

Received June 8, 1769.

XXX. *A Letter from Mr. Lane, Apothecary, in Aldersgate-street, to the Honourable Henry Cavendish, F. R. S. on the Solubility of Iron in simple Water, by the Intervention of fixed Air.*

Aldersgate-street, June 5, 1769.

S I R,

Read Nov. 23,
1769.

THE various impregnations of mineral waters have always been very difficult to explain : and whoever has read the divers, and often contradictory reasonings upon the subject, must clearly perceive, that there is still room for discoveries in this part of natural history.

You, Sir, by your accounts of fixed air, and of Rathbone-place water, related in the last volume of Philosophical Transactions, have obliged the public with many additional lights on this branch of knowledge ; and, from your known accuracy, and diligent pursuits in most philosophical inquiries, the learned world has great reason to hope for many other new and useful improvements. To your judgment therefore, I submit the following experiments ; which are intended to shew, that iron is soluble in simple water,
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by the intervention of fixed air; and thence, that it is very probable, many different chalybeate springs sustain their metallic charge by this means only.

The solution of iron in mineral waters, especially in such as, by exposure, readily lose the property of striking a purple colour with astringent vegetables, has usually been attributed to some subtile gas, or volatile acid. Chymistry, however, does not discover any acid solvent for iron, but what has greater affinity with alcalies; and by means of which, therefore, this metal will be precipitated. Hence if any water appears, with a predominant alkali, which has also the power of tinging with galls, and, on being exposed to the open-air, lets fall the iron, and loses that property; may we not conclude the metal to have been suspended by some other medium?

This, for example, is plainly the case in German Spa water, which Dr. Brownrigg has proved to abound with fixed air. Your own very curious experiments, before cited, have clearly shewn, that calcarious earths may be suspended in water by this principle of fixed air. And these have led me to examine, whether iron might not be dissolved by the same natural means.

I would not, however, be supposed to deny, that iron is frequently found united with an acid. The fact is sufficiently evinced in the pyrites and vitriolic earths. Nor can I doubt, but that these substances do largely contribute to the primary impregnation of waters, they being so readily soluble in them. But as an alkali, or absorbent earth, is often found more than sufficient to saturate the acid in mineral waters; this would effectually disengage every

particle of iron dissolved by an acid, unless the metal was supported by some other menstruum.

My endeavours, therefore, to detect this solvent, by experiments, are what I now beg leave to lay before you, in the order I made them.

EXPERIMENT I.

A wide-mouthed bottle, containing half a pint of distilled water and sixty grains of steel-filings, was suspended forty-eight hours over some distillers melasses, in brisk fermentation; so as to receive the fixed air escaping from the fermenting liquor; the surface of which was ten inches below the mouth of the bottle. Immediately after its removal, the clear water was decanted from the filings and ochrous sediment.

This liquor had a brisk and ferruginous taste, with a flavour of the melasses. An infusion of galls, or green tea, soon changed part of it to a colour like ink. The remainder, being exposed to the open air, presently became turbid, threw up a party-coloured pellicle, and deposited a yellowish sediment.

The water now retained but very little power of tinging with galls; and in a few days lost this property entirely.

EXPERIMENT II.

Fourteen ounces of coarse sugar, dissolved in seven pints of water, were mixed with half a pint of yeast, in a bottle capable of holding more than twice the above quantity. One end of a bent tube was luted into this vessel, so that no air might escape but through the