'RY OF PUBLIC HEALTH

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APPLIED SCIENTIFIC RESEARCH CORPORATION OF THAILAND

COOPERATIVE RESEARCH PROGRAMME NO. 16

INCORPORATION OF MICRO-CONSTITUENTS IN MIXTURES

RESEARCH PROJECT NO. 16/1

IODIZATION OF CRUDE SALT

REPORT NO. 2

CONSTRUCTION, INSTALLATION, AND MODIFICATION OF SALT IODATION UNITS

BY

BERNARD PH. ESSELINK

CHEMICAL TECHNOLOGY GROUP

TECHNOLOGICAL RESEARCH INSTITUTE

ASRCT, BANGKOK 1969

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FOREWORD

North-east Thailand is a region in which goitre caused by simple iodine deficiency is endemic. The Ministry of Public Health of Thailand, with the cooperation of UNICEF, has therefore addressed itself to the problem of alleviating this iodine deficiency. To this end, it was proposed to add to the crude salt destined for consumption in the goitrous area an appropriate level of potassium iodate. This is an accepted method of dealing with regional iodine deficiency.

The iodation of crude salt presents a number of problems, most of which were solved by the UNICEF Food Conservation Engineer.*

However, difficulties were encountered in the practical operation and the need for design changes became evident. The assistance of ASRCT was sought in making suitable design changes and constructing a prototype unit. This work was described in Report No. 1 on this Research Project.+

The present report gives details of the construction, installation; and operation of production-scale units made according to the design reported earlier with some modifications.

The third report on this Project gives details of the modification of UNICEF's pilot-plant unit to incorporate the design changes described earlier.

UNICEF has underwritten the cost of constructing the production-scale units and modifying the pilot-plant unit.

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* HUNNIKIN, Cyril, (1964).—The iodization of crude salt for the prophylaxis of goitre. Fd Technol. **18**: 40-43.

\+ "Design of salt iodation machine" by Narinder S. Saluja. (ASRCT unpublished report.)

CONSTRUCTION, INSTALLATION, AND MODIFICATION OF SALT IODINE UNITS

By Bernard Ph. Esselink*

SUMMARY

Two salt iodation units have been constructed in ASRCT's workshop according to ASRCT design. These units have been installed at the salt iodation plant of the Ministry of Public Health and have been in full-scale operation for several months.

I. INTRODUCTION

This report deals with the construction, installation, and modification of two salt iodation units, each unit consisting of two machines which were designed by ASRCT. The background, justification, and design of this machine were discussed in the first report on this Research Project. (Report No. 1 on Research Project No. 16/1 already referred to).

ASRCT has been responsible for the construction of the two salt iodation units. The Ministry of Public Health and UNICEF took over the responsibility after the construction and transported the units to the production site where the units were installed and modified.

II. CONSTRUCTION OF THE UNITS

In the workshop of ASRCT two production units were constructed according to the original ASRCT design. Figures 1 to 4 show several views of the finished machines. The photographs were taken immediately after the construction and the testing of the machines. No difficulties were encountered during the construction. It was necessary to divert from the original design on the following points:-

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* Chemical Technology Group, Technological Research Institute, ASRCT.

