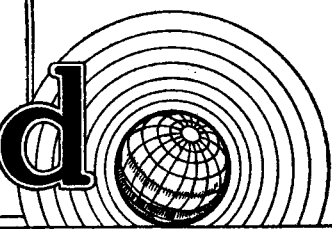
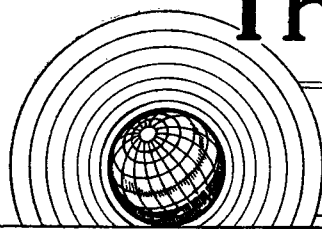


# The Wireless World

THE  
PRACTICAL RADIO  
JOURNAL  
25<sup>th</sup> Year of Publication



No. 818

FRIDAY, MAY 3RD, 1935.

VOL. XXXVI. No. 18.

Proprietors: ILIFFE & SONS LTD.

Editor:

HUGH S. POCOCK.

Editorial,

Advertising and Publishing Offices:  
DORSET HOUSE, STAMFORD STREET,  
LONDON, S.E.1.

Telephone: Hop. 3333 (50 lines).  
Telegrams: "Ethaworld, Watloo, London."

COVENTRY: Hertford Street.

Telegrams: "Autocar, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:

Guildhall Buildings, Navigation Street, 2.

Telegrams: "Autopress, Birmingham." Telephone: 2971 Midland (4 lines).

MANCHESTER: 260, Deansgate, 3.

Telegrams: "Iliffe, Manchester." Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Renfield Street, C.2.

Telegrams: "Iliffe, Glasgow." Telephone: Central 4857.

PUBLISHED WEEKLY. ENTERED AS SECOND CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:

Home, £1 1s. 8d.; Canada, £1 1s. 8d.; other countries, £1 3s. 10d. per annum.

*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

### Jubilee Week

**T**HIS week of Silver Jubilee celebrations will provide a memorable and inspiring climax to the splendid economic and social achievements standing to the credit of Great Britain after anxious periods magnificently surmounted. Had the same set of circumstances occurred some twenty or even fewer years ago the nation would have been thrilled. But the complete absorption of the whole of the people into one united family surrounding the Throne would not have been possible then, in the absence of broadcasting, as it is to-day.

To-day, thanks to the universal use of wireless, and thanks also to the British Broadcasting Corporation for having established not only a complete broadcasting service throughout the mother country, but also a short-wave broadcast distribution, the whole Empire is simultaneously informed of all that is happening this week in the heart of the British commonwealth of nations.

No matter where Britons may be found, Buckingham Palace, St. Paul's and the great thoroughfares of the Metropolis will be brought before them by the agency of broadcasting. Throughout the far-flung Empire, in the very remotest parts of the earth, the subjects of the King will be able to take an intimate part in the Pageant of the Silver Jubilee as it unfolds itself before those who can be actual eye-witnesses of it.

Nothing could provide a more striking demonstration than this of the value of an invention, that it should have done so much to weld the British peoples into one closely knit family.

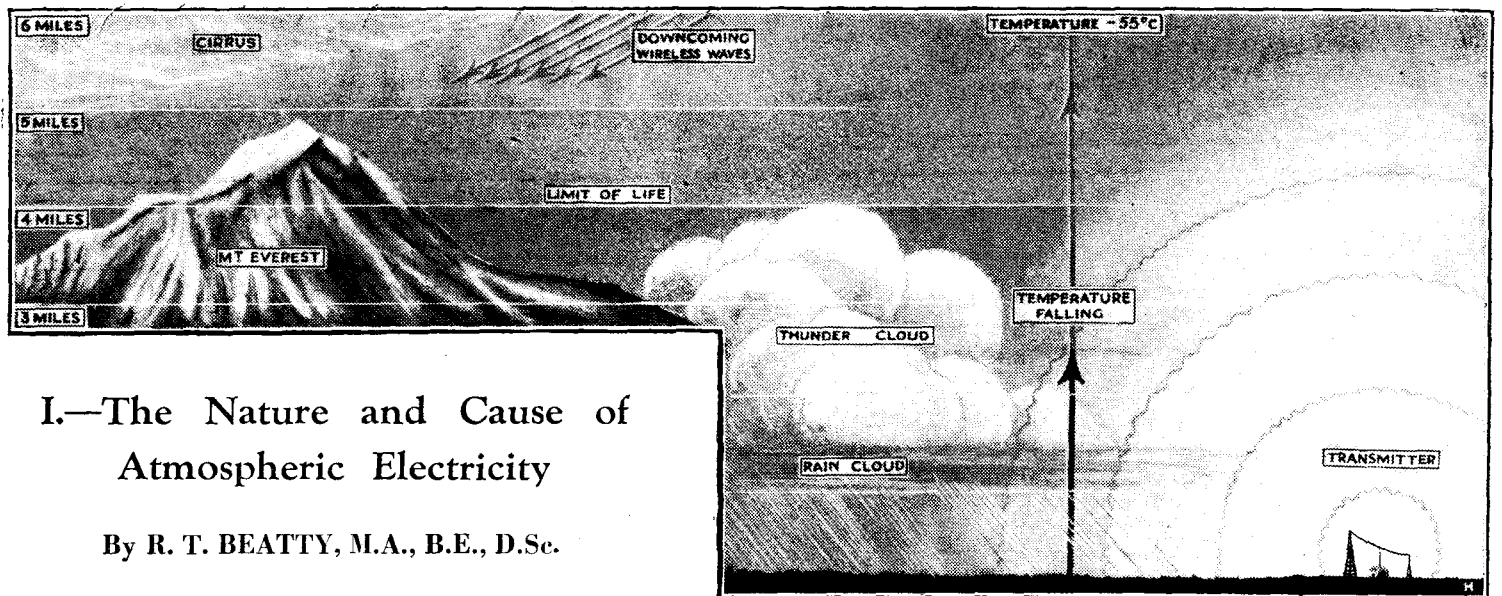
His Majesty, whose twenty-five years of beneficent sovereignty we acclaim this week, is himself a broadcaster. By means of wireless King George's voice has reached the ears of millions of his subjects, and it is but bare truth to say that no broadcast is ever awaited with such eagerness and expectancy as His Majesty's annual greeting to his peoples on Christmas Day.

