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Editor:
HUGH S. POCKOCK.

Editorial,
Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
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Telephone: Waterloo 3333 (50 lines).
Telegrams: "Ethaworld, Sedist, London."

COVENTRY: Hertford Street.
Telegrams: "Autocar, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:
Guildhall Buildings, Navigation Street, 2.
Telegrams: "Autopress, Birmingham." Telephone: 2971 Midland (4 lines).

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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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Editorial Comment

Wireless for Christmas Presents Unlimited Variety of Choice

AS each Christmas comes round broadcasting plays an increasingly important part in bringing the atmosphere of Christmas into every home and linking together every part of the Empire in closer harmony. Each year we refer especially to the question of wireless in connection with Christmas presents because we feel that there can be no better gift than one which provides such lasting pleasure at so small a maintenance cost. Unquestionably broadcasting to-day is still the cheapest possible entertainment. Wireless has the advantage that as a present it is definitely a family gift of interest equally to everyone in the home. A wireless set can be given as a joint present with the assurance that it will give more pleasure than individual gifts where the sum expended would be divided up. Those who are interested in wireless as a hobby would no doubt prefer the parts for building a set such as the "Variable Selectivity Four" recently described, or they may want to add something to their present set, when there is a wide selection of possible gifts.

Wireless provides a good choice from complete radio gramophones down to a valve or other component, so that something wireless can come within the capacity of every pocket.

Christmas holidays are an occasion when spare time may be very usefully spent on doing the many things which need attention in the wireless set from time to time but have been postponed through lack of opportunity. Aerials and earths may be overhauled, or if the weather is unsuitable for this work the set itself may receive attention or experiments be undertaken with interference suppressors to get rid of unwanted noises.

We take this opportunity to convey to our readers, both at home and in all parts of the world, our sincere wishes for Christmas and the New Year.

Empire Broadcasting

Growing Importance of the Service

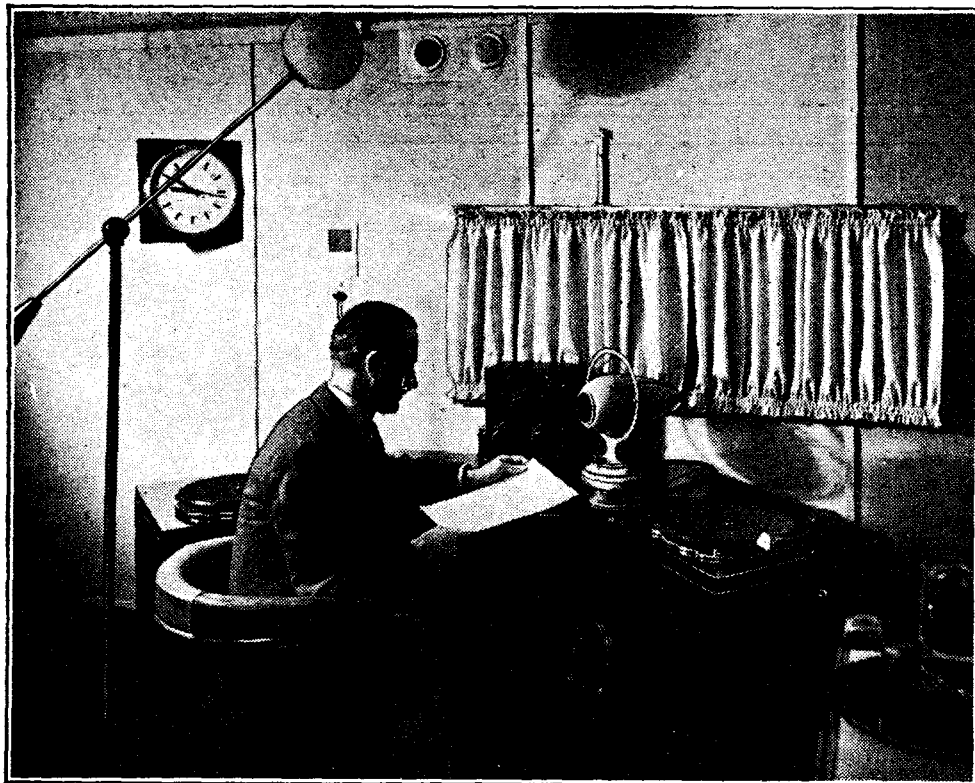
THE approach of Christmas naturally directs our thoughts to the broadcast of His Majesty the King, which is now looked forward to as an annual event. Only through Empire Broadcasting has the forging of this link throughout the Empire been made possible, and the importance of the Empire service grows steadily as its efficiency is improved by the efforts of B.B.C. engineers and organisers.

