38 here shown as three in number and consisting of small projections. By virtue of these projections, tube 30 is permitted to rest around nozzle 28 while permitting ready access of the mercury from the outside to the inside of tube 30. The diffusing tube which is loose is steadied and maintained in position by a plurality of springs 40 extending radially from baffle 35 to the inside surface of section 11 of the pump. These springs may be made of any metal such as tungsten and are maintained in position by small protuberances or knobs 41 formed on the outside of baffle 36.

Branching off from section 11 of the pump near the bottom thereof is a side arm 42, having an elbow 43 and thence going up as discharge section 13 of the pump. Section 13 may have a reduced portion 45 to which the auxiliary mechanical pump may be connected directly.

It will be noted that sections 10 and 11 of the pump are joined together at portion 21 to form a substantially straight structure that is adapted to stand vertically when in normal use. The upper portion of section 11 of the pump has a reduced head section 47 having a diameter smaller than the diameter of baffle 35 on diffusion tube 30. Thus, the amount of vertical movement of tube 30 within section 11 is controlled and may be eliminated entirely if desired. Head section 47 of the pump has a side branch 12 leading therefrom and supporting the intake trap. Thus, as shown here, branch 12 carries at the end thereof a chamber 49 extending downwardly from branch 12 and terminating in a tip 50. The upper portion 51 of chamber 49 has fused therein an intake 52. Tube 52 extends well down into chamber 49 substantially below the level of side branch 12. The entire chamber 49 is adapted to be kept at a very low temperature such as by a liquid air jacket. The pump proper consisting of sections 10, 11 and 13 may be disposed in water so that condensation of mercury vapor will be effected. It is understood that leads 18 and 19 are suitably insulated so that water will not be part of any circuit.

The entire structure is preferably made of glass excepting for the heater and possibly springs 40. However, it is possible to make this pump out of any other suitable material. Over a period of use, any oil, water (frozen to ice) or other condensates collected in chamber 49 of the trap may be removed by opening tip 50.

It is clear that the boiler proper, consisting of chamber 25 with the space below nozzle 28, is insulated from the outer envelope 15 by a vacuum chamber 27. Thus heat leakage is reduced to a minimum.

In the operation of the apparatus the mercury vapor discharged upwardly through the nozzle 28 into the diffusing tube 32 and out of this tube into the pump section 11 will be condensed pursuant to the heat absorption therefrom by the water about said section 11. The mercury resulting from the condensed vapor collects in the annular trap receiving the enlarged lower end of the tube 30 and thus forms a mercury pool which upon reaching an elevation slightly exceeding the upper end of the nozzle 28 will spill over into the boiler 22, resupplying the boiler with mercury and causing the pump to possess a continuous operating character. This mercury pool within the annular sump on the upper end of the boiler 22 seals the spaces between the supporting feet 38 for the tube 32 to prevent the escape of the mercury vapor from beneath the lower end of said tube and causes the discharge of such vapor through the sets of holes 33 and 34. Said spaces at the lower edge of the tube 32 between the feet 38 permit flow of mercury accumulating from the condensation in the pump 11 beneath the lower end of the tube 32 and upwardly between the enlarged lower end wall of this tube and the nozzle 28 to ultimately spill over the upper end of this nozzle and into the boiler in the aforesaid manner. The springs 40 disposed upon the bosses 41 projecting radially from the skirt-like baffle 35 on the upper end of the tube 32 impinge with sufficient force against the wall of the boiler 11 to frictionally resist endwise movement of the tube 32 whereby the feet 38 are maintained upon the upper end of the boiler. The height of the spaces between such feet and between the lower end of the tube 32 and the upper wall of the boiler 22 is controllable by predetermining the height of the feet.

What is claimed is:

1. In a diffusion mercury pump, a boiler section comprising an outer envelope having a re-entrant portion at the bottom thereof, lead-in wires sealed in said re-entrant portion, an electric heating element connected to said lead-in wires and disposed within said envelope and extending toward the top thereof, a mercury retaining section connected to the top of said boiler section and spaced from said envelope and extending downwardly toward the bottom and having a reentrant portion surrounding said heater, the chambers within and around said mercury containing section being sealed from each other and from atmosphere, said envelope being evacuated to provide thermal insulation between said envelope and said mercury retaining section.

2. A mercury diffusion pump comprising an elongated tube normally adapted to stand in a vertical position, the bottom portion thereof being formed as a boiler section and the remaining portion being formed as a pumping section, said boiler section having a mercury retaining sump and a means for heating said mercury, said pumping section having a separate elongated tube loosely disposed therein, said tube having access to said mercury boiler section and adapted to conduct mercury vapor upwardly within said tube, said tube having its upper end closed and having a plurality of apertures through the wall thereof, baffles carried by said tube for directing mercury vapor issuing through said apertures back toward the bottom of said tube, an intake for said pump at the top of said pump section and an exhaust for said pump at the bottom of said pump section.

3. A mercury diffusion pump comprising an elongated outer envelope adapted to be disposed in a vertical position during operation, the bottom portion of said envelope forming a boiler section, said boiler section having a mercury containing chamber spaced from the outer envelope and carried by the top of said boiler section and depending downwardly toward the bottom thereof and having a reentrant portion extending upwardly, said mercury containing chamber being sealed from the outer envelope at the boiler section, lead-in wires sealed in said envelope at the bottom of said boiler section, an electric heating element connected to said lead-in wires and disposed within the reentrant portion of said mercury containing chamber, said mercury containing chamber being surrounded by an annular evacuated chamber of which the outer enve-