May he long be spared to repeat again and again that heartening bond made possible by wireless between the Royal House and the homes of his subjects.

## Programmes

**J**UST as Jubilee Week is an outstanding event in the lives of every one of us so is it a week of great undertakings and responsibility for the B.B.C. The task which the Corporation has set itself to do in order to enable this country, the Empire, and the world to participate in these celebrations will exact a high degree of efficiency even from so well organised a system already accustomed to big achievements in broadcasting topical events. The Outside Broadcast Department of the B.B.C. in London will have one of the busiest weeks on record. No less than eighty-four microphones will be in use and eighteen control units. The B.B.C. estimates that 5,200 yards of cable will be used for connecting up the microphones and there will be a thousand terminal connections to make. Elsewhere in this issue we devote special pages to giving our readers a general guide to what is being provided in the way of special programme items.

# Wireless and the Atmosphere



## I.—The Nature and Cause of Atmospheric Electricity

By R. T. BEATTY, M.A., B.E., D.Sc.

**T**HE purpose of this series of articles is to explain in a simple way the various factors which affect our reception of wireless signals. Chief among these factors is the atmosphere, whose many layers, sensitive as they are to the influence of solar radiation and to invaders such as meteors, cosmic rays, and electrified particles of all kinds, control reception at medium and long distances. Indeed, our knowledge of the upper atmosphere, in those rarefied regions which man can scarcely hope to reach, is chiefly due to wireless waves, which, as they return bent and twisted to earth, reveal the story of their adventures in the high sky a hundred miles above us.

**I**T is now well known that the successful transmission of wireless waves over long distances is due to a strange series of events which takes place in the upper reaches of the great ocean of air which is flung around the earth.

The air which we breathe and explore in balloons and aeroplanes has no influence on wireless waves. It is transparent to them just as it is transparent to the light of the sun or to the cosmic rays which stream in from outer space and pass through unhindered. Save for transient disturbances due to lightning and to the effects of electrified drops of rain falling upon aerials, our reception of wireless programmes is unaffected by the atmosphere at these low levels.

But high in the sky, far above the highest level to which a balloon has ever carried a human being, lie the regions which have a profound influence on the path of wireless waves. From fifty to a hundred miles above our heads, where the air is so thin that the most delicate barometer would fail to detect its pressure, and where molecules of gas are so few that one of them may travel for a mile before colliding with another, there are layers of intense electrification which serve to prevent the escape of all except the very shortest waves.

Two of these regions are more permanent than the others. The lower one is the Heaviside layer, and fifty miles farther up lies the Appleton layer. Though permanent in the sense that they never fade

away completely, we must not think of them as rigid and burnished mirrors set in the sky. We may with greater truth regard them as tides in the high atmosphere, waxing and waning as the earth turns between day and night, varying with the phases of the moon, sensitive to those gigantic solar convulsions which appear as sunspots, and appreciably disturbed by the showers of meteors which from time to time invade the upper air.

The behaviour of these layers is, as we shall show, largely dependent on events which take place far below in the lower regions of the atmosphere, and since the

*The title illustration gives a pictorial representation of the troposphere, the lowest of the layers of the atmosphere. In it are generated practically all the atmospherics which trouble wireless reception, for it is only in this region that air is dense enough and winds strong enough to cause intense electrical discharges. A typical summer thundercloud is shown with its accompaniment of lightning and electrified rain. On the ground we must imagine the wireless station as competing with the noises from unsilenced electrical machines of all kinds. This region is filled with wireless waves pouring along the surface of the earth and forming a wireless atmosphere which is densest in the troposphere.*

lower regions are also the seat of disturbances which are of great importance to radio workers it seems worth while to begin at the surface of the earth and try to explain, as we travel farther and farther

upwards, the somewhat surprising discoveries which have been made of late years in the domain of meteorology regarded from a radio point of view.

### The Troposphere

The lowest layer, the troposphere (the word means a region of movement), is the domain of wind and rain, and of clouds and thunderstorms. It extends upwards to a height of about six miles and so surmounts the tops of the highest mountain peaks. In this region the air becomes steadily colder with increasing altitude, the fall in temperature amounting to about 9 deg. C. per mile, so that at the upper boundary of the troposphere the thermometer may read  $-55$  deg. C., a degree of cold as intense as is ever reached in Polar regions on the earth's surface. At this temperature all known liquids are frozen, mercury included. This coldness is at first thought surprising, for at an altitude of six miles the sun's rays have an intensity greater than at the earth's surface, since they have not yet suffered absorption by the clouds which lie below, and, indeed, Piccard in his balloon ascent to a height of ten miles found that the sealed metal car in which he was enclosed became uncomfortably hot.

But air differs from metal in being practically transparent to solar radiations except for the small fraction which extends into the far infra-red spectrum, and since a body can only grow hot by absorbing

**Wireless and the Atmosphere—**

energy the intense radiation which pours down fails, even on the equator, to warm the air through which it passes. Hence it is the surface of the earth and not the air which is heated by the direct rays of the sun.

It is from this heated surface that the layer of air just above receives warmth, both by direct contact and from the long-waved heat rays emitted by the earth, which, unlike the shorter waves comprised in sunlight, are readily absorbed by air.

**The Invisible Man**

While on this subject we might make a scientific prediction concerning the Invisible Man described by Mr. H. G. Wells. Since this unfortunate creature was perfectly transparent he could never enjoy the warmth of sunlight but must have relied on transmission of heat by contact to his body from the surrounding air and the ground on which he trod.

