Worthwhile Improvements for that Old Receiver

Paul H. Lee, W3JHR
c/o Page, Creutz, Steel, and Waldschmitt, Inc.
Washington, D. C.

While overseas in Venezuela for two years, we were reduced to the status of SWL in our spare time as the result of a "silent key" enforced by Zenezuelan law which grants amateur licenses only to nationals. Therefore, we did our best to think up ways and means of improving the RCA Model CR-88A receiver which was the best thing available locally for our SWL-ing. For those who have never seen a CR-88A, let us state for the record that it is an excellent receiver of the H.F. superheterodyne variety, designed and built by RCA for point-to-point communications service. It is a component of their DR-89A Triple Diversity Receiver Unit, and is brother, sister, or what-have-you to their other models, namely the AR-88, AR-88D, AR-88LF, CR-88, CR-88B, CR-91, and CR-91A, many of which are in use by the Armed Forces both here and abroad. Now and then, some of the AR-88's find their way into surplus, or can be seen advertised in the "Ham-ads" in magazines. Many of them are in surplus in England, as a glance through the ads in "Wireless World" will show. (And at very reasonable prices, too, for anyone interested). All of the above is merely to introduce the reader to this type of receiver, because some may not be acquainted with it.

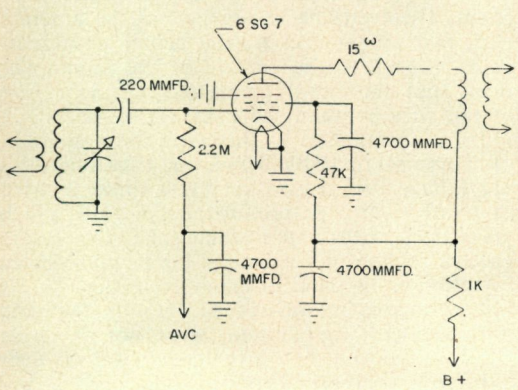

Fig. 1. Old 1st AF Stage

However, the modifications described in this article will be applicable not only to the above receivers but to almost any standard communications superheterodyne receiver found in the average ham shack. We are planning to "do the deed" to our Super-Pro now that we are back in the United States. It is not the purpose of this article to describe a new invention, but it is merely to show the application of simple principles which will put new life into your old super-het, and lift it out of the "trade-in" class.

Much has been written in the past about low-noise-level amplifiers, and many schemes have been tried. For those who wish to indulge in a bit of mathematics as self-justification, reference may be made to page 374 of "Reference Data for Radio Engineers," Fourth Edition, published by Federal Telephone and Radio Corporation, wherein one finds practical approximations of formulae for equivalent noise input-resistance values for triodes and pentodes. Quoting: $R_{eq} = 2.5/G_m$ for triodes, and $R_{eq} = \frac{I_b}{I_b + I_c^2}\left(\frac{2.5}{G_m} + \frac{20\ I_c^2}{G_m^2}\right)$ for pentodes.

In the above formula, R_{eq} is in ohms, I_b is the average plate current in amperes, I_c^2 is the average screen current in amperes, and G_m is the transconductance in mhos. A few computations with paper and pencil, using data from the tube handbooks, will show that the R_{eq} for a triode is much lower than for a pentode. The best triode of all will be the one with the highest transconductance, as can be readily seen. Reference to the tube handbooks shows that the 6BK7A fills this requirement very well. This tube was designed for use in TV receiver 'front ends," and has a transconductance of 9300 micromhos. Its equivalent noise resistance is only 270 ohms. Fine! Let's use it!

Fig 1 shows the basic circuit of the first R.F. stage of the CR-88A before modification. No doubt the first R.F. stage of the reader's receiver is very similar, and therefore we can say that the modification shown in *fig 2* will be just what is needed to reduce input stage noise and increase sensitivity and selectivity. The poorer the pentode, the greater will be the