

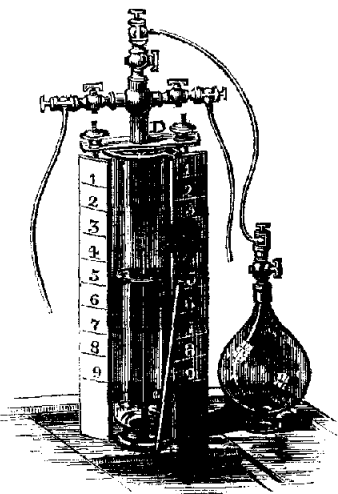
counted for by this consideration—that as soon as the vapour begins to condense by the rarefaction and refrigeration of the air, the rarefaction of the vapour is greater than the rarefaction of the air caused by centrifugal force alone; and therefore the vapouric atmosphere will press itself through the whirlwind into the greater vacuum of vapour, and thus the supply will be constantly kept up. Besides, during the progress of the whirlwind, new portions of air, with its vapour, are constantly brought within its action.

I may mention here, for the sake of some who may read these remarks, and have not attended to the subject before, that it is now known to meteorologists, that aqueous vapour and air form independent atmospheres, each pressing only on particles of its own kind, and that the vapour which is in the atmosphere is not in the least degree buoyed up by the air, but supports itself by its own elasticity, becoming more rare, like the air, as the elevation increases.

*Large Volumescopes, for the Analysis of Atmospheric Air, by means of Nitric Oxide.* By ROBERT HARE, M. D., Professor of Chemistry in the University of Pennsylvania.

This apparatus illustrates conspicuously the condensation which ensues when nitric oxide gas and atmospheric air, are mingled in due proportion.

The hollow glass cylinder, which constitutes the main body of the instrument, is four and a half inches in diameter, and thirty in height. It is situated over one of the three wells in my pneumatic cistern; being secured between two iron rods well fastened to the shelf below; and terminating above in screws furnished with nuts. By means of these screws, and an intervening bar of iron, a brass disk, by which the upper orifice of the cylinder is closed, is pressed upon the rim of that orifice, so as to make with it an air tight juncture. From a hole in the centre of the brass disk, a stout tube of brass proceeds, terminating in three cocks, furnished with gallowes screws, so as to permit of the attachment of three flexible leaden tubes. Of these, one communicates with an air pump, another is attached to a pear shaped glass receiver, which (for want of a better name) I shall call a volumeter, as it serves



conveniently, and accurately, to measure gas into precisely equal volumes.

On each side of the cylinder, a strip of wood covered with white paper, is supported; each of which is made to receive graduating lines in the following way. The cylinder having been filled with water, the lines are so applied as to indicate the changes of level successively produced in the surface of the water within the cylinder, by the successive introduction of equal volumes of air. These graduations are so proportioned, as to render the portion of the cavity comprised within three of them equivalent in content, to one measure of the volumeter already described. In all there are nine graduations.

In operating with this instrument, I commence by exhausting the air from the cylinder, and thus causing the water of the pneumatic cistern, over which it is situated, to rise to the fifth graduation. The volumeter may be filled at the same time, if the cocks between it and the cylinder be opened. Care must be taken to close them as soon as the water reaches the apex, so as to prevent the lead tube from being obstructed by water. The volumeter should, in the next place, be filled with nitric oxide gas. The apparatus thus prepared, it is only necessary to open the cocks, between the volumeter and the cylinder, in order to cause the nitric oxide to pass from the one to the other. Copious red fumes of nitrous acid immediately appear. By means of the gum elastic bag, and recurved tube, jets of water are next to be thrown up into the mixture, by which the absorption of the fumes is promoted. When these have all been absorbed, there will appear to have been a condensation of about three volumes and a fifth, so that the water will have risen a little above the point to which it has been supposed to be raised agreeably to the premises.

For the satisfaction of spectators, the accuracy of the graduation may be proved by allowing the contents of the volumeter in atmospheric air to pass in three times, showing that the water is thereby depressed to 3d, 6th, and 9th graduations. Also, by adding the contents of the volumeter containing three of the volumes indicated by the scale, to five previously introduced; thus, showing that the aggregate will be eight volumes, instead of less than five, as when three of nitric oxide are admitted to five of air.

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*Apparatus for showing the influence of Pressure on Effervescence.*

By the Author of the preceding article.

A tall cylindrical receiver is supported on a wooden pedestal, between upright iron rods fastened into the pedestal, and at top cut into screws furnished with nuts. By means of these screws and nuts, and an intervening cross bar, a disk of lead, alloyed with tin to harden it, is pressed upon the rim of the receiver. The disk is so fitted to the rim of the glass, as that, with the aid of sheet gum elastic, or oiled