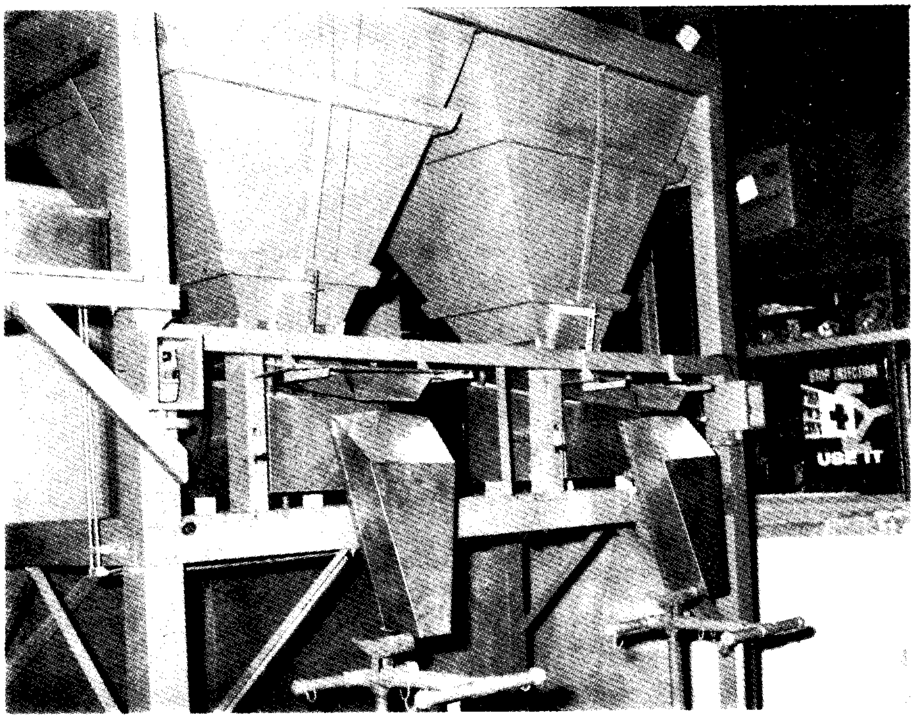

Figure 1. Salt iodation unit, general view.

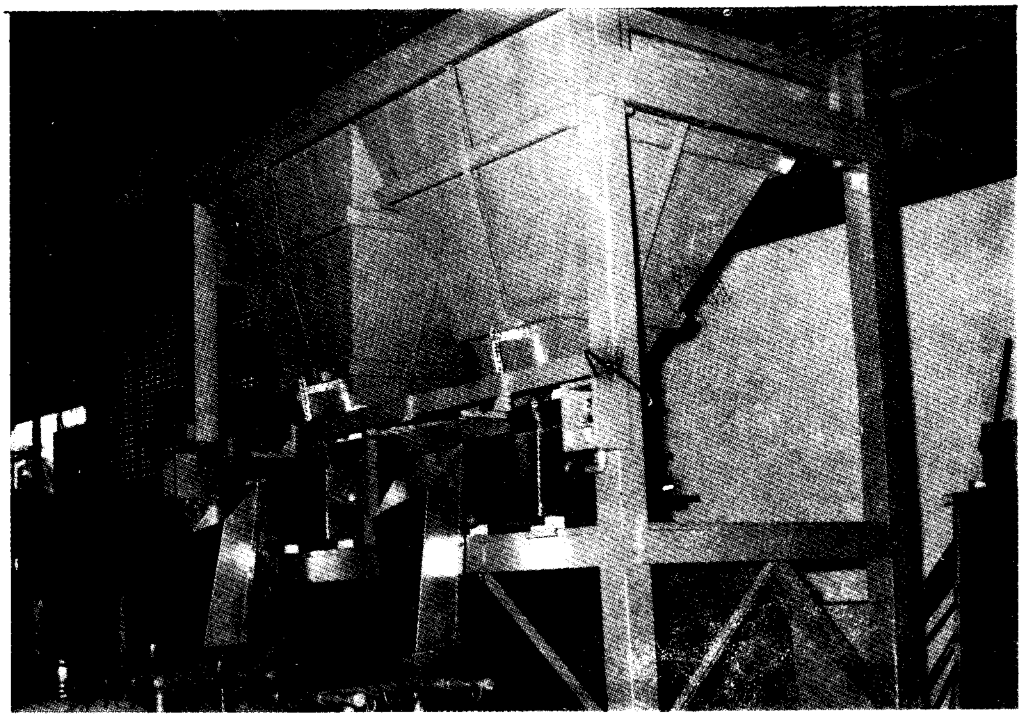

Figure 2. Salt iodation unit, another general view, (second unit in background).

