

Why a Crystal is Needed.

IT is usually considered that when an operator knows something about what he is operating he will be more efficient. In view of this a few notes are to be given on the principle of rectification as embodied in the crystal.

Now, to get down to non-technical language, and explain what has been just said.

Sounds are picked up by the microphone and are impressed on a strong electric wave leaving the transmitting station. This wave is rising and falling like all other waves, the rise and fall being expressed in the voltage fluctuation.

The voltage rises from 0 to a maximum and then falls to 0, then reverses and goes to the same maximum, but this time negative volts are expressed. It then comes back to the original 0. This is termed an alternating current, and is of the type employed in our lighting systems, and in wireless.

Whereas there are approximately 60 of these cycles or rises and falls per second in house lighting, wireless goes out at a rate varying from a few hundred to millions of cycles per second. One thousand of these form a kilocycle, and the frequency of a station is expressed in kilocycles per second. The distance between each wave crest is the wave-length.

Detection.

ON this rapidly rising and falling wave the sounds are carried to our aerial, and though the portion we pick up is very weak, it is nevertheless sufficient to be heard if suitable devices are provided.

Travelling at the rate it does those sounds could not be heard—they must be altered in form and converted into a flow in one direction only. That is the crests must be separated from the troughs. To do this a detector is employed.

The crystal detector may be composed of many substances—carborundum, galena, zincite, tellurium and silicon are those usually used. Of these, carborundum, which is made into a fixed cartridge, and galena, with which a cat's whisker is employed, are the most common. Zincite and tellurium are becoming popular in the "Perikon" type of crystal.

THE crystal exhibits a peculiar action: it strips away the lower half of the wave, passing only the crests to the earphones, the coils of which steady up the current and render the signals audible. The troughs of the waves (the magnetic alternations) are passed off in heat.

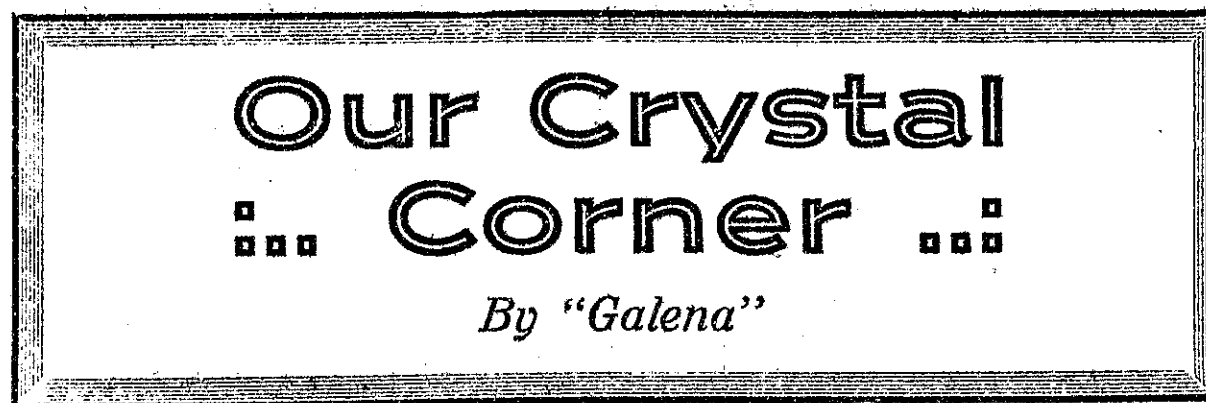
A crystal does not make the signals any louder, so that when they get too weak to be heard without being strengthened up, the crystal becomes useless, unless strengthened by an amplifier.

Some parts of the crystal are more sensitive than others, that is they pass the crests through more readily. These spots are the goal of all who use a cat's whisker.

The Cat's Whisker.

THIS popular type of detector is the most sensitive, but requires more attention than the other types and it is doubtful whether the sacrifice in sensitivity is not outbalanced by the qualities of the semi-permanent and permanent types.

In the earlier times the cat's whisker held the field unopposed, but it is now



THIS week marks the commencement of a new section, a Crystal Corner for crystal users. The corner is being conducted by a crystal-user so that a common interest exists between him and all others who use this modest detector. Queries, suggestions or experiences are welcome. The aim of the corner is to interest the user of the crystal and of the amplified crystal.

Next week's issue will be a special issue for crystal owners as an offering for the Christmas season.

steadily being replaced, but each listener must decide for himself which he prefers, sensitivity or absence of trouble.

The cat's whisker type consists of a piece of jagged galena, fixed in a metal cup, preferably by a metal with a low melting point—lower than solder. Solder melts at a high temperature and is likely to damage the crystal. Woods metal, however, does not do any damage.

THE cat's whisker, a piece of fine wire, may be composed of any suitable metal ranging from steel to gold. There is little to be gained, however, in the different types of wire, remembering, however, that such factors as fineness and pressure, do enter into the reception. Galena crystal requires a fine cat's whisker, lightly applied.

The crystal should be kept free from dust and is usually enclosed in a glass tube. Some crystals have the fine wire attached permanently, but these are not common.

The Perikon Detector.

THIS is a type which is gaining great popularity. The cat's whisker has been replaced by another crystal and is usually marketed under the name of "semi-permanent." The crystals used are usually zincite and tellurium.

Perikon detectors are usually made up of a crystal, set in a metal base on to which is screwed a tapering top containing a shaft with a spring, at the end of which is a piece of moderately sharp crystal.

A certain pressure is to be exerted between the two crystals so that a spring is attached to the shaft. The correct pressure, about 1½ pounds, is adjusted by this carefully-constructed spring.

The point of the upper crystal should be neither too fine, in which case it is easily broken, nor too flat, in which case sensitivity is lost. Sometimes it pays to judiciously sharpen the movable crystal to get a good contact.

When adjusting or readjusting a Perikon detector do not grind the crystals together. Tellurium is a very soft material, and the grinding of it against the harder crystal of the zincite will result in the surface of the latter crystal being blackened by a deposit of tellurium. The presence of this deposit tends to lower the resistance between the two crystals, and thus decrease the rectifying efficiency.

Like every other form of crystal rectifying device, a Perikon detector,

which is not completely cased in, should be kept free from dust.

Carborundum Units.

THERE is another material, carborundum, which is not nearly so sensitive as galena, but which is not easily thrown out of adjustment. With a galena crystal, the pressure exerted by the point of wire on the crystal is only a matter of an ounce or less. With carborundum this pressure may be around four or five pounds between the two parts. Contact with carborundum is made through a fine steel point.

In order to obtain as sensitive an action with carborundum as with galena, it is necessary to use a small battery in the circuit. The method of application of this battery will be the subject of a future article.

The effect of the battery is to keep a small voltage continually applied across the crystal. The signal voltages and current waves are then added to and subtracted from this steady voltage. The voltage lowers the resistance of the carborundum and allows the signals to come through with much greater strength. With a battery applied, the detector acts as a very efficient rectifier.

A great deal could be said of the carborundum which would be of great value to those who use or contemplate using this type of detector, but for the present introduction such details cannot be entered upon. The carborundum, like other aspects of the crystal circuit, will receive attention in future numbers of the "Radio Record."

DO not stand the loud-speaker too close to the set itself, or you may cause it to vibrate the filaments of the valves, and this will give rise to a loud howl.

DUST, fluff, and other similar foreign bodies, if allowed to enter the horn of a loud-speaker, may accumulate on the diaphragm and seriously interfere with reception.

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