

A silver bath of from 35 grs. to 40 grs. is recommended for these collodions. For hot summer weather he gives the following:—

Alcohol at 52°	400
Ether at 62°	600
Pyroxyline	8
Iodide of ammonium	5
Iodide of cadmium ...	3
Bromide of ammonium	0.5
Bromide of cadmium	0.2
Iodine	0.3

With this a 30-grain bath is recommended.

Protosulphate of iron, 20 grains to the ounce, with 20 minims of acetic acid, or pyrogallie acid 4 grains, and 4 minims of acetic acid, may be used for development. Flat negatives he strengthens with the following solution,—

Water	2 oz.
Bichloride of mercury	3 grs.
Hydrochloric acid	6 "
Chloride of gold	1 "

—*The Photographic Journal.*

Selected Articles.

THE MICHIGAN SALT WORKS.*

The existence of salt springs in the lower peninsula of Michigan has been known from the time of its earliest settlement, and when in 1836 the State was admitted into the Union, the privilege was granted her of selecting 72 sections of salt spring lands. In the following year she organized a geological survey, principally for the purpose of ascertaining the number and distribution of the salt springs in the State. This survey led to erroneous conclusions, and the borings for salt which followed these conclusions were unsuccessful.

In 1859 a second survey was commenced and this led to the discovery and announcement, for the first time, that below the carboniferous limestone of Michigan occurs a series, 180 feet thick, of argillaceous shales, clays, magnesian limestones, and beds of gypsum; and that here is truly the origin of the brine. The strike of the outcropping edges of these strata describes an irregular circle, inclosing all the central portion of the State. The Michigan salt group of rocks underlies 17,000 square miles, in the form of a vast reservoir, constituting the most magnificent saliferous basin on the continent. The edges are sufficiently elevated to prevent the efflux of water which finds its way into it, and hence the saline particles have never been washed away. Beneath this series of shales is a porous sandstone—the Napoleon sandstone—which, within the circumference of the basin, becomes saturated with brine from above. From the nature of the case, it is evident that the strongest brine must accumulate in the deepest part of the basin.

Under this more intelligent guidance new borings were commenced and a well at East Saginaw reached the solid rock at the depth of 92 feet, and after passing through the coal measures, with their terminal and initial sandstones, pierced the carboniferous limestone, and found the Michigan salt group of strata 169 feet thick and eminently saliferous. In the Napoleon sandstone beneath, 109 feet thick, the

reservoir of the brine was struck, and a supply, abundant in quantity, and of 90° strength, was obtained at almost exactly the point which geology had predicted. This well was 669 feet deep, terminating near the middle of the sandstone. Another was subsequently bored, 806 feet deep, extending through the sandstone and penetrating the underlying shales 64 feet.

This decided success was attained early in 1860. By July of that year a "block" had been erected and boiling commenced. Before the close of the year 4,000 barrels of salt had been manufactured, and no less than four other companies had commenced boring at different points along the river.

The following analyses will exhibit the strength and purity of Saginaw brines in comparison with those of other salt-producing regions:—

	Saginaw City. 1-180	East Saginaw. 1-170	Bay City. 1-163	Syracuse N. Y. 1-142	Kanawha, Va. 1-073
Specific gravity					
Chloride of Sodium	19.246	17.912	19.692	17.690	7.300
Chloride of Calcium	2.395	2.142	0.742	0.156	1.526
Chloride of Magnesium	1.804	1.522	0.432	0.119	0.374
Sulphate of Lime	0.534	0.116	0.165	0.673	—
Sulphate of Soda	—	—	0.116	—	—
Compounds of Iron	0.064	0.105	—	0.002	—
Other constituents	0.127	0.220	0.013	—	—

Total solid matter in 100 parts	24.170	22.017	21.140	18.540	9.209
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As pure saturated brine has a specific gravity of 1.205, and contains 25.7 per cent of saline matter, it appears that the Saginaw brines approximate remarkably near to saturation.

The following table exhibits further comparisons:

Localities.	Weight of one gall. of brine.	Solid matter in one gall.	Pure salt in one gall.	Galls. re- quired for 1 bus. salt.
Saginaw City, lbs.	9.858	2.38	1.90	29
East Saginaw	9.775	2.15	1.75	32
Bay City	9.716	1.95	1.82	31
Syracuse	9.541	1.76	1.68	33
Kanawha	9.404	0.94	0.75	75

An intelligent writer in *Hunt's Merchants' Magazine* for September, to whom we are indebted for these interesting facts, states:—

It is now but two years since the first salt was manufactured in Saginaw valley; yet it is estimated that in this time the value of real estate has increased to the extent of three and a half millions of dollars in the counties of Bay and Saginaw. At Carrollton, grounds suitable for salt lots, which, two years ago were bought at \$20 an acre, are now held at \$300 and \$400 per acre. At Saginaw city, salt lands have risen from \$30 to \$200 and \$300 an acre. Wood lands, from one to eight miles west and north of Saginaw city, which, as late as 1861, sold for \$15 and \$20 per acre, are now selling for \$40 and \$45 per acre. At Bay city, the increased valuation has been similar. And this is but the first impression of the creation of this new branch of industry in what is generally regarded as a Michigan wilderness.

He also gives the following account of the processes of boring the wells and manufacturing the salt:—

In the boring of the wells of the Saginaw valley, steam power is always used, and the tools and details of the process are similar to those employed in Ohio and Virginia. The boring is generally done by contract. The price per foot two years ago was \$3; at the present time it is \$2, and I see no reason why the price should not be reduced to \$1 50

* *Scientific American.*