A SHORT ACCOUNT OF EXPERIMENTS AND INSTRUMENTS, DEPENDING ON THE RELATIONS OF AIR TO HEAT AND MOISTURE

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JOHN LESLIE

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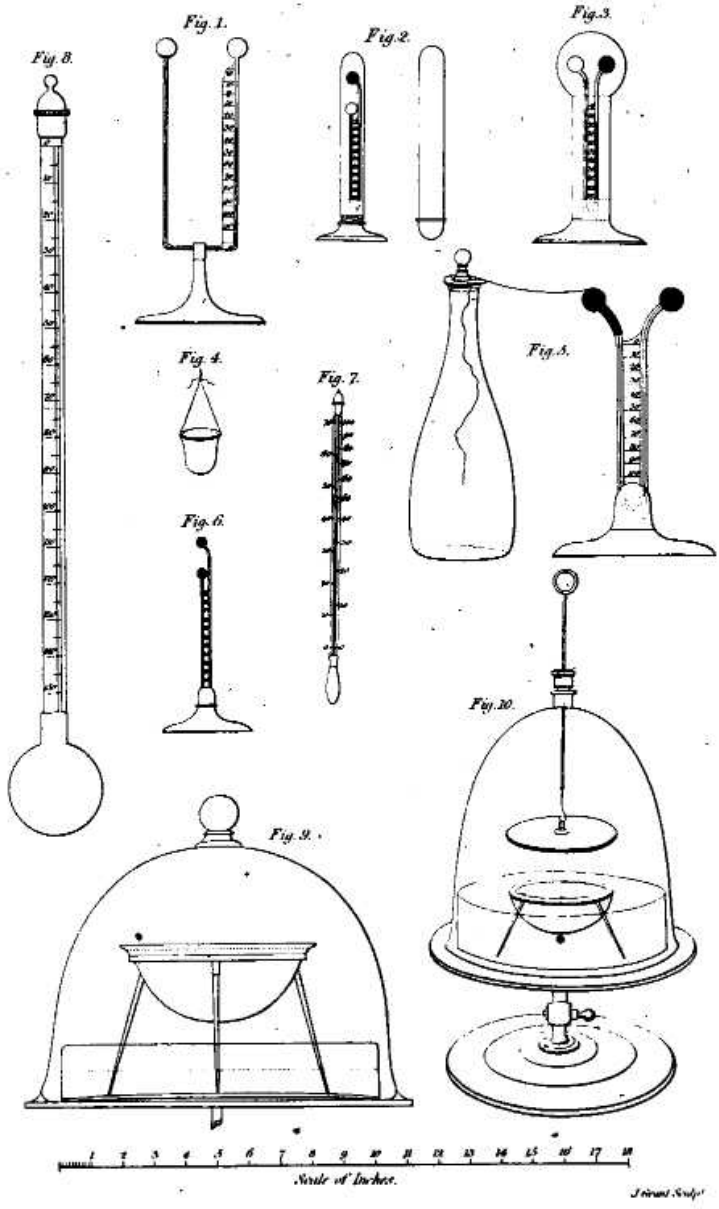
Fig. 8.
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 7.
Fig. 5.
Fig. 6.
Fig. 10.
Fig. 9.
Scale of Inches.

A

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1813.

ADVERTISEMENT.

In the Preface to the '*Experimental Inquiry into the Nature and Propagation of Heat*,' I promised to resume that subject, and to extend my researches into the relations subsisting between heat and moisture, which elucidate and confirm all the former deductions.

As I was anxious to obtain still more accurate results, it became requisite to devise new experiments, and to procure apparatus of the largest dimensions, and of the most refined elaborate construction. Some of the observations, it was necessary to repeat at different seasons; and the circle of my professional avocations, joined to that of the publications which I had connected with them, could not fail to create delay, and to suspend in part my application to experimental research. Several years have thus unfortunately gone by, without allowing me sufficient time to perform, in

the way which I had proposed, my original engagement. I have at length advanced so far, however, that I may hope to be able very soon to discharge that task.

In the meantime, it seemed desirable for the advancement of science, to promote the circulation of several instruments founded on my speculations, and to give the public more correct notions of their principle and their mode of operation. With this view, I was induced to draw up a concise statement, in as popular a form as the regard to accuracy would admit, but which, from the accumulation of materials, has swelled by degrees into a volume. I have only farther to add, that, in order to avoid troublesome calculations, I have satisfied myself with citing round numbers; but these, if not absolutely correct, are in general very near approximations to the truth.

College of Edinburgh,
5th May 1813.

ON

THE RELATIONS OF AIR

TO

HEAT AND MOISTURE.

THE various phenomena of heat are most easily conceived, by referring them to the operation of a peculiar fluid, possessing extreme activity, and diffused through all bodies. This fluid exists, however, only in a state of combination, and never appears under a distinct and separate form. Though subject, from different causes, to partial derangement, it constantly endeavours to recover its equilibrium among adjacent bodies. Its accumulation in any substance is invariably marked by a corresponding expansion,

unless an absolute change of constitution has been induced. Thus, a lump of ice intensely cold, if exposed to a mild air, will regularly expand, till it begins to melt; and during its conversion into water, it will suffer a material contraction, but, after this change, it will again dilate, from the repeated accessions of warmth. In like manner, a bit of clay, though in the furnace it contracts, from the expulsion of part of the water combined with it, will, on being withdrawn and suffered to cool, expand by the application of any lower degree of heat than what it had before sustained.

When the heat shared among bodies is mutually balanced, they are said to have the same *temperature*. But such balance or equality of temperature is far more quickly attained in some substances than in others. Silver transmits heat more readily than platina, platina than glass, and glass than loose down. This property, by which bodies are so widely diversified, is called their *conducting power*; and it has a most extensive influence in the economy of nature.

Among different substances, too, the rise of temperature is accompanied by very different degrees of expansion. Air is found, in like circumstances, to expand 5 times more than alcohol, 20 times more than mercury, 100 times more than platina, and even 500 times more than glass.

The *thermometer* is an instrument contrived to measure its own expansions, and consequently fitted, by its nice sensibility, to indicate the temperature of surrounding bodies. Still the thermometer can mark only the heat of its own bulb, as affected by external communication; and any farther inferences drawn from its different indications are merely the result of some process of reasoning.

The primary source of heat is the sun, whose genial rays are partly detained in the atmosphere, and partly received at the surface of the land and of the ocean. The incessant addition thus made to the elementary fluid, varying with the latitude and the change of seasons, are speedily dispersed by the vehicle of aërial currents, and gradually absorbed into