We may treat the electrometer as though it were a simple condenser in series with a high resistance, neglecting both changes in this resistance and the capacity of the condenser. The arrangement of the discharge circuit is shown in Figure 2. The battery whose emf is E supplies the current I through the resistance R_1 and a key K_1, which is one of the keys of a drop chronograph. The two condensers of capacities C_1 and C_2 are connected as shown and are charged so that the potential difference is I R. R_2 is the high resistance of the electrometer whose capacity is C_2. L is a self-inductance inserted so that the discharge may be oscillatory. The second key K_2 of the drop chronograph may be inserted at x, y or z. When both keys are closed the system is charged and in both condensers the plates are at a common difference of potential I R. If K_1 is opened the discharge begins and continues until K_2 is opened. If K_2 is at x, the oscillation ceases and the two condensers settle down to the same difference of potential. If K_2 is at y, the first condenser C_1 is left with the charge it had at the instant of opening the key K_2. If K_2 be connected at z, the condenser C_2 is left with the charge it had at the instant of opening the key. In any case we may measure the charge by connecting both with a ballistic galvanometer and calculate the potential from the known capacities. Or we may connect to an electrometer and measure the potential. For the case where K_2 is at x or z, we may use the capillary electrometer to measure the potential. The first arrangement only was used.

Suppose plates *a* and *b* are charged positively so that when K_1 is opened the charge flows from *a* and *b* through the system. Let the current in circuit 1 be i_1, in circuit 2 be i_2, the charge on plate *a* of C_1 be q_1, on plate *b* of C_2 be q_2, potential of *a* be V_a and of *c* be V_c. Let R_1 include resistance of L. We may call the capacities of the condensers C_1 and C_2 respectively.

Then:

$$i_1 R_1 = V_a - V_c - L\frac{di_1}{dt} = \frac{q_1}{C_1} - L\frac{di_1}{dt}$$

$$i_2 R_2 = V_b - V_a = V_b - V_c - (V_a - V_c) = \frac{q_2}{C_2} - \frac{q_1}{C_1}$$

and also,

$$i_2 = -\frac{dq_2}{dt} \text{ and } i_1 = -\frac{dq_1}{dt} - \frac{dq_2}{dt}$$

So we have $$L\left(\frac{d^2q_1}{dt^2} + \frac{d^2q_2}{dt^2}\right) + R_1\left(\frac{dq_1}{dt} + \frac{dq_2}{dt}\right) + \frac{q_1}{C_1} = 0 \qquad (1)$$

and $$R_2\frac{dq_2}{dt} + \frac{q_2}{C_2} - \frac{q_1}{C_1} = 0 \qquad (2)$$