



Summary of the laws which govern matter in the spheroidal state

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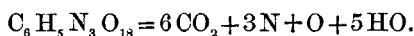


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into more highly oxidized stable compounds. This condition is fulfilled by nitroglycerine; in fact, experiment proves that its decomposition in a closed vessel is represented by the theoretic equation



(5) *Mining-powder*.—The composition of the gases was found sensibly the same for densities equal to 0·3 and 0·6; it is given below.

In a recapitulation we infer from these results the qualitative and quantitative composition of the gases furnished by each explosive under the normal conditions of its employment. The following Table gives the volume (in litres) of each of the gases, per kilogram of the substance, under those conditions:—

	CO.	CO ₂ .	H.	N.	O.	C ₂ H ₄ .	HS.	Total.
Pure gun-cotton	234	234	166	107	..	..	..	741
Gun-cotton with nitrate of potass . . . . .	..	171	..	109	45	..	..	325
Gun-cotton with nitrate of ammonia		184	..	211	6	..	..	401
Nitroglycerine . . . . .	..	295	..	147	25	..	..	467
Ordinary mining-powder	64	150	4	65	..	4	17	304

—*Comptes Rendus de l'Académie des Sciences*, May 3, 1880, t. xc. pp. 1058–1060.

SUMMARY OF THE LAWS WHICH GOVERN MATTER IN THE SPHEROIDAL STATE. BY P.-H. BOUTIGNY.

I. *Temperature*.—The temperature of bodies in the spheroidal state is always below that of their ebullition: it is +97° for water.

II. *Non-equilibrium of Temperature*.—The substance in the spheroidal state never places itself in equilibrium of temperature with the vessel which contains it; its temperature is always in a state of stable equilibrium, whether it be in a capsule with free access of air or in the muffle of a cupel furnace. But if the body in the spheroidal state does not place itself in equilibrium of temperature, the vapour emanating from it always does so. These two phenomena are manifested very clearly when the operation is performed in a hollow sphere arranged *ad hoc*.

III. *Reflection of Radiant Heat*.—Matter in the spheroidal state reflects radiant heat.

IV. *Volume and Mass of the Spheroids*.—The volumes of matter in the spheroidal state are in the inverse ratio of their density; and their masses are equal among themselves.

V. *Repellent Force at a sensible Distance*.—This law is the most important of all, the richest in deductions; for we regard it as the antagonist of universal attraction.

On the floor of the Panthéon, in the axis of the cupola, upon a good charcoal fire a large platinum capsule is placed, and its temperature raised to the utmost possible. This being arranged, water is poured down from the top of the Panthéon (about 70 metres

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high), falls into the capsule without wetting it, and instantly passes into the spheroidal state.

The experiment is recommenced in the open air when it rains or when hail is falling; and the results are the same as in the Panthéon experiment. Can it be said that in these experiments the water and the hail are sustained in the capsule by the vapour which envelops them? Certainly not; they are repelled instantaneously by the repellent force to which the heat in the capsule gives rise.

Let us now operate with non-volatile bodies, which cannot be distilled, but are decomposed by heat.

The capsule is heated as before, and small fragments of wax, tallow, stearic or margaric acid are then thrown into it, or else some drops of oleic acid or a fixed oil; and this is what takes place:—As the molecular motions are not transmitted with very great velocity, the body experimented on remains suspended over the capsule *without vapour and without gas* proceeding from its decomposition; afterwards the gases resulting from its decomposition are liberated, not from its surface, but from its interior: they take fire, and the spheroid vanishes.

The body under experiment not being volatile, giving off no vapour, and the gases arising from its decomposition not being yet produced, evidently the body can only be sustained beyond the radius of the physico-chemical activity of the capsule by the repulsion of the latter.—*Comptes Rendus de l'Académie des Sciences*, May 3, 1880, t. xc. pp. 1074–1075.

ON A GENERAL THEOREM ADVANCED BY PROF. CLAUSIUS IN REFERENCE TO ELECTRICAL INFLUENCE. BY G. J. LEGERBEKE.

In vol. i. of Wiedemann's *Annalen** Prof. Clausius communicated a theorem on the connexion between the electrical charges of an arbitrary number of conductors which act by influence on one another. That author deems this theorem very general and new, and also assumes it in Part II. of his *Mechanische Wärmetheorie*, p. 33. I wish to point out that Clausius's is a special case of a more general principle, which, again, can itself be regarded as an extension of a well-known equation of Gauss's.

Over each of the closed surfaces $C_1, C_2, \&c.$, named generally C , a layer of a certain agent is spread, and acts by attraction or repulsion according to the usual laws. The density of the agent in points of

$$C_1, C_2, \&c., C,$$

is represented by

$$h_1, h_2, \&c., h,$$

and the potential of all these layers in the same points by

$$V_1, V_2, \&c., V.$$

Secondly, the layers upon $C_1, C_2, \&c., C$, are replaced by layers

* See *Phil. Mag.* [5] iv. pp. 454 *et seqq.*