It is interesting to recall that early in 1926 the proposals put forward by *The Wireless World* that an Empire Broadcasting station should be set up received only discouragement from the B.B.C., who took the view that nothing should be done until a reliable service could be guaranteed. If such a policy had been allowed to stand we should probably still be waiting for Empire Broadcasting to-day, since even those who have been responsible for building up the organisation, an account of which we publish in this issue, would not yet claim to have achieved such results, in spite of the tremendous importance of the service they now direct. We have only to consider for a moment how we should feel to-day if no Empire station had been established to realise how important the service is both now and potentially.

Empire Broadcasting

The Truth about the-

By E. C. THOMSON



The Empire announcer "eats and sleeps at Broadcasting House—lives there, in fact, for five or six days a week." A picture taken during the reading of a news bulletin.

IF travel broadens the mind it also gives people the courage of their convictions. At least, this is the inference to be drawn from a study of the B.B.C.'s Empire post bag. And when the travellers (or sons of travellers) break into print this downright, straight-from-the-shoulder attitude sometimes grieves the B.B.C.

Matters came to a head one black Friday in July last when *The Wireless World* published an article* by a resident in Singapore who stigmatised the Empire programmes as being "of a low standard and unworthy of British broadcasting." It was clear, he added, that the funds for the provision of "live" programme material "must be very limited" and that "most of the efforts of the Empire programme Department are valiant attempts to make bricks without straw."

The Empire Department bridled at this, not because it is a sin to be poor, but because, having a certain amount of straw, they resented the imputation that the bricks lacked that commodity.

Agitated, they invited me to visit the "brickworks," take notes, and give *Wireless World* readers an unvarnished account of what I saw.

From the outset it was obvious that, to impart all the facts it would be necessary for me to travel from China to Peru—at the B.B.C.'s expense—for it is no

* "This Empire Broadcasting," *The Wireless World*, July 26th, 1935, p. 82.

more possible to judge the final effect of an Empire programme by sitting in the studio than it is to appraise a modern painting with a high-power microscope. "Does Broadcasting Serve the Empire?" then, would have been the title of this article, and on an even grander scale than Mr. Leslie Baily I should have scoured the globe, visiting the mud huts of the Malayan Archipelago and drinking tea in the pavilions of the maharajahs, seeking all the time a civil answer to a civil question. But it was not to be.

I could still, however, enjoy a "close-up" of the machine at work and thus determine in broad outline whether, in my opinion, the B.B.C. was setting about this business of Empire broadcasting in the right manner, so I accepted the invitation to Broadcasting House.

An Empire Tourist

I was welcomed by Mr. Malcolm Frost, who will be remembered as the B.B.C.'s "Ambassador of Empire"; three years ago he toured the world on a special mission, distributing programme records and establishing liaisons between the Corporation and broadcasting organisations overseas. As one of the small squad of B.B.C. men who have actually shared life with Empire listeners, Mr. Frost should know just what is wanted in each of the six zones. ("Zones," by the way, is a forbidden word nowadays, as I shall

explain later, but there is no adequate synonym.)

In company with Mr. Frost I was able to apply the stethoscope to the whole pulsing Empire organism, examining the programmes from day to day, touring the studios and watching the staff at work.

As a High Court Judge might put it, "What is Empire Broadcasting?"

The service now run by that self-contained Empire Department at Broadcasting House has a definite aim, which is to provide every part of the Empire with an evening programme daily. It is important to grasp this aim clearly, otherwise we may find ourselves reproaching the B.B.C. for failing to do that which it never set out to do.

Strait-Jackets for Short Waves

To realise this evening programme ideal the B.B.C. divides the 24-hour day into six sections, or Transmissions, each of which is intended, in some degree, to satisfy a particular portion of the British Empire. Actually there is a considerable amount of overlap, hence the discontinuance of the old "Zone" idea, which worked out admirably on paper but failed to take into account the vagaries of the short waves. It was found, for example, that the entertainment intended for South African listeners during the long balmy evenings in Johannesburg was being audaciously picked up by Western Canadians at breakfast.

