinion of its Advisory Committee on Spoken English. However we at home regard the work of this committee, and however freely we may criticise its decisions, it has become very evident that all foreign students of our language regard the committee's work with interest, and are grateful for an authoritative guiding hand to help them through the labyrinthine intricacy of our pronunciation.

Every word in the list published in the pamphlet "Broadcast English" (obtainable from the B.B.C., price 3*d*., post free) has given rise to doubt in the mind of Announcers as to its pronunciation, and the Advisory Committee, after consulting existing standard dictionaries, and, where possible, technical authorities or such people as are most likely to use the word in question, has decided to recommend that the Announcers shall use the pronunciation indicated. This is *not* to be regarded as implying that all other pronunciations are wrong: the recommendations are made in order to ensure uniformity of practice, and to protect the Announcers from the criticism to which the very peculiar nature of their work renders them liable.

English literature is one of the finest, richest, and most varied in the modern world, and a knowledge of the language is indispensable to the scholar, on account of the wealth of technical literature written in English.

So much is to our credit, and it must be confessed that these tributes to our language do much to restore the self-respect of a nation whose besetting sin is sometimes said to be that of self-depreciation. But there is a debit side, and it is to be hoped that native critics of broadcast English will think of Professor Meillet's words.

"Pronunciation alone isolates the English language. Its pronunciation has neither the clearness nor the sureness of that of most Romance or Slavonic tongues: it is one of the most indistinct possible, and, indeed, it is, at the same time, one of the most singular. A consonant that causes difficulty to almost every nation in Europe (*th* as in *then*) plays a great part, notably in the article. Its vowels, which have a surprising variety, do not agree with those of any language in Europe. There is no language which an adult foreigner finds harder to pronounce correctly. It is pronunciation, and pronunciation alone, which is the great obstacle to the universal use of English."

Such, then, is our language; in grammatical form and structure the simplest in Europe; in pronunciation one of the most difficult in the world, and difficult in many respects. We have isolated sounds (e.g. *th*) that are intrinsically difficult to make; we have vowel sounds (*e.g.* as in *man*, *cup*, *burn*) that are seldom, if ever, heard outside these islands; we have diphthongs (as in *day*, *no*, *my*, *now*, *boy*) that belong to us alone, and we have a rhythmic system that is the perpetual despair of all foreign students. Finally, since the relationship between spelling and pronunciation in a language is one of the learner's first problems, we have in English a spelling system that was designed to represent the pronunciation in vogue about the time of the introduction of printing, and in consequence has little regular relationship with the pronunciation of to-day.

It will be seen, then, that our language is unique in the world of languages, and presents serious problems even to those whose business it is to specialise in the many-sided study of linguistic questions throughout the world. The B.B.C. is sary, so, too, does the foreigner find it increasingly difficult to avoid some contact with English.

The study of our language is a compulsory subject in most of the secondary schools of Europe; some form of instruction in the English language is given by means of wireless in many foreign countries; thousands of listeners on the Continent listen regularly to Daventry and perfect thereby their knowledge of our language.

How does our language strike them?

Jacob Grimm, who with his brother Wilhelm gave us the "Fairy Tales," ranks as one of the greatest philologists of the nineteenth century. His view of English was that it had acquired, simply through ridding itself of inflections, a degree of force and power possessed by no other language. It owed its wonderfully happy structure to the marriage of two of Europe's noblest languages, and was the fitting vehicle for the greatest poet of all times. It might justly claim the right to be called a world language, and seemed, like the English people, destined to reign in future in all parts of the earth. Such is Jacob Grimm's view, as quoted by Jespersen in his fascinating study of "Language," published in 1922.

Most foreign students of our language bless us for the simplicity of our grammatical forms, for the absence of grammatical agreements in number and gender, and for the simplicity of our system of genders. We have reduced "grammar" to a minimum; indeed, Jespersen compares our language with Chinese, which has next to no "grammar," as being almost pure logic.

Foremost among contemporary European linguistic scholars is Professor Meillet, of the University of Paris, and his estimate of our language must be received with respect. It will be found in his book, "Les Langues dans l'Europe Nouvelle," published in 1918; here are Professor Meillet's principal points:—English is the most world-wide of all civilised languages. It has lost nearly all its archaic forms, and the few that remain in the verb are easily mastered. Its vocabulary, half Latin, half German, gives to it a familiar appearance in the eyes of those whose native language is either German or one of the Latin family of languages. Neither Frenchman, Dutchman, Norwegian, Dane, Swede, nor German feels quite at sea when confronted with English.

