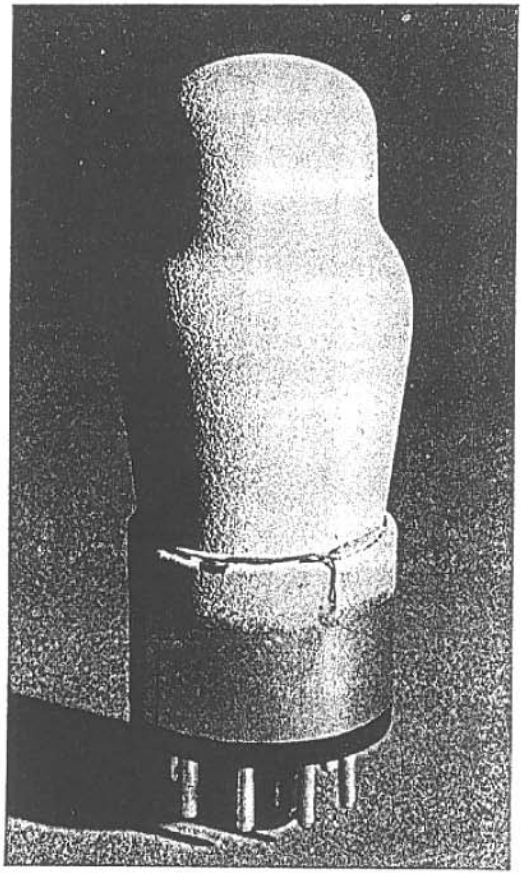

A Pentode for the Battle Front in Three Days

ONE evening last December a messenger hurried into the Empire State Building and delivered a package to the local Office of Scientific Research and Development, meeting a deadline by less than five minutes. That night the package went to LaGuardia Field to be flown to Europe.

In this package were replicas of a foreign vacuum tube which had never before been made in this country. A cathode-type pentode, made by Siemens Halske, the original was different from any known American tube not only in electrical characteristics and in heater voltage but also in the dimensions of the bulb and base and in the disposition of the pins; moreover, as is common in Europe, the bulb was sprayed with metal for purposes of electrostatic shielding. Yet the Laboratories designed and the Western Electric Tube Shop made eight replicas of this tube in three days.

This tube is used in German-type repeaters in strategic telephone communications which the enemy abandoned during their retreat in France and Belgium. Except that nearly all the tubes had been removed, these repeaters were substantially intact and usable. So when an OSRD official returned from Europe, he brought a sample tube and an urgent request from one of the generals for 1,000 duplicates at once.

Late one afternoon the sample tube was brought to the Laboratories. The job appeared feasible. So working late that night, engineers roughed out the design of a tube which would duplicate the characteristics of the German tube and which could be made by combining a new grid with parts of our carrier-repeater tubes that were available in stock.

Other engineers obtained the nearest-size bulbs, redrilled the holes in available American bases, obtained proper sized pins, had grids made, and collected the necessary other parts. Next day the tube design was completed and the bases were ready. Two days later the assembled tubes started coming in from the Tube Shop for final processing and testing at the Laboratories. Electrically and mechanically the models substantially duplicated the German tube. The electrostatic shielding of the tube derives from a metal coating which is deposited by spraying molten particles of metal. The wire appearing on the outside connects the shield to the base and, internally, to one of the pins.

In the meantime, the Tube Shop started production of 1,000 tubes. The Westinghouse Electric and Manufacturing Company contributed by supplying the tube bases, which they made by utilizing an available mold quickly modified to meet the design requirements. Within three weeks the entire lot of pentodes had been delivered. Equipped with these tubes, the repeaters worked.

The following telegram, dated December 26, 1944, was received from Dr. Vannevar Bush, Director of the OSRD: "Your part in the spectacular job accomplished under our contract in providing the tube represents a record-breaking performance and merits