This seemed an unpardonable liberty, until even the official "card index" minds came to realise that Hertzian waves could escape from the strait-jacket of the Zone system, and that all time-tables would have to be fairly elastic. Nowadays, frequent changes are made in the transmitting arrangements at Daventry, the object being to provide maximum reception in the countries for which each transmission is primarily intended. A table of call signs, directions and times throughout the year is given on page 581, but Empire listeners are warned that the times are likely to change and that it is advisable to listen carefully to the announcements.

Normally there are two simultaneous transmissions from Daventry, any two of the following waves being available.—

GSA	..	49.59 m.	GSG	..	16.86 m.
GSB	..	31.55 m.	GSH	..	13.97 m.
GSC	..	31.32 m.	GSI	..	19.66 m.
GSD	..	25.53 m.	GSI	..	13.93 m.
GSE	..	25.29 m.	GSL	..	49.10 m.
GSF	..	19.82 m.			

From Within

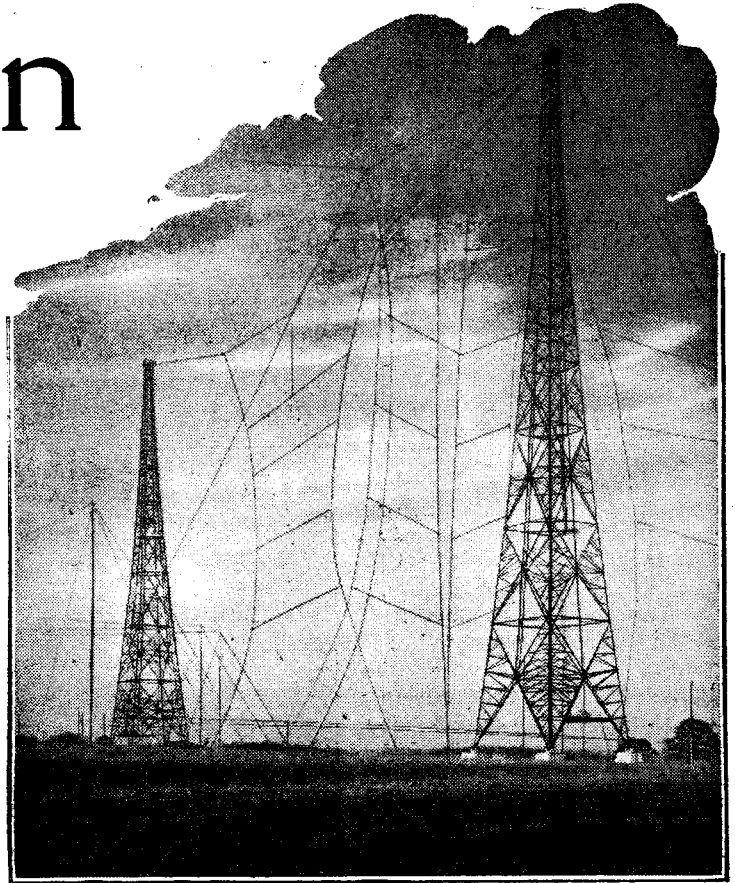
B.B.C.'s Short-wave Service

PRAISE and criticism rain upon the B.B.C. Empire Broadcasting Department from all parts of the world. This article, based on an impartial investigation at Broadcasting House, explains clearly just how the Empire Department is attempting to reconcile the varying interests of listeners all over the world, and how, on the technical side, the transmissions are designed to give maximum signal strength to as large an audience as possible. Interesting facts are given regarding the B.B.C.'s attitude to propaganda in news bulletins.

Of late three wavelengths have sometimes been used at the same time, the old 5 SW transmitter having been brought to Daventry from Chelmsford; this is another indication that the Zone system has been finally jettisoned and that the B.B.C. wishes to satisfy as many listeners as possible. A three-wavelength transmission is especially useful in the case of Africa. Between Kenya and Sierra Leone—the 3,500-mile stretch from east to west of the African Continent—there is a time difference of four hours. Transmission 4 was originally intended to cover the entire Continent, but it is easy to see that three separate beams can give a much more satisfactory service than one or even two.

It has been pleaded by many Empire listeners that the B.B.C.

would do them a service by making the transmissions more directional, i.e., by the use of reflectors producing a more intense beam. Against this idea the B.B.C. brings the argument that it must work for the greatest good for the greatest number. If, for example, reflectors were fitted on all three aerials in the case of Transmission 4, which relays the main National programme to Africa, Canada would suffer, for the waves travel north as well as south, finding their way over the North Pole.