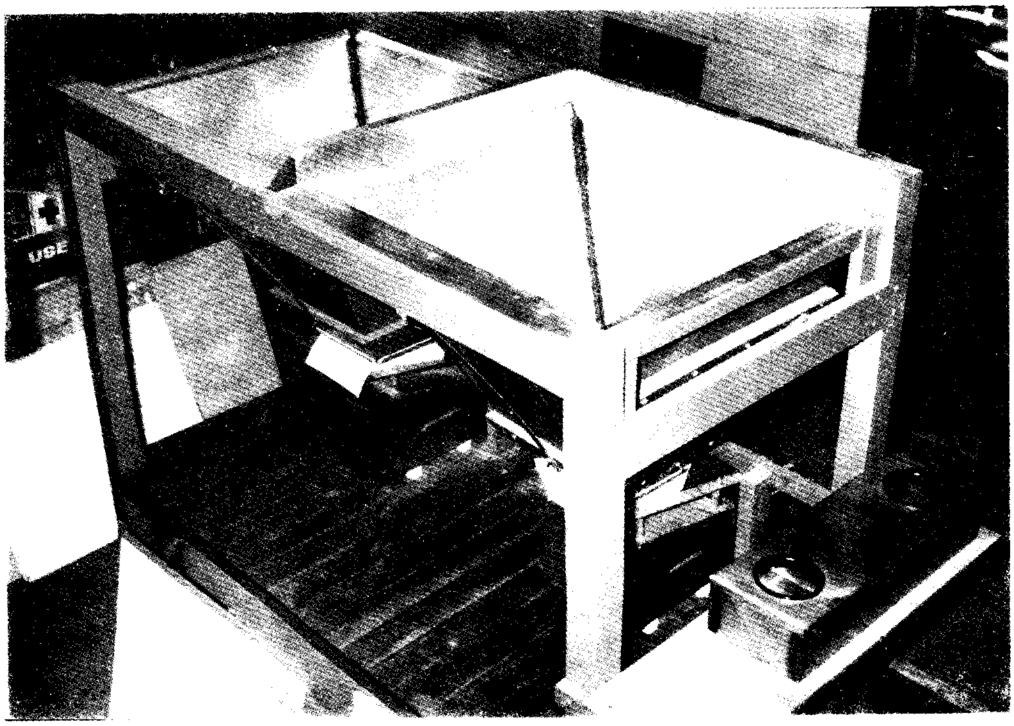

Figure 3. The hoppers of the salt iodation unit.

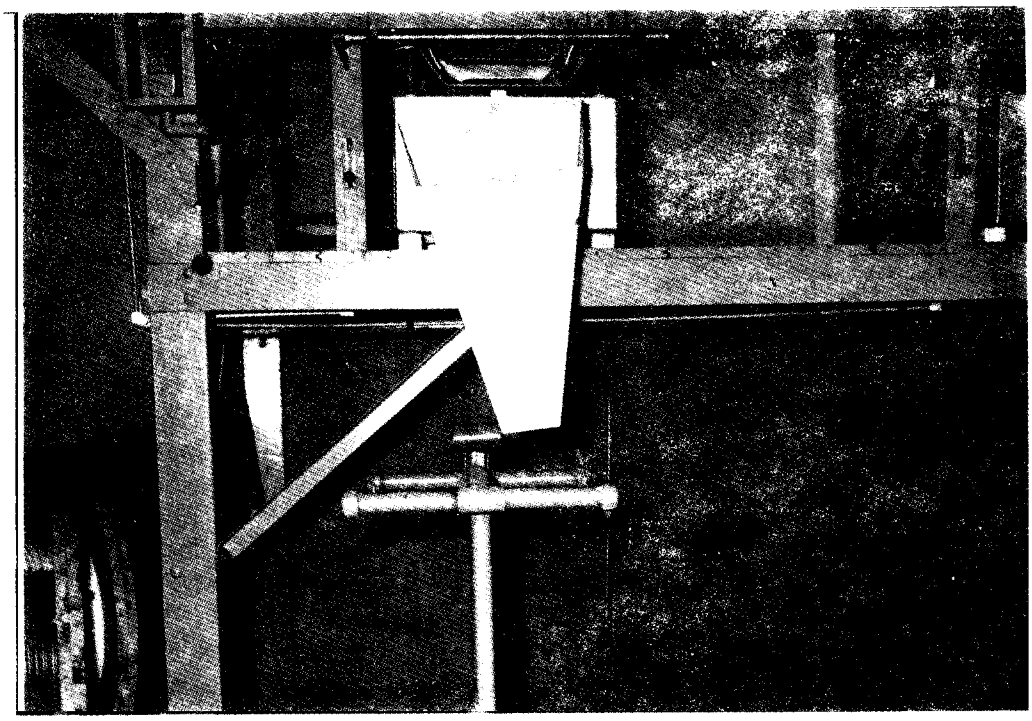

Figure 4. Discharge system of salt iodation machine.

