however, is its ability to eliminate heterodynes. Suppose, for instance, a signal has been carefully tuned in with reasonably good intelligibility and during the transmission an interfering station comes on, causing a bad heterodyne, inverted speech, etc., ordinarily the desired signal would be "smeared," but careful adjustment of the phasing condenser will eliminate the heterodyne and the interfering station, in most cases, completely. Intelligibility will remain practically as good as before the interfering station came on.

From a practical standpoint, it is important that the crystal filter be used most of the time where such interference is apt to be encountered, as it is almost impossible to switch on the crystal filter and re-tune the desired signal through the heterodyne. The phasing adjustment will remove one signal only. If another interfering station comes on, however, only one heterodyne will be present, instead of the several resulting from three station carriers beating together.

C.W. Reception with the Crystal Filter

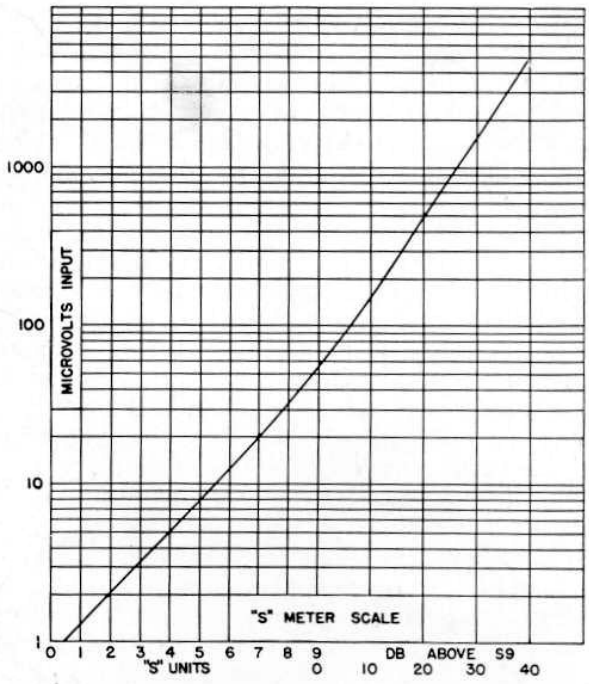
To use the crystal filter for c.w. reception, the filter is switched in by means of the phasing control and the phasing condenser set about mid-scale. The AVC switch must be off and the c.w. oscillator turned on. Advancing the R.F. and audio gain controls will result in a hollow, ringing sound the pitch of which will depend upon the setting of the c.w. oscillator dial. The actual pitch is not important as long as it is near the middle of the audio range, where the loudspeaker or phones have good sensitivity.

When a signal is picked up, it will be found that as the receiver is tuned slowly across the carrier the beat note will be very sharply peaked at the same pitch as that of the ringing noise, previously mentioned. All other parts of the beat note will be extremely weak and, furthermore, this peak will be found to occur on only one side of the audio beat note. The sharpness of the peak is determined by the selectivity control (upper right-hand knob). At maximum selectivity, the peak is so sharp that it may be hard to find, whereas at minimum selectivity the peak will be very broad. If a signal is being received, after having been properly tuned in, and an interfering station comes on, the resulting heterodyne and interference may be eliminated by adjustment of the phasing condenser. This phasing adjustment is effective in eliminating interference regardless of the setting of the selectivity control.

S-Meter

The S-meter serves to indicate the strength of a received signal. It is calibrated from 1 to 9 in arbitrary units which correspond, roughly, to the definition of the nine points of the "S" scale of the R-S-T system of amateur signal reports.

Probably no two operators will agree on just how strong a signal must be to warrant an S-9 report. After making measurements on a large



number of amateur signals, the present meter scale was chosen and we believe it will provide a good practical means of giving accurate reports. The accompanying curve shows the relation between average meter readings and the actual signal input to receiver in microvolts and from this curve it will be noted that each "S" unit is equal to a change of approximately 4 db. The 40 db. range above the S-9 level is used for comparative checks on extremely strong signals.

Figure 3 shows the "S-meter" network connected in the B supply circuit to the R.F. and I.F. stages. Actually the meter is the indicator of a bridge circuit, three legs of which are fixed resistors, and the fourth (variable) leg the plate circuits of the a.v.c. controlled tubes. The bridge is balanced by means of the manual R.F. gain control, which, through its action of indirectly changing the plate resistance of the tubes, automatically adjusts the R.F. and I.F. gain to a predetermined level at the same time that the meter is brought to zero. The strength of the incoming signal is, therefore, accurately indicated by the action of the A.V.C. circuits in controlling high frequency gain.

Before making a measurement on a signal, certain adjustments must be made. Since the meter is actuated by the amount of signal reaching the second detector, it is obviously necessary that the receiver be adjusted to have a predetermined amount of amplification between the antenna and second detector. To adjust the amplification to the proper value, the AVC switch must be off, the c.w. oscillator off, the crystal filter off, and the selectivity control set for maximum sensitivity. Now press the meter switch and advance the R.F. gain control until the meter comes to 0. The R.F. gain dial will read about 9½. The receiver is now adjusted and