Two 350-ft. towers at Daventry for supporting experimental aerials.

With a third transmitter in use, it is, however, possible to "beam" two of them, leaving the third omni-directional.

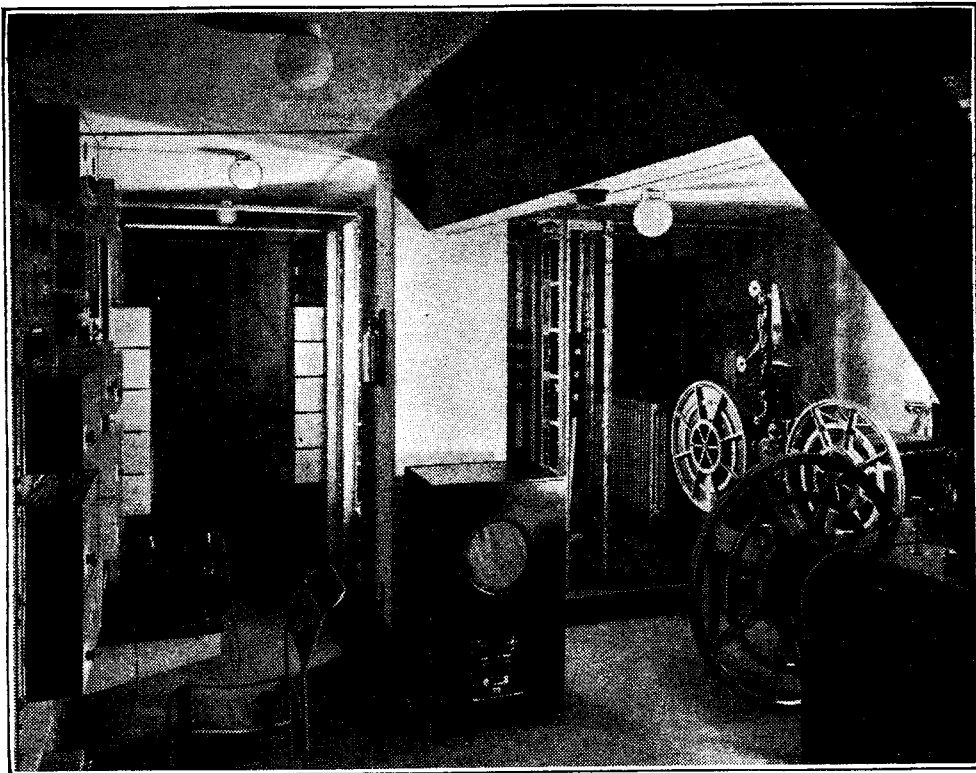
The Daventry transmitters are at present using a power of from 10 to 15 kW. When the two new transmitters are put into operation in approximately eighteen months' time, employing a power of 50 kW., a consistently better signal should be available all over the Empire. Nevertheless, on the technical side, the B.B.C. Empire Service has come in for an increasing measure of praise during the past year.

But what of the programmes? Are these being organised in the right way? Or, if obstacles prevent the full realisation of the Programme Department's ideals, is a "bad hand" being played in the best possible manner?

Let us examine a typical day's programmes, working through from Transmissions 1 to 6. All times mentioned will be G.M.T.

The Day Begins

Transmission 1, intended for Australia, New Zealand, the Pacific and Western Canada, begins at 8 a.m. (GSD, 25.53 m.; GSB, 31.55 m.), and the first 30 minutes is usually a "live" broadcast, as distinct from recorded, consisting of variety or a cinema organ recital. Following is an electrically recorded talk from a recent home programme and, at 9 a.m. a "live" performance by the B.B.C. Empire Orchestra, or a small musical combination. News comes at



Even recorded programmes cost money; one programme may account for £120 in royalties. This view of No. 1 Steel Tape Recording Room at Maida Vale shows (left to right) tone source and amplifiers, checking loud speaker and two recording machines.

Empire Broadcasting From Within—

9.45, and the close-down is at 10.

Eleven a.m. sees the start of Transmission 2, which is picked up in Western Australia, Malaya, China, and part of India (GSG 16.86 m.; GSF 19.82 m.) A large proportion of this transmission is live, consisting mostly of light music which is being simultaneously radiated in the home programme. At about 12 there is an electrically recorded talk, then more live music, followed by the news at 1 p.m. More light music—orchestral or organ—and the close-down comes at 1.45.

