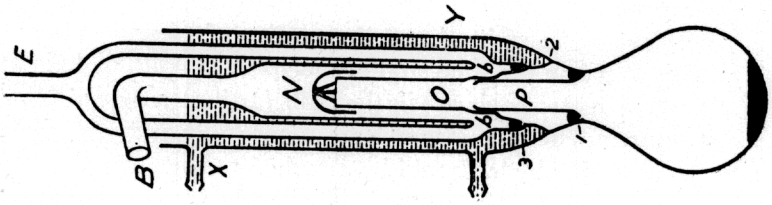
AN IMPROVED FORM OF HIGH VACUUM HIGH SPEED MERCURY VAPOR AIR PUMP

ABSTRACT

CHAS. T. KNIPP, UNIVERSITY OF ILLINOIS

Dr. Gaede[1] of Berlin, in a recent number of the *Annalen*, described an air pump based partially upon the principle of the aspirator, in which the air to be evacuated diffuses through a narrow slit into a stream of mercury vapor and is carried away with it. Langmuir[2], of the General Electric Company, pointed out that even greater speeds in evacuation may be obtained by replacing the slit by a large nozzle opening into a condensing chamber surrounded by a water jacket. The un-



derlying principle is that the gas is trapped mechanically by the condensing mercury vapor and forced onward along the walls of the condensing vessel to a side opening through which the accumulated gas is drawn by the supporting pump.

The writer has improved the design and efficiency of this pump by making it more compact and at the same time securing better heat insulation at certain points and more effective cooling at others. An idea of the speed of evacuation may be obtained from the following test. A 6 litre flask was attached to the mercury vapor pump which in turn was supported by a Gaede rotary mercury pump. With the Gaede pump operating alone (it should be remarked that this pump is the type now generally used in the production of very high vacua) it required 52 minutes to produce an X-ray vacuum; while *with the mercury vapor pump operative it required but 2½ minutes to produce the same vacuum.*

1. Ann. Phys., 46, 357, 1915.
2. Phys. Rev., 8, 48, July 1916; Gen. Elect. Rev., 19, 1060, Dec. 1916.

Not only is the pump one of high speed, but it is also one giving an extremely high vacuum. The limit to which the pressure in the evacuated vessel tends is zero, or, more strictly, to the vapor pressure of glass, or of aluminum, i.e., to that of the material of which the electrodes are made. Obviously if no trap for freezing out the mercury vapor is attached, the limit of the pressure attainable is that of mercury. When made of pyrex glass the pump is durable.