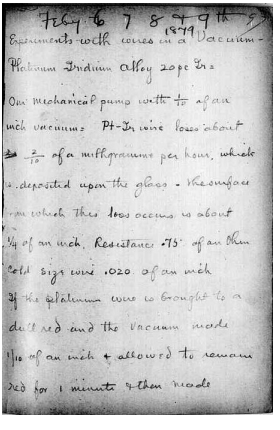
Notebook Entry: Electric Lighting[1]

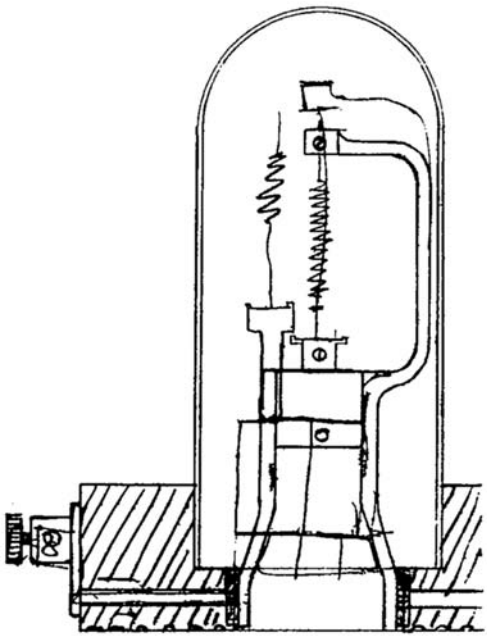


[Menlo Park,] Feby ~~7~~6 7 8 & 9th 1879[2]

Experiments with wires in a Vacuum— Platinum Iridium alloy 20 pc Ir=

On mechanical pump with 1/10 of an inch vacuum=[3] Pt-Ir wire loses about ~~3~~ 2/10 of a milligramme per hour which is deposited upon the glass— The surface on which this loss occurs is about 1/4 of an inch. Resistance .75 of an Ohm cold size wire .020 of an inch If the platinum wire is brought to a dull red and the vacuum made 1/10 of an inch & allowed to remain red for 1 minute & then made yellow and the vacuum made perfect again then wire brought gradually up making vacuum perfect after each increment of heat the wire may be brought to 21 candle power ie[a] 1/4 of inch radiating surface will give 21 c.p. the wire grows exceedingly bright, rivilling polished silver and under the microscope shews no cracks, whereas if brought to incandescence suddenly it shews great cracks. I think from our experiments that the melting point is determined greatly by the amount of gas within the pores of the metal which by its expansion disrupts the metals and makes it fuse easier.[4] by gradually increasing the heat the gas gradually comes out of the metal without disrupting or cracking it= Roughly speaking I think that if the melting point of platina in the air by suddenly bringing to incandescence is 2000 ~~F~~C then its melting point is raised to at least 5000 C by subjecting it to the process of occluding its gas by heat in a vacuum 3 to 4 candle power is all that we can on an average obtain from 1/4 inch in open air= I think all metals which hold gas in their pores or even other metals or metalloids have a lower melting point because the unequal expansion disrupts the metals & crack it thus allowing it to fall an[b] easy prey to the heat=

The earliest dated vacuum lamp drawing, 3 February 1879.



X, NjWOE, Lab., N-78-12-31:97 (*TAEM* 30:424; *TAED* No14:48). [a]Circled. [b]Obscured overwritten text.

1. This entry is continued in Doc. 1678.

2. Edison dated this document, probably retrospectively, using a different pencil from that in the body of the text. The notebook entry summarizes Edison's interpretation of research on platinum-iridium wires in vacuum conducted in early February, probably using apparatus like that drawn by Batchelor on 3 February. The only other extant notes on these experiments were made by Francis Upton and Charles Batchelor on 8 February. In trials conducted that day, Upton and Batchelor recorded the appearance of a thin coating on the glass and the change in weight of wires about which Edison hypothesizes here. They calculated a slower rate of loss of a wire's mass than Edison does in this document. Edison probably wrote these notes before drafting his 9 February caveat (Doc. 1676). Vol. 16:368, N-78-11-22:75–89, both Lab. (*TAEM* 4:803, 29:190–97; *TAED* NV16:325, No02:39–46).

3. It is not known what kind of mechanical pump Edison had, but several pumps were capable of producing such a vacuum, equal to about 2.5 millimeters of mercury (air pressure is equal to 760 millimeters). Turner 1983, 98–103.

4. Two days earlier, in an entry witnessed by Edison and Batchelor, Upton had written: "An explanation of the changes wh[ich] occur in Pt. may be the following. The Pt absorbs an enormous amount of H[ydrogen] gas which is given off at high temperatures." N-79-01-21:41, Lab. (*TAEM* 30:607; *TAED* No16:22).