Fifteen minutes later Transmission 3 begins. It is intended for India, Ceylon, and the Near East (GSG, 16.86 m.; GSF, 19.82 m.; GSE, 25.29 m., or GSB, 16.86 m.) Very largely it is made up of the B.B.C. afternoon home programmes, with an occasional tape-recorded talk or variety programme. News is given at 4.30, and the transmission closes down at 5 p.m.

The Best Transmission

The luckiest listeners are those who can tune in Transmission 4, which is mainly a relay of the B.B.C.'s National programme. Part I, from 5.15 to 8.45 p.m., is primarily intended for East and South Africa (GSI, 19.66 m.; GSD, 25.53 m.; GSB, 31.55 m., or GSL, 49.10 m.), and Part II for West Africa (GSC, 31.32 m.; GSB, 31.55 m., and GSA, 49.59 m.). Actually, however, part, or all, of the transmission is picked up at varying strengths in the West Indies and South America, Canada and Northern Australia. The few recorded items are mostly musical interludes. Part II of Transmission 4 closes down at 10.45.

We are now entering the night watches. Big Ben at 11 p.m. announces the start of Transmission 5, which is aimed at Canada, the West Indies, and the American Continent (GSC, 31.32 m.; GSB, 31.55 m.; or GSL, 49.10 m.) On Sundays an entire church service, tape recorded, lasts from 11 to 11.45 p.m.; on weekdays there is live music by a light orchestra. Sometimes a speaker can be induced to give an actual talk at this hour; Sir Walford Davies discussed "Music and the Ordinary Listener" at 11.10 p.m., on November 18th last. After midnight a devoted cinema organist may tickle the keys for half an hour, but usually it is necessary to fall back on electrical recordings of variety or feature programmes. News and announcements are given at 12.45 a.m., and the close-down comes at 1.5.

Now follows the real test of a 24-hour

service—the provision of a bright programme between 3 and 4 a.m. Transmission 6, which was recently added to fill a gap in Western Canada, at present occupies the shortest period of all the Empire programmes, although I understand that it may shortly be extended. (GSD, 25.53 m.; GSC, 31.32 m., or GSL, 49.10 m.) A great effort is made to include at least 50 per cent. of live material, and this is usually supplied by the B.B.C. Empire Orchestra, a string quartet, a dance band, or two or three soloists. Sometimes there is an actuality broadcast (recorded) from some place of interest, such as a railway station or a dockyard.

for sustained and concentrated listening, which is often made impossible by atmospheric conditions on the short waves. In such cases good, "snappy" recordings of variety are much to be preferred.

The actual percentage of recorded items is surprisingly small. In a typical day of 19 hours' transmission, only 3 hours and ten minutes consisted of disc or tape records.

The Ullswater Report will doubtlessly recommend the apportionment of a larger sum for Empire Broadcasting, but in the meantime the financial side is a very serious problem to the Department, which has many more hours to fill than the home programme organisation, yet has considerably less money with which to do it. Incidentally most artists demand a higher fee for broadcasting in the small hours of the morning. Home programmes cost £915,000 in 1934, or £2,500 a day—a figure far beyond the wildest dreams of Mr. J. B. Clark, the new Empire Service Director, who discussed his problems with me on the day he took office

The "Chief" Speaks

"We have been greatly helped," he told me, "by the 45,000 letters which have come to us from listeners. These have enabled us to discriminate between the needs of different parts of the Empire.

Mr. Clark was amused at the idea that he and his staff resent criticism.

"We want it!" he declared. "We welcome suggestions, though there are some that simply can't be complied with. People ask us to give them Dr. Boulton and the B.B.C. Symphony Orchestra in Transmission 5 and 6. Obviously, we can't bring such a 'turn' to the microphone at 3 in the morning. The nearest we get to broadcasting the Symphony Orches-