# ENGLISH—HOW IT STRIKES THE FOREIGNER

By A. Lloyd James

IT is very doubtful whether there exist to-day any literate inhabitants of these islands who can truthfully say that they do not know one single word of any foreign language. Life has become, in the twentieth century, a much more international activity than it used to be, and linguistic frontiers have ceased to be a hindrance. We, who have no geographical frontiers, have been throughout our history the most linguistically conservative nation in Europe, and this simple fact is responsible for strange elements in our national character. Nowhere, for instance, is the foreign name venerated in music as it is in our country; we believe, because we have no linguistic frontiers, that foreign lands and foreign tongues are in some mysterious way vastly superior to our own. It is beyond the scope of this article to develop the wider aspects of the problem, but we may with advantage consider how our language stands in the world of languages, and how it is regarded by the foreigner. Just as we find, in varying degree according to our needs, a smattering of some foreign languages neces-

A. LLOYD JAMES
*who is Hon. Secretary of the Advisory Committee on Spoken English*

ligible buzz of sound, whilst very low tones will probably be lost altogether in transmission. Such a restriction might seem to lead to monotony of tone—a thing to be avoided at all costs—but actual volume of sound or intensity must not be confused with inflection of voice. The colouring of a miniature may be as subtle and varied as that of a life-size picture; a voice may employ every variation of tone whilst keeping within certain limits of intensity. This restriction, it may be added, is frequently inimical to the success of the platform speaker and the elocutionist at the microphone.

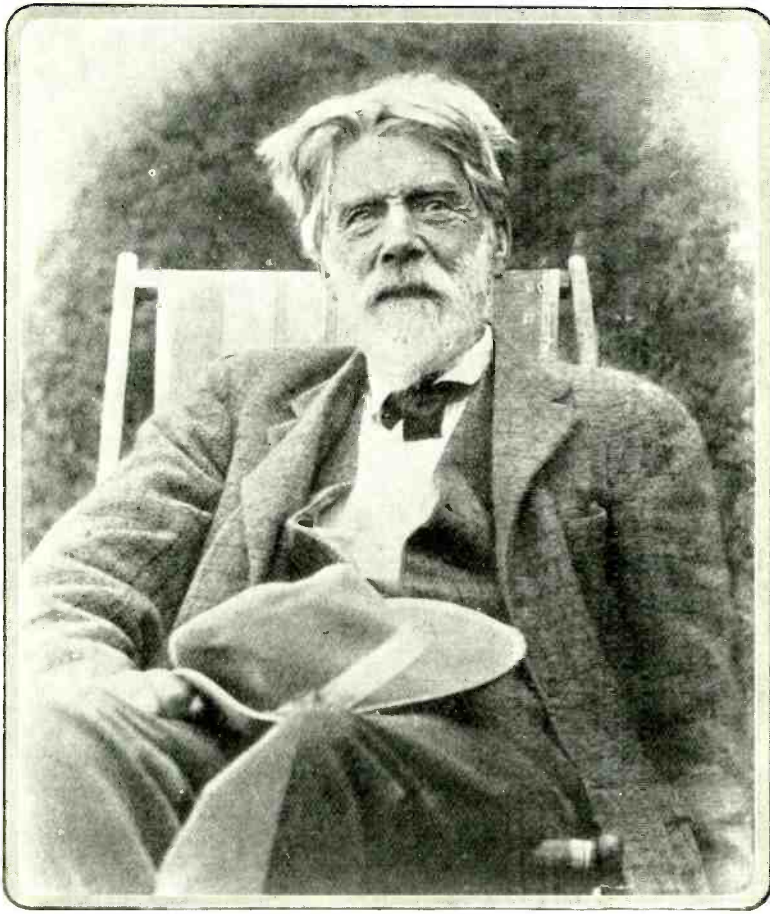
For the microphone one other quality is desirable, which may be termed "voice-personality." Such a quality does exist, but as yet we know little about it. Certain voices—and this, curiously enough, does not necessarily depend upon their beauty or resonance—are peculiarly suited to the microphone: they transmit easily, and establish an immediate contact with listeners. Whether this is due to the voice itself, or to some quality of ease and friendliness in the speaker, it is at present hard to determine.