The warmed air expands and rises owing to its increased buoyancy. As it ascends into more rarefied regions it cools both on account of its continuing expansion and because it radiates away its heat; this loss cannot be made good by absorption, at least, not until its temperature falls to about - 55 deg. C., for, as we have already pointed out, the absorptive power is small. And so within the limit of the shell of gas called the troposphere there is a steady fall of temperature with increase in elevation.

The radio worker has good reason to consider the troposphere as the home of unwanted radio signals, which are due largely to lightning and to a smaller extent to electrified rain. Rain, fortunately, is strictly local in its effects, and is only electrified if it has fallen through a turbulent atmosphere, but the atmospheres which plague us nightly reach our aerials from thunderstorms up to distances of a thousand miles away. Let us consider the cracklings and mutterings which at times disturb our enjoyment of the gentle music of Schubert as faint echoes from gigantic and brutal Wagnerian compositions roaring over mid-Europe or far out in the Atlantic, and we may then regard them more tolerantly.

**Thunderstorms and Wireless**

Few people realise how enormous is the power emitted in a thunderstorm or the reasons for the production of the considerable charge of electricity accumulated prior to its discharge as a flash of lightning.

It is not easy to electrify raindrops. Dr. Simpson, in his attempts to produce a thundercloud in the laboratory, found that no electrification was produced by freezing drops of water or by thawing the result-

ing hailstones, or by friction of falling drops against still air. But when air was blown upwards against the drops so that the relative speed exceeded twenty miles an hour, spray was torn off and the upward-carried spray was charged negatively, while the drops were left behind with a positive charge. Thus, an upward blast of air of sufficient intensity acts as a kind of Wimshurst machine, generating electricity as long as rain is falling. Now, upward air currents of this kind obviously occur in cumulus clouds, those white, massive, towering structures which are thunderclouds *par excellence*. For the summit of the cloud is often observed to be in violent motion and to be blown out like the head of a cauliflower. Moreover, the hailstones which frequently occur in thunderstorms must originate as raindrops which, after their formation, are carried up to higher and colder altitudes where they freeze, and to carry an average hailstone upwards an air blast at twenty miles an hour is required.

So far, then, the explanation of the working of the great electric generator is acceptable. The next question is, Whence comes the vertical draught?

Imagine a hot, still afternoon when the warmed surface air is drifting gently upwards. Over a moist region the air is more heavily charged with water vapour

cloud. For the heated air becomes more buoyant than air at the same level outside the cloud, and wind begins to rush into the cloud from the regions outside and from below. Here, then, is the origin of the updraught which, like air ascending in a heated chimney, blows up along the core of the cumulus, and attains enough speed to disrupt and electrify the falling rain.

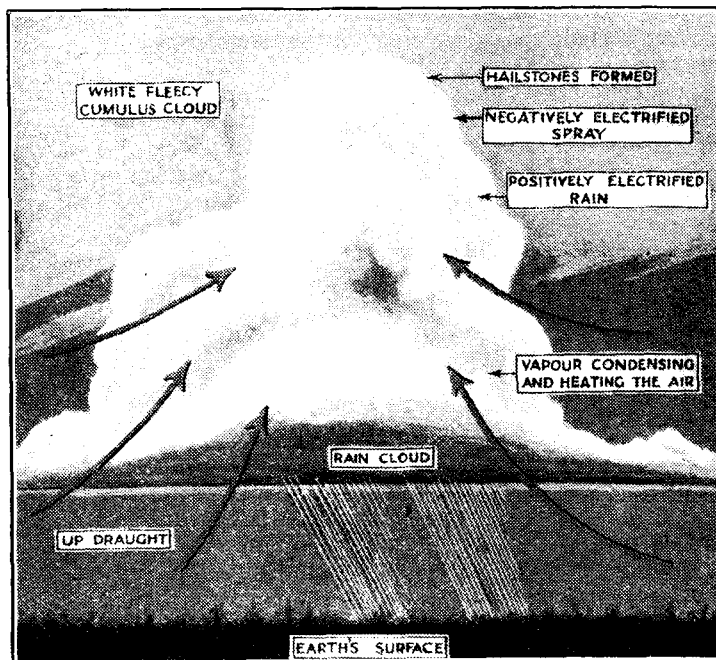
**The Thundercloud Dynamo**

The numerical figures relating to thunderclouds are of startling magnitude. In five seconds a charge of 20 coulombs (equivalent to 4 amperes flowing for five seconds) may be carried up by the ascending spray, thus forming an electric condenser with an upper negatively charged plate and a lower positive plate formed by the positively charged raindrops or by the earth below. In thirty seconds the potential difference may amount to five thousand million volts, whereupon a flash occurs. The thundercloud machine keeps on generating electricity at this high pressure, and if we reckon on a flash every thirty seconds we arrive at a figure of the average horse power of the stupendous value of four million horse power. Compare with this the performance of the great Battersea power station which (if its third steam turbine has been installed at the date of writing) is capable of 300,000 horse power. One thundercloud equals thirteen Battersea stations! Or consider that one H.P. = the power of six men, but, since a man can only work at this rate for six hours per day, while a machine works continuously, one H.P. = twenty-four men, and since including women and children only one individual out of four is capable of this work, one H.P. = ninety-six individuals. Accordingly, one thundercloud machine =  $4 \times 96$  million individuals, so that the total man power of the 2,000 million inhabitants of our globe is equalled by the power emitted by five working thunderclouds.

So, if on a night in which atmospheres tend to drown the wireless programme any reader should feel resentment mounting within him, I would recommend him to read again this article and ponder over the remarkable events and gigantic forces of which he has the privilege to be an auditor. *Tout comprendre, c'est tout pardonner.*

Further articles in this series will deal with the following subjects:—

2. The Stratosphere, the world of fair weather and intense sunshine.
3. The Ozone Layer, and its protective action.
4. The Ionosphere, the home of the Heavenside and Appleton Layers.
5. Absorption of wireless waves, and wireless echoes.