(1) The wooden platform on which the motor with shaking mechanism was located has been reinforced with iron bars between the platform and the wooden frame.

(2) The piping system for the iodate solution flow was constructed in a slightly different way to make it stronger.

(3) An additional beam was added to support the dripping pipes. The original construction permitted too much vibration of the pipes.

(4) A wooden protection was built around the sensitive flow meters.

(5) A flow regulator was added to control the salt flow out of the hopper. This was provided by a stainless steel strip which could regulate the size of the hopper outlet. Rubber strips prevent over flow of salt at the bottom of the hopper.

III. INSTALLATION AND MODIFICATION OF THE UNITS

The units were installed at the site of the salt iodation plant of the Ministry of Public Health, located near the harbour of Bangkok. The salt arrives by boat and is distributed by train and truck after iodation. Figure 5 shows one unit at the salt iodation plant in full production.

However, before the units reached full production the following adjustments had to be made:

(1) Elevation of the salt. As the combined capacity of the two units is ± 10 tonnes per hour, it was considered to be impractical to use manpower for lifting the salt into the hopper. UNICEF decided to purchase two bucket elevators from Hong Kong. Figures 7 and 8 show an elevator in operation. Salt is carried by labourers from the boats to a platform at the bottom of the bucket elevator. From this platform salt is lifted by each bucket elevator to the two hoppers of a unit. From the hoppers, the salt flows by gravity through the iodizing system and the iodized salt is collected in bags.

(2) Bag filling system. The bag filling system as originally designed proved to be impractical. Originally it was anticipated that gunny bags would be used for the transport of the iodized salt, and therefore a stand was supplied to which the bags could be hooked.

