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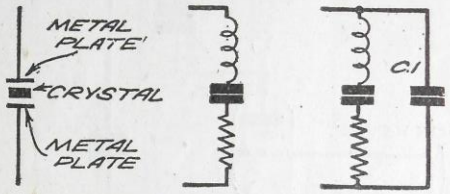
APPENDIX

Operation.—When a crystal is vibrating or oscillating at the very high frequencies usually associated with radio-frequency circuits, a certain amount of heat is generated, due to molecular friction, and the rise in temperature can affect the frequency.

The amount of variation produced depends on the " cut " of the crystal, there being various ways of obtaining or cutting out the little slabs from the natural crystal formation. However, if certain operating points are watched, the temperature-frequency variation can almost be ignored.

The higher the radio frequency voltages across the crystal, i.e., the greater the amplitude of the vibrations, the greater will be the temperature rise, therefore, certain limiting factors are introduced if satisfactory operation is to be maintained.



Figs. 34 to 36.—The electrical equivalent of a crystal circuit.

A peculiar part about a quartz crystal, is that apart from the what may be called useful vibrations, there are others which tend to produce additional heating, and stresses of a mechanical nature in the crystal's structure. If the radio-frequency voltages are great enough, it is possible for the crystal to crack up, due to the excessive stresses thus produced, so it becomes necessary to limit the power to be handled by the circuit. This is one of the points which must be noted about a crystal-controlled oscillator ; it will only handle low power, say, 4 to 5 watts, therefore, it becomes necessary, with the average transmitter, to amplify the output, and the section of a transmitter which attends to that, is known as the power amplifier.

It is not always an easy matter to measure the radio-frequency voltages across the crystal, so the more simple procedure of checking the r.f. current is usually adopted. This can be done with the aid of a suitable meter or lamp in series with the earth potential side of the crystal.

The safe current depends on the type or " cut " of crystal, but for the type concerned with these articles, it should not exceed, say, 50 mA., the value being also governed by the H.T. applied, and the valve in use.

the supplies to the screens, to prevent any trace of H.F. getting into the respective circuits.

The Mains Unit.—The mains unit, for the transmitter, is shown in Fig. 117 where it will be seen that it differs slightly from normal practice, in the arrangement of the smoothing chokes.

It will be appreciated, after the diagram has been examined, that the output should be free of any trace of ripple or hum, as it is essential for the various feeds to be pure D.C., as far

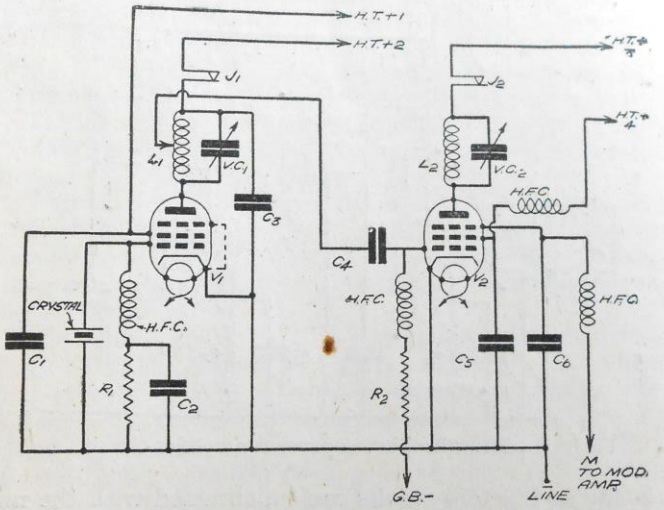


Fig. 116.—The oscillator and power amplifier circuit.

as possible, otherwise objectional snags will be introduced into the transmission.

It is not necessary for the chokes to be all of the same type or make. The vital qualifications are, sufficient inductance when carrying their current load, reasonable resistance and well constructed cores.

The various outputs are arranged for the H.T. supply points shown in the diagrams of the speech amplifier, and the C.O. and R.F. amplifier stages.

In case any constructor has a 500/0/500 volt transformer, it could be used, providing the output is reduced by shunt or series resistances to the equivalent of that indicated in Fig. 117.

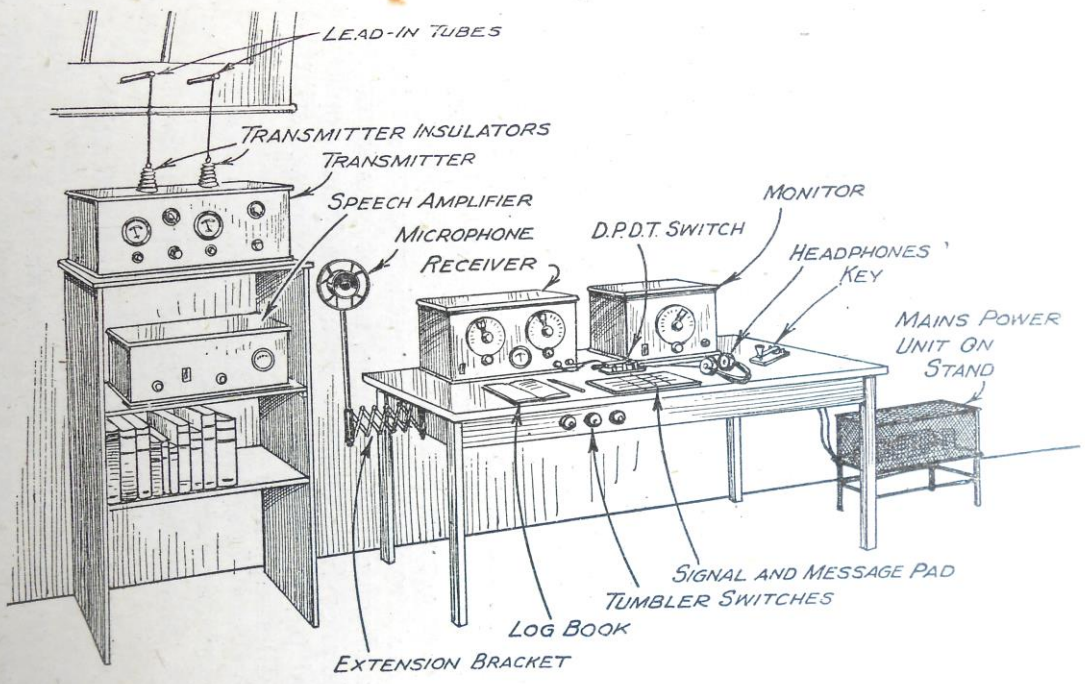


Fig. 97.—Suggested arrangement of the amateur transmitter's " den " to provide efficiency and comfort.