Events in a thundercloud, the most potent source of atmospherics.

than over the surrounding drier surface, but in any case the air as it rises enters colder and colder altitudes. At a height of, say, a mile, the moist air becomes cooled to a point where its water vapour reaches saturation and begins to condense as a fine rain. Now, as steam engineers know well, when vapour condenses heat is given out—the latent heat of steam—to such an amount that for every pound of water formed enough heat is produced to raise five pounds of water to boiling point.

This heat, produced by condensation, has a profound effect on the behaviour of the column of moist air—the cumulus

# The Tone-control Transformer

## Principles of Operation and Design

By L. E. C. HUGHES, Ph.D.

*ALTHOUGH tone-correcting LF transformers, of which the frequency characteristics may be adjusted through an external control to suit varying needs, have been in use for some time, little technical information has hitherto been published on their design.*

**M**ANY readers of this journal are well acquainted with methods of tone correction and control as applied to radio reception. Tone control is, briefly, the art of adjusting frequency-response curves of apparatus to specified shapes. This can be done with exactness when all the apparatus and suitable measuring gear are available. In broadcasting, it is not possible to get at both ends of the system at the same time and measure the overall response; indeed, there is some difficulty in deciding the definition of such a response, including, as it does, the acoustic conditions of and surrounding the microphone and loud speaker.

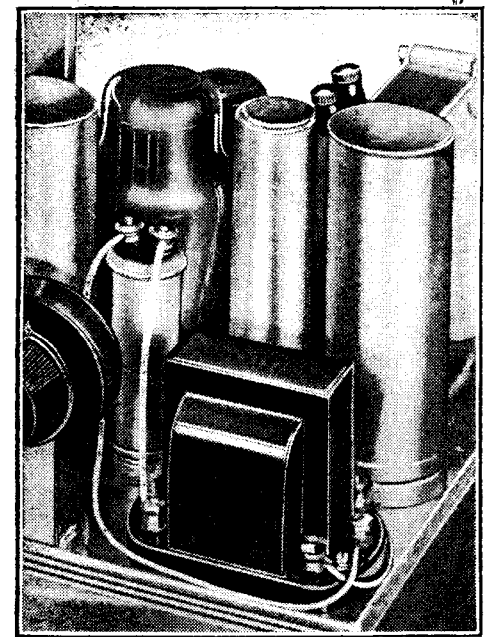
Supposing that the response curves under the control of the broadcasting authorities are adjusted to an acceptable shape up to the radiation, there remain variabilities in the receiver, such as in the selective circuits and in the position of the reproducer, which make empirical

transformer of turns ratio  $N$ , that is, one with infinitely great primary and secondary impedances and no leakage inductances.

$M$  is the mutual inductance of the transformer when the ratio is reduced to  $1/1$ , instead of  $N$ , by dividing all the secondary impedances by  $N^2$ . The primary and secondary leakages and effective resistances are represented by  $L_1$ ,  $L_2$ ,  $R_1$  and  $R_2$  respectively.  $C$  is the self-capacity of the secondary winding, depending only on the shape of the winding and which end of the windings or the core is earthed, and independent of the actual number of turns. The larger is  $N$  in an actual transformer of fixed size secondary, the greater is  $C$  in the equivalent circuit, since it becomes multiplied by  $N^2$ .

The terminations of a transformer are most important. The primary is connected to a source of electro-motive force,  $E$ , in series with an internal impedance  $R$ , generally resistive, as in a thermionic valve. In the latter,  $E$  is the product of the applied voltage to the grid and the amplification factor.

The response of the transformer is defined as the ratio of the secondary voltage  $V$ , since this is applied to the grid and determines the power output of the succeeding valve, to  $E$ , not to the



The tone-control transformer in practical use. A Multitone component incorporated in *The Wireless World* Universal AC-DC III.

of  $M$  and  $C$  are high and do not appreciably shunt the transmission line. Also the leakage impedances are small in comparison with  $M$ , the leakage impedances being normally less than 1 per cent. of  $M$ . Hence  $V=E$ ; there is no gain or loss, apart from the step-up, centre of curve A, Fig. 2.

At low frequencies  $M$  becomes an appreciable shunt, due to its fall in impedance; there is a voltage drop in  $R$ ,  $V$  is less than  $E$ , and there is a progressive loss in the bass.

With increasing frequency the series-leakage impedance rises and thus provides an increasing drop for the greater current taken by  $C$ . At some frequency, when the reactance of  $C$  equals the leakage reactances, the current through  $C$  may be a maximum; hence the response may be a maximum. At very high frequencies  $C$  becomes a short-circuit and the response tends to zero. The magnitude of the resonant current, for a given  $E$ , depends on the series effective resistance, that is, the

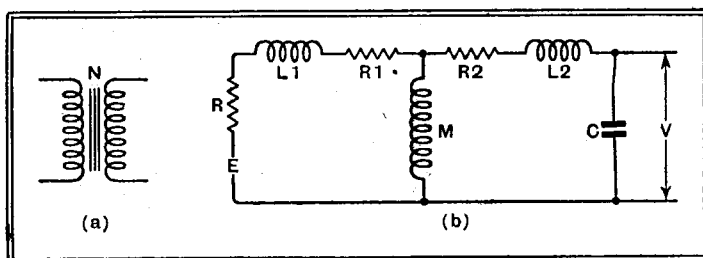


Fig. 1.—A normal LF transformer and its equivalent circuit.

tone-control an asset, so that the optimum overall response can be attained in a variety of conditions.

The tone-control transformer is a device providing for continuous adjustment of frequency response; and no doubt many of its users desire to know its principle of operation.

