

On Wind Pressure in the Human Lungs During Performance on Wind Instruments

by W. H. Stone

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April 18, 1874.

II. *On Wind-pressure in the Human Lungs during Performance on Wind Instruments.* By Dr. W. H. STONE.

THE object of these experiments was originally physiological. It had been stated by many writers that the forced expiration employed in playing tended to produce emphysema of the lungs; but the real amount of such pressure had never been measured.

The facts elicited had also an interest of a purely physical character, which was the principal cause of their being brought before this Society, although, the writer of the paper remarked, it was on the border-ground between two great subjects of study that new phenomena were often to be looked for.

The experiments were two in number. The first aimed simply at measuring, by means of a water-gauge, the extreme pressure which could be supported by the muscles of the lips, both in trained musicians and in persons unaccustomed to the continuous exercise of these organs. The difference between different individuals was very great, some untrained persons having naturally considerable muscular power. About 6 feet of water was the ordinary maximum when a small tube was inserted between the lips. When the lips were supported by a cupped mouthpiece, such as is used for brass instruments, a greater height of the column could be obtained. The great majority of untrained persons could not support more than three or four feet of water. It was to be noticed that the lip-muscles invariably gave way long before the expiratory power of the thoracic muscles was exhausted. By pinching the lips round the orifice of the tube with the hand, and thus preventing their yielding, a far higher column of water could be supported.

The second experiment consisted in introducing a small bent glass tube into the angle of the mouth, connected with a flexible tube passing over the shoulder. It was found that most instruments could be played as well with this addition as without it. It obviously established a communication between the cavity of the performer's mouth, and therefore of his thorax, and the pressure-gauge. The following Table was compiled from many

observations on some of our principal English musicians. The person experimented on was placed with his back to the gauge, the small tube was inserted in his mouth, and he was directed to sound in succession the chief notes of his instrument. As soon as the tone became full and steady, the position of the water-gauge was noted. A fair "mezzo-forte" note was employed. Of course, by forcing the wind and overblowing the instrument, much greater pressure could be obtained; but those given here were sufficient to produce an average orchestral tone.

Oboe . . .	lower notes	9 inches;	highest	17 inches.
Clarinet . . .	"	15 "	"	8 "
Bassoon . . .	"	12 "	"	24 "
Horn . . .	"	5 "	"	27 "
Cornet . . .	"	10 "	"	34 "
Trumpet . . .	"	12 "	"	33 "
Euphonium . . .	"	8 "	"	40 "
Bombardon . . .	"	3 "	"	36 "

It is to be noticed that the clarinet, in this as in some other respects, differs from its kindred instruments—and also that most of the pressures are small, not exceeding or, indeed, attaining the pressure of a fit of sneezing or of coughing. They are therefore very unlikely to injure the lungs, or to produce the emphysema erroneously attributed to them.

May 9, 1874.

III. *On some Physical Properties of Ice; on the Transposition of Boulders from below to above the Ice; and on Mammoth-remains.* By JOHN RAE, M.D., LL.D., &c.

Is the ice formed on salt water fresh? or, in other words, if ice formed on the sea is thawed, will the water obtained thereby be fresh?

For a number of years past I have spoken with many persons on the above subject; and seldom, if ever, have I found a single individual who did not say that the ice of the sea was fresh.