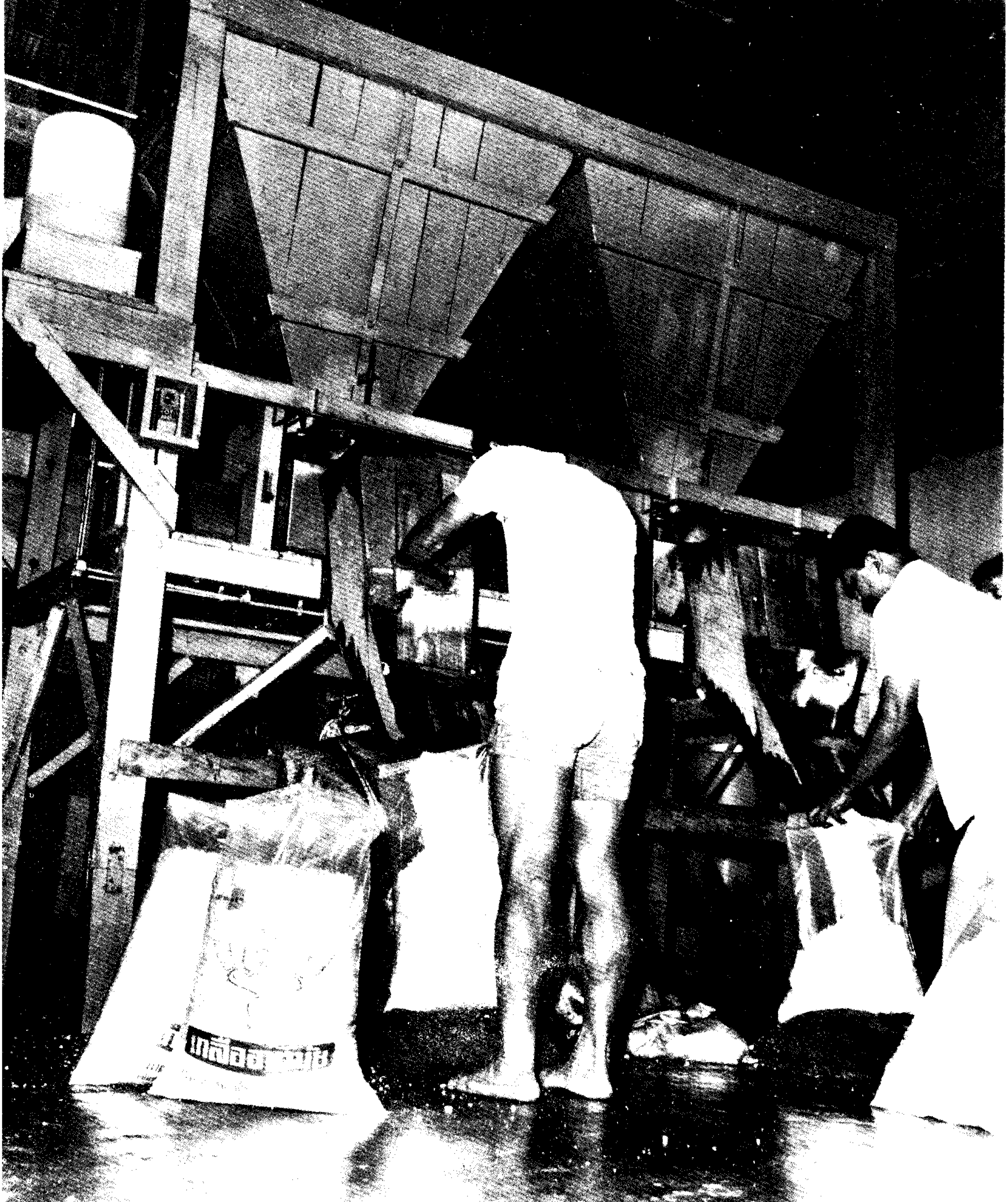

Figure 5. Salt iodation unit in full production.