### Normal Transformer Action

Its circuit is based on an ingenious combination of properties of transformers. The tone-control transformer is more simply explained, therefore, from a consideration of the equivalent circuit of the conventional double-wound transformer.

Referring to Figure 1, a transformer with turns ratio  $N$  in (a) is equivalent to the network (b) in series with an ideal

voltage applied to the primary of the transformer. The response is plotted for each frequency as

$$20 \log_{10}(V/E) \dots \dots \text{decibels,}$$

in conformity with all other response curves which determine ultimately the overall response curve of an acoustic system. To this is added

$$20 \log_{10}N \dots \dots \text{decibels,}$$

indicating the gain obtained by virtue of the fact that the device transforms.

In practice, the network of Figure 1 (b) is not on open circuit, but operates into a grid-capacity, which is determined by the constants of the valve and the load in its anode circuit. The circuit is simplified by adding this grid input-capacity in parallel with the self-capacity of the secondary of the transformer.

At medium frequencies the impedance

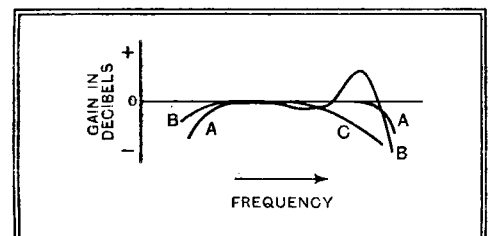


Fig. 2.—Response curves of normal transformers.

losses in the transformer windings, both copper and iron, and the impedance of the source  $R$ . If the latter is low, the resonant current may result in  $V$  being

**The Tone-control Transformer—**

considerably greater than  $E$ , as in curve B. At the same time, the response is held up in the bass because at a given frequency  $M$  takes a larger voltage drop. If the source impedance  $R$  is high, then the resonant current is small and  $V$  may be less than  $E$ , as in curve C. If the grid is shunted by a resistance, such a load reduces the top response also.

The art of designing a transformer with a level response over a wide frequency range is, therefore, the adjustment of the mutual  $M$ , the leakages, and the self-capacity  $C$ , so that the resonant current at the upper end of the response curve has the right value to make the ratio  $V/E$  the same as at a medium frequency.

**High-permeability Cores.**

Now  $M$  depends on the number of turns placed on a given sized core, and the percentage leakage inductances on the permeability of that core. The use of nickel-iron alloys of high differential permeability results in a smaller core for a given  $M$ ; the smaller core also results in a smaller  $C$ , since this diminishes with the dimensions of the winding. Thus improved core material helps in two ways in obtaining a level response over a wide range for a given step-up, because increases of the leakage inductance or effective self-capacity of the secondary winding both reduce the secondary resonant frequency.

In a given transformer, information for further design is easily obtained.  $M$  is substantially the primary inductance and is measured at low frequency, say 50 c/s, on a bridge with a vibration galvano-

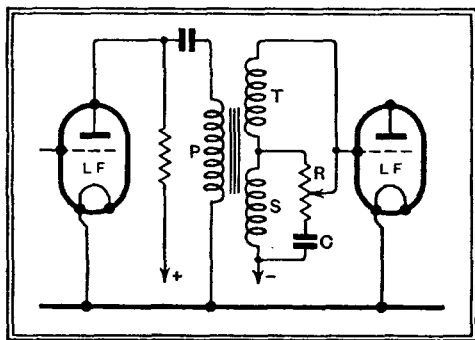


Fig. 3.—Connections of a tone-control transformer.

meter, or simply with a thermocouple or rectifying instrument to measure series current and a valve voltmeter to measure voltage drop. The leakages, which cannot be distinguished practically, are measured by taking the primary impedance with the secondary shorted.

The self-capacity of the secondary is found from the leakage reactances by ascertaining at what high frequency the primary impedance is a minimum and resistive; the value of this resistance is clearly the series effective resistances. As a check,  $M$  and  $C$  resonate and the primary impedance becomes a maximum and resistive at some middle frequency, which is readily obtained with a suitable bridge.

There are subsidiary effects due to capacities between the windings which modify the response curve slightly in practice, but they do not modify the preceding argument.

Turning now to the tone-control transformer, Fig. 3, it consists of a normal primary  $P$ , suited to the source impedance, a main secondary  $S$ , and a further secondary  $T$  connected by an external high-resistance potentiometer  $R$  and a con-

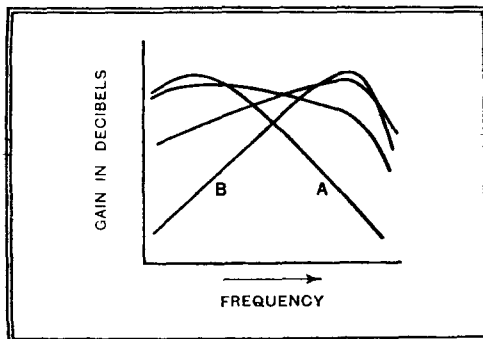


Fig. 4.—Various types of response curve obtainable from a tone-correcting transformer.

denser  $C$ , which is conveniently formed from a bifilar winding on the primary.

Remembering the action of a normal transformer, the modified transformer acts as follows. With the slider at its lower extremity  $S$  and  $T$  resonate with  $C$ . The latter is adjusted so that the resonant frequency is about 90 c/s, above which the response, as measured by the ratio of the voltage applied to the second grid to the voltage applied to the first grid, falls off rapidly, as indicated in Fig. 4, curve A.

With the slider of  $R$  at the upper end,  $T$  is shorted on the core and the comparatively heavy short-circuit ampere-turns are balanced by primary ampere-turns, with the result that the apparent primary impedance falls to a low value. Remembering that the valve has a fixed differential anode resistance, loss in primary impedance means that there is a larger voltage drop in the valve, less voltage is applied to the primary, less voltage transformed by  $S$ , and so the response is low.

