

But work has now been done in two ways, first by bringing fresh electricity on to the plates of the condenser, and secondly in the movement of the plate of glass. The former amount is equal to $F(D_1 - D)/4\pi$, for quantity of electricity \times voltage equals energy, and in this case the quantity is brought up to a constant potential and not, as when the condenser was first charged, to a potential gradually rising from zero to F , and whose average value was therefore $1/2 F$.

But $F(D_1 - D)/4\pi$ is greater than $F(D_1 - D)/8\pi$, and the difference, $F(D_1 - D)/8\pi$, must have been spent on the motion of the glass plate. Since there are 10 cubic centimeters, the total so spent will be $10 F(D_1 - D)/8\pi$, and if the amount of motion is as before 5 centimeters, the average force will be $2 F(D_1 - D)/8\pi$.

Since $D = x F$, and $x =$ unity in the case of air, this formula reduces to $2(D_1^2 - D^2/x)/8\pi$, as before.

We thus see that the force acting to suck in the glass plate is the same whether the charge or the voltage is kept constant, but that in the former case the energy of the whole system is lowered by an amount $10(D_1^2 - D^2/k)/8\pi$, whilst in the latter case it is increased by the same amount. It is for this reason that twice that amount had to be spent in bringing the additional charge up to the given potential.

[To be continued.]

BOOK NOTICES.

The Rise and Development of the Liquefaction of Gases. By Willett L. Hardin, Ph.D., Harrison Senior Fellow in Chemistry in the University of Pennsylvania. New York: The Macmillan Company. 1899. John Wanamaker, Philadelphia. (Price, \$1.50.)

The author has given us in convenient form the important data bearing on the history of the subject of the liquefaction of gases, which are scattered through the periodical literature of the past thirty years. The scientific investigator of the subject and the inventor who is chiefly interested in the practical applications of liquefied gases will find Dr. Hardin's work equally serviceable.

W.