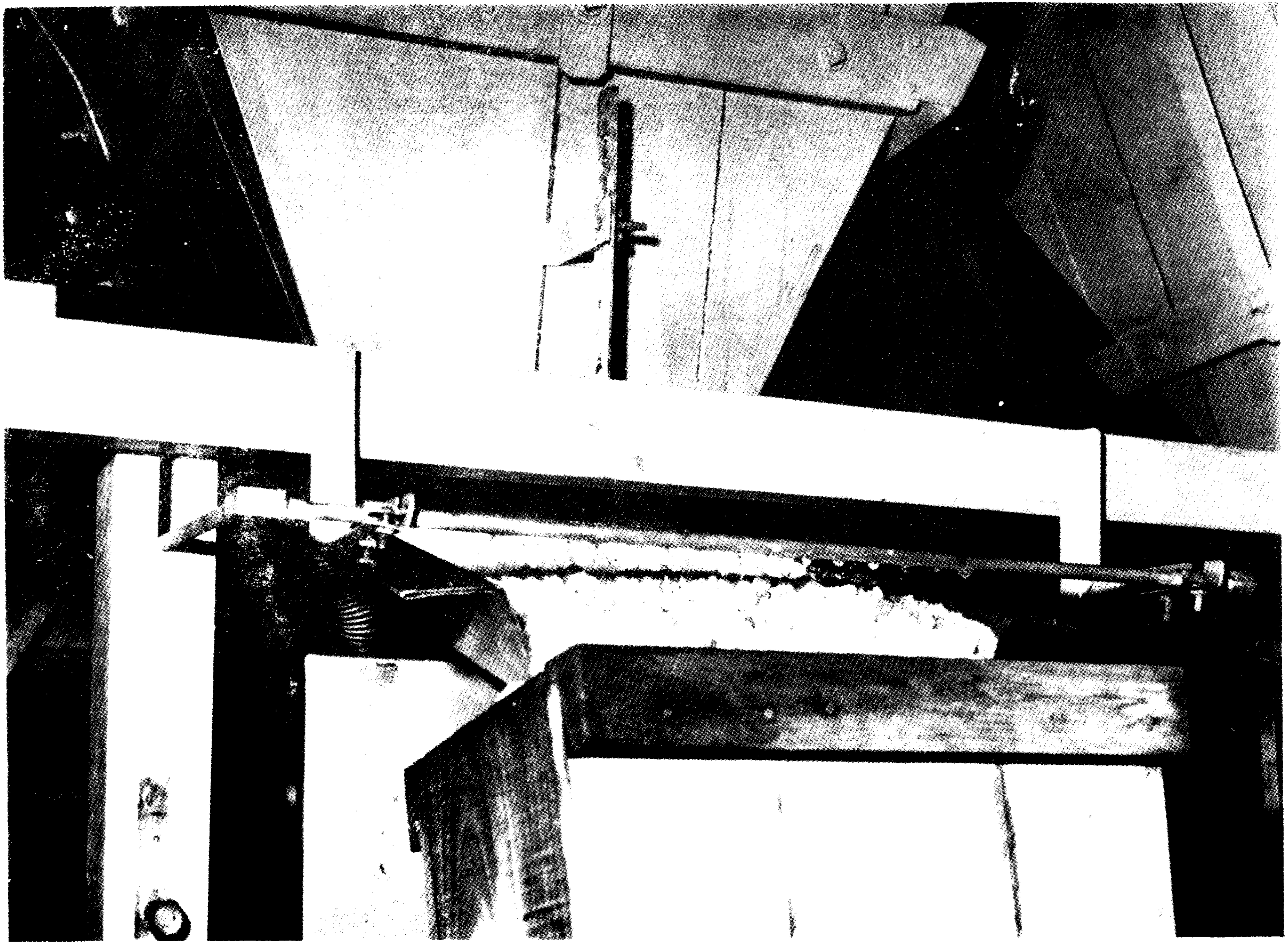

Figure 6. The full capacity of the salt iodation machine is used.