The short-circuit current is a maximum at the lowest frequencies. As the frequency rises, so does the reactance of the leakage of  $T$ , with consequent drop in short-circuit current, rise in primary impedance, increase of voltage applied to primary, and increase in overall response, as indicated by curve B.

The response continues to rise until the resonant frequency of the winding  $S$  is passed, after which the response drops sharply, as is normal.

For intermediate positions of the slider of  $R$ , there is a combination of the resonant current in  $S$  and the short-circuit current in  $T$ , and response curves intermediate between A and B are obtained, the change from one response curve to another being continuous with rotation of the potentiometer  $R$ .

The range of frequency response is determined by the step-up ratio as pre-

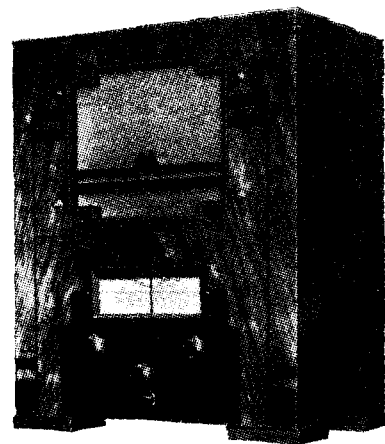
viously explained. It is not possible to have both high gain due to step-up and great band-width of response. Moreover, to get the range of control in response it is necessary to adjust the leakage of  $T$ , which means, in practice, the permeability of the core material, within close limits.

The tone-control transformer gives, therefore, a considerable margin of response tilt in both directions, a property which has been found of considerable use not only in radio-receivers, where it is most used, but also in deaf-aids, for which it was devised, and in public-address systems; in fact, in all reproducing systems which have to work in adverse acoustic conditions and which require adjustment of their overall response.

**Marconiphone Model 223**

THE latest addition to the "Jubilee" series of Marconiphone receivers is an AC/DC superheterodyne which has been introduced to meet the demands of those who anticipate a change in the nature of their supply mains.

An unusually interesting three-valve circuit has been adopted in which the middle valve, a double-diode-pentode, performs the functions of IF amplifier, second detector, AVC, and LF amplifier. This versatile valve is preceded by a heptode frequency-changer, and is followed by a separate pentode output valve.



Marconiphone Model 223 AC/DC Superheterodyne

Special attention has been given to the question of heat dissipation, which is of necessity a very real problem in table sets employing universal valves, and deflecting cowls have been included to maintain steady convection currents.

The price of the Model 223 is 11½ guineas.

**Jubilee Issues**

THE principal motoring happenings during the King's reign are described in a beautifully produced Jubilee issue of our sister journal, *The Autocar*, dated May 3rd, which also includes an authoritative description of His Majesty's garage and cars at Buckingham Palace.

An article on "Snapshotting Royalty" appears in the special Jubilee issue of *The Amateur Photographer* (May 1st), together with details of a Jubilee competition. *The Yachting World* (May 3rd) gives a vivid record of the King's activities on the famous Royal cutter, *Britannia*.



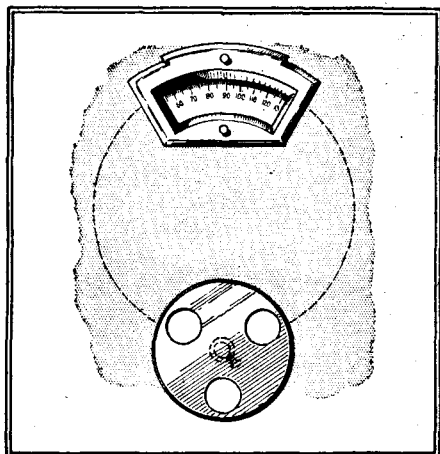
# HINTS AND TIPS

## Practical Aids to Better Reception

**A** CRITICISM sometimes directed against all-wave receivers is that the ratio of the tuning drive fitted is too low for the very fine adjustments needed on short waves. Actually, this is not due to short-sighted manufacturing policy, but to

### A Dual-Purpose Tuning Knob

the fact that a reduction gear really high enough for the short waves would make tedious an exploration of the medium and long waves. Another possible disadvantage of a high ratio is that it can give a quite false impression of poor selectivity, particularly on long



On the principle of the dial telephone; an easily made two-speed drive.

waves. Consequently, failing a suitable two-ratio drive, the ultimate choice is a compromise between the two requirements, with a bias in favour of the higher wavelengths, which are likely to be the most used by the average listener.

Conversely, with sets designed primarily for short waves, the slow-motion ratio is sometimes so high that the user is irritated by the tedious operation of repeatedly turning the knob; a strong desire is felt for some way of speeding up the tuning process when skipping from one waveband to another.

Those who use this type of set may be interested in a simple device which permits both fast and slow control to be obtained with a standard tuning drive. It is suggested that the usual tuning knob should be replaced by a large flat disc—a convenient form being the type used for vernier thumb-controlled condensers; near the periphery a hole (or several symmetrical holes) is drilled, suitably counter-sunk so that it fits the tip of a forefinger comfortably.

Now, by placing a finger-tip in the hole and rotating it from the knuckle joint, thereby spinning the "dial" as when using an automatic telephone, one can

pass from one end of the scale to the other in far less time than by the usual "twiddling" method; while for the relatively slow and careful process of tuning in a station, the large size and knurled rim of the disc enables one to make the finest adjustments with the greatest accuracy.

**WITH** the object of obtaining the maximum amount of undistorted volume from an output valve, every effort should be made to apply to its anode the highest possible voltage up to the limit imposed by the manufacturer.

### HT Voltage and Power Output

The reason for this advice is that the decline in AC output is not merely proportional to reductions in HT voltage; it is much worse than that, amounting in practice to the square of the voltage.

