



## George Washington Frost Mellen and Resuscitation with Nitrous Oxide in 1847

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### ABSTRACT

In *The Boston Medical and Surgical Journal* of 1847 (later to be called *The New England Journal of Medicine*), Boston chemist George Washington Frost Mellen claimed that inhaled nitrous oxide gas supports human life in the manner of oxygen gas, and he proposed the use of nitrous oxide in resuscitation from drowning and from carbon monoxide poisoning. The claim was reprinted in at least one dental journal and was long cited as justification for the use of 100% nitrous oxide for inhaled anesthesia. Advocates included anesthesia pioneer and painless dentist Gardner Quincy Colton. Though misguided as to nitrous oxide, Mellen was a prominent member of the Boston community for the abolition of slavery.

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English scientist Humphry Davy (1778–1829) chose to describe nitrous oxide (N<sub>2</sub>O) as respirable in 1800.<sup>1</sup> He meant only that the gas was not irritating to inhale. He amply showed that prolonged inhalation of N<sub>2</sub>O also required the administration of oxygen (O<sub>2</sub>). However, oxygenating N<sub>2</sub>O at one atmosphere to reach 21% oxygen incurs a significant decrease in anesthetic power. Furthermore, N<sub>2</sub>O gas was far less expensive than pure O<sub>2</sub> gas in the 1800s. Dentists were thus prompted to administer 100% N<sub>2</sub>O for brief procedures.

### Misleading Claim

N<sub>2</sub>O supports combustion in the manner of O<sub>2</sub>. For instance, a smoldering wooden splint bursts into flame upon entering a bottle of N<sub>2</sub>O gas. It was tempting to falsely believe that the O atom of the N<sub>2</sub>O molecule would support life as do the O atoms of O<sub>2</sub>. In this regard, a given volume of 100% N<sub>2</sub>O contains 2.14 times as many O atoms as 21% O<sub>2</sub>. On that basis, N<sub>2</sub>O might relieve cellular hypoxia even better than O<sub>2</sub> can do so. This misguided argument may have first appeared in 1847 in *The Boston Medical and Surgical Journal* (later named *The New England Journal of Medicine*).<sup>2</sup> The article was

reprinted in at least one dental forum.<sup>3</sup> The claim was propagated by anesthesia pioneer and influential dentist Gardner Q. Colton<sup>4</sup> and his colleagues.<sup>5</sup> Entitled “Nitrous Oxide Gas in Asphyxia,” the short entry reads in part:

*“I would recommend that as soon as may be, after a person has been taken from the water, or from a room where charcoal has been burning, nitrous oxide gas should be made, and applied to the nostrils, after having the mouth closed, so that the gas might be forced into the lungs, until life is restored, or it is found evident that the case is too far gone for recovery. A common bladder filled with the gas might answer the purpose.” ...“The theory of its operation, would be this. The superabundant oxygen (there being about twice as much oxygen in the nitrous oxide as there is in common air) would combine with the charcoal, that has accumulated in the blood, and come off in the form of carbonic acid gas, and the nitrogen would combine with the blood, and thereby render it fit for circulation. If nitrous oxide could not be obtained, no doubt it would be a good plan to blow common air into the lungs, as has before been recommended, by a pair of bellows, through the nose, stopping the mouth, and then forcing it from them by compressing the ribs. A constant repetition of this might, in some cases, prove effectual—pure air being better than that blown in by the mouth of an individual, as is sometimes done. If possible, however, I should obtain the nitrous oxide, and should administer it even if the person was not apparently dead, using judgment*

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**Fig. 1.** G.W.F. Mellen in 1855.<sup>6</sup> The scan is of a lithograph prepared from a daguerreotype photograph. The lithographer was Winslow Homer (1836–1910), whose illustrious art career so began in Boston. Originals are preserved by the US National Library of Medicine and by the Massachusetts Historical Society.

*in the amount that might be required in any case. A quarter of a pound of the nitrate of ammonia might be enough to be used in any given case. An ounce or less might answer, but allowance should be made for waste."*

## G.W.F. Mellen

The Boston author was George Washington Frost Mellen (1804–1875) (Fig. 1.)<sup>6</sup> He is not to be confused with his nephew George Frost Mellen, MD (1826–1877).<sup>7</sup> GWFM was a fifth-generation New England Mellen, and his grandfather George Frost (1720–1796) served in the Continental Congress.

In 1838, Mellen self-published an essay entitled *An Inquiry into the Composition and Formation of Acetic Acid, or Common Vinegar*. He established a chemistry business on Chatham Street in Boston amid a cluster of chemical and drug importers. He became known for political activism, and in 1841 he produced a much cited treatise entitled *An Argument on the Unconstitutionality of Slavery*.

Mellen became known as an eccentric in years following 1847.<sup>8</sup> His abolitionist views were sound, but his contribution to anesthesia was misguided.

Though not taken seriously, Mellen offered himself for president of the United States in 1852, 1856, and 1860, and he commissioned the lithograph for campaign purposes. He was an abolitionist and is shown with a paper labeled Habeas Corpus. The legal concept of habeas corpus had been invoked against the federal Fugitive Slave Act of 1850. In 1854–5, Mellen produced a periodical entitled *Habeas Corpus & Scientific Journal: Devoted to Civil & Religious Liberty, Science, Arts & Literature*. Therein he offered to lecture on topics including resuscitation.

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