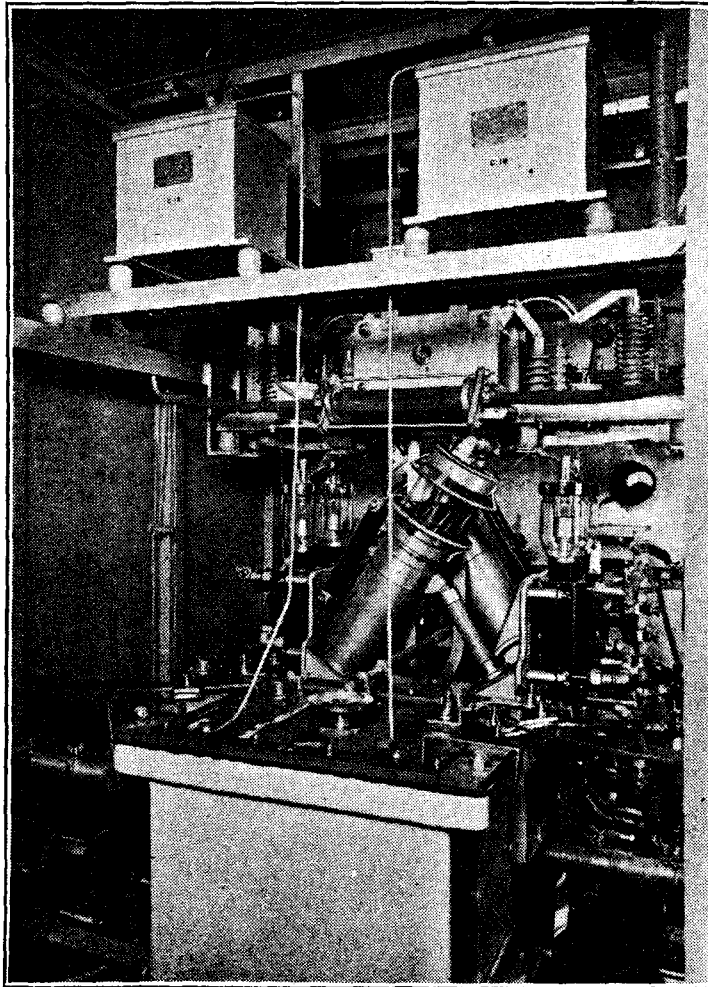
tra at awkward hours is to relay a final rehearsal in Transmission II. Don't forget, though, that the Regional orchestras are often called upon for 'live' programmes."

I asked Mr. Clark if we might expect big developments in the Empire Service in the near future.

He smiled enigmatically.

"There will be nothing catastrophic," he replied. "We look upon the Empire Service as a complete structure. It is already formed, and what changes come about, will be in the nature of gradual additions to the programmes and improvements in the transmitters.

"In fact, the next landmark will be the opening of the new transmitters at Daventry."



A rear view of the inside of a Power Output stage at the Daventry short-wave station.

News is given at 3.45 a.m., and the transmission closes at 4.5.

Daventry is now silent until Transmission 1 begins at 8 a.m.

The B.B.C. calls this a day.

No one pretends that the service is perfect. Many listeners still kick at the notion of recorded programmes, though they may find some consolation in the fact that these, too, cost money. If a home variety programme involves an expenditure of £500, copyright fees may account for £120, and these must be paid whether the transmission is live or recorded. An important argument in favour of recorded versions is that many home programmes are too long for Empire radiation. Plays especially call

Empire Broadcasting From Within—

There is one very important respect in which Empire broadcasting differs from the home variety. It is competitive, and the staff should avoid any tendency to ignore this fact. While the home stations have a virtual monopoly in their own territory, the Empire transmitters compete for listeners' attention on equal terms with the highly developed short-wave systems of other countries. They must hold their own with the spate of news, propaganda and entertainment radiated from Germany, Holland, France, Italy, Russia—all countries, in fact, which have nothing to lose and everything to gain from making the world continually conscious of their existence.

News—Not Propaganda

The B.B.C. casts no aspersions when it declares that the sole aim of its own Empire news service is accuracy, with a rigorous exclusion of all propaganda. An Empire News Section has been created which selects items likely to interest particular portions of the Empire. For instance, ice hockey commentaries are included in Transmission 5 for the benefit of Canadians; the latest rubber prices are never omitted from Transmission 2, for the Malay States.

Apart from this sub-editing, however, the news is radiated from Daventry without fear or favour, and comment occurs only in running commentaries on sport, never in connection with politics or ticklish questions affecting international relations. All news is in English.

