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MADRAS RECORD OFFICE

GOVERNMENT OF MADRAS

Rev. DEPARTMENT

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Dated	15th January	1874 ~~196~~

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61/1

Proceedings of the Madras Government, Revenue Department, 15th January 1874.

Read the following :—

No. 116. Proceedings of the Board of Revenue, dated 5th April 1873, No. 534.

Read Report,* dated 25th November 1872, by Dr. Ratton on the Manufacture of Salt in the Madras Presidency.

In this report, Dr. Ratton, who was appointed to investigate the salt manufacture in this Presidency in G. O., 30th January 1872, No. 191, submits the results of his examination of the factories in the six northern districts on the Eastern Coast. The report contains much valuable matter, and practical observations which will be of great use to those charged with the supervision of the manufacture. The Board will briefly summarize Dr. Ratton's principal results of a general character.

2. Common salt or chloride of sodium is ordinarily held in solution in sea-water to the extent of 2·7 per cent., and, with the exception of sulphate of lime, is the least soluble of the contained salts. The sea-water must be reduced in bulk nine-tenths by evaporation before any of the salt is precipitated. This point corresponds with 25° of Beaumè's hydrometer, and before it is reached the whole of the sulphate of lime has been deposited. As the condensation of the brine advances from 25° to 32°, the salt is deposited pure to the extent of 92 per cent. of the whole contained; and after 35° are reached the brine has yielded the whole [illegible] Epsom salts are precipitated, and if the evaporation is continued to dryness, other salts which act powerfully on the skin are obtained in addition. The most important practical lesson, therefore, is that in no case should the brine be allowed to concentrate beyond 32°, at which point, as above stated, nine-tenths of the salt has been extracted. A large number of Beaumè's hydrometers has been received and will be distributed for use in each salt division. The Superintendents should be instructed to see that the brine in the pans is run off after it reaches 32° of density. They should explain to the ryots that above that point it contains chiefly noxious constituents, and that its further evaporation or admixture with fresh brine merely tends to spoil the pans and injure the quality of future crops.

3. In paragraphs 50 to 90, Dr. Ratton deals with the question of crystallization. He shows that the size of the crystals depends upon the rate of evaporation, and states that he has found in practice that if this be regulated so that the brine shall take about seven days in passing from 25° to 32° B., good crystals will be produced. The excellence of the salt as an article of consumption in no way depends on the size of the crystal, and it is now stated that the Lambadies who have to carry the salt long distances prefer small salt which packs better than that of large size. The revenue, as stated by Dr. Ratton, is not at present concerned; but in consequence of the vigour with which large salt is demanded, it "threatens to become a question whether it will not be necessary for the revenue to assist the manufacture in the production '(of large salt)' by increasing the Kudivaram."

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* Separately printed.

The sole reason why the large crystal is preferred is that the merchants who buy by weight, sell by measure. In these circumstances, the Board entirely concur with Dr. Ratton in his opinion that too much importance is now attached to the production of large salt. It is stated in paragraph 77, that in the divisions examined by him, no less than 1,20,000 Maunds or 1,000 Garce are annually destroyed on this account, and this represents a heavy loss to the salt manufacturers. The Board direct that in future salt which is of good quality as regards purity shall not be condemned solely on the ground of the small size of the crystals.

4. The ascertainment of the rate of evaporation under different conditions is, of course, a matter of supreme importance. Three days to the inch of depth is said to be the mean; but this seems a loose way of stating it, inasmuch as, owing to the retardation as the brine becomes concentrated, the second inch will necessarily take much longer than the first. As Dr. Ratton says, "there can be little doubt that a well-kept meteorological chart in connection with the works would in a short time lead to the establishment of rules very profitable to the manufacturer." He is requested to favour the Board with suggestions for initiating a system of record of this kind, and meantime it is probable that, in a rough way, much valuable information may be obtained even during the current season. The Deputy Collectors should themselves make, and should instruct the most intelligent of their Superintendents to make, experiments with this view. Small beds should be carefully prepared so as to guard against leakage, and the points noted in the margin observed. The results should be reported at the end of the season.

1. Date of commencing experiment.
2. Area of the bed.
3. Initial depth of brine.
4. Its density at admission.
5. Direction of wind.
6. Its force, described generally.
7. Depth of the brine.
8. Its density.
9. General character of the weather.

(6–9: To be observed and recorded daily as the evaporation proceeds.)

5. In paragraphs 112 to 144, Dr. Ratton discusses the desiderata in sites for salt works. These may be classed under the heads of supply, soil, and level. The supply should be if possible from the sea itself, and not from backwaters liable to be closed and receiving drainage; and to admit of direct irrigation, the level should be a foot below floodtide level. At lower levels near the sea, the upward pressure of the tidal wave causes weak brine to percolate into the pans and condensers and retards the work. The impermeability of the soil is of the utmost importance, stiff clay being the best.

