

REPORT

S. E. Flinders 12

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on  
UNDERGROUND WATER AT THE BUTTER FACTORY,  
WHITE MARK, FLINDERS ISLAND.

The butter factory at White Mark is using underground water from a shallow well sunk about three chains from the factory.

It is located on what is locally termed a clay ridge, but which is not actually a ridge as it rises at the most only a few feet above the adjacent country. It is probably so-called because the surrounding country is occupied by more sandy and gravelly deposits.

The latter are probably of recent origin and of very small thickness while the clay ridge is formed of Pleistocene deposits upon the eroded surface of which the recent ones rest.

The well was 8 feet deep and after passing through soil sub-soil and sand for a depth of  $5\frac{1}{2}$  feet, entered one foot of clay and 18 inches of a calcareous grit which yielded water. The latter grit represents an impure type of the thinly bedded limestone so prominent on the island.

The well is bricked in the upper portion and has a concrete cover. It is noted that as the water is lowered by pumping, a red coating is visible on the brickwork. The water has a bright metallic film floating on its surface.

About 3,000 gallons per day are used in the factory and this amount, though it lowers the water-level, does not represent the maximum yield obtainable from the well.

The water is pumped from the well by a double acting vertical pump situated in the factory and having a suction pipe (iron) some three chains in length. The water was originally pumped into an overhead tank and then distributed for use in the boiler, condensers, pasteurizing plant, for washing the butter etc. It was stated the water had a disagreeable smell at times which was of course objectionable in such a process as butter making. It was also found that scale formed in the boiler. Two improvements were made consisting of

- (1). A large concrete tank to catch the rain water from the factory roof.
- (2). A large concrete filter (with settling and storage divisions) with sand beds to filter portion of the well water.

The present arrangements are that

- (1). The unfiltered well water is used in the engine and condensers.
- (2). A mixture of the rain water and well water is used in the boiler for pasteurizing and scale is not formed.
- (3). The filtered water is used to wash the butter.

It is claimed that the filtering succeeded in removing the objectionable smells. It was also stated that the smell was not noticeable in the well but only after it had been pumped.

The smell may have been due to

- (1). Organic matter. In this case the filtering would probably remove the organic matter and the smell.
- (2). Hydrogen sulphide. This gas is present in all the underground waters on Flinders Island that have been investigated by the writer and the smell at the factory was most likely due to this gas. The actual filtering should not however, have removed this gas except in so far as the extra passing of the water from tank to tank would permit of the escape of the gas into the atmosphere. The fact that the smell was not noticed in the well may not have any significance as it may have been overlooked. If it has any significance it would suggest that the passage through the metal pipes, tanks etc. helped to generate, or make more noticeable the smell, of the hydrogen sulphide. However, it would appear from the attached analyses of the water from the well, before filtering, and other filtering, that there is more hydrogen sulphide in the water in the well than in the water near the filter. This is readily understandable when it is considered that every time the water is exposed to the air in its passage into a tank the gas has a chance of passing out of solution.

Thus it would appear that if the smell was due to hydrogen sulphide, the observations made do not agree with the results as shown by the analyses. The only alternative is that the smell is due to other causes than the hydrogen sulphide, but this is not very likely.

The analyses of the three samples show slight differences which are understandable when it is remembered

- (1). That the samples may have differed slightly due to the positions from which they were taken.
- (2). Differences in figures expressed as parts per million are naturally very small and often within the limits of a accuracy of analytical methods.
- (3). The water is subject to evaporation at many points after it leaves the well. This would explain the general increases in the total solids and other constituents, excepting the hydrogen sulphide.

The main constituents present as dissolved mineral substances are sodium, calcium and magnesium in the form of chlorides, carbonates and sulphates. The chief salts which they represent are sodium chloride (common salt), magnesium sulphate (epsom salt) and calcium carbonate or bicarbonate.

The water has not been suitable for the butter factory purposes in two ways

- (1). It yielded a scale in the boiler. This has been overcome by mixing the water with rain water. It could also have been overcome by the installation of a water softening plant. This would have removed the calcium and magnesium carbonates by precipitation.
- (2). The objectionable smell was probably due to hydrogen sulphide and it is stated that the filtering plant has removed this smell. This would probably not be due to the actual filtering, but to the increased opportunities for the gas to pass into the atmosphere when passing from tank to tank and through the filtering plant. A system of cascading would probably have achieved the same result. In using a water with hydrogen sulphide it is advisable as far as possible to use concrete in place of metals in tanks, pipes etc. When using metal such as tanks they should be coated with tar or other mineral to prevent contact with the water. Further cascading should be resorted to as soon as possible after the water has been pumped from the well.

P.B. Nye (signed)  
GOVERNMENT GEOLOGIST.

Es Department,  
ROBERT.

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ANALYSES OF WATER FROM BUTTER FACTORY

(Results expressed in parts per million of radicles)

|                   | From the<br>Well. | Before<br>Filtering. | After<br>Filtering. |
|-------------------|-------------------|----------------------|---------------------|
| Total Solids      | 1316.0            | 1362.4               | 1388.0              |
| Silica            | 16.0              | 20.0                 | 16.0                |
| Iron              | 0.6               | 0.2                  | 0.2                 |
| Aluminium         | 1.7               | 1.1                  | 1.1                 |
| Calcium           | 100.0             | 114.4                | 110.0               |
| Magnesium         | 36.0              | 37.6                 | 38.4                |
| Sodium            | 343.2             | 342.9                | 360.0               |
| Chloride          | 394.1             | 400.8                | 407.8               |
| Sulphate          | 111.1             | 111.1                | 111.1               |
| Carbonate         | 288.8             | 302.4                | 314.8               |
| Volatile Solids   | 18.0              | 30.4                 | 27.2                |
| Hydrogen Sulphide | 16.84             | 5.61                 | 5.61                |