One serious criticism on the technical side may be met by the opening of the new transmitters. Listeners all over the world write to Broadcasting House complaining that the Dutch, German or French transmissions "romp in" at much better strength than the British. It is significant that these complaints come first from one area and then from another—never from all parts simultaneously. The B.B.C. contention is that such wonderful reception of the foreign transmissions is spasmodic, whereas their own transmitters give the best consistently good signal strength all the year round. This is a proud claim which I, personally, am not prepared to substantiate. The question could only be decided by a world plebiscite, perhaps conducted by the International Broadcasting Union.

The B.B.C. certainly have a good case when attacked on the score that their transmissions are lamentably inferior to the Dutch. By a happy dispensation of providence, our friends in Holland are able to use the same beam to cover both the West and the East Indies. Into this beam they can concentrate tremendous signal strength. Perhaps it is not unnatural that British listeners living at points within this beam should draw odious comparisons, but is it fair?

What impresses the visitor to the Empire Department at Broadcasting House is the keenness of every member of the staff. They look upon this business

Transmission.	Optimum Direction.	Times (G.M.T.).
1 GSF GSB	East and West " "	Nov. 10th to Dec. 14th .. 08.00—10.00 Dec. 15th to Jan. 18th .. 08.30—10.30 Jan. 19th to Feb. 15th .. 08.00—10.00
2 GSG GSF	East and West " "	11.00—13.45 (Sundays 12.00—13.45)
3 GSF GSE GSB	East and West " " " "	14.00—15.15 14.00—17.00 15.30—17.00
4a GSD GSB GSI GSL	North and South " " " " North-West and South-East ..	17.15—21.00 19.15—21.00 Experimental only 17.15—19.15 " " 19.30—21.00
4b GSC GSB	East and West North and South	21.15—22.45
5 GSA GSC	North-West and South-East .. East and West	23.00—01.00
6 GSC GSL	North-West and South-East .. " " " "	03.00—04.00

of linking the Empire with the Homeland as an exalted mission, and such it is. For this reason, every Empire broadcaster has been specially picked for his job.

I sat in a tiny box-like studio beside a young announcer who was quietly introducing Reginald New and his organ to listeners in the Malay States. Like his colleagues, this announcer had been chosen for his rather high-pitched voice,

which, so listeners say, pierces the atmospherics more successfully than the heavy and fatherly tones of the home announcers. Like his colleagues, this announcer eats and sleeps at Broadcasting House—lives there, in fact, for five or six days a week—and gets four or five weeks' holiday a year to tone up his nervous system. He needs it.

It is a job on which the sun never sets.

At the Transmitting End

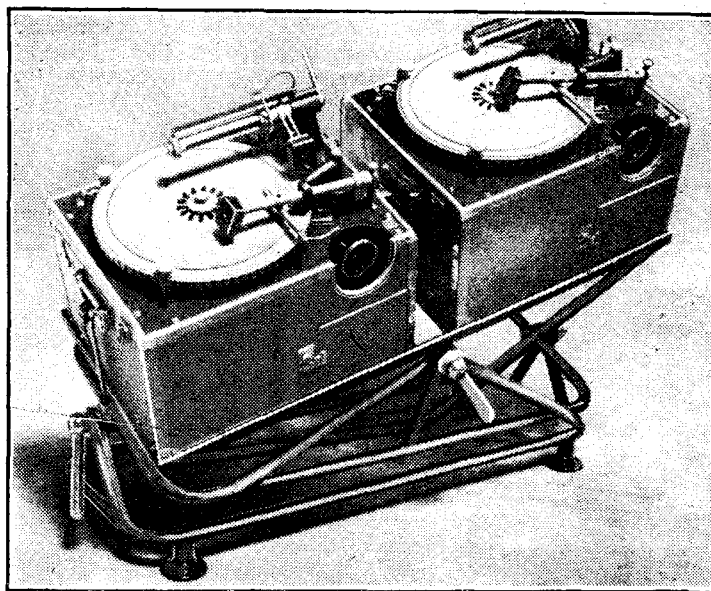
Technical Criticisms of Recent Broadcasts

One can harp on this Balance theme *ad infinitum*, apparently. There seems to be no real control over most of the broadcast material after it leaves the studio microphones, so that if we do get a nicely balanced programme—as is sometimes the case—it is largely a matter of luck, and, conversely, the following evening's listening

involved in the making of a picture from a photographic negative and warrants just as much care. The way in which it is done is, of course, unimportant, so long as it is done; one sure way being to make the producer the final control link in the microphone-aerial chain so that he has complete control over the outgoing programme and can adjust the aural perspective within fairly wide limits.

