Goessmann (C. A.)

REPORT

ON THE

Brines of Onondaga,

BY

C. A. GOESSMANN, Dr. Ph.

MADE TO

The Salt Company of Onondaga.

DECEMBER, 1862.

REPORT

OF

C. A. GOESSMANN, Dr. Ph.

J. W. BARKER, ESQ.,

SECRETARY OF THE SALT COMPANY OF ONONDAGA:

Dear Sir:

I received from you in writing on the 13th of May, 1862, the following resolution of the Board of Trustees of the SALT COMPANY OF ONONDAGA, with the remark, that I was designated to carry out its object:

Resolution—The Company shall employ a competent person not interested in the making of Salt, whose duty it shall be as often as once in each week to ascertain the strength of the brine furnished by the Superintendent, to the Blocks in the different Districts, and to cause the same to be analyzed, and to make return of the same under oath, at such times as the Board shall direct.

C. FRANCHOT, REC. SEC.

During the past seven months I have endeavored to comply with the direction of this order, and allow me to submit the following results of my investigations, etc. To secure reliable facts I collected the brines from the main tanks, at the Pump-houses in the different Districts, on different days, and at different hours, in successive weeks, applying the surest, and most approved methods, for ascertaining correctly their relative percentage of saline matter, as well as their respective chemical composition.

In corresponding cases the same methods have been used, and the numbers in the analytical statements reported, are, in every case, the average results of at least two carefully repeated analyses of brines collected at the same time.

The enclosed pages treat the matter in the following order :

No. I. Contains the average percentage of saline matter in the different brines for each month during the past season.

No. II. Contains the percentage of saline matter, averaged for the whole past season.

No. III. Contains the chemical composition of the brines from the different Districts.

No. IV. Contains the transferring of the analytical results into proportions used in practice,

No. V. Contains some inferences drawn from the analytical results, concluding with some suggestions, on my part, in regard to the relative value of the different brines in question.

Presenting the whole matter to your consideration, I have the honor to remain your most obedient servant.

C. A. GOESSMANN.

Syracuse, 3rd of December, 1862.

I.

Average Strength of the Brine during the following successive months:

1862.	MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.	OCTOBER.	NOVEMBER.
SYRACUSE,	16.789	16.460	16.169	16.027	16.052	16.178	16.111
GEDDES,	16.684	16.309	16.125	16.057	15.895	16.004	16.066
SALINA,	16.708	16.068	15.790	15.627	15.349	15.748	15.609
LIVERPOOL,	15.360	15.129	15.123	15.183	14.715	14.595	14.379
J. P. HASKIN, Esq.		15.486	15.149				

II.

Average strength of the Brine during the whole past season, 1862.

MONTHS.	SYRACUSE.	GEDDES.	SALINA.	LIVERPOOL.	J. P. HASKIN, ESQ.
MAY,.....	16.789	16.684	16.708	15.360	16.708
JUNE,.....	16.460	16.309	16.068	15.129	15.486
JULY,.....	16.169	16.125	15.790	15.123	15.149
AUGUST,.....	16.027	16.057	15.627	15.183	15.627
SEPTEMBER,.....	16.052	15.895	15.349	14.715	15.349
OCTOBER,.....	16.178	16.004	15.748	14.595	15.748
NOVEMBER,.....	16.111	16.066	15.609	14.379	15.609
Mean for the Season,.....	16.255	16.163	15.843	14.926	15.668

III.

Composition of the Brines taken at the different Pump Houses on the 5th of July, 1862.

NAMES OF THE COMPONENT PARTS.	SYRACUSE.	GEDDES.	SALINA.	LIVERPOOL.
Sulphate of Lime,.....	0.5747	0.5747	0.5873	0.5234
Chloride of Calcium,.....	0.0795	0.0795	0.0827	0.1037
Chloride of Magnesium,.....	0.1449	0.1449	0.1316	0.1336
Peroxyd of Iron,.....	0.0029	0.0012	0.0021	0.0010
Salt,.....	15.3570	15.2027	14.9443	14.1483
Saline Matter,.....	16.3570	16.0030	15.7480	14.9100
Water,.....	83.8410	83.9970	84.2520	85.0900
	100.000	100.000	100.000	100.000

N. B.—All the brines from the Onondaga Wells contain small quantities of compounds of Bromine; these compounds, are, in regard to the practical question, of no consequence, they are included in those of chlorine.

IV.

Calculations concerning the relative quantities of Salt, which result. by the evaporation of brine, from different districts.

I have based my calculations on the following analysis of COMMOM SALT which, as far as my own observation proves. represents an average of that article.

1,2550—Sulphate of Lime.
0.1550—Chloride of Calcium.
0,1369—Chloride of Magnesium.
3,0000—Moisture.
95,4531—Chloride of Sodium. (Salt.)

100,0000.

The proportions between the impurities in the brines and this quality of Salt is such. that we can safely calculate in each case, the whole quantity of saline matter in the brines. as corresponding with the actual amount of Salt, resulting by the working of the brine—for the moisture etc., retained in the common Salt—even after a usual good draining—balances sufficiently the quantity of impurities separated by the process of boiling and draining.

SYRACUSE.

The brine of this district, as proved by the above statements, consists

of 16,2550—SALINE MATTER.
and 83,7450—WATER.

Consequently. to produce 16.255 lbs. of Salt, requires the evaporation of 83,745 lbs. of water, and, in the same proportion. to produce one bushel of 56 lbs., of 288 05 lbs., or 36,06 gallons of water, of 8 lbs., each.

GEDDES.