6. Dr. Ratton points out a radical imperfection in the present method of manufacture. The reservoirs are considered simply as intended for the storage of salt-water, and consequently they are constructed of considerable depth. No attempt is made to render them impermeable; and the result is that the brine in them never attains a high degree of concentration. It is admitted from the reservoirs direct into the salt-beds, where it has to be condensed. Dr. Ratton's report clearly shows that while at the earlier stages economy requires the evaporation to be as rapid as possible, in the later stages it is necessary, not only for the purpose of producing good crystals, but also for securing purity, that the rate of evaporation should be entirely under control. He, therefore, proposes to conduct the condensation of the brine in shallow beds of large area, and to keep the crystallizing process entirely distinct. The latter is to be carried on in small beds, into which none but saturated brine at 25° B. is to be admitted, at depths regulated by the meteorological conditions at the time, or speaking roughly, according to the period of the season. The theory of his standard ullum therefore is that the dimensions of the crystallizing and condensing beds should be so regulated relatively to each other that as fast as a supply of brine is condensed to the point of saturation in the condensing beds, the crystallizing beds shall be ready to receive it, the salt in the previous irrigation having been crystallized out and scraped; and thus condensing and crystallizing beds would be employed throughout the season in a continuous round of work. As the evaporation of the brine after saturation is much slower,* it is possible so to regulate the dimensions of the beds.

*In paragraph 282, Dr. Ratton states the retardation to be 50 per cent. From paragraph 281, the rate of evaporation of the saturated brine would seem to be an inch in 5¾ days, or nearly double the mean rate.

7. To provide for the variations in the rate of evaporation due to season, etc., Dr. Ratton would have five crystallizing beds, measuring each 1,152 square feet, attached to each condenser of 23,040. Of these four would suffice at the mean rate, and either five or three could be used according as the rate is found to be below or above the mean. The object of the adjustment is to secure on the one hand that no chloride of sodium shall be precipitated in the condensing beds, in other words that the brine therein should always be below 25° B.; and on the other that there shall be such depth in the crystallizing beds that the process shall be sufficiently long to produce proper crystallization, and to maintain uniformity in the physical standard. This method would probably work well in practice, and is preferred by Dr. Ratton to retarding the crystallization by admission of additional saturated brine; because this would bring with it a relatively larger quantity of chloride of magnesium, whereby the precipitation of the common salt would be accelerated. He remarks that this action of the magnesian chloride might perhaps be turned to account; but at present the subject needs further investigation.

8. The Board observe that Dr. Ratton's calculations as to the proper dimensions of the ullum apparently assume absolute freedom from leakage—a condition not likely to be realized in practice; and they further doubt whether so nice an adjustment as is aimed at is necessary. One of the objects of the new process—the prevention of precipitation of salt in the condensing bed—might be secured by the admission of fresh sea-water, so as to keep the density below 25°B.; and this is of course not open to the same objection as the retardation of the evaporation in the crystallizing bed, by means of fresh irrigations of saturated brine.

9. The Board cannot exaggerate the value of the improvements in the process of salt manufacture described in this report. They will secure practically absolute purity in the salt, as the sulphate of lime, harmless though it is, will be deposited in the condensing beds, and the other residual salts will be carried off in the refuse brine after 32° B. have been reached. The productive power of the pans will be at least doubled, as twice as many crops of salt can be scraped in the season; and the cost of the article to the ryot and the Government will be greatly

Proceedings of the Madras Government, Revenue Department,
15th January 1874.

lessened. Without adopting in full Dr. Ratton's calculation which goes to show that salt can be made and stored for Annas 10, Pies 9 per garce,* and which has yet to be put to the test of practice, the Board think it conclusively shown that the present rates of Kudivaram would be not only adequate but liberal; and could the improved manufacture be introduced at once, there would be no necessity for an enhancement of the rate which is now pressed upon the Board from several districts.

* In these calculations Dr. Ratton allows nothing for the preparation of the pans and condensing beds.

10. But the most important saving which would result to Government is the reduced wastage consequent on the purity of the salt. The presence of the magnesian chloride is probably the chief cause of the large wastage which is now annually written off the accounts. It is stated in paragraph 27 that pure chloride of sodium (common salt) is slightly hydroscopic, and does not deliquesce; whereas the chloride of magnesium (paragraph 323) attracts moisture rapidly and dissolves, carrying with it a quantity of common salt and breaking up the crystals. The impurity cannot probably be entirely got rid of, as the brine which dries upon the salt, no matter how it may be washed, must contain a certain quantity; but it is reduced to a minimum by Dr. Ratton's process. The Board do not know where he got the figures given in paragraph 319. The Board's returns show wastage in 1870-71 (on retail sales) only 186,735 Indian Maunds, not 20,628,331.

11. The report contains numerous minor suggestions, but of great practical [illegible] Such are that salt should be scraped at 3 P.M. (paragraph 346 to obtain the minimum of magnesian and other salts; and to secure cleanliness of the salt, the filtration of the saturated brine before admission into the crystallizing beds (paragraph 272), the protection of those beds from dust and wind, strewing the beds thinly with sand (paragraph 309), and the washing of the salt with saturated brine at 26° B. (paragraph 313). The last simple process, if generally adopted, would save the destruction of enormous quantities of salt every year.

