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Atmospherics and Reception

STATIC, fading, atmospherics—these are terms on the lips of every owner of a radio set; they annoy him; he talks about them; yet, does he know just what he is talking about? The chance is that he does not, and it is probable that Mark Twain's saying: "Everybody talks of the weather when no one knows anything about it," is not without modern application.

Of all the natural phenomena which affect radio operations, static is perhaps the most important. Static has attracted the attention of radio engineers from the time the first "wireless" apparatus was set up, over 30 years ago. Static will always interfere with radio, so long as radio transmission consists in the sending out of electrical waves into the ether. Devices have been brought forward to overcome this annoyance: underground aerials, loop aerials, high frequency transmission, high resistances, filtration, and greater station power. All these are more or less useful in combating the trouble, but they are not in general use as either reception is distorted by them or they are too expensive to be generally employed.

No one can explain entirely the significance of static. That it is a form of stray electric charge, wave or current, entirely different from atmospheric electricity, is accepted by all, yet, through experiments with underground, and extremely high aerial, it has been shown that static is of atmospheric origin. It is not evenly distributed over the surface of the earth, being more frequent at the equator than at the poles, in summer than in winter, during the day than during the night. This fact is known to all, but perhaps its interpretation is not so commonly known.

The "Home" of Static.

Immediately above the earth there is a belt of air known to meteorologists as the "troposphere." This is the belt in which static occurs and as its upper limit rises to higher or lower elevations static will be more or less prevalent. Owing to the greater heat at the equator, and during the summer months the air expands, increasing the depth of the troposphere. With the increased volume of the troposphere comes the increase of static, and the particularly bad reception of weak signals. These static impulses are several thousand times as powerful as the impulses or waves coming from a distant station. As static has no particular frequency it cannot be prevented from entering the set.

In the normal state air is an insulator, but when it is acted upon by sunlight, falling rain, or snowflakes, or when it contains numerous small globules of moisture deposited on particles of dust, part of the air molecules (extremely small bodies of which everything is composed) are broken up into positive and negative ions, or minute electric charges. When this happens the air is no longer an insulator, but a partial conductor of rather high resistance. Air thus made a conductor, is said to be "ionized" and when struck by radio waves acts as a metallic shield, or as a sponge. Weather conditions affect the ionization of the atmosphere. Whenever the moisture-content of the air is great, or when dust is excessive, ionization may be quite dense. Falling rain may produce great ionization due to the impact between the drops and their constant breaking and reforming. The drops themselves bring down to the earth considerable positive electricity, while the fine spray thrown off by the falling raindrops gives a negative ionisation.

From this it is seen that the atmosphere becomes filled with millions of small patches, or areas of atmospheric gas, which is ionised to some degree. Each area, therefore, has its individual electric charge. By the phenomenon known as induction each patch of ionized air, or charged cloud, if brought near enough to the ground, attracts an electrical charge of an opposite nature. It is as though a ball were held over a mirror, the ball being the ionized area, and the reflection the inducted charge, but of course of opposite polarity.

Storms.

WHEN this charged atmosphere becomes excessive, a thunderstorm arises. This can be best explained by a simple analogy. Every person who has electricity in the home knows what happens when, by accident, two electric wires, say of the iron cord, touch. A flash, a hiss, and the fuse at the switch board is burnt out. Here, precisely the same thing has happened as when two differently charged areas of ionized atmosphere come near enough to form a contact—a flash (lightning), and a hiss, or rather, a roar (thunder). Compare the length of flash on your iron cord to the length of the lightning flash, and some idea of the enormous power of electricity that effects radio will be arrived at. From what has been said it will be evident that flashes may occur between the ionized areas and the earth, or between the areas themselves. When the discharge occurs between the ionized area and the earth through the radio set by means of the aerial and the earth system, there is a severe crash—static.

Classification of Noises.

STATIC noises have been classified into a few different types: "grinders," "clicks," "hisses," etc., each classification denoting a different source—lightning, patches of drifting electrified atmospheric gas and hot, dry winds carrying highly charged dust.

Fading, in the main, is due to the movements of "ionized" atmosphere drifting past a transmission or receiving station and acting as a sponge to the waves.

Summing up the meteorological effects which stand out as most obvious we have:

1. Static produced by drifting and irregular densities of charged atmospheric gases coming in contact with the aerial.

2. Static caused by lightning.

3. Static produced through induction in the aerial and receiver because of a passing cloud connecting with an induced ground charge of the opposite nature.

4. Fading produced by drifting ionized masses in the atmosphere absorbing radio waves.

5. Good radio reception in clear, cold weather.

6. Poor reception during warm and cloudy weather.