As an example, by halving the anode voltage, the power output is reduced, not by half, but to a fourth of the figure corresponding to maximum rated voltage.

**WHEN** fluctuations in signal strength and changes in quality of reproduction take place during the hours of daylight (true fading should not then occur on the normal broadcast bands) we have a fairly certain indication, if the

### Inconstant Oscillator Frequency

receiver is a superheterodyne, that the oscillator frequency is "wandering." It may be, of course, that the source of the trouble is external, but this is hardly likely nowadays.

In any case, the point can be determined quite easily with the help of an extemporised oscillator consisting of the reacting detector circuit of a borrowed receiver. The procedure is to tune the suspected receiver to a signal which is subject to variation, and then to heterodyne it from the local oscillator, when a

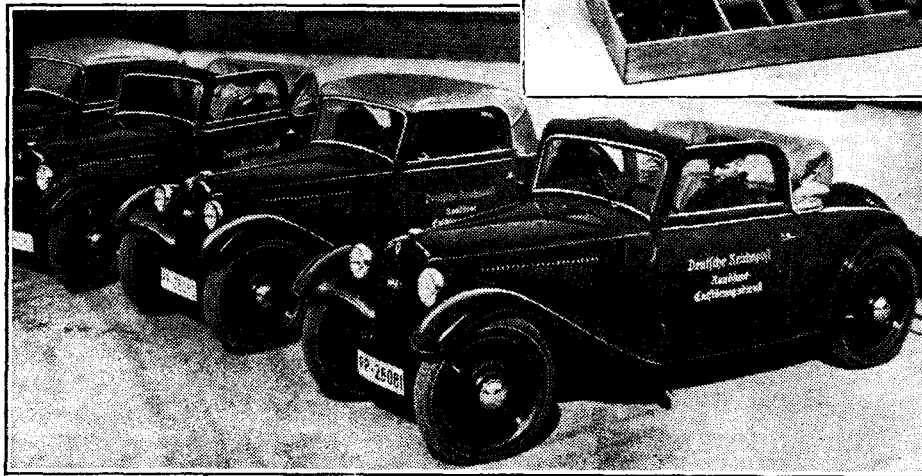
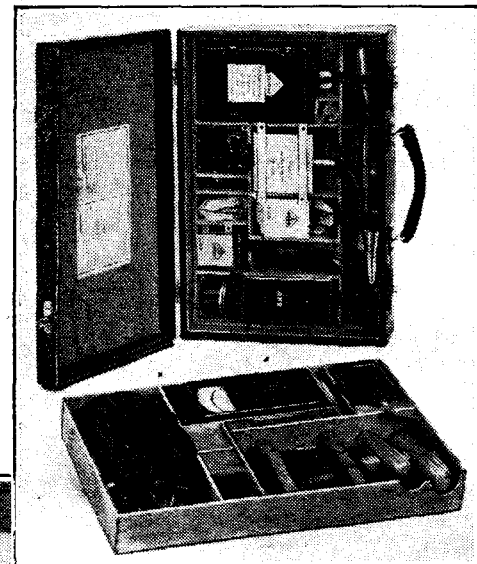
whistle of pitch dependent upon the setting of the oscillator condenser will occur. If the pitch of this whistle is observed to vary when the volume varies, it may be concluded, with some confidence, that the trouble is due wholly to wandering of the oscillator frequency.

**I**N a recent issue it was pointed out that the small mass-plate type of accumulator is hardly suitable for the filament-current demands of five- or six-valve sets. The truth of this assertion can often be

### Accumulators for Superhets

proved by checking the voltage of one such overworked cell after a prolonged period of listening, and it is a fact that many cases of poor performance and erratic behaviour can be traced to inadequate low-tension supply, particularly amongst last season's superheterodynes, which, generally speaking, contain a minimum of five valves.

For example, in a set of this type it sometimes happens that the detector-oscillator valve suddenly stops oscillating, or fails to oscillate over the whole wave-range. This is most likely to occur with screened-grid "cathode-injection" frequency changers, where the oscillator coupling coil is inserted in the filament leads; with this arrangement there may be insufficient reaction coupling to maintain oscillation when emission falls through even a slight decline in filament voltage.



GERMANY WAGES WAR ON INTERFERENCE.—A fleet of 65 cars are being put into service for tracing and suppressing electrical disturbances. Above is shown the portable kit of tools and instruments with which each of the investigating engineers is provided.

Events of the  
Week  
in Brief Review

# Current Topics

## Keeping It Dark

THERE is to be no public radio show in America during 1935. Such is the decision of the U.S. Radio Manufacturers' Association, which meets in Chicago on June 11th and 12th for a secret session on set designs for 1935-6.

## Medium Waves Span Atlantic

TESTS conducted by the new Rennes-Bretagne Regional station, working on 288.5 metres between 4 and 6 a.m., have revealed that this 120-kilowatt medium-wave transmitter is easily heard in America.

## Sir Ambrose Fleming

SIR AMBROSE FLEMING, inventor of the thermionic valve, has been awarded the Franklin Medal for 1935 by the Franklin Institute, Philadelphia, for his work in the field of wireless research. The name of Sir Ambrose is coupled with that of Professor Einstein, who receives a similar medal for his researches into relativity.

## The Listener's Chance

BELIEVING that the only bar to the complete enjoyment of broadcast programmes is the listener's inability to reply, the Stuttgart station authorities are introducing a Listeners' Programme once a fortnight. During these two-hour sessions, representative listeners are led to the microphone and permitted to catechise the station director on matters pertaining to the arrangement of programmes.

## French Television Claim

NONE other than M. Mandel, the French P.M.G., is responsible for the statement that the Eiffel Tower will soon be transmitting television "better and more up to date than anything in Great Britain or Germany."

