

# MARITIME MINING RECORD

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## SELECTED QUESTIONS AND ANSWERS.

### Engineering.

Q.—Name some of the chief impurities in boiler feed water. What difficulties or dangers arise from using impure water, and what precautions would you adopt where you were compelled to use it?

A.—The following are the chief impurities in feed water for boilers, viz:

- 1.—Carbonate of Lime.
- 2.—Sulphate of Lime.
- 3.—Carbonate of Magnesia.
- 4.—Phosphate of Lime.
- 5.—Oxide of Iron.
- 6.—Silica.

The chief difficulty or danger arising from impure water entering the boiler is the formation of scale, which is very dangerous and which considerably lessens the efficiency of the boiler. The carbonates give us temporary hardness, and can be removed by boiling, which drives off the carbonic acid and causes the carbonate of lime or magnesia to be precipitated. Permanent hardness is due to the presence of sulphates. Ordinary boiling at atmospheric pressure does not precipitate these, but they are precipitated at a temperature of 300 degrees Fah. This is often exceeded in ordinary boilers, and then the sulphate are precipitated as well as the carbonates. Some well-known waters contain as much as 30 degrees of hardness, which means that about 1 1/4 cwt. of scale would be deposited per week, assuming the boiler consuming 25 tons of coal, and evaporating 8 lb. of water per lb. of coal.

As I have said, this scale forming is extremely dangerous, as overheating of the plates is liable to occur, which would eventually end in an explosion; also corrosion is liable to take place, in the form of pitting and grooving of the boiler shell.

In accordance with the most up-to-date practice, water should be properly purified before being fed into the boiler, but if this cannot be done the formation of hard scale may be somewhat prevented by the use of a boiler composition. This has not, however, the effect of eliminating the incrustation forming salts, but merely changes their character, and prevents their deposition as a hard scale. To use a boiler composition safely without running any undue risks is to have it prepared by a competent chemist, after he has made a thorough analysis

of the feed water, as there are many compositions on the market at the present time, which are absolutely injurious to the iron or steel which the boiler shell is made of.

Oak, hemlock, and other barks and woods are effective as a preventive of scale forming in waters containing carbonates of lime or magnesia. Milk of lime and metallic zinc have been used with success in waters charged with bicarbonate of lime, reducing the bicarbonate to the insoluble carbonate.

Soda ash is useful in waters containing sulphate of lime by converting it into a carbonate, and so forming a soft scale and easily removable.

Petroleum has also much been used. It acts best in waters containing sulphate of lime.

By far the most satisfactory method, however, is to take out the incrustation salts, and whitest by chemical treatment and subsequent filtration this can be successfully done on a large scale, probably on a small scale, or with single boilers the least troublesome, cheapest, and most effective method of preventing sulphate and carbonate of lime entering a boiler is by heating the water to the temperature of the steam. We all know that if water is heated up to upwards of 320 degrees Fah. the carbonate of lime and magnesia and the sulphate of lime become insoluble and are thus deposited, the carbonates almost instantaneously, and the sulphates more slowly.

There are two very good processes now being used, the 'Archbutt Deeley Process,' and the 'Desrumaux Process.' In the Archbutt Deeley Process, the purification is effected in open tanks. Its principal feature is the ingenious way in which the impurities in the water are themselves during the operation made to act as a filtering medium, and rapidly accelerate the process of precipitation.

The Desrumaux Process is a continuous one, the precipitation being effected in a closed vessel, through which the water flows in a spiral channel of conical form, and from the surfaces in which any deposit can be quickly and effectively removed.

### Geology.

Q.—What are the principal divisions in the Carboniferous system, and in which is coal found?

A.—The great rock system which is known to the geologist and student as the carboniferous formation lies seventh upward in the classified system, and derives its name from the fact that in this formation are about nine-tenths of the seams of that