

Fig. 4 (above)—Coil connections in a commercial band-spread unit, designed for use in the National SW-58 short-wave receiver. Fig. 5 (right)—A commercial form of band-spread plug-in unit, which may be instantly replaced by standard coils for band extension. Fig. 6 (left)—The National SW-58 with band-spread coils.

# BAND SPREADING

By JAMES MILLEN, M.E. ♦

● CONDITIONS concomitant with short-wave reception are such as to necessitate an unusual degree of finesse and technique on the part of the operator, when tuning systems, closely comparable to those used in broadcast receivers, are employed. This delicacy of control is immediately appreciated when it is considered, for instance, that the average short-wave receiver design for 20-meter reception covers a band of about 8 megacycles in one complete sweep of the dial, which is more than eight times the frequency range encompassed by broadcast transmission between 200 and 550 meters! On a broadcast receiver designed for simplified tuning and logging, the 400 kc. band between 300 and 500 meters occupies about three-quarters of the dial. In contrast, the same number of kilocycles, representing the amateur 20-meter allocation, occupies only one-thirtieth of the entire dial range! Such concentration inevitably results in hair breadth tuning and micrometer logging which is unsatisfactory and inaccurate.

To start with, it must be understood that the problem has nothing to do with the electrical separation of stations—the actual selectivity. Whatever means are adopted to facilitate the mechanical location of the station will not reduce interference from adjacent channels, except to the extent that simplified tuning may

The "broadcast" fan who has just become acquainted with the wonders of short-wave reception will be particularly interested in this article by Mr. Millen, a leading short-wave expert, who here describes the theory and practice of how to spread the signals over the dial and thus render short-wave tuning easier.

facilitate sideband choice with a slightly superior rejection characteristic. If we so design the tuning ensemble that 400 kc. is spread over 100 dial divisions, instead of 9, the selectivity characteristics of a signal receiving interference from two stations 5 kc. on each side of the desired frequency will not be improved in the least. The 5-kilocycle beat notes will be as intrusive as ever—but it will be much easier to center and log the desired signal. And if the interference is caused only by a solitary station, sim-

plified tuning will make possible the rapid reduction of this interference by selecting sidebands (in the case of a modulated signal) or by employing a local beat frequency (in C.W. reception) on the side away from the interference.

## A High Ratio Dial

The most obvious solution to the problem is the simple mechanical expedient of employing a high ratio dial—such as the 250-to-1 device used in the crystal controlled Stenode. This, of course, does not effect band-spreading, as far as the dial reading is concerned, but it does eliminate the necessity for over-exacting delicacy in control. The objections to the high ratio dial are that it does not solve the logging problem and, unless the mechanism is cleverly designed and carefully made, the back lash is likely to be annoyingly excessive.

## Special Condenser Plates

Attacking the subject from an electrical point of view, the possibility of specially curved condenser plates is an immediate consideration. It is not at all difficult to design a condenser plate so

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\* The National Company, Malden, Mass.

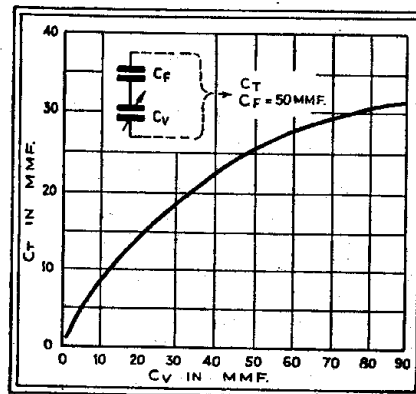
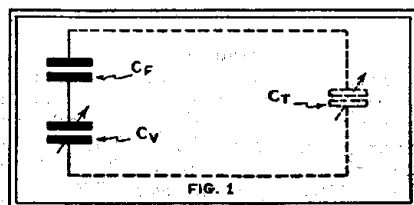


Fig. 1—A simple series condenser arrangement for reducing the variation in tuning capacity,  $C_t$ , with changes in the variable or control capacity,  $C_v$ . Fig. 2—Indicating how the rate change in tuning capacity,  $C_t$ , varies as the relationship of variable to fixed capacities is changed. Fig. 3—A circuit arrangement which approximates Figure 1, and which permits the inclusion of band spread components in the coil unit.