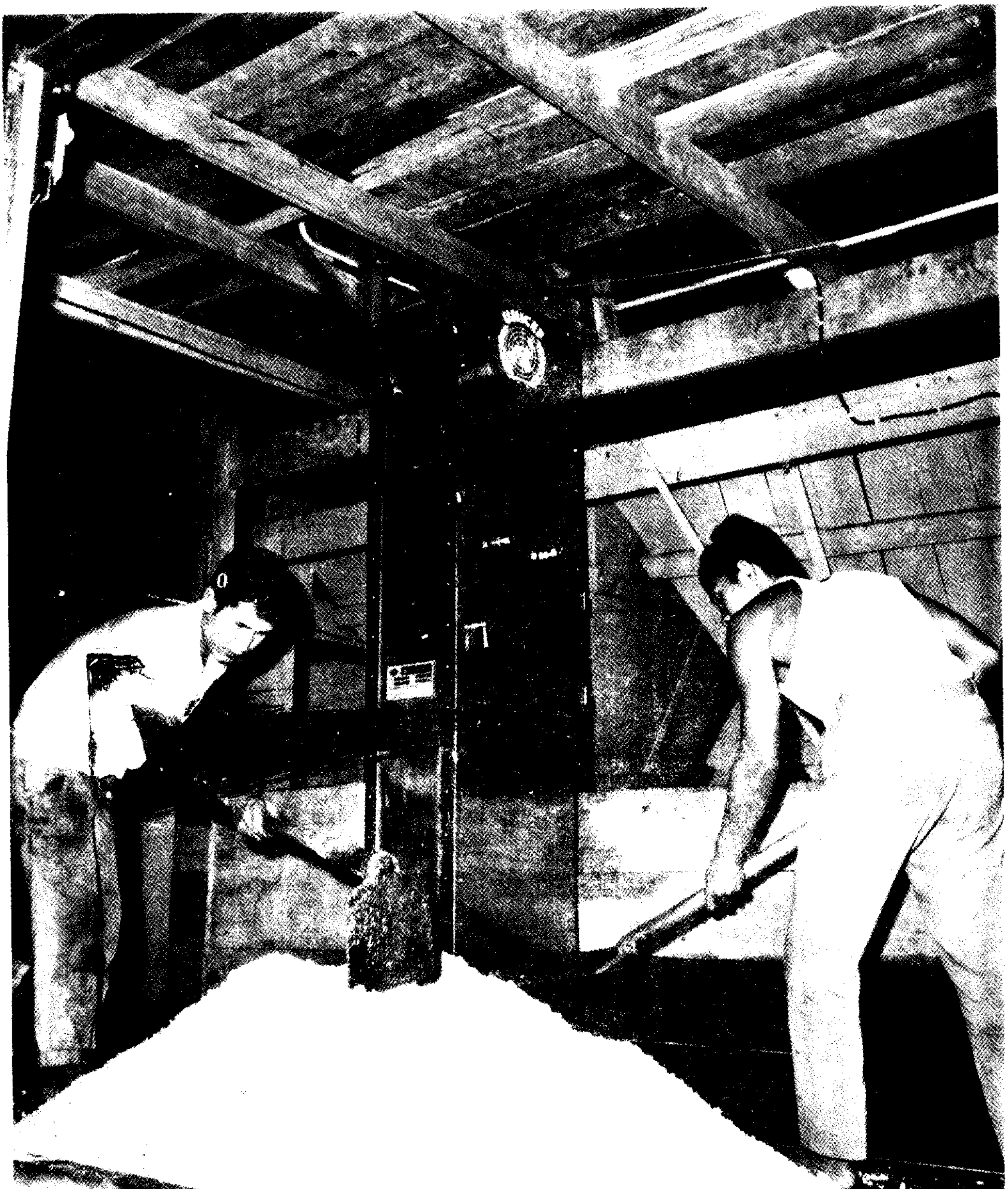

Figure 7. Bucket elevator for the salt iodation unit.