A smaller edition of the apparatus, which is all-French, is about to begin broadcasts from Paris P.T.T. parallel with the ordinary sound broadcasts. These will be on 175 metres, with 60-line scanning at 25 frames per second.

The Eiffel Tower tests three months hence will employ 240-line scanning.

## Paying the Postman

RADIO licence fees in Italy have hitherto been collected by postmen, but there are certain objections to this arrangement, including possible non-delivery of letters to delinquents. In future Italian listeners must pay at the post office.

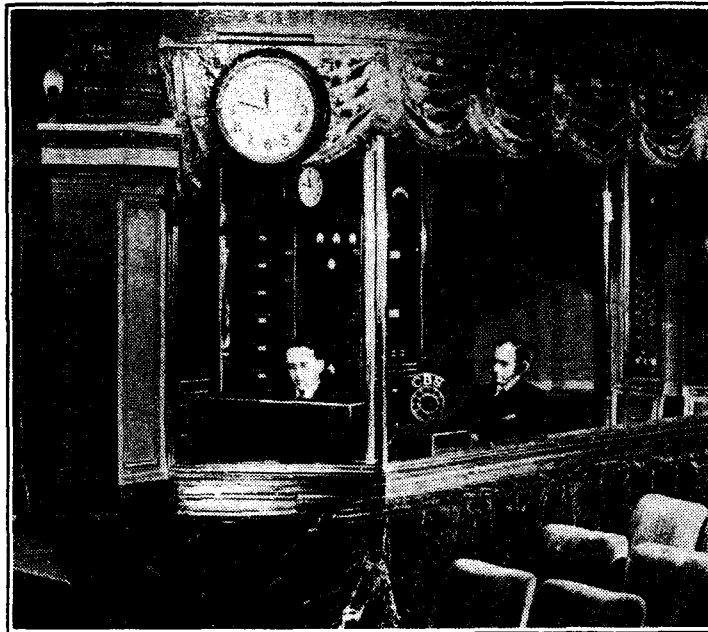
## "Free Shows" Battle in U.S.

AMERICAN theatrical producers and actors' organisations are complaining against the prevalence of "free shows" provided by the broadcasting networks. It is estimated that about 5,000 persons attend weekly in the studios of the two main networks, while large

## Mexico Tells the Universe

STATION XECC has been opened by the Mexican Ministry of Foreign Affairs "to carry out active propaganda of news on behalf of Mexico's good name abroad." In an official notice we read that "XECC will serve lofty aims, as in addition to broadcasting all over the universe the truth in regard to the situation in Mexico, it will do its share towards drawing closer the bonds of international friendship and rectifying by actual facts distorted world opinions in regard to the Republic of Mexico, originated by malevolent and misleading reports."

XECC works on 40.6 metres



A CATHODE RAY OSCILLOGRAPH is used by the engineers as a visual check on quality in this control cabinet in the Columbia Broadcasting system's Radio Playhouse near Times Square, New York. Non-paying audiences of 750 persons can attend the performances, and the theatrical profession is complaining bitterly.

numbers occupy complimentary seats at the minor broadcasting stations.

The largest attendances are in the large and small studio theatres at Radio City, New York.

The broadcasters' contention is that radio artists demand a visible audience as a stimulus to better performance, but it seems doubtful whether theatre organisations appreciate the strength of this argument. Probably they would prefer that the standard of broadcast performance was not too high.

## Listening in France

FRENCH registered listeners numbered 1,882,607 at the beginning of March, 843,789 belonging to the Paris district.

(3,780 k/c) every Sunday from 23.00 to 24.00 G.M.T.

## Wonders of the Detector Van

AN amusing tale is told in the *Post Office Magazine* of a visit of the P.O. "detector" van to the elderly landlord of a Welsh inn. When the licensee explained to the engineers that his son had taken the wireless licence out with him, he was informed that he would find it in the pocket of his son's blue coat. Sure enough the licence was there, and the old man's astonishment was wonderful to behold when, asking how the engineers knew, he was informed, "This is the licence detector van you've been reading about."

Not till evening did he learn

that his son had met the van on the road prior to its visit and had told the Post Office men where the licence was to be found.

## Alternative Programmes

THE first serious attempt to introduce alternative broadcast programmes in France, with a contrasting appeal, will be made at the end of this month. When Radio-Paris is broadcasting dramatic and literary material, the Eiffel Tower will offer light music, and vice versa. The principle will ultimately be extended to include the whole of the French Regional scheme.

## "Ultra-Shorts" in Central London

DIRECTIONAL and omnidirectional 5-metre transmissions will be carried out on Sunday, May 19th, by the International Short Wave Club on the roof of *The Daily Telegraph* building in Fleet Street, London, and a special appeal is made for listeners to report on the tests. It is hoped to secure reports from listeners located over 200 miles away.

A complete schedule of the tests, which will run from 11 a.m. to 4.30 p.m., will be published in next week's *Wireless World*. The "Ultra Short Wave Two," which was described in the issue of this journal dated June 16th, 1933, is a very suitable receiver for those who wish to take part, being of simple construction and capable of reception up to two or three hundred miles. A limited number of copies of the issue can still be obtained from the Publisher, Dorset House, Stamford Street, S.E.1.

## N.R.E.A.

THE suggestion that a printed list should be prepared showing the usual charges for ordinary radio repair jobs is being considered by the National Radio Engineers' Association.

Since the recent formation of the Association successful meetings have been held in Leicester, Nottingham, Plymouth, Bristol, Cardiff and Newcastle. Organisers have been appointed for Norwich, Manchester and Barnsley.

Radio engineers are invited to apply for full particulars of the Association's activities to the Secretary at 48, High Road, London, N.2.

## Components Famine

RESTRICTION of imports has placed Roumania in the sorry position of not having enough radio parts, writes a correspondent. As a result the factories are working only three days a week, while amateur construction work is at a standstill.