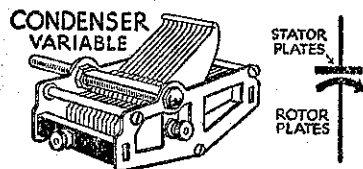


A Diagnosis of Radio

Variable Condensers

A VARIABLE condenser is one the capacity of which can be varied easily. There are several different types such as tuning, midget, differential and compression. Let us look for a moment at the tuning condenser.

This is usually a fairly large piece of apparatus with one set of metal plates mounted with another set of



plates, affixed to a spindle so that they can be meshed to any degree with the first plates. Of these there are three distinct types, the straight-line wavelength, the straight-line frequency and the straight-line capacity. In the straight-line capacity the dial readings are in direct proportion to the capacity. Thus, if the dial is graduated from 0 to 100 and it is reading at 25, the capacity of the condenser is a quarter of the maximum; in other words, it is a .0005 condenser. The amount in the circuit is .000125.

The straight-line wavelength type has plates which are cut off and curved upon the entering side. At first the capacity increases slowly, but as the plates go further into the mesh, the capacity increases more rapidly. It is arranged so that the dial graduation is in proportion to the wavelength. The capacity varies as the square of the dial reading.

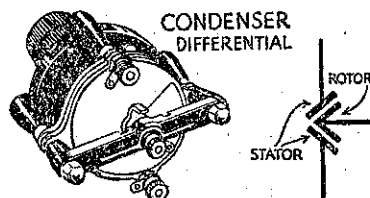
The plates of the straight-line frequency type condenser are still more sharply tapered. Increase in capacity is even slower than the straight-line wavelength type, but the increase becomes greater and greater as the dial travels toward 100. The condenser is arranged so that its capacity is increased with the dial readings at such a rate that stations separated according to kilocycles are evenly spaced from each other all the way across the dial, that is, the same number of broadcast frequencies as between zero

and 10 on the dial and as between 90 and 100. This even separation of the stations is undoubtedly an advantage. The same can be said of the straight-line wavelength line, only in this case it would be the number of wavelengths.

Nowadays condensers are made in all different shapes to suit the needs of individual manufacturers. The condenser generally used by constructors is straight-line frequency, and is as illustrated in our sketch.

In the compression type condenser the plates are pressed together by means of a screw. They are separated by mica or some similar dielectric. They are very much smaller than the average variable condenser and can be used for a variety of purposes. They are specially recommended for wave-traps.

The differential condenser has two fixed or stator plates, and one set of rotary plates. It is a straight-line capacity type, that is to say, the capacity is directly proportional to the dial reading. Whereas air is used to separate the plates of the tuning condenser almost invariably the differential condenser employs thin sheets of mica. The mica must be of a high quality to withstand the constant friction with the moving plates. Generally speaking, the two sets of fixed plates



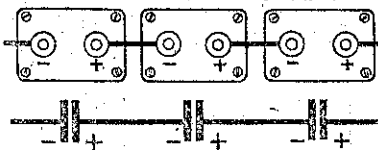
are connected to the reaction coil and the moving plates to earth, although there are many other ways they can be connected.

Midget Condensers: These are similar to the ordinary variable condenser,

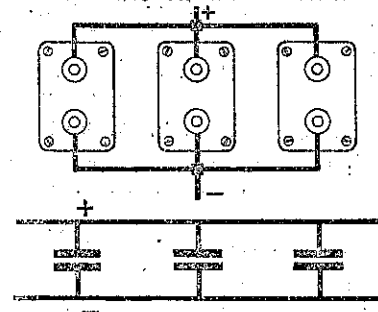
but are much smaller. They are put to a variety of uses in the modern set.

When condensers are connected in series it is necessary to add together the reciprocals of the separate capacities, which gives the reciprocal of the

CONDENSERS IN SERIES



CONDENSERS IN PARALLEL



total capacity. The reciprocal of a number is one divided by the number. When condensers are connected in parallel, the total capacity is equal to the sum of the separate capacities.

The Crystal

"CRYSTAL" in radio parlance is a general name given to certain kinds of minerals, and is not to be confused with the product of the glass manufacturers. The types of crystals that are most widely used for radio purposes are galena, zincite, and silicon. These crystals have the property of allowing current to pass in one way only. The current which is sent out by a broadcasting station flows in more directions than one. Its voltage rises to a maximum positive peak and then falls to zero, then reverses to a maximum negative peak. In this stage it cannot be heard by the ear. It must be "rectified" or made to flow in one direction only, and this is the function of the crystal—it allows the positive halves of the waves to go through, but prevents the negatives.

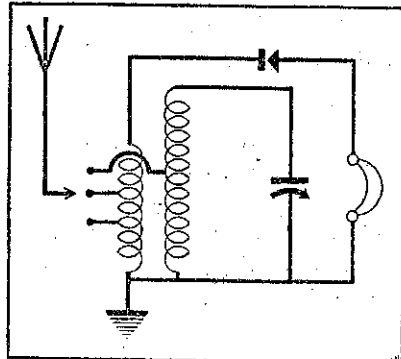
To make a contact with the crystal, if it is of the galena type, a fine wire, which will not easily corrode, is employed, and this is known as the "cat whisker." With zincite, silicon, car-

borundum and other minerals, a different means of contact has to be found.

For carborundum a steel point is used, but it is fixed in a certain position—the most sensitive one—for few crystals are of even sensitiveness and we must find the best point. Zincite and silicon are usually employed together; that is, one is used as a cat whisker, and these are combined, usually in the semi-permanent type of crystal. A galena and cat whisker is the most sensitive combination, but the most sensitive point cannot be held for long. A loud signal may often throw it out of adjustment. For this reason the semi-permanent type, with carborundum or permanent crystal, has become very popular. In the carborundum type a battery and a potentiometer can be employed, and this will improve the results.

Here are a few hints concerning crystals:—

1. Never handle the surfaces with the hands. A film of grease covers them.
2. If it is desired to clean crystals, dip them in methylated spirits.
3. In the semi-permanent type always pull back the plunger before exploring for a more sensitive point.
4. Carborundums can be knocked very hard in order to find a better point. They can even be thrown on to a concrete floor and not be damaged.
5. A crystal set can be tuned with a very sensitive voltmeter. If a meter of the 1000 or 250 volts per ohm type is available, put it on to the lowest reading (no greater than 0.7) and connect either side to the phone terminals, and take out the phones. You will



A typical crystal set.

that the needle will show maximum reading when the set is tuned to the optimum point. If a very sensitive milliammeter is available, it can be used in the same way as a voltmeter.

You will get a lot of fun out of trying the different points on the coil and different combinations of the whisker and crystal in this way.

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