



RADIO

-and How it Works

A faint, stylized background illustration. On the left, a radio tower with multiple cross-arms extends upwards. On the right, a silhouette of a person stands, possibly a radio operator or a customer. The overall tone is light and technical.

A WORD TO THE APPLIANCE SALESMAN

This little booklet was written to give you a quick, non-technical glimpse into the realm of radio broadcasting and receiving. You'll find it a handy guide in answering questions customers may ask.

THE CROSLEY CORPORATION



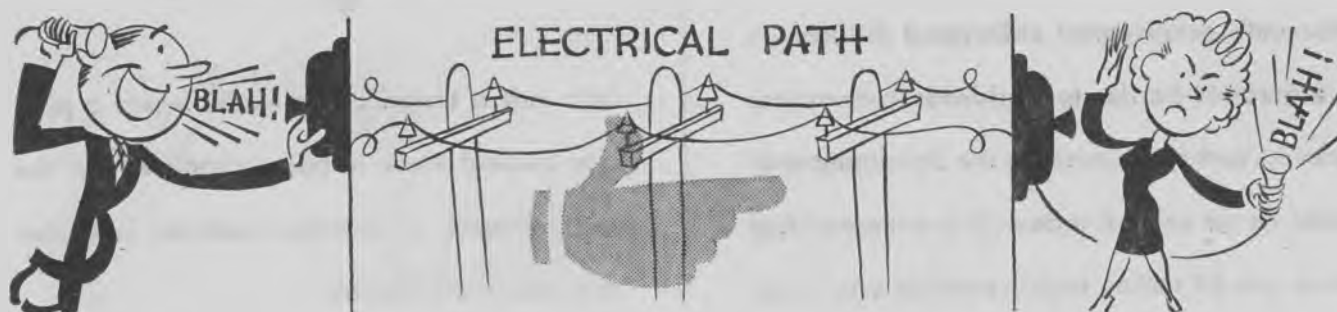
RADIO, AND HOW IT WORKS

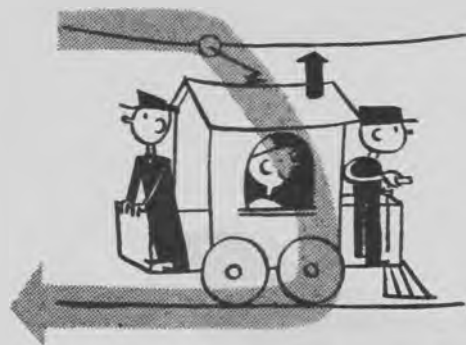
with a non-technical Glossary of Radio Terms

IN 1901, Marconi succeeded in transmitting electrical impulses ... without the use of wires ... a distance of 2000 miles across the Atlantic Ocean. In accomplishing this feat, Marconi made use of an "Electri-

cal Path," which is nothing more than a complete route along which electricity can flow. The electrical path may be a gas, a liquid, a vacuum or a system of wires.

A trolley system is a dandy example of an electrical path. The electricity flows along the path from the trolley wire, through the trolley to the electric motors that make the trolley "go," and on out through the wheels to the rails.





The path followed by the electrical impulses sent out by Marconi was the one nature provided; the airwaves between the earth and a layer of ionized air 100 miles or so above the earth. Electrical impulses (radio waves) can travel along this path, by bouncing back and forth between the earth and the ionized air, to radio receiving apparatus on the other side of the globe.



Marconi's achievement obliterated distance... the greatest barrier to worldwide communications... and made possible the development of radio as we enjoy it today. It is estimated that there are 48 million radio receiving sets in use

in the United States alone. That's more than one for every family!



We're not going to linger over the years of painstaking research and development, which began when Marconi first span-

ned an ocean by radio. Instead, we're going to give you a readily understandable, non-technical explanation of just what happens when vocal and musical sounds... originating in a broadcast studio, are heard in a living room hundreds of miles away.

AS SIMPLE AS
ABC
-ALMOST



Let's visit a broadcasting studio where a popular musical show is being produced for the entertainment of countless listeners in homes throughout the country.

