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J. A. Dodge

the "raison d' etre" of the state board of health. But, underlying all, is the sanitary duty of individual and family, which in the long run, determines that of the community, and the character of its performance. To go into the details of the whys and hows of the duty of the individual and family, though of the utmost importance, is desirable, but impossible now. It would take a course of lectures, illustrated from large experience, and with the aid of the microscope, test tube, lantern and diagrams. It is not needed to clinch my argument of to-night. Appealing to the experience of all who hear me, and in the light of what has been said, I claim it to be proved that the duty of the citizen, as an individual, or as head of a family, is: 1st. To recognize his duty as a health officer, to learn it, and to do it. 2d. That this will compel him to learn his duty, as a citizen, to the local board of health and to the state board. He will take a business interest in their personnel, work, and efficiency, which they need. I think of nothing more, available here, to strengthen my appeal, in the name of the sanitary forces of the whole population. Come up to the duty, every one, and do your share of the work of public health which is to prolong the life and increase the efficiency and happiness of every man, woman and child of our commonwealth.

December 4, 1888.

[*Paper DD.*]

ANALYSES OF WATER USED IN A BOILER EMPLOYED FOR HEATING A PUBLIC BUILDING IN ST. PETER, MINN.—*J. A. Dodge.*

Two samples of water were sent, one being a sample of the water as supplied to the boiler, the other a sample of water run off from the boiler (circumstances not stated).

1. Analysis of the mineral matter found in the water as supplied to the boiler:

Sulphate of lime, $CaSO_4+2H_2O$,	247.2	parts per million.
Carbonate of lime, $CaCO_3$,	251.0	" " "
Carbonate of magnesia, $MgCO_3$,	135.3	" " "
Sulphate of magnesia, $MgSO_4$,	27.6	" " "
Sulphate of soda, Na_2SO_4,	185.0	" " "
Chloride of sodium, NaCl,	38.0	" " "
Undetermined, - -	11.0	" " "
	895.1	

2. Analysis of the mineral matter found in the water run off from the boiler:

Sulphate of lime, $CaSO_4+2H_2O$,	1677.8	parts per million.
Carbonate of lime, $CaCO_3$,	traces.	
Carbonate of magnesia, $MgCO_3$,	traces.	
Sulphate of magnesia, $MgSO_4$,	275.7	" " "
Sulphate of soda, Na_2SO_4,	1850.0	" " "
Chloride of sodium, NaCl,	386.0	" " "
Undetermined, - -	20.0	" " "
	4209.5	

COMMENTS ON THE RESULTS OF FOREGOING ANALYSES.

(1). The amount of mineral matter as a whole was greatly increased by the boiler. Often the reverse of this is observed.

(2). The increase is seen to be due chiefly to the presence of *sulphates*. The sulphate of soda and the sulphate of magnesia being very soluble salts of course remain in the water and produce a *concentrated solution*. In this case the same is seen to be true to a great extent with the sulphate of lime.

(3). Some matters were removed by the boiling process, by precipitation, namely the carbonates of lime and magnesia. If these alone had been present, the second sample of water would have been quite soft.

(4). A saturated solution of sulphate of lime contains about 3,000 parts of $CaSO_4+2H_2O$ to one million of water, at temperatures from 60° to 212° Fahr. Above the boiling point less sulphate of lime remains dissolved. Hence the water in the boiler may have been a saturated solution of sulphate of lime, though found to be less than saturated when run off and cooled (disregarding the effects of other salts on the solubility of this).

NOTE.—Specimens of the dry residues from equal volumes of the two samples of water, in porcelain evaporating dishes, were shown. They exhibited a marked difference in appearance. From the second sample there was a large residue with abundant crystals of sulphate of lime and some of sodium chloride; from the first sample there was a comparatively small residue, with very few crystals noticed.

April 2, 1889.