12. The Board resolve to urge upon Government that it is in the highest degree advisable that this method of manufacture, which, in the Board's opinion, promises most valuable results, should be put to the test of practice on a sufficiently large scale and by Dr. Ratton himself. Until the advantages shall have been demonstrated by experience, and the difficulties which will doubtless be found in applying the theory to practice shall have been met, it would be hopeless to attempt radical changes in the present system. Dr. Ratton will be engaged till the end of the current season in the inspection of the pans in the Southern and West Coast Districts; and the Board trust that Government will apply for sanction for his employment on special duty for a further term to enable him to carry out the experiment. Meanwhile something might be done during the current season. The Board would select Mr. Freer, Deputy Collector of South Arcot, to carry out, in correspondence with Dr. Ratton, an experiment on the system described, one or two ullums being constructed for the purpose at Merkanum, or other place in the South Arcot District which Dr. Ratton, who has now examined that district, may select. The cost can be met from savings in the salt grant.

13. Copies of the report will be sent to Government and to all Collectors and Salt Deputy Collectors.

14. The Board commend it to officers connected with salt manufacture for careful study. They will review in separate Proceedings Dr. Ratton's remarks on individual works.

No. 117. Proceedings of the Board of Revenue, dated 10th January 1874, No. 32:—

Read the following Proceedings of the Madras Government, dated 23rd December 1873, No. 1,475, Revenue Department:—

ABSTRACT.—Permitting Dr. Ratton's services to be retained in the Revenue Department for conducting experiments in connection with salt manufacture, and requesting the Board to name a definite period.

COMMUNICATED to the Surgeon-General, Indian Medical Department, and to Dr. Ratton, with reference to Board's Proceedings, Miscellaneous No. 7,234, dated 27th October 1873.

2. The Board would name at present a period of two years for Dr. Ratton's employment. It is essential that he should carry out his system of manufacture other; and both for further test of the system and for further dissemination of its principles that he should continue the experiment for a second season at some other place of differing conditions. During the first season, he might be employed in the southern and during the second in the northern districts. He is requested to submit to the Board a plan of operations.

No. 118. ORDER THEREON, 15th January 1874, No. 61.

Separate Revenue, No. 3.
Salt.

ORDERED that application be made to the Government of India accordingly, copies being furnished to that Government at the same time of Board's Proceedings, 5th April last, No. 534, with its enclosure, Dr. Ratton's Report, dated 25th November 1872.

(True Extract.)
(Signed) D. F. CARMICHAEL,
Secretary to Government.

To the Board of Revenue.

Rd. W. H. French.

Govt. of (1874) Madras
REVENUE.
To
The Board of Revenue.
dated January 1874.
Read
G. O. 15th January 1874, No. 61.
JANUARY.
Nos. 116—118.

PROCEEDINGS OF THE BOARD OF REVENUE,

Dated 10th January — 1874.

READ Proceedings of the Madras Government, Revenue Department, dated 23d December 1873, No 1475, permitting Dr Patton's services to be retained in the Revenue Department for conducting experiments in connection with salt Manufacture, and requesting the Board to name a definite period.

Communicated to the Surgeon General, Indian Medical Department and to Dr Patton with reference to Boards Proceedings Miscellaneous No 7234 dated 27th October 1873.

2. The Board would name at present a period of two years for Dr Patton's employment. It is essential that he should carry out his system of Manufacture throughout

throughout a whole season at some place, or places within easy reach of each other; and both for further test of the system and for further dissemination of its principles, that he should continue the experiments for a second season at some other places of differing conditions.

During the first season he might be employed in the Southern and during the second in the Northern Districts.

He is requested to submit to the Board a plan of operations.

(True Extract)

H Elliott
Ag Sub Secretary

To,
The Secretary to Government
Revenues Department

Copy

Rev. 1874. Dept
A. 75

90—23 December/73 No 300—307.

PROCEEDINGS OF THE
BOARD OF REVENUE.

Dated 10th } January 1874.
Despatched }

Rec'd 17th
G. O. No 61 — 15 Jany 74

Copy to Surgeon General, I. M. D. & to Dr Ratton, order of Govt permitting Dr Ratton's services to be retained in Revenue Deptt for conducting Experiments in connection with Salt Manufacture. — Informing Govt that Board propose to employ Dr Ratton on this duty for two years more. — Requesting this Office to submit a plan of operation to Board.

No 61

Related that application be made to the Govt of India, according to proposal forwarded to that Govt at the same time for Bds Proc 5th April last No 534 with its enclosure, Dr Ratton's Report dd 25th March 74.

D. R. L. 13/1-74

65/3

116—118

Sd. T. Revenue
Ex. Offg. No. 15 Jany 74