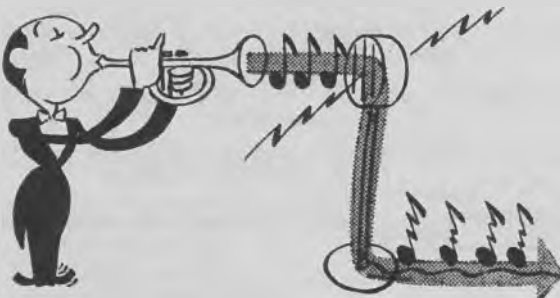
NOW remember,

Marconi's work did not make possible the transmission of actual sound through hundreds of miles of space. As yet, this feat has not been accomplished.

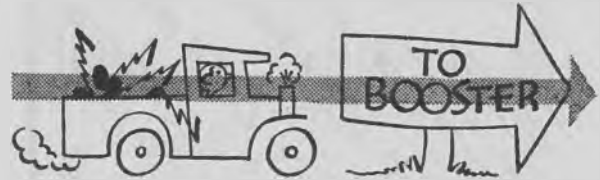


But sound...if transformed into electrical impulses —

You're right, Watson! That's the answer! The studio microphone transforms the sounds produced by radio entertainers into electrical "sound" impulses...the exact "electrical duplicates" of the sounds that entered the microphone.



As they leave the microphone, the "sound" impulses are very weak, and must be given a "boost" in strength so they'll have plenty of zip needed for processing by the transmitter.



When they emerge from the "booster," the electrical "sound" impulses...though many times stronger...are not yet capable of traveling along the airwaves. Before their journey through space can be attempted, further processing is necessary by the transmitter.



To provide a vehicle to carry the "sound" impulses, a very powerful electrical impulse known as the Signal is generated by the Transmitter. The signal is capable of traveling along the electrical path between earth and ionized air, and is generated for the sole purpose of combining with the electrical "sound" impulses to carry them safely along the airwaves.

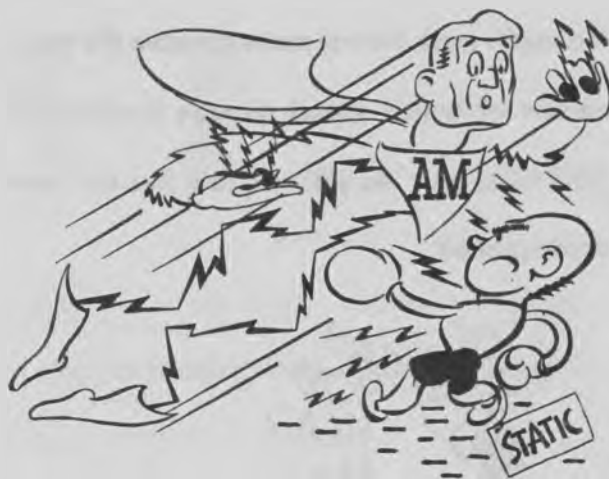


THE SIGNAL CARRYING THE SOUND IMPULSES

There are two ways of combining the signal with the "sound" impulses. The one with which we are concerned in this booklet is most commonly used, and known as Amplitude Modulation. This method causes the signal to move up and down in strength-varying pulses, in accordance with the "sound" impulses, but has no effect on its "size" or frequency.



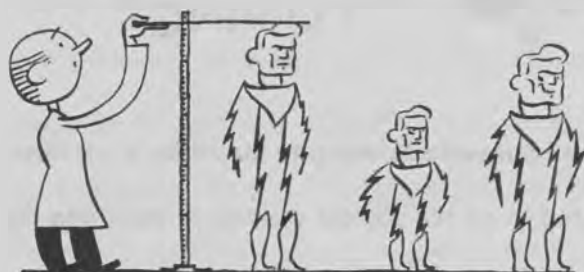
Electrical disturbances...both natural and man-made...cause abnormal variations in this combination of signal and "sound" impulses, which we hear as "static."



The other and newest method of combining the signal with the "sound" impulses is known as Frequency Modulation (FM). This method causes the size (frequency) of the signal to vary from side to side, in accordance with the "sound" impulses, but has no effect on the signal strength, which remains constant. Electrical disturbances have little or no effect on this combination. Specially designed transmitting and receiving equipment is needed for transmission and reception of FM signals.

