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AN ANTISEPTIC CALLED "OZONE."

By ROBERT B. WARDER.

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V.—AN ANTISEPTIC CALLED "OZONE."

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The attention of the Section has already been called to the claims of the "Prentiss Preserving Company," and to their exhibit of meats, fruits, etc, which were said to be preserved by the antiseptic action of ozone. While it is not the purpose of the author either to recommend or to decry any particular business, some reference to the advertisers of ozone is unavoidable. The claims of the company are briefly expressed in the following words from their advertisement: "Ozone—a new process for preserving all perishable articles, animal and vegetable, from fermentation and putrefaction, retaining their odor and flavor." "This preservative * * * * is simply and purely *Ozone.*"* The material sold is a dark powder, which is put up in packages of about one pound each. This substance is burned in an air-tight chamber, in which the articles to be preserved are placed. The gas formed by combustion is the real antiseptic, which is called ozone, but the same name is applied also to the original powder. The visitor who inspects the eggs and meats exhibited by the Prentiss Preserving Company is readily persuaded that they use a real antiseptic, and that their claims are at least partly true. The chemist who is asked to believe that *ozone* is produced so cheaply, must feel that his credulity is severely taxed.

The first inquiry which reached me was from Mr. H. C. Freeman, of Illinois, whose habits of practical observation led him to believe that the powder consists of sulphur disguised with charcoal and cinnamon. Dr. E. Osmond, of this city, had reached nearly the same conclusion; and he compares the Prentiss method with "Shourd's New Dominion Process" (said to have been patented in Ontario, Nov. 9, 1868), which depends simply on the fumes of burning sulphur. My own examination led to

*After the reading of this paper before the Section, the last claim was withdrawn; but "Ozone" is still retained as a trade name. The claims have also been modified, in regard to the preservation of fruits.

the following results: The so-called "ozone" is a powder, nearly black, perfectly dry and tasteless, but with a very distinct odor of cinnamon. It contains numerous light-brown particles (under ½ millimeter long), which seemed to be ground cinnamon bark. The powder burns with a blue flame, emitting pungent fumes (which constitute the real antiseptic agent), and leaving black crusts, which also can be consumed by the aid of sufficient heat. It repels moisture, and is not readily wetted.

This substance consists essentially of sulphur and carbon. The percentage of the former constituent was estimated by oxidation with nitric acid and potassium chlorate, evaporation with hydrochloric acid, and precipitation with barium chloride. The fixed carbon was estimated approximately by coking in a porcelain boat, within a closed tube, and deducting the ash and the traces of sulphur which remained in the boat. Actual combustion of the carbon was thus prevented, as the air was quickly driven out by sulphur vapor; but there may have been a small loss of carbon as sulphide. Traces of bituminous matter appeared to be driven out with the sulphur, making black stains on the walls of the tube. The moisture was estimated by heating at 100° Centigrade to constant weight.

Qualitative tests for other volatile inorganic bodies, as ammonium salts, iodine, and mercury, gave negative results.

The general results of the analysis are tabulated as follows:

Moisture (including any volatile oil),	.26	per cent.
Sulphur,	93.67	"
Fixed carbon,	4.63	"
Loss, and carbonaceous matter expelled at a red heat,	1.35	"
Ash,	.09	"
Total,	100.00	"

In an attempt to separate the carbon and sulphur by dissolving the latter in carbonic sulphide, only 66.80 per cent. of the substance was removed, while at least 80.0 per cent. of the residue was found to be sulphur. It is not likely that so large an amount of the "insoluble modification" of sulphur is present, but that it is mechanically protected by the carbon. This view is also supported by the microscopical examination.

Under a magnifying power of fifty diameters, and with reflected light, the powder is clearly seen to have the form of botryoidal clusters, of an iron-gray color. The spheroids are of nearly uniform size, closely resembling flowers of sulphur, except in color. A few patches that have escaped the general blackening, are of a beautiful yellow; and here the resemblance is complete. Any one who will examine the "ozone" powder and flowers of sulphur side by side, under a suitable low-power microscope, will find the appearance very characteristic. When the powder is crushed it becomes much lighter, as the spherules are broken and the pale color within is revealed. The carbon, then, is not simply mingled with the sulphur, but is made to adhere to its surface. With a magnifying power of 220 diameters, in bright sunlight, minute black particles are seen upon the yellow background. Lampblack is very finely divided carbon, and this is probably the most available form of carbon with which to disguise the sulphur. It thus appears that the "ozone," as sold, consists essentially of about nineteen parts of flowers of sulphur mixed with one part of lampblack, and scented with ground cinnamon or something closely resembling it.

