Atmospherics and Interference in Radio

IN the following article is described the nature and origin of "atmospherics," that bugbear of distant wireless reception. Though devices which undoubtedly reduce undesirable atmospheric effects have been invented, still it is highly probable that this particular type of interference will never be completely eliminated.

ONE of the greatest difficulties met with in modern wireless communication is that of interference. Almost every day a new wireless transmitting station is set up somewhere and begins to launch forth its waves in an already congested ether, and it has truly been said that the main difficulty of modern wireless reception is not to receive a signal but to keep out unwanted signals.

Interference in wireless is broadly divisible into three classes: atmospherics, unwanted signals—either morse or telephony—and our old friend "oscillation." At about this season of the year listeners to broadcast programmes begin to renew their acquaintance with the crashing, rattling, and hissing noises produced by atmospherics.

In the reception of wireless pictures and in television the atmospheric also makes its presence felt by the production of irregular streaks or smudges upon the field of the picture. While these atmospherics may spoil otherwise perfect reception from a nearby station, it is in long distance working that the effect of atmospheric interference is experienced at its worst. In many parts of the world the intensity and frequency of these atmospheric disturbances are so great that many commercial wireless operators are unable to wear head telephones, and automatic recording apparatus is rendered inoperative for several hours a day during certain portions of the year.

As may be gathered from the name which was given to this type of interference many years ago, the origin of these electrical disturbances is intimately connected with the atmosphere. Scientific research on the subject of recent years has shown that they arise from a discharge between separate accumulations of positive and negative electricity in the atmosphere, or between one such accumulated charge and the earth's surface. While it is not necessary that such a discharge should be either audible or visible it is commonly known to our senses in the form of thunder and lightning.

Tests at 1,000,000 Volts.

SOME idea of the order of interference to be experienced from a lightning flash has been obtained recently in laboratory experiments with a high-voltage electrical discharge apparatus. Using a plant capable of generating appreciable power at pressures up to 1,000,000 volts, spark discharges were produced over a string of insulators about 6 feet long, the potential difference between the terminals prior to breakdown being about 850,000 volts. At the frequency of 50 cycles per second employed, the current through a maintained arc discharge was about 0.5 ampere.

Effects on Receivers.

OBSERVATIONS carried out on various wireless receivers operating on different wavelengths between 7.5 and 1600 metres showed that, while the interference effect of the spark discharge was very serious at short distances it decreased, very rapidly as the distance was increased. Thus, within 50 yards of the spark the strength of the interference was approximately equal to the strength of signals from a powerful broadcasting station some 10 miles away. As the receiver was moved away from the spark, however, the interference decreased rapidly until at distances greater than half a mile it was quite inaudible on the most sensitive receiver. In the case of all the experiments no audible effect was detectable before the occurrence of the spark discharge, and this result would tend to support the view that all atmospherics in wireless communication are due to actual lightning flashes.

On first consideration it might be thought that the effect of a lightning flash would only make itself felt over a small area, and that ordinary observation shows that insufficient flashes are normally experienced to account for all the atmospherics received. It must be pointed out, however, that natural lightning is an electrical discharge on an enormously greater scale than the relatively puny discharges which we can produce artificially.

10,000 Amperes!

FOR instance, the average length of a lightning flash is of the order of 10,000 feet as against the 6-foot spark employed in the above experiments; also, the current in the lightning flash has been estimated at about 10,000 amperes as against the half ampere mentioned above. From such figures it can be shown that the radiation from a single lightning flash is from 2000 to 10,000 times as strong as that from a high-power broadcasting station. It is thus small wonder that the effects of such a flash are detectable as an atmospheric on all sensitive receivers within a radius of several thousand miles.

NEW ZEALAND listeners to the Australian stations are well acquainted with the voice of Miss Gladys Edwardes, the distinguished soprano who has been broadcasting from 2FC, 2BL, and 2GB, for several years past. The good news is now to hand that Miss Edwardes is settling permanently in Wellington and arrived here by the Maunganui on April 8. Miss Edwardes has had a distinguished musical career. She studied at the Melba Conservatorium, Melbourne, and among the many musical honours she has gained is that of New Zealand gold medallist. Actually Miss Edwardes is one of the pioneer broadcasting artistes, having been heard regularly from 2GB (Sydney) for the past seven years.

1800 Thunderstorms Always in Progress.

THE complete analysis of this world study of thunderstorms actually observed shows that on an average there are in progress, at any one moment, about 1800 thunderstorms in different parts of the world. Actually, of course, at any one place, the storms are of more frequent occurrence in the summer than in the winter months. In association with these storms it is estimated that lightning flashes occur at an average rate of 100 per second. When regarded on this basis one begins to understand the possibility of all the numerous atmospherics heard on a wireless receiver being attributable to lightning flashes as their origin.

With the aid of direction-finding and recording apparatus, investigations have been carried out in many countries with a view to locating the source of origin of atmospherics at various hours of the day and night. The general result of these investigations (which are still in progress) is to indicate that the majority of atmospherics originate in land areas and particularly in tropical mountainous districts such as South Africa and South America, where it is possible that the convection of large masses of air with subsequent cooling at the upper levels causes the separation of electrical charges which is a necessary predecessor of the lightning flash. All observers appear to agree that large stretches of sea, such as the Atlantic and Pacific Oceans, are seldom the source of atmospherics.

Atmospheric Elimination Impossible.

IN addition to research into the origin of atmospherics, many workers have tackled the problem of devising aerial systems and circuit arrangements which will render the receiver immune from the effect of atmospherics. Although some of these are very successful in reducing the undesired effects without disturbing the required signals, there is as yet no known means of entirely eliminating the atmospheric disturbance from wireless receivers; in fact, at the present time, many experts are of the opinion that atmospherics, like the poor, will always be with us.