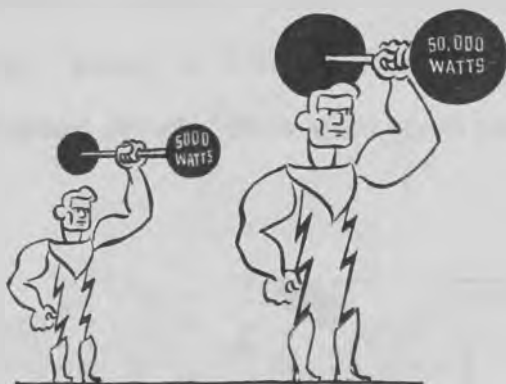


Each broadcast station transmitter generates a signal with a certain "Kilocycle" measurement, so that the different signals can be distinguished from one another.



KILOCYCLE MEASUREMENT

Each signal is also measured in "Watts of Power"...the more Watts the more powerful the signal, and the better its chances of surviving a long journey through space.



WATTS OF POWER

Transporting the musical and vocal sounds from the program, in the form of electrical "sound" impulses, the signal must now be routed to the electrical path between the earth and the ionized layer of air above the earth. The Transmitting Antenna acts as a "springboard" lead-

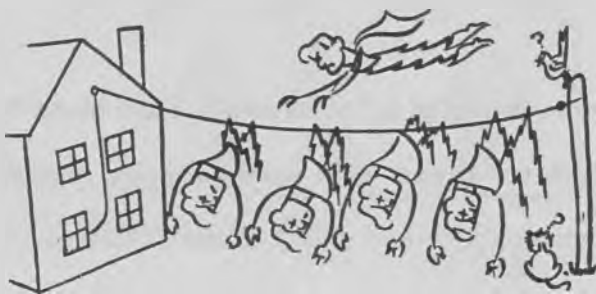
ing to this path, and easily launches the signal on its long, treacherous trip through space.



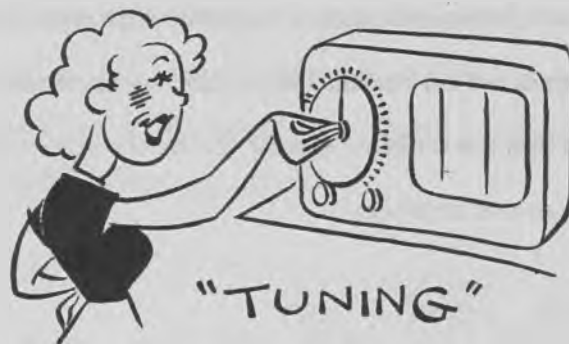
Now the signal is "on its own"...and along its path are strewn more energy-sapping hurdles than you'd find on a G. I. Obstacle Course. A few of the pitfalls lying in wait to drain energy from the hard-pressed signal are telegraph wires, power lines, mountains and tall buildings. There are others, too. All are waiting to absorb or reflect energy from the signal as a blotter absorbs ink, or a mirror reflects light.



After fighting many miles along the electrical path between earth and ionized air, the badly buffeted signal flops onto the antenna of a radio receiver. And it is not without company, for countless signals from other broadcasting stations also crowd onto the antenna...all of those that have traveled any great distance are in a sadly weakened condition.



Each of these signals has a different kilocycle and power (wattage) measurement. All of them are absorbed by the antenna and flow down the lead-in to the radio receiver. In Crosley, and almost all modern receivers, antenna and lead-in are built right into the radio cabinet... tied in one neat package, which makes unnecessary the old-fashioned antenna wire that used to hang across the backyard.



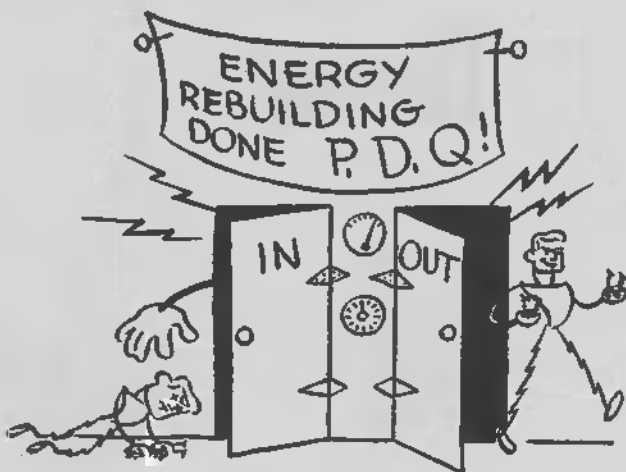
The housewife listening to the radio is not interested in all the signals waiting to push into the receiver, so she spins the tuning dial indicator to the number on the dial which identifies the station she wishes to hear. This is the "kilocycle" measurement of the chosen station. Milady's radio-log tells her what stations are broadcasting signals which transport the entertainment she desires. Of course, the entertainment is still in the form of "sound" impulses, until finally made audible by the loudspeaker.



