Observations on the Phenomenon observed by M. CLEMENT, in the emission of Steam, and on an analogous effect in the attempt to separate two flat disks by a current of air.

MUCH interest was excited by the phenomenon first observed by M. Clement, of Paris, an account of which will be found in vol. 4, p. 97 of this Journal; and also some remarks thereon, by Mr. Perkins, at p. 252 of the same volume. A similar phenomenon has since engaged the attention of the curious, the apparatus for exhibiting which is so extremely simple that every one can try the experiment for himself. Take two disks of card about the size of a dollar, perforate one of them in the centre, so that a tube may fit it; a common quill answers the purpose perfectly well; if these disks be placed upon each other, wind may be blown through the tube without separating the disks, or if one of them be placed on a table, it may be raised up by causing the perforated disk to approach it, and blowing through the tube.

Of this phenomenon Professor Hare has published a rationale; and we have received two others from correspondents, the whole of which we now publish, presenting them in the order in which they have been written.

EDITOR.

Rationale, of the difficulty, in certain cases, of separating plane surfaces by a blast. By R. HARE, M. D., Professor of Chemistry in the University of Pennsylvania.

THE phenomenon above alluded to, is usually illustrated by means of two disks, into the centre of one of which a tube is fastened, so that on blowing through the tube the current is arrested by the moveable disk. Under these circumstances the moveable disk is not removed, as would be naturally expected.

Supposing the diameter of the disks to be to that of the orifice as 8 to 1, the area of the former to the latter must be as 64 to 1. Hence if the disks were to be separated (their surfaces remaining parallel) with a velocity as great as that of the blast, a column of air must meanwhile be interposed, 64 times greater than that which would escape from the tube during the interim. Consequently, if all the air necessary to preserve the equilibrium be supplied from the tube, the disks must be separated with a velocity as much less than that of the blast, as the column required between them is greater than that yielded by the tube, and yet the air cannot be supplied from any other source, unless a deficit of pressure be created between the disks unfavourable to their separation.

It follows then, that under the circumstances in question, the disks cannot be made to move asunder with a velocity greater than 1-64th of that of the blast. Of course, all the momentum of the aerial particles which constitute the current through the tube will be expended on the moveable disk, and the thin ring of air which exists

around the orifice between the disks; and since the moveable disk can only move with $\frac{1}{64}$ th of the velocity of the blast, the ring of air in the interstice must experience nearly all the momentum of the jet, and must be driven outwards, the blast following it in various currents, radiating from the common centre of the tube and disks. The effect of such currents in producing an afflux of the adjoining portions of any fluid in which they may be excited, is well known, having been successfully illustrated by Venturi. See Nicholson's Journal, quarto, vol. 2nd, p. 172.

Accordingly the afflux of the air towards the disks counteracts the small velocity which the blast would communicate, and thus prevents their separation, and may even cause them to approach each other, if previously situated a small distance apart.

This rationale commences with the assumption that the disks will remain nearly parallel. That there cannot be much deviation from parallelism must be evident, since any obliquity will make the opening greater on one side than on the other; and the jet proceeding with most force towards the widest opening, will increase the afflux of air upon the outer surface of the moveable disk in the part where the current is strongest, and thus correct the obliquity. [*Chronicle.*

An inquiry into the cause of the adhesion of disks, when an attempt is made to separate them by a current of air. By JAMES P. ESPY, Professor of Languages.

TO THE EDITOR OF THE FRANKLIN JOURNAL.

Philadelphia, June 20th, 1828.

DEAR SIR,—The subjoined explanation of the phenomenon to which it relates was given by me to a gentleman of this city, in reply to a communication from him, and may probably be deemed worthy a place in your Journal.

Yours, &c.

JAMES P. ESPY.

If you take two disks of common playing cards, about two inches in diameter, or even less, and insert the end of a small tube into a hole made in the centre of one of them, and lay the other on the top, and cause a current of air to pass through the tube with moderate velocity, the upper card will not be removed, but will be pressed towards the other card with considerable force; a force sufficient to support its weight, when the experiment is performed with the cards reversed, and the current of air made to pass downwards.

The only explanation of this remarkable phenomenon, that I have seen, which has any plausibility, is that of Professor Hare, which you had the kindness to send me. The direct force of the current at the centre of the disks is correctly estimated, and is, indeed, very small, where a free passage is given to the air laterally; but the counteracting force assigned by the Professor is, if it exists at all, hardly appreciable, and is therefore not the true cause of the phenomenon.