These remarks are inspired by the Gala Variety (London Regional, November 23rd), in which some correction could have been

usefully employed in giving both Tessa Dean and the two pianists, Rawicz and Landauer, the prominence above the accompaniment which should have been theirs.



Engineers at Radio-Geneve have devised this "cradle" to enable them to make records when the recording van is standing on a slope.

is just as likely to be exasperating in the extreme.

It is no exaggeration to say that the putting over of any programme in this respect is every bit as important as the processes

The latter artists, in particular, did not get over at all well, for, compared with the announcer's hearty voice, the two pianos sounded as vigorous as an anæmic ukelele.
H. C. H.



Suggestions for the Holiday Season

ALTHOUGH it is too early to talk of New Year resolutions, the Christmas holidays offer an excellent opportunity of making amends for some of our sins of omission. The natural tendency to put off until to-morrow those jobs which are non-essential is every bit as pronounced with regard to our wireless activities as in other spheres; now is the time, of all others, to put into effect those alterations and additions which have often been considered, but always postponed, and which will do so much to increase the pleasure to be derived from a good receiver.

Even the most critical and knowledgeable of wireless users seem to be surprisingly tolerant—or apathetic, or procrastinating?—in their outlook on electrical interference. They know—or if they do not it is through no fault of *The Wireless World*—that it is only in very rare cases that background noises cannot be reduced to a very acceptable extent; more often than not, interference can be rendered entirely innocuous, so far as received signals of any real programme value are concerned. But all who have special opportunities for getting inside information on the conditions under which reception is carried out will agree that it is still a rare experience to find any kind of interference suppressor in use. This in spite of the fact that those well qualified to express an opinion are agreed that the interference

MANY of us can count on a holiday of three or four days at Christmas time. Traditionally, this holiday is spent at home, and how better can the time be used than in improving our facilities for broadcast reception? Further, on the natural assumption that one's wirelessly-minded friends will be of the same mind, the wherewithal to carry out the alterations and additions suggested in this article would surely make acceptable presents

level is high enough to prejudice long-distance reception in about 30 per cent. of the homes with an electric supply.

What is to be done about it? Of all the cures open to the average amateur there is nothing more likely to be productive of the desired results than the simple condenser filter, connected across the incoming mains as close as possible to their point of entry into the building. Most of the interference reaching a receiver installed under ordinary domestic conditions has its source at a considerable distance from the sufferer, and is transferred to his receiver either by radiation from the electrical wiring or by direct injection into the set; trouble from both these sources is satisfactorily overcome by such a filter.

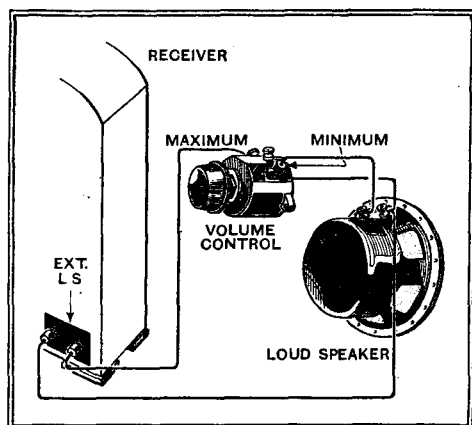
Of course there is no objection to making up one's own filter with a pair of condensers, and, to be on the safe side, a pair of fuses as well. However, it is easier, and generally rather neater, to use one of the ready-

made units, supplied in a bakelite case and with such complete instructions that anyone with the slightest knowledge of electrical practice could hardly fail to fit it properly. A similar condenser filter connected across the mains supply of the set itself is often surprisingly effective, but it can do nothing to stop mains-radiated interference, costs about the same, and is very little easier to fit; it is therefore a device for the very lazy, or where some special conditions exist.

Amateur Sleuths

In those few cases where insufficient improvement is brought about by the methods suggested above, the next step may logically be the fitting of a screened down-lead for the aerial. The method most in favour at the present time calls for matching transformers at each end of the screened line; the effectiveness of commercial components for installations of this kind has greatly increased of late, but it should be emphasised that the user must do his part, and devote careful thought to the positioning of the business (or un-screened) part of the aerial.

Before leaving the subject of interference—which, by the way, is quite a fascinating one, perhaps because it arouses the natural instincts of the chase—it should be pointed out that for the cause of a certain amount of avoidable back-



Method of connecting a volume-control potentiometer to an extension speaker.