As far, then, as one can dogmatise on so thorny a subject, the qualities of a good reader are, firstly, the ability to read fluently and with restraint; secondly, a love and understanding of the subject; thirdly, a pleasant voice; and lastly, "voice-personality." The combination of these qualities is unfortunately rare; those who possess them may do much to further the appreciation of poetry.

The reader at the microphone must, however, be possessed of certain qualities which to the ordinary reader are not essential. In the first place, he must remember that he is a voice, and a voice only: no trick of gesture—though readers at the microphone frequently, from sheer force of habit, waste their energies in gesticulation—no advantage of appearance, no facial expression will further his cause one whit: all he conveys must be conveyed only by the subtleties of tone within the register of his voice. Just as a blind man will be quick to detect a false note in music, so the wireless listener will unfailingly respond to the slightest lack of conviction, hesitation, nervousness, or boredom in a reader's voice. Should he dislike a poem ever so slightly, his listeners will be aware of it; should he not fully grasp the meaning of a line, the sense of it will be lost upon his audience; should his attention waver but for a moment, the attention of his hearers will be immediately distracted. The point cannot be too strongly emphasised: it is the reader whose attention is passionately concentrated upon his subject, whose sense of it is so strong that a constant series of visual images are called up to his mind as he reads, who will send a spark across the ether and set fire to the minds of his listeners.

This enthusiasm is the basis of good reading; but in itself it is not sufficient: it can also be dangerous. There are many people—we have all met them—who ardently misinterpret or over-emphasise the poetry they love, either because their ear is false, or because they have not learned to control their voice. Some measure of voice-training, in order to acquire fluency and voice-control, is, except in cases of natural ability, as necessary to a reader as are foundations to a house, and should be as little in evidence. Consciously mouthed phrases are no less irritating than a lisp or a stammer: a reader whose attention is fixed on the sound of his own voice cannot hope to reach the heart of his audience.

The microphone places a further limitation upon the reader's voice: the volume of sound must be kept within a certain compass. For technical reasons, and also because, in the absence of visible expression and gesture, the effect of each subtle inflection of voice is heightened, the reader can neither shout nor whisper: a sudden loudness of tone will produce "blasting," and will reach listeners in an unintel-



THE POET LAUREATE—ROBERT BRIDGES

*who is chairman of the B.B.C.'s Advisory Committee on Spoken English*

# THE BROADCASTING OF POETRY

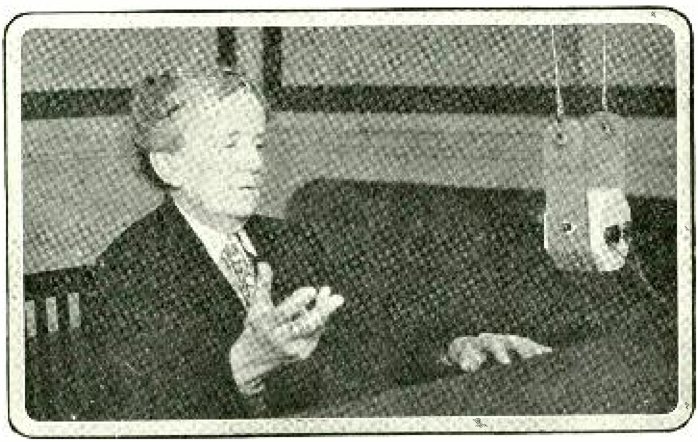
POETRY is seldom well read. For this reason, and because the present age is inclined to view any emotional performance with disfavour, the poetry-reader finds small scope for his abilities. The art has atrophied by disuse; and the misuse of it by soulful people who passionately misinterpret the poets has resulted in a reaction against all forms of poetry-reading. Yet poetry is written to be spoken; and although there will always be some who maintain that it can best be appreciated by the eye, the vast majority will only respond to its beauty when the voice gives life and coherence to thought, phrase, and rhythm.

