

A natural corollary of this view is that the phenomena attending the formation of solutions must be different in kind to those accompanying the exertion of "chemism" in the formation of a chemical compound; and the evolution of heat in the latter case has come to be regarded as a necessary consequence of the collision of the atoms, and indeed finally as a direct measure of the force exerted by "chemism" in the reaction. Thus originated

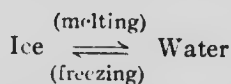
The false law of Maximum Work.

"Every chemical reaction which occurs without the assistance of foreign energy gives off heat."

"Physical" reactions are obviously exempt from the application of this law—when water freezes heat is given out, and when ice melts it is absorbed; and it was the discovery that numerous "genuine chemical" reactions are reversible, in the sense that the reaction between water and ice is reversible, absorbing heat when taking place in one direction and giving it off in the other, that led to the repeal of the false law, and to the final abandonment of the distinction between the two classes of reactions.

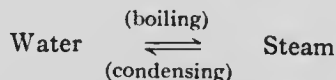
EQUILIBRIUM.

When ice and water are brought together below 0°C , the water freezes; if the temperature be raised above 0° the ice melts; at 0° neither change takes place. The two reactions may be represented by the symbol



and are said to be "in equilibrium" at 0°C . They are often spoken of as one reaction which may take place "in two directions," viz., from the right to the left of the symbol, or *vice versa*.

The reactions



are in equilibrium at 100°C and one atmosphere pressure; if the pressure be changed the temperature at which water and steam can remain in contact changes also (see the tables of the vapour tensions of water, or of the boiling-points of water at different pressures). In this respect the present case seems to differ from the equilibrium between water and ice; the difference is only one of degree, however, for careful experiments have shewn that the freezing-point of water is lowered 0.0076°C for every additional atmosphere of pressure.