When the tuning indicator is set to the kilocycle measurement of the signal from a certain broadcasting station, only the signal from that station

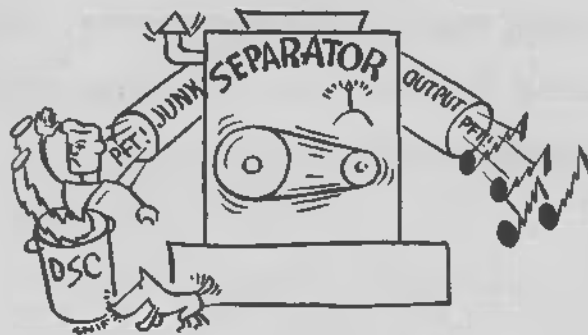
is permitted to enter the radio receiver. All others are barred by the electrical "gateman" built into the radio receiver circuit.

Having bounced a long way along the electrical path between earth and ionized air, and engaged in innumerable skirmishes with energy-sapping power lines, tall buildings and the like, the chosen electrical "sound" impulses and their transporting signal are woefully weak. If they are to survive the electronic processes to follow in the receiver, they must be helped to regain some of their lost energy. Certain sections of the receiver are designed to handle this "energy-rebuilding" job.



Now, with "physical condition" much improved, the electrical "sound" impulses and their transporting signal are herded into a "Separator,"

which takes them away from the loyal signal that has carried them so far. For, it is at this point that the signal is no longer useful; and, without fanfare, is "filtered" out of the radio receiver into the ground portion of the electrical path.



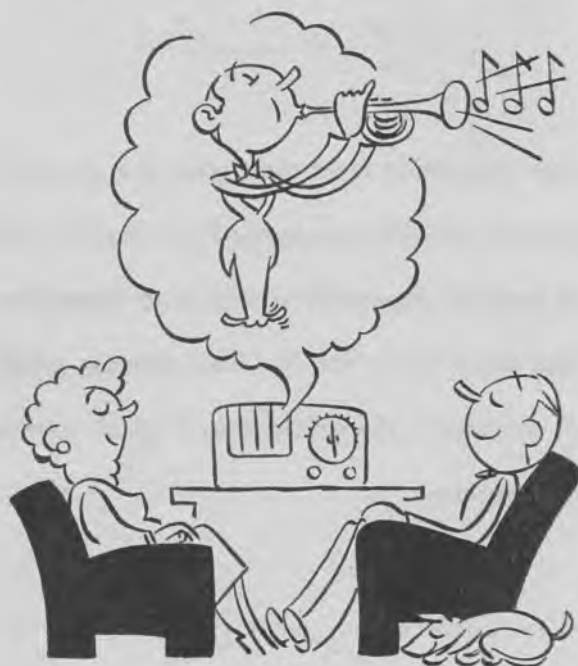
After separation from the signal, the electrical "sound" impulses are hurried into a section of the receiver especially qualified to strengthen them even more, for the final process which will transform them into the original sounds they represent.



Once more bulging and throbbing with strength, the "sound" impulses are rushed into the loud-

