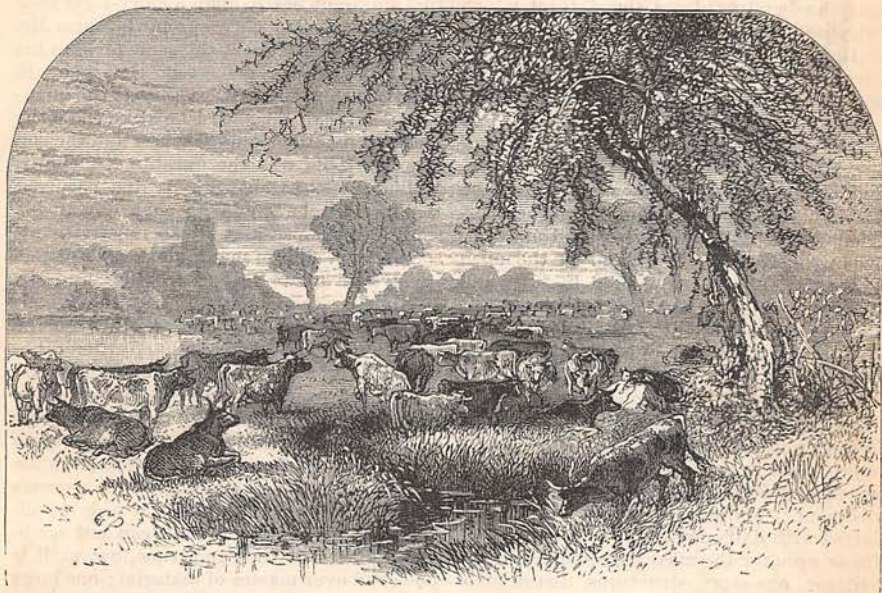


pressing Rochefort to her bosom; and hundreds more, describable and indescribable, but equally striking.

And now, once more, after so many proofs of its fatal impolicy, the government of

France has adopted the system of suppressing political, while permitting abominable, caricature. Nothing in the way of pictorial burlesque can be too vile for the censure to pass.

BUTTER AND CHEESE.



PASTURAGE.

THERE has been no specialty of agriculture that has recently made such marked progress, both in extent of production and in improvement of practice, as the branch which begins with the culture of fragrant grasses in the pasture, gathers this sweetness in the veins of the milk-producing animal, draws it therefrom as one draws the spirit of the grape from the wine-press, tosses it about in carefully arranged temperatures and with ingeniously contrived machinery, stores it in a package, as nature fills an egg, and places it at length in a silver dish upon a city table—bringing to the city-bound Mohammed the very substance and fresh fragrance of the mountain. Such is the service of the dairy-man, such his claim to popular consideration. But it is not for this that popular attention is invited to his work. It is rather because of the inherent interest of the methods which he has devised, the almost scientific perfection of his system, and the extent of his industry, which commands consideration by its very greatness, that this, the first comprehensive showing of dairy facts and methods in a popular magazine, is undertaken.

It is hardly half a century since dairying, as a distinct specialty in agriculture, began

in this country. Before that, of course, there was the old-time churning in farm-houses, and there was the rude curdling and ruder pressing in which our grandmothers achieved a gossipy reputation. There was the early trade system by which a tub of butter or a queer little cheese was bartered for coffee or calico at the country store. But these were the blossoms of that early agriculture; no one had thought of them as roots or branches. After a few years the willingness with which cheese was taken by the country dealers, and the natural adaptation of the country for the pasture, led naturally to the gradual increase of the amount of cheese. It began to be apparent that the men who sold cheese had fuller purses than they who toiled in grain fields, and profit, the greatest incentive to production, began to impart to the hills of Herkimer County that distinctive characteristic of a dairy region, a continuous verdure. And yet men regarded the newly found road to wealth with doubt and suspicion. It was altogether new. It seemed broad and smooth, but no one could tell whither it led or how soon the men who set out upon it might be