The brine in this district, being supplied exclusively from Syracuse wells, contains consequently the same impurities, and with the exception of Peroxyde of Iron, in the same proportions. The slight differ-

ence in concentration may be ascribed to the influence of powerful suc tion-pumps upon the wooden logs used to convey the brine from the Syracuse pump-house. The average strength of the brine here, is

16,1630—Saline Matter.
83,8370—Water.

The making of one bushel of Salt requires the volatilizing of 289,99 lbs. of water, equal to 36,25 gallons.

SALINA.

The brine used in this district consists of about 3-5 brine from Syracuse, and 2-5 from its own ground, including, in the latter quantity, the brine from the recently opened, superior well, near the beach. The average concentration for the past season was found to be

15,843—Salina Matter.
84,157—Water.

To produce one bushel of Salt, 56 lbs., 297,46 lbs. of water, equal to 37,18 gallons of water, requires to be evaporated.

LIVERPOOL.

In this district, which, in addition to its own wells, is largely supplied by the above mentioned mixture of brines from Salina, the average strength for the seven months past was equal to

14,9260—Saline Matter.
85,0740—Water.

Requiring, consequently, to be evaporated, 319,18 lbs. of water, equal to 39, 899 gallons—to yield one bushel of Salt, 56 lbs.

J. P. HASKIN, Esq.

The blocks of J. P. Haskin Esq., were supplied during the month of May and a part of June from Salina ; during the latter part of June and almost the entire month of July, from his own well ; and since then up to the present, from the Salina pump-house. The average strength of the brines used in his works, is

15,6680.—Saline Matter.
84,3320.—Water.

Requiring, for the production of one bushel or 56 lbs. Salt, the evaporation of 301,41 lbs., or 37.9 gallons of water.

RESUME.

Syracuse,	—36.06 Gall.	Are required
Geddes,	—36.25 Gall.	to produce
Salina,	—37.18 Gall.	one bushel
Liverpool,	—39.899 Gall.	= 56 lbs.,
J. P. Haskin, esq.,	—37.900 Gall.	of common salt.

V.

Conclusions drawn from the analytical results—reported with some suggestions in regard to the relative value of the brines of the different Districts.

(a) The brines from the different Districts bear the striking characteristics of a common origin and source ; their composition is very much alike in consequence of being, to a large proportion, obtained from one District,—Syracuse.

(b) Their relative proportions between impurities and Salt, are almost corresponding with each other :

	Syracuse.	Geddes.	Salina.	Liverpool.
Impurities,	—0.8020	0.8003	0.8037	0.7617
Salt,	—15.2027	15.2027	14.9443	14.1483

(c) A smaller percentage of Sulphate of Lime in some cases, is balanced by a larger percentage of the Chlorids of Calcium and Magnesium, in others.

(d) The difference in percentage of Peroxyd of Iron (being altogether so small a quantity,) cannot be considered as influencing the value of the brine ; the quantity of quick lime generally used for the settling of the brine, is more than sufficient to precipitate, and thus remove, a much larger amount of that compound.

(e) The brines from all the different Districts, in the process of boiling, settle a considerable amount of Sulphate of Lime—nearly all, the same amount to a relative equal amount of Salt obtained ; they present, thus, similar difficulties to the manufacture of Salt. To prove this fact, I entered into a series of experiments, of which I relate the following results :

1. A brine from the Syracuse wells, when simply saturated, retains still in solution, 0.4422 per cent. of Sulphate of Lime.

2. In the same degree, as in the course of the usual boiling operation, the Chlorids of Calcium and Magnesium increase in the saturated brine,

remaining in the kettles, commonly called pickle, the percentage of Sulphate of Lime decreases : so for instance, a brine which contained in its original state, 0.5706, per cent. of Sulphate of Lime, being brought to saturation, contains 0.4422 per cent, and after eight days continued use of the kettles, the remaining pickle contained but 0.1211 per cent. of that compound. These facts apply, in a certain degree, alike to the brines in the different Districts ; the incrustation, consisting, by a proper management, mainly of Sulphate of Lime, with more or less Salt, would, if not for other reasons, by corresponding precaution, equally increase in the course of a few days in every District.

(f) The Onondaga brines possess, as my former remarks state, a disadvantage common with some of the most valued brines of foreign countries—they contain considerable quantities of sulphate of lime, and soon cause, in consequence of that—aided by an excessive heat—a coating in the boiling vessels (kettles); a fact which seriously interferes with a rapid evaporation. The more concentrated brines of Syracuse are almost saturated with sulphate of lime, and consequently, the least evaporation is marked by a separation of that compound. A brine thus constituted is less fitted to act as a dissolvent on the (after every boiling down) thickly incrustated kettles, than a weaker brine ; they consequently favor a more rapid increase of incrustation, and thus reduce the effect of fuel. Weaker brines act more powerfully as a solvent than the stronger brines—after every fresh filling of the kettles, they will thus, at least for a certain period in the beginning, balance the disadvantage of being necessitated to evaporate a larger quantity of such brine, for the purpose of obtaining the same amount of Salt, as from a stronger brine.

I do not venture to propose here, numbers in regard to this question ; it is unquestionably very difficult to fix proportions where the actual results will differ considerably in consequence of the influence of a more or less judicious application of fuel, and of professional skill on the part of the workman ; and more so, in a case like the one in question, where, in consideration of the above stated facts, the actual difference in the different districts, would prove to be, in reality, scarcely perceptible.

Well founded experience, which entitles alone to settle for the present, this question, is in abundance in the hands of the gentleman to whose consideration I have the honor to submit these suggestions. I beg, therefore, leave to conclude.

CH. A. GOESSMANN.

Syracuse, ~~February~~ December 3, 1862.