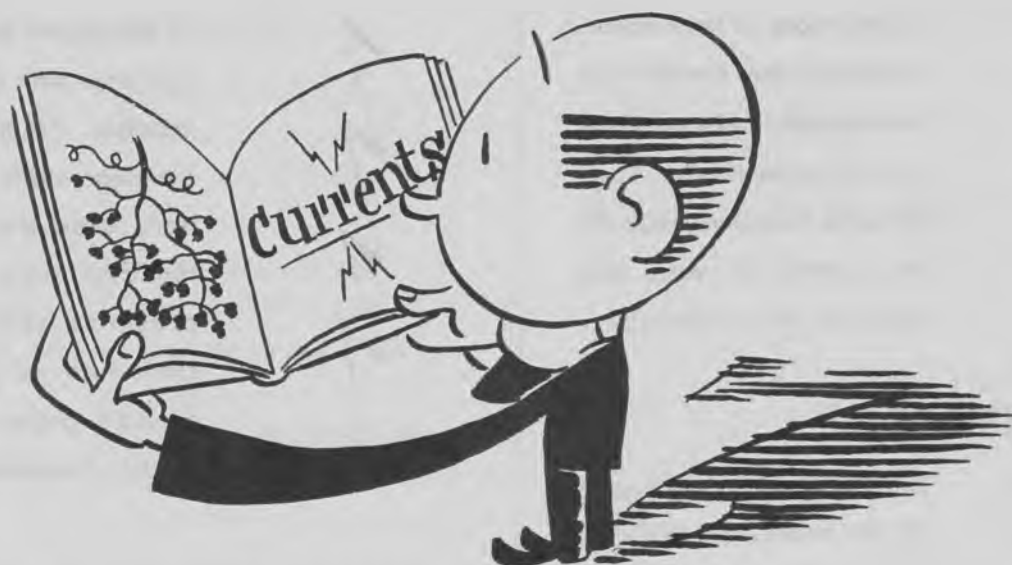


speaker, where they are instantaneously transformed into the identical musical and vocal sounds that entered the microphone in the broadcasting studio.



And so... from Marconi's thrilling achievement 44 years ago... stems the marvel of radio reception as we enjoy it today. Reception which, for the mere twist of a knob, brings into our homes the skill and artistry of the world's most talented entertainers.

A Glossary of Radio Terms



... OR, WHAT'S IT ALL ABOUT ?

ALTERNATING CURRENT...



Electric current which regularly alternates its direction.

DIRECT CURRENT...



Current which flows in one direction only. Batteries are a common source of direct current.

CYCLE...



Each complete change in direction made by alternating current.

FREQUENCY...



The number of times per second the current alternate its direction.

AUDIO FREQUENCIES...



Alternating current frequencies ranging between 30 and 15,000 cycles per second, that can be converted into sound by the loudspeaker. These frequencies are equivalent to the notes on a piano.

RADIO FREQUENCIES...



Alternating current which changes its direction between 15,000 and 1,000,000,000 or more times per second.

WAVELENGTH...



The distance between the start and finish of each cycle in a radio signal. As the frequency becomes higher, the time required to complete a cycle becomes short-



er, and more of them occur. This means that the distance (wavelength) between each one becomes shorter. Lowering the frequency reduces the number of cycles and increases the wavelength.

RADIO CIRCUIT...



The electrical route followed by the incoming signal during its processing and transformation into the sound you hear from the loudspeaker.

AMPLITUDE MODULATION...



The most commonly used process of combining the weak electrical "sound" impulses from the microphone with the powerful signal generated by the transmitter. The process causes the signal to vary in strength or "amplitude" in accordance with the "sound" impulses.

FREQUENCY MODULATION (FM)...



A new transmitting system utilizing frequencies much higher than those formerly used for broadcasting. In FM broadcasting, the electrical "sound" impulses from the mike are combined with the transmitter signal in such a manner that the frequency



of the signal varies in accordance with the "sound" impulses. FM makes possible clear, static-free reception, even during heavy thunderstorms, or in the presence of man-made static such as that caused by auto ignition and some electrical appliances.

SUPERHETERODYNE RECEIVER...



This tongue-twister describes a radio receiver that tunes sharply and gets more stations with clear reception. Today, with swarms of powerful stations broadcasting on adjacent frequencies, the Superheterodyne is a necessity for pleasurable listening.

RADIO FREQUENCY AMPLIFIER...



An impressive title for an important circuit. This is the "electronic gateman" which permits the signal you want to hear to enter the receiver, and closes the gate to all others. In addition, this section provides a "tonic" for the signal; strengthens it for the electronic processing to follow.

MIXER OR CONVERTER...



No good for whipping up a cake . . . but very essential to a Superhetrodyne. It is here that the signal from the broadcasting station is "mixed" with a signal of a special type generated in the High Frequency Oscillator. The result of this electronic "cooking" is a third signal, which retains all the necessary characteristics for transformation into sound, but is better adapted for the processing to follow.

DETECTOR CIRCUIT...