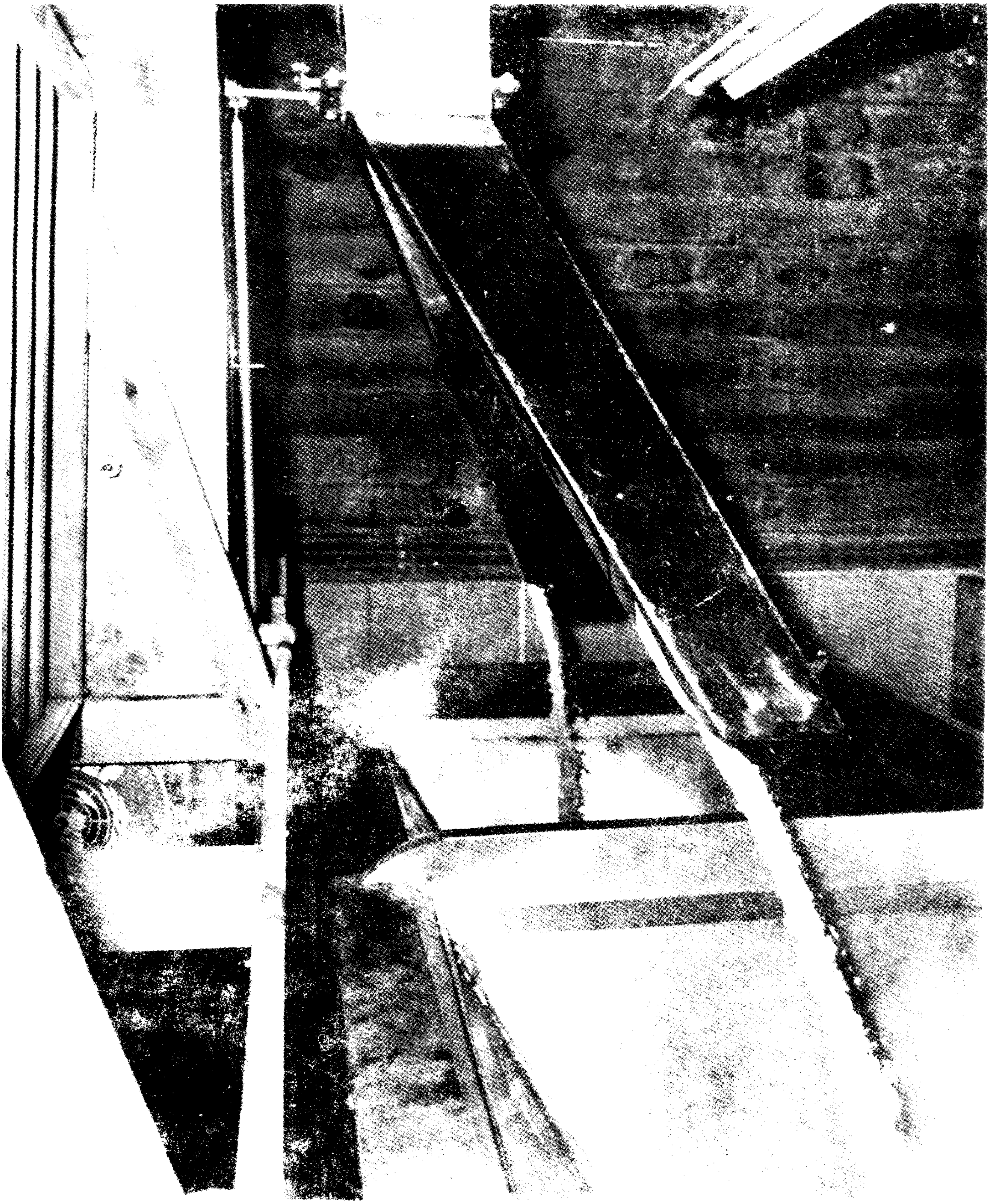

Figure 8. Flow of salt from the bucket elevator to two hoppers.

However, mostly polyethylene or PVC bags are used and hooks cannot be used with these bags. The discharge system was therefore changed to the system shown in Figure 5. The wooden storage bin can hold just over one bag of iodized salt and in this provides time to change to another bag.

(3) Reinforcing of the wooden frame. The new discharge system needed more height. As the frame became higher it was necessary to reinforce the frame of each unit with extra cross bars, visible in Figure 5.

IV. OPERATION

As finally installed and modified, the two units were operated regularly by the Nutrition Division, Department of Health, Ministry of Public Health. From August 1968 until July 1969 they produced over 6,000 tonnes of iodized salt. A quality control laboratory operated in conjunction with the plant made daily analyses for iodate in the product. The results reported for the month of October 1968 are given in Table 1.

The results show considerable variation in the iodate content of the product, from as high as one part in 12,000 to as low as one part in 30,000.. However, Department of Health and UNICEF officers are satisfied with the results. They regard the operation as successful from a Public Health standpoint. It is therefore concluded that a satisfactory design and construction of salt iodation units has been accomplished and demonstrated.

TABLE 1

SALT IODATION PRODUCTION IN OCTOBER 1968

Sample	Amount solar salt used (tonne)		KIO_3 used (g)	Analysis result, KIO_3: solar salt
	Granular	Powder		
A - 10 - 11		2.16	172.80	1:15,000
B - 10 - 11		5.04	403.20	1:18,000
C - 10 - 11	45.5		3640.0	1:20,000
C - 10 - 11		2.58	206.40	1:16,000
D - 10 - 11		12.00	960.00	1:19,000
F - 10 - 11		14.88	1190.40	1:29,000
H - 10 - 11	33.48		2678.40	1:18,000
H - 10 - 11		20.40	1632.00	1:14,000
I - 10 - 11		6.00	480.00	1:17,000
AJ - 10 - 11	41.12		3289.60	1:19,000
AA - 10 - 11		12.00	960.00	1:17,000
AD - 10 - 11		1.80	124.00	1:14,000
AE - 10 - 11	35.69		2855.20	1:15,000
AF - 10 - 11		1.50	120.00	1:18,000
AG - 10 - 11	44.26		3540.80	1:16,000
AG - 10 - 11		23.18	1854.40	1:15,000
AI - 10 - 11	41.32		3305.60	1:14,000
BJ - 10 - 11		7.50	600.00	1:19,000
BA - 10 - 11		13.32	1065.60	1:30,000
BB - 10 - 11		7.80	624.00	1:12,000
BC - 10 - 11	35.20		2816.00	1:23,000
BD - 10 - 11		5.40	432.00	1:12,000
BE - 10 - 11	44.63		3570.40	1:16,000
BF - 10 - 11		6.00	480.00	1:19,000
BH - 10 - 11	38.20		3056.00	1:20,000
BI - 10 - 11		12.00	960.00	1:12,000
CJ - 10 - 11	43.84		3507.20	1:25,000
Total	403.24	153.56	44544.00	