A reader is faced with many difficulties: the appreciation of poetry is in itself largely an affair of mood and temperament, whilst the criticism of a reading will depend not only upon the reader's voice and personality, but also upon the response awakened by the poems selected in the mood and attitude of mind of his audience. Visual imagery, for instance, will evoke a readier appreciation than abstract poetry; the ballad will probably prove more popular than the sonnet; and always the criticism of a reader will be coloured by the personal tastes of his listeners.

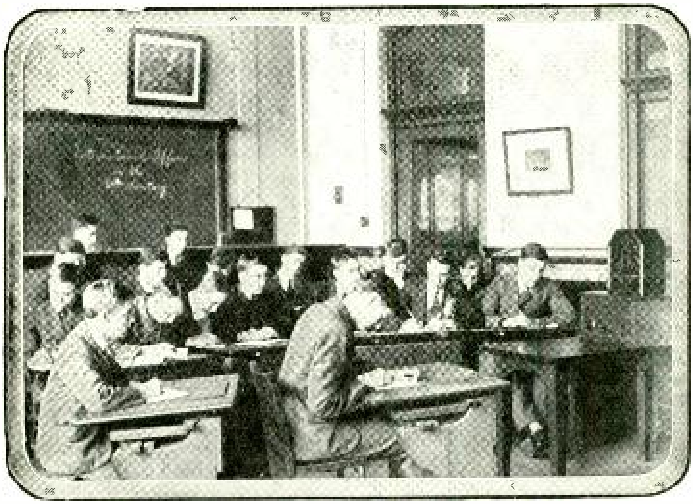
Styles of poetry-reading range in an infinite number of gradations from the declamatory to the intimate, from passionate emotionalism to the well-bred monotone which, in the opinion of some, "lets a poem speak for itself." Somewhere within these extremes lies what Yeats has called "the subtle monotony of voice which runs through the nerves like fire"—the perfect harmony of voice, rhythm, and expression which interprets and vitalises a poem.

If poetry is to be read at all, the microphone provides an ideal medium. The listener is under no compulsion to listen: he is not tied to his chair by the fact that he has paid for it, or by politeness to a poetically-minded friend: he can listen to as much or as little as he pleases, and his attention is not distracted by unusual surroundings—if he is held at all, he is held only by the beauty of the poem conveyed by the reader's voice. Here the ideal is postulated: voices which can fully convey the beauty of poetry without disturbing the listener's conceptions are unfortunately few and far between.

the realisation that if thousands of schools are listening it must be worth while. New ideas have been introduced into the classroom which, it is anticipated, must ultimately react upon all, staff as well as boys. The average teacher, who gives thirty lessons a week (in addition to other duties), is clearly at a disadvantage when compared with the teacher in the studio, who has only one lesson to prepare! At the same time, the loud speaker will never be able to supplant the teacher. School life is much more than a series of talks or lessons. But the experiment has proved its value as a useful supplement to the ordinary work. The keen teacher is confronted with a new problem in technique—how to use the wireless lesson to the best advantage. Most lessons need a preliminary talk from the teacher and to be supplemented by a later discussion. The schoolmaster has a new colleague at the microphone, and he should treat him as a colleague! Our experience goes to show that broadcasting is destined to play a very important part in developing a broad cultural outlook in our schools, and, given proper organisation, it need not interfere unduly with ordinary work.



A GREAT MUSICAL PERSONALITY
*Dame Ethel Smyth gives her reminiscences*



THE SIXTH FORM LISTENS

out-of-school time, with no master in charge, the boys making their own arrangements. Their note-books show how much they have benefited from the experiment.

The inevitable interference with the normal curriculum and organisation of the school is reduced to a minimum by spreading the wireless lessons as uniformly as possible through the school, allotting not more than one series of talks to any Form. The varied nature of the transmissions from Daventry makes this possible. These talks have proved more satisfactory than those from the local station, owing to the fact that a printed pamphlet in connection with each series is published in advance. The pamphlets are excellent, and their use is an essential part of the scheme.