It would be well to remember here that the signal being processed in the radio receiver is really a combination of the sound impulses that entered the studio microphone, and the radio frequency energy (signal) generated by the transmitter. The sound impulses must now be separated from the transmitter signal, which is no longer of any value. This job is cheerfully done by the "detector circuit."

HIGH FREQUENCY OSCILLATOR...



Don't let this one scare you. It's the section of the radio receiver which works hand in glove with the mixer, to produce the special signal

needed for the "electronic cooking" that takes place in the "Mixer."

INTERMEDIATE FREQUENCY AMPLIFIER...



DR. RAY D. OOH
SIGNAL
STRENGTHENER



Further strengthens the signal which comes out of the "Mixer" for the processing to follow.

AUDIO AMPLIFIER...



Strengthens the "sound" impulses now separated from the signal, for transformation into sound by the loudspeaker.

PUSH-PULL POWER AMPLIFIER...



Sounds like a tug-o-war . . . but isn't. Uses two power amplifier tubes to reduce distortion and insure the finest, high-quality sound reproduction. Power output is twice that obtainable with a single tube.

LOUDSPEAKER...



The cone-shaped device which transforms the electrical "sound" impulses into audible sound.

POWER TRANSFORMER...



An electrical device used to build up the alternating current voltage from the power line, into higher voltages which will be rectified and used to supply power for the receiver.

RECTIFIER TUBE...



A real "quick change" artist that changes the stepped-up alternating current voltage from the Power Transformer, into Direct Current Voltage for use in making the receiver operate. The process is known as rectification.

BANDS...



No, not music-makers . . . but groups of radio frequencies used by broadcasting stations. The 540 to 1600 Kilocycle band used for domestic reception is a low frequency (long wavelength) band. Overseas broadcasts, amateur, aircraft, ship and police signals are heard on the shortwave (high frequency) bands between 2.2 and 16 Megacycles.

BAND SWITCH...



The switch used to select the "Band" on which reception is desired. It is operated by turning a knob on the front of the receiver.

SENSITIVITY...



The ability of the radio receiver to tune in weak signals and strengthen them so that they can be heard through the loudspeaker. With a sensitive receiver, you can tune in many more distant (dx) stations.

SELECTIVITY...



The ability of the radio receiver to select the station you want to hear, without interference from other stations. Sharp tuning is a common characteristic of a selective receiver.

FIDELITY...



Faithful reproduction through the loudspeaker of the sounds being broadcast from the station you have tuned-in.

STABILITY...



The ability of the receiver to stay tuned to the station you have dialed.

ANTENNA...



This is the wire that provides a path to the radio receiver for the electrical impulses sent out by the transmitter. In all Crosley, and most other modern receivers, the antenna is built-in. This eliminates the need for stringing unsightly wires over the backyard. You'll hear some folks refer to the antenna as the "aerial."

SIGNAL WEB...



The especially designed, built-in antenna used in Crosley sets, which enables the listener to tune in distant stations from all parts of the world with greatly reduced interference from noise.

FLOATING JEWEL TONE SYSTEM...



Exclusive and patented by Crosley, this development makes phonograph recordings many times more enjoyable by virtually eliminating needle scratch, hiss and chatter. Banishes the fuss and bother of changing needles... makes records last up to ten times longer.

MASTER TONE CONTROL...



Exclusive with Crosley! Provides a choice of 64 different tone combinations. Insures high fidelity reception... permits the listener to choose the tones he likes best.

AUTOMATIC SENSITIVITY CONTROL...



A circuit in the radio receiver which maintains constant volume of sound from the loudspeaker, even though the broadcast signal varies in strength.

VOLUME CONTROL...



A mechanical device used to adjust the volume of sound, delivered by the loudspeaker, to the desired level. It is operated by turning a knob on the front of the radio.

AUTOMATIC BASS COMPENSATION...



Automatically brings out the deep, rich bass notes when the volume is turned down. This eliminates "tin-niness" at low volume levels, where most receivers without Automatic Base Compensation have a tendency to overemphasize the "highs."

CROSLEY

THE CROSLEY CORPORATION, CINCINNATI, OHIO

*Refrigerators : Home Freezers : Kitchen Sinks and Cabinets : Ranges : Laundry Equipment : Radios : Radio
Phonographs : FM : Television : Short Wave : Electronics : Radar : Home of WLW—"The Nation's Station"*