A sample of distilled water which had been subjected to the Prentiss process was found to be perfectly clear and colorless, with a very distinct smell of sulphurous acid. It had a mildly acid taste, with distinct acid and bleaching reaction on litmus; it reduced potassium permanganate and potassium bichromate, destroyed the blue color of iodide of starch, liberated iodine from potassium iodate, gave a blue precipitate when added to a mixture of potassium ferricyanide and ferric chloride, and yielded sulphuretted hydrogen by the action of zinc and dilute acid. These reactions confirm the presence of sulphurous acid, an active reducing agent, and most conclusively exclude the presence of ozone. A volumetric estimation with potassium permanganate showed the presence of about one-half volume of sulphurous anhydride to one volume of the solution.

Having thus shown that sulphurous anhydride is the chief constituent of the antiseptic gas used in the process described, we may consider three practical questions bearing upon its value:

1st. Are its claims as an antiseptic to be trusted?

2d. Are the foods preserved in a normal condition, with their proper odor and flavor?

3d. Is this preparation superior to pure sulphur, or to a cheap mixture of the substances of which it seems to be prepared?

A complete answer to the first question would require a series of varied experiments, extending, at least, over some months; while the conditions must be under the control of the experimenter during the whole time. Such experiments I have not made. The testimony of interested parties who use sulphurous anhydride, and distinctly advertise that it "is simply and purely ozone," must be received with all the caution required in such cases, by the ordinary rules of evidence. The antiseptic properties of sulphurous anhydride, however, are well known. Hundreds or thousands of test packages of the Prentiss preparation are sent out daily, and thus the process is subjected to practical tests by numerous consumers. If the claims made are too sweeping, they may still contain a large share of truth. It must be admitted, however, that the antiseptic action of sulphurous acid (like its bleaching action) is said to be more transient than that of some other chemicals. A series of experiments, in which which chlorine, nitric oxide, and other oxidizing agents are compared with sulphurous acid in the permanence of their antiseptic action, may lead to interesting results.

I may add that dilute solutions of tartaric and gallic acids were prepared, one portion of each being subjected to the Prentiss process; these remained quite clear for two months, while flocks of organic growth were observed after a few days in the portions that had not been so treated.

But the mere absence of fermentation and decay is not sufficient to ensure the preservation of articles in their normal conditions. A mummy resists decay for thousands of years. Even in packing-houses, where eggs are kept near the freezing point, they suffer gradual evaporation—the air bubble enlarges at the expense of the fluid contents; and if an egg which can resist decay is kept during the heat of summer, it may require close watching to prevent it from drying up and becoming unsalable. I would recommend, for summer storage, that one or more lots be carefully weighed from week to week, in order that the owner may detect any marked diminution of weight in time to save himself from serious loss. The same principle applies to meat. The shipper or dealer must not merely guard against actual shrinkage in the weight of his stock, but rather he must watch whether it becomes hard, dry, and insipid, losing its juicy freshness. The danger is still greater with some kinds of fruits and vegetables; and if these are kept under water (or solution of sulphurous acid), some of the soluble constituents, to which the delicate flavor is due, must inevitably be removed by diffusion. A single rain will materially alter the chemical composition of a crop of hay. How, then, can we hope for the delicate flavor of a tomato, or green corn, after a month's soaking? While the claims of perfect odor and flavor are evidently quite too sweeping, yet such considerations may possibly lead us to overestimate these inconveniences. The demands of the great public do not recognize that there are pears of more delicate flavor than the Bartlett, or that green corn when first gathered is far superior to that usually sold in market. While all existing modes of preserving foods from one season to another are more or less inconvenient, or imperfect, the Prentiss method also must be subjected to the test of experience, and abide by the verdict of a discriminating or indiscriminating public, as the case may be.

If sulphurous acid or the Prentiss preserver proves to be of any value, the thanks of the public may be due to the Prentiss Company for the part they have taken in making the antiseptic properties of this substance more widely known. But men of practical business tact will doubtless attempt an improvement on the Prentiss formula, by further experiments with the combustion of sulphur. It is desirable so to regulate the heat generated in the combustion, that the vaporization of unburnt sulphur shall be avoided, and that the contents of the chamber shall not be scorched. The thin coating of carbon, which is spread over the surface of the more inflammable sulphur, may contribute to this end; but that will be readily imitated, if it is found needful to do so.

In conclusion, First, the antiseptic gas stated to be ozone is chiefly sulphur dioxide, the exact value of which still remains to be proved. Second, this is not the only antiseptic. Third, the use of sulphurous acid as an antiseptic is not new. Fourth, sulphur becomes extremely expensive when purchased under the name of ozone at $1.00 to $2.00 per pound.