### *GENERAL CONCLUSIONS*

From the point of view of the boys, it is clear that the school broadcasting has introduced a new interest into the work, together with a certain eagerness and freshness and a sense of reality, due probably to the psychological effect of

# SCHOOL BROADCASTING

## *FROM THE SCHOOLMASTER'S POINT OF VIEW*

By Thomas Curzon, Head Master, West Leeds High School

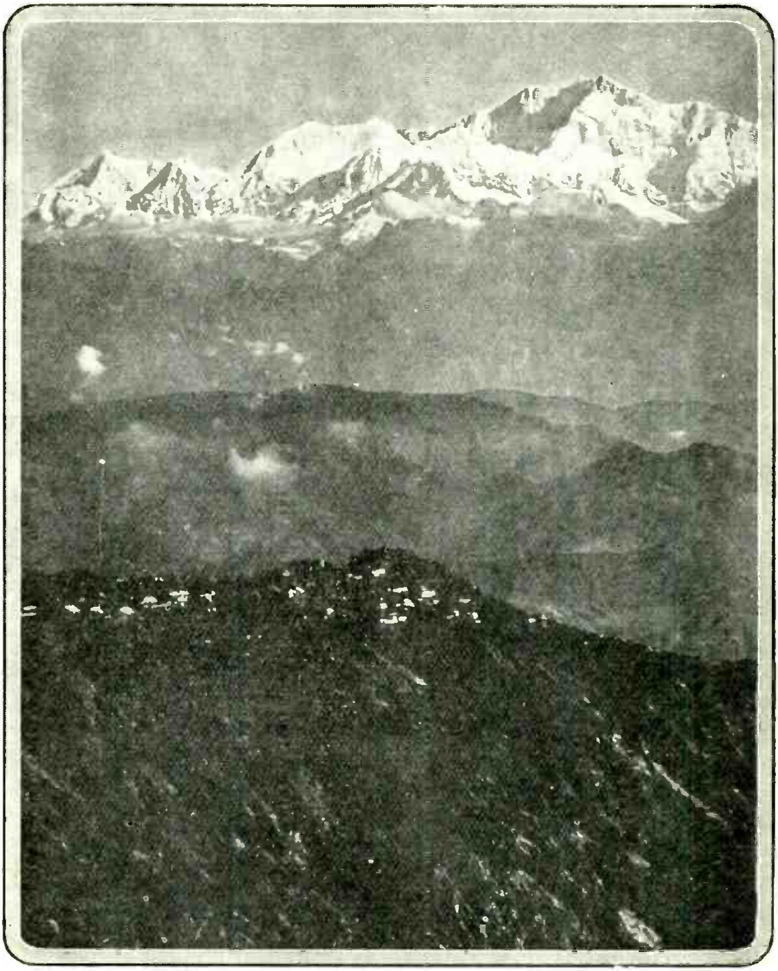
THE value of a new method of instruction or a new instrument of education can be estimated only after an adequate trial. If, as in the case of school broadcasting, there is a natural prejudice in the schoolmaster's mind in favour of the teacher in the classroom as against the "lecturer" at the microphone, there is a probability that the new method will either be condemned without a trial or be regarded with grave suspicion. The experienced teacher has confidence in his own ability to teach, so why should he admit into the classroom the distracting influence of the loud speaker? Experience of this "distraction" is the best answer to the question.

### *RECEPTION*

Satisfactory reception is not easily achieved. The experiment which is here described was carried out in a school in which all the conditions were unfavourable. Expensive commercial sets which gave perfect reception in a drawing-room were useless in the classroom. Interference from trains and echo were the chief obstacles. The first results were very disappointing, but the quality of the reception now is never questioned. The assistance of the B.B.C. engineer who came to advise us in regard to our peculiar difficulties was invaluable. It is advisable to refrain from taking a single wireless lesson until satisfactory reception is assured.

### *THE EXPERIMENT*

It has been found that a good way to introduce school broadcasting into a large school is to appeal to the school, staff and boys, to enter into the experiment; to ask for suggestions and criticisms; to allow the wireless lessons to justify themselves. A Sixth Form boy, keen on work and inclined to regard wireless as a "stunt," preferred, and was allowed, to work problems in Trigonometry in his first wireless lesson, which was a talk on "International Affairs in the Twentieth Century," but the speaker at the microphone soon engaged his attention. The Sixth Form has attended voluntarily in



E.N.A

MT. KINCHINJUNGA VIEWED FROM DARJEELING

*An illustration from a Schools Pamphlet*

A WIRELESS DISCUSSION-GROUP OF THE INFORMAL KIND really good results—poor reception will spoil a group quicker than anything. If in difficulty on this point, write for advice to the B.B.C. Thirdly, every group should avail itself of the "aids to study" pamphlets issued in connection with the course they wish to follow. These pamphlets give help about books, as well as notes on the lectures and suggestions for discussion. Copies can be obtained for a few pence on application to the B.B.C., and every member should have one before him at the time of the talk.

