EGGS IN COLD STORAGE: THEORY AND PRACTICE IN PRESERVING EGGS BY REFRIGIRATION. DATA, EXPERIMENTS, HINTS ON CONSTRUCTION, ETC., FROM PRACTICAL EXPERIENCE, WITH ILLUSTRATIONS

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BY

MADISON COOPER.

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PREFACE.

IN the interest of a better understanding and dissemination of knowledge on the cold storage of eggs, the writer has communicated with quite a large number of individuals and companies, asking their ideas and requesting that they give full answers to a printed list of questions sent them. Although, at first, the replies were rather slow in coming in, the total result of these letters has been most gratifying; nearly one-half acknowledging receipt of the inquiry, and more than one-half of this number giving fairly full replies to the questions submitted. Considering the fact that the inquiries were regarded by some as being of a rather personal nature, the proportion of managers sending full replies is large. Several gentlemen were frank enough to say that personal considerations prevented them from giving any information; others gave guarded or partial replies. In the main, however, storage men have been willing to give information and exchange ideas.

The list of inquiries sent out covers the subject very thoroughly, and divides it into six different parts, with three separate questions relating to each. To the data so cheerfully furnished by others is added information from the writer's experience and practice, with such explanation of theory and practice as may seem necessary to a clear understanding of the principles of successful egg refrigeration. It is hoped that those who are new to the business may obtain valuable information from these collected data, and that those with experience may derive some benefit in the way of a review, and possibly pick up some new ideas as well.

A large portion of the matter contained in these

pages appeared in *Ice and Refrigeration* as a series of articles entitled: "Eggs in Cold Storage." The present book is printed for the purpose of putting the matter in permanent form, believing that those who have followed the original articles would find it convenient for future reference. While the present book has many shortcomings, and there is no doubt room for the addition of much information, reliable data, and the results of extended observations and tests, there has not heretofore been anything like a complete write-up of the subject; and in consideration of this fact the reader is asked to be liberal in his criticism.

If any errors or lack of details are noted, the author would gladly acknowledge and explain the points at fault if his attention is called to any. No other object has been in mind in writing these articles than a furtherance of scientific knowledge on the subject of refrigeration as applied to the preservation of perishable products, and the great assistance rendered by those who have written painstaking replies to the list of inquiries is hereby acknowledged. The combination and comparison of information are beneficial, and if those who have further data or records of tests will only put them before others in their line of business, no loss will be sustained by the individual giving the information, while much general good will result.

INTRODUCTION.

THE value of the eggs placed in cold storage for preservation is estimated at about $20,000,000 annually for the United States alone. Considering the importance the industry has already attained, its rapid growth and future outlook, the amount of accurate information available to those engaged in the business seems very meager. The difficulties to be overcome, the skill required and the importance of a well designed structure are not usually explained by those interested in promoting new enterprises in this line, and consequently not appreciated by those making the investment. Financial disaster has overtaken many large companies who have erected costly refrigerating warehouses; those which have succeeded have been forced to install new systems, make expensive changes, and make a thorough study of the products handled. The experience of nearly all has been emphasized at times by heavy losses paid in claims made by customers for damage to goods while in storage, or the necessity of running a large house while doing a very small business. Those about to become interested in the business may find food for thought in the above, and the history of a dozen houses, in different localities, will be good information for would-be investors.

The scarcity of knowledge on the subject in hand, while being partly the result of the half developed state of the art until very recently, is also very largely owing to narrow-mindedness on the part of some of the older members of the craft, who have largely obtained their skill by years of experience and study, some of them having expended large sums on experimental work. The same experiments have

perhaps been made before, and are of necessity to be made again by others, simply because the first experimenter would not give other people the benefit of his experience. It seems at this stage in the development of refrigeration, that the improvements to be made during the next twenty years will be of very much less importance than those made during the twenty years just ending; trade secrets, so jealously guarded by some, must disappear, as they have in other branches of engineering. Storage men have been obliged to work out their own salvation in storing problems, sometimes sending their most difficult points to be answered through the columns of *Ice and Refrigeration*, and, perhaps, comparing ideas with those of their personal friends in the same line of business. It is to be observed that the most progressive and up-to-date manufacturing concerns in the United States to-day are giving their contemporaries every opportunity of observing their methods, and are very willing and anxious to talk over matters pertaining to their work, from an unselfish standpoint. So, too, the successful cold storage of the future will be sure to make "visitors welcome."

In anything which will appear in these articles, it is not the writer's intention to convey the idea that any mere theoretical knowledge, which can be acquired by reading and study, or even by an exchange of ideas in conversation, can take the place of practical observation in actual house management; but there are applications of well known natural laws, which are not generally understood by storage men, and their progress is handicapped from lack of this theoretical knowledge. The two following illustrations, bearing on temperature and ventilation, are among the common errors made in practice, yet easily understood when studied and tested: Some storage houses have formerly held their egg rooms at 33° F., fearing any nearer approach to the freezing point of

water (32° F.), thinking the eggs would freeze. A simple experiment would settle this point, giving the exact freezing temperature, as well as the effect of any low temperature on the egg tissues. Again, others have thought to ventilate by opening doors during warm weather. It never happens that storage rooms can be benefited by this treatment at any time during the summer months, and only occasionally during spring and fall. The dew point of outside air is rarely below 45° F. during summer, and when cooled to the temperature of an egg room, moisture will be deposited on the goods in storage, causing a vigorous growth of mildew.