

paring it with the average of five of the leading foreign botanical journals it appears that during the past two years the *Gazette* has been giving 945 pages to their 648, 45 plates to their 12; and 182 text figures to their 122, while the average subscription price of the foreign journals is thirty per cent. higher. Accordingly after consulting with many botanists as to what changes should be made to equalize the *Gazette* with other journals of its rank, the editors announce that since "the pressure for publication is increasing rather than diminishing" they will maintain the 80-page size for each number, however gaining additional space by "a more rigid selection of original papers, a greater compression of these papers in text and illustrations, a franker expression of opinion in reviews, and the abandonment of the department of 'News.'" With these changes the publishers advance the subscription price to seven dollars per year, a step which is amply justified by the fact that the *Gazette* will still cost far less per page and plate than any of the foreign journals of its rank. Botanists everywhere will be glad to know of the growth and development of this American journal, and will wish it the continued success which it has earned so well.

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SPECIAL ARTICLES

AN EXAMINATION OF THE THEOREM OF ALLEN HAZEN THAT FOR EVERY DEATH FROM TYPHOID FEVER AVOIDED BY THE PURIFICATION OF PUBLIC WATER SUPPLIES TWO OR THREE DEATHS ARE AVOIDED FROM OTHER CAUSES¹

IF Hazen's theorem is true, the purification of polluted water supplies has sanitary and economic consequences much more far reaching than has hitherto been supposed. If, for example, in the city of Pittsburg, purification of the public water supplies by the new municipal filters should, as may reasonably be expected, effect a saving of at least one hundred deaths a year from typhoid fever and, according to the theorem, in addition two or

¹ Preliminary communication.

three hundred deaths from other causes, such saving of human life means also the avoidance of a present economic waste of two millions of dollars annually instead of half a million from typhoid fever alone.

Hazen's theorem rests upon the discovery by Hiram F. Mills and others that in several cities purification of the public water supply has been immediately followed by a marked decline in the total death rate, such decline being far greater than that which would have been effected by the decline in typhoid fever mortality alone. It appears to have been first definitely formulated and published by Mr. Hazen in a paper on "The Purification of Water in America," presented to the International Engineering Congress at St. Louis, in 1904. The theorem has not hitherto attracted the attention or consideration which it deserves, and we have therefore critically examined the evidence upon which it rests and, having found the theorem not only correct but conservative, have gone further and undertaken to discover precisely what are those "other causes" of death in which the extraordinary decline referred to takes place.

For these purposes we have made an elaborate statistical study of the influence of the purification of polluted public water supplies in Lowell and Lawrence, Mass., upon the total death rates of those cities, and also upon their death rates from various diseases; comparing the data for each city with those of the other, and of both with similar data for Manchester, N. H., a city of the same class which from various points of view, such as location and population, is remarkably well adapted to serve as a norm. As a result of our studies we have found that the theorem is true not only for the cities mentioned, but also for certain other cities, including Hamburg, Germany, when this city substituted a pure for a polluted water supply in 1893. We find, furthermore, that the decline in total mortality is accounted for to a large extent by the diminished number of typhoid fever deaths, but to a much greater extent by a decline in deaths from other causes; that about eighty per cent. of the decline in general mortality

can be readily accounted for; and that among the "other causes" from which the death rates are diminished *pulmonary tuberculosis*, *pneumonia* and *infant mortality* are prominent.

Finally, we have raised the questions, To what is this remarkable result of the substitution of pure for polluted water due? Is the marked decline in the total death-rate attributable simply to cessation of infection; or is it due to some enhancement of vital resistance; or is it due to the cooperation of these factors? In other words, must pulmonary tuberculosis, pneumonia, infant mortality, etc., be added to the list of water-borne diseases, or does the use of impure water depress the vital resistance of the human organism?

The complete paper, containing a discussion of these and similar questions, numerous statistical tables, diagrams, etc., will be published in the near future.

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THE THIRTY-EIGHTH GENERAL MEETING
OF THE AMERICAN CHEMICAL
SOCIETY—II.

BIOLOGICAL AND SANITARY CHEMISTRY
THOMAS B. OSBORNE, *Chairman*

The Effect of Pasteurization upon the Development of Ammonia in Milk: W. G. WHITMAN and H. C. SHERMAN.

The purpose of this investigation was to follow by accurate quantitative determination the development of ammonia in raw and pasteurized milk as a possible measure of protein decomposition. The ammonia content of raw milk kept at 15° to 20° C. usually increased rather rapidly for two days, more slowly during the third and fourth days, and then decreased somewhat for a few days following, increasing again later if the observations were sufficiently prolonged. A similar slight decrease of ammonia toward the end of the first week was sometimes, but not usually, observed in milk pasteurized at 65°; never in milk pasteurized at 85°, which always showed a continuous increase in ammonia content. In milk obtained under ordinary market conditions in New York City and thereafter kept at 15–20°, pasteurization was usually less efficient in check-

ing the development of ammonia than in checking the production of acid, and this was especially true of the milk pasteurized at the higher temperature (85°) which often developed a relatively large amount of ammonia before becoming sour.

Chemical Evidence of Peptonization in Raw and Pasteurized Milk: RACHEL H. COLWELL and H. C. SHERMAN.

An attempt was made to judge roughly of the extent of peptonization from the intensity of the biuret reaction after the removal of coagulable proteins and proteoses. The results indicate that pasteurization at 60° for twenty minutes restrained peptonization to about the same extent that it restrained souring, and had no marked influence upon the development of offensive odors. Pasteurization at higher temperatures (75° and 90°) delayed souring to a much greater extent, had less restraining effect upon peptonization and resulted in the subsequent development of much more offensive odors.

Investigations of Wheat Oil: JOSEPH S. CHAMBERLAIN and GEO. L. BIDWELL.

The authors determined the physical properties, the iodine absorption, saponification value and refractive index of the crude fats extracted by ether from wheat germ and from wheat flour. The crude fats were then purified by treatment with acetone. The soluble portions consisting in each case of pure liquid oil were studied in the same way. The results show that the purified oils obtained from wheat germ and wheat flour are much more alike than the crude fats. They think it possible that the usual statement, that these two oils are distinctly different, may not be true and expect to study the question further.

Plant Food removed from Growing Plants by Rain or Dew: J. A. LE CLERC and J. F. BREAZEALE.

Wheat, barley and other plants were grown in pots in a greenhouse and not subjected to weathering conditions. It was demonstrated that the gradual decrease in the total salt content of these crops from the milk stage until final harvest is not due to a physiological process, as was formerly supposed by many investigators, but to a purely mechanical one. The salts do not recede from the plants to the soil through the stems, but are dissolved and leached out by rain or dew.

Analytical data were also cited to show that the same process takes place in potato, rice and oat plants and also in the leaves of trees.