It is often well to meet a few minutes before each talk, and always essential to shut out all interruption once it has begun. Do not make notes of what the lecturer *says*, but jot down only points of difficulty or questions for discussion. It should always be arranged beforehand who is to open the discussion. If no one can do this, try reading out the questions suggested by the lecturer and discuss them. Some member of the group might be asked to note any points raised during the discussion which are worth referring to the lecturer. If these are posted at once to the Adult Education Section, B.B.C., they can usually be dealt with in time for the next meeting. In some cases members of a group may be enthusiastic enough to write down their thoughts on paper. This is really worth doing, and several societies have encouraged their members by offering prizes for the best papers written in connection with wireless courses.

In conclusion it should be remembered that the B.B.C. is ready to help and advise all discussion groups, large and small, if they will get into touch and state their difficulties and needs. There is a great field for experiment open here.

## NOTE ON RECEIVING SETS

Diagrams of various receivers recommended by the B.B.C. will be found in the Technical and Reference Sections. When distance permits of its use, the one-valve receiver, capable of taking up to six pairs of headphones, shown in the Reference Section is particularly recommended for group-listening owing to its cheapness and simplicity.

A DISCUSSION-GROUP AT DEPTFORD WORKING-MEN'S INSTITUTE

Finally, there is the fireside group, where a family listens together, or where hospitality is extended to a few friends or neighbours who drop in to listen and discuss. In some ways this is the most delightful of all forms of group-listening. It should be particularly popular in villages and out-of-the-way places where a neighbourly spirit prevails. A village teacher or doctor or parson could do much to set the movement going.

To run a successful discussion-group there are just one or two points specially worth observing if disappointment is to be avoided. The first is—someone *must* take the lead in forming the group, seeing that it is comfortable, and ensuring that the discussion runs smoothly. Many people who would never *dream* of lecturing or speaking themselves could, nevertheless, help here to the extent of setting the ball rolling once the broadcast lecturer had finished. The would-be leader of a group will first select the course to be followed from the sessional Programme of Talks and Lectures (obtainable 1*d.* post free from the B.B.C.). Next he should make sure that the receiving apparatus which his group is to use is giving

# HOW TO CONDUCT A WIRELESS DISCUSSION-GROUP

THERE is no one way of using the wireless talks for discussion purposes. The charm of discussion—surely one of the pleasant things of life—lies in its complete spontaneity and informality. The experience of the past year—and the idea has been tried out in some fifty or sixty different centres all over the country—suggests that these groups may spring up in many different ways, some of them quite unexpected.

To begin with, there are many social or educational institutions (clubs, village halls, reading-rooms, Y.M.C.A.'s, colleges) which possess receiving apparatus, often used for entertainment purposes only. Among the members of such institutions probably there are several who would be glad to follow this or that series of talks, if arrangements could be made to give them at suitable times the use of a room and the loud speaker. Secondly, there are many occasions on which groups of individuals are gathered together not entirely of their own choice, *e.g.* in prisons, workhouses, and reformatories, or again in recreation-rooms and rest-rooms connected with their place of work. Group-listening may here also provide both diversion and benefit.

Then, again, it is worth remembering that group-discussion is possible even when group-listening is not. Many men and women belong to societies (dramatic, musical, literary, political, and social) which meet at times or in places unsuitable for wireless reception. But among the broadcast courses of lectures there are sure to be from time to time some which have a special interest for them. So they may arrange to follow these talks individually on their own sets at home, and afterwards meet together in twos and threes or larger numbers to exchange ideas and criticisms. An energetic secretary could do much to see that the possibility of this was brought home to his members. Similarly, wireless courses may be found useful to adult students attending formal classes (*e.g.* in the W.E.A., or in technical and other evening institutes), in supplementing their studies of particular subjects; the talks may be introduced into class and discussed with the class tutor or with fellow-students.

stand, and that qualifications of any statement should be added after it, not inserted as a clause in the statement itself —unless the broadcaster is a very skilful reader.

At the other end of the scale are talks which depend more upon personality and the illusion that the broadcaster is in the room with the listener. These must, of course, be written in a conversational style; and although this style has an easy air and reads as if it had been written straight off, it cannot be achieved by scribbling down sentences no editor would pass without correction. It is not a bad plan for a beginner to write out first, as elaborately and carefully as he can, what he wants to say (the effort will fix in his memory his happiest phrases and sentences), and then, putting the manuscript aside, to spout it all again to a stenographer. The result ought to prove a good discourse in the conversational style. Something approximating to the same result may be reached by reading aloud what he has written before delivering it. While he reads he will discover which phrases and sentences sound pretentious or unnatural. He will say to himself, "I can't imagine *talking* like that!" He will also discover that correct punctuation is often too logical for a would-be spontaneous discourse. He will find he pauses longer at a comma, sometimes, than at a semi-colon, or that he even hurries over a grammatical full-stop. He should mark these natural pauses with pencil lines and observe them while broadcasting. He should also vary the pace of his reading: this is most important.

Clear enunciation is essential, but it is fatal to allow listeners to perceive that you are taking desperate pains to articulate correctly. Such pains must be taken in rehearsal; in front of the microphone it is best to forget yourself. I have sometimes listened with more pleasure to a delivery in which both accent and enunciation left much to be desired, than to one marked by a too silvery, too self-conscious distinctness. In short, when preparing material think of your audience; when rehearsing, of yourself; and when actually broadcasting —only of your subject.

than public. If the broadcaster imagines that he is addressing a few people who happen to be ignorant about what he knows best himself but are interested in it, he will hit upon the right kind of words and sentences. He should also himself be a listener, for he can learn as much from hearing others broadcast as from practice. Yet it is a mistake to imitate any particular model. Just as stolen jokes are seldom successful, so a manner extremely agreeable in one person may not fit another. The public ear is sensitive to artificiality. Be yourself, whatever limitations that implies. It is safer. When you are sitting in front of the little cube in that empty, muffled room you have dwindled to a voice; you have been deprived of all means of expressing yourself except one. Ordinarily we get our impressions of each other through our eyes; we read from looks and gestures. When we are listening we discover—what every blind man knows—that tones of voice also convey character.

In daily life we smile when we wish others to know that we are pleased, or that we want to please; and since we are at once understood, few of us learn to make our voices subtly expressive. It is enough to grin agreeably, but it is no use grinning into the microphone. One vocal habit, however, everybody learns more or less—namely, to use a polite or conciliatory tone on special occasions. Unfortunately, this accomplishment does not carry the broadcaster far. The tone in which one apologises for not passing the potatoes is not suitable for explaining the habits of the shark, or describing an ascent of Mount Everest. The broadcaster should therefore avoid the ingratiating tone if his subject is explanatory or descriptive. It may, however, be necessary in the course of a talk to apologise for dwelling on some point, and this is better done by a slight change of voice than by a verbal apology; for the broadcaster who confesses that he feels he is boring his listeners communicates that feeling.

There are many different kinds of discourses which come under the head of "B.B.C. Talks." Some are not exactly talks, but brief expositions of technical subjects. It is not so necessary to disguise the fact that these are being read from a manuscript. They should convey information as concisely and clearly as possible. In preparing them the important thing to remember is that short sentences are easiest to under-

# TALKS & EDUCATION

## THE ART OF BROADCASTING TALKS

By Desmond MacCarthy

IT is a new art different from that of the orator, the author, or the lecturer. Although the broadcaster may be addressing an audience a hundred times larger than any which has ever assembled to hear the most famous orator, he is not addressing them in a mass, but privately, one by one. Dramatic emphasis and images, which would be appropriate in a speech, or phrases and transitions which are characteristic of good prose, do not necessarily sound right when they reach the ears of a solitary person by the fire or a small group of people in a room. Some master this new art at once, but the vast majority require to learn it.

It used to be the privilege of exceptionally favoured hosts to be able to invite specialists, travellers, or literary men and get them to talk about their own subjects. Now, thanks to wireless, all can enjoy that privilege. The broadcaster is in the position of "a lion" who has been persuaded one evening to expound what he knows, or to describe what he has seen, to a few acquaintances—thoroughly, because his little audience want to learn; clearly, because they may be puzzled or ignorant; and informally, because they have not assembled to hear a lecture. The occasion is "social" rather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