

CONTENTS

	PAGE
PREFACE	vii
PREFACE TO THE FOURTH EDITION	viii

INTRODUCTION

THE GENERAL PRINCIPLES

The basic law of refrigeration—Theoretical efficiency—Classification of refrigerating machines—Refrigerating agents—The absorption machine—The compression machine

CHAPTER I

THE LAWS OF HEAT, FLUIDS, LIQUIDS, GASES, AND VAPOURS

Heat—Temperature—Transference of heat—Radiation of heat—Conduction of heat—Convection of heat—Absolute zero—Expansion of heat—Latent heat—Heat capacity—Specific heat—Sources of heat—Chemical combination—Combustion—Unit of heat—Fluids—Specific gravity—Gases—Compression and expansion of gases—Resisted expansion of gases—Free expansion of gases—Mixture of gases—Pressure of gases—Volume and pressure of gases—Unit of pressure—Liquefaction of gases—Critical temperature and pressure—Isothermal and adiabatic expansion and compression—Absorption of gases—Vapours—Saturated vapours—Boiling—Latent heat of vaporization—Permanent gases

CHAPTER II

THERMODYNAMICS

The two laws—Heat and work—Adiabatic expansion and compression—Isothermal expansion and compression—Unavailability—Carnot's cycle—The actual refrigerating cycle—The use of diagrams—Functions of state—Entropy—Internal energy—Heat content—Entropy diagram—The Mollier diagrams—The diagram of ammonia—The diagram of CO_2

CHAPTER III

HISTORICAL

The freezing mixture—Machines using gas, or cold-air machines—Machinery which produces its refrigerating effect by the evaporation of some volatile liquid having a low boiling point—The compression process—The Binary system

CHAPTER IV

THE PROPERTIES OF AMMONIA, CARBON DIOXIDE, AND OTHER REFRIGERANTS

Ammonia—Ammonia accidents—First aid—Carbon dioxide—The properties of CO_2 —The manufacture of CO_2 —Other gases

CHAPTER V

TYPES OF MACHINES

Machines built in Great Britain—The "Brotherhood" machines—The "Douglas" machines—The "Hall" machines—The "Lightfoot" machines—The "Seager" machines—The "Sterne" machines—The "U.D." machines—Machines built abroad—The Frick Co.—The "Sulzer" machines—The "York" machines

CHAPTER VI

THE REFRIGERATING PLANT

Various ratings—The American rating—International rating—British rating—Ice-making capacity—The ton refrigeration—The compressor—Superheating during compression—Water jackets—Dry and wet compression—Clearance in the compressor—Testing for clearance—Indicating the compressor—Horse-power—Capacity and power—Refrigerating power required for ice-making—Power required for cold storage—Oil separators—The condenser—Types of condensers—Submerged condensers—The open condenser—The double pipe condenser—Size of condensers—Water required—Getting air out of condensers—Cleaning condensers—Liquid receivers—Liquid coolers—Evaporators—The flooded system—Cross connections—Valves and fittings—Dryers and purifiers—Carbon dioxide refrigerating machines—The condenser—The evaporator—General considerations—Cylinders for NH_3 or CO_2

CHAPTER VII

AUXILIARY PLANT

Buying machinery—Engines—Efficiency—Simplicity—Durability and solidity—Types of engines—Uniflow engines—Vertical high-speed engines—Steam turbines—Steam condensers—Boilers and steam pipes—The Cornish and Lancashire boilers—The marine, dryback, and locomotive boilers—Water-tube boilers—Steam piping—Fuel economizers—Automatic stokers—Oil fuel—Water softening—Condensing water cooling—Internal combustion engines—Wells—Circulating pumps—Boiler feed pumps—Air lift pumps—Electrical power and lighting—Motors—Power factor improvement—Motor starters—Electric lighting and wiring—Electric lifts—General uses of electricity

CHAPTER VIII

INSULATION

The objects of insulation—Various insulators and filling materials—Charcoal—Cork—Cork boards—Silicate cotton—Slagbestos—Principles to be observed—Air spaces—Paper—Dry rot—Outer walls—Partitions—Floors—Columns and beams—Pipes and tanks—Interior finish—Tests—Nicoloid—Expanded rubber—Unifil—Celotex—Aifol—Rock cork—Stillite

CHAPTER IX

BRINE

Comparison of sodium and calcium chlorides—Making the brine solution—Regenerating brine

CHAPTER X

ICE MAKING

Refrigerating capacity required for making ice—Water for ice making—Quality of ice—Opaque ice—Ice for the fish trade—Types of ice-making plant—The can system—Types of can ice-making plant—Distilled water ice plant—Air agitation—Other systems of agitation—Withdrawing cores—Operation of a can ice plant—Construction and sizes of ice moulds—Time of freezing—Evaporator piping—Temperature of brine—Capacity performance and proportions of parts—Circulation of brine—Thawing-off tank—The spray thawer—Ice dumps—Can fillers—Forecooling tank—Pushing gear—Ice tank cranes—The plate system—The pluperfect system—The cell system—Storing and sale of manufactured ice—Position and construction of ice stores—Transport of ice—Selling ice—Solid CO_2

CONTENTS

CHAPTER XI

COLD STORAGE

Site for stores—Classes of cold stores—Methods of cooling—Direct expansion piping—Brine circulation—Air circulation—Piping for cold stores—Air locks and lobbies—Doors—Brine tank and brine pumps—Lifts and conveyors—
✓ Humidity in cold storage—Buildings—Timber construction—Ferro-concrete construction—Steel construction—Sprinklers—Lloyd's rules—Lloyd's Register of Shipping—Exhibition chambers—Small cold stores—Ship work—Cold storage management—Plant—Insulation—Running—The cold store superintendent—Managerial duties—Stores department—Engineer's department—Finance—Moulds and fungus

CHAPTER XII

ARTICLES IN COLD STORAGE

• Butter—Cheese—Eggs—Furs and fabrics—Dried fish—Fruit—Apples—Wrapping—Pears—Peaches—Soft fruits—Cherries—Apricots—Loganberries—Red raspberries—Currants—Strawberries—Oranges—Nuts and fried fruit—Tomatoes—Grapes—Gas storage of fruit—Hops—Meat—Frozen meat—Chilled meat—Gas storage of meat

CHAPTER XIII

OTHER APPLICATIONS

• Air cooling—Brewery refrigeration—Cooling of wort—The fermentation of wort—Heat to be removed—During the cooling of the wort—During the fermentation of the wort—Types of wort coolers—The direct expansion wort cooler—Attemporators—Submerged and Baudelot coolers—The distribution of liquor over a Baudelot cooler—Iced liquor and direct expansion Baudelot cooler for wort and liquor—Beer chilling—Lager beer—Chocolate cooling—Explosive manufacture—The freezing of food products—Fish—Air freezing—Brine freezing—Quick freezing—The Z process—Other methods of quick freezing—The Peterson system—The Kolbe system—The Birdseye system—Ice cream—Margarine—Milk cooling and preserving—The cooling of cream—Mineral waters—Mortuaries—Paraffin crystallization—Pipe line refrigerations—Rubber manufacture—Shaft sinking—Refrigerated transport—Silk, artificial—Skating rinks—Horticulture—Wine—Bakeries—Silk worms—Sundry uses

CHAPTER XIV

THE DESIGN OF ABATTOIRS, FREEZING AND MEAT PACKING WORKS

Abattoirs—Freezing and meat packing works—Fat Rendering—Bacon factories

INDEX