$$\dot{I} = \frac{\dot{V}}{(R_0+R)+j(X-1/\omega K)} \tag{7}$$

which is the formula of U-effect II.

When the load impedance is only resistive, *i. e.* $X=0$ and $Z=R$, the power supplied to this is

$$P = I^2R = \frac{V^2R}{(R_0+R)^2+1/\omega^2K^2} \ ,$$

where I and V are the moduli of $\dot{I}$ and $\dot{V}$, respectively. The condition of maximum P with variable R is given by

$$\partial P/\partial R = 0,$$

or

$$R_0^2 + 1/\omega^2K^2 = R^2.$$

This is nothing but the principle of the impedance matching method for capacity measurement.

When, on the other hand, the load impedance is inductive, *i. e.* $X=\omega L$, we get

$$\dot{I} = \frac{\dot{V}}{(R_0+R)+j(\omega L-1/\omega K)}$$

This gives maximum value of I, when

$$\omega L = 1/\omega K,$$

which is the case of series resonance.

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8. Study on Surface Electricity. (XVII)

Measurement of Interfacial Capacity by Resonance Method Using U-effect

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From the theory developed in the preceding article, the circuit of U-effect II is a series combination of the double layer capacity, resistance of solution and a load impedance. Hence, we can make a resonance circuit when we use an inductance in place of the load impedance. It is clear that we get maximum current for the value of $L = L_0$, where

$$\omega L_0 = 1/\omega K$$

holds. Accordingly, we can calculate the mean value of the capacity by

$$K = 1/\omega^2 L_0.$$

Experiments were performed with an element with two Hg-N-H_2SO_4 aq. interfaces in series. The resonance curves were taken with various frequencies of vibration, and the results were

freq. (cps.)	2,500	3,000	5,000	6,000
1/freq.^{2}	1.6	11.11	4.00	$2.78 \cdot 10^{-4}$
L_0 (mh)	158	109.5	41	28.5

From the last equation, L_0 must be inversely proportional to the square of the frequency, which can easily be shown from the figures in this table.

Now, in our effect the capacitance is not constant, but, changes with time according to the equation $c = K + \Delta \dot{C}\ \epsilon^{j\omega t}$. In the derivation of the equation of U-effect II in the last paper, we assumed that $\Delta c/K \ll 1$ held for our effect. To ascertain whether this assumption can be used or not, we measured the values of L_0 with different values of Δc, which could be controlled by the input voltage of the vibrator. The results were

Vibrator input	L_0	I_0
100	142 mh	104.2
20	142	68
10	142	33.9
5	142	8.5
3	142	2.5

In this experiment the frequency of vibration was 2,500 cps. It is clear that the resonance occurred with the same value of L_0 despite of Δc within the values of Δc in our experiment.

While the impedance matching method described in the past by the same authors required two independent measurements of current and voltage, the one here described includes only a measurement of current with various inductances, which is the superiority of this method in its simplicity of operation. In addition, the easiness in obtaining the maximum point of current enables this method the better measurement for the interfacial capacity among the many devices, *e. g.* the impedance bride method and others.

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9. Study on Surface Electricity. (XVIII)

On the Q-value of Interfaces

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A resonance circuit has a characteristic value, called "Quality factor" or "Q-value", which is the ratio of the reactance and resistance components, defined by

$$Q = \omega L_0/(R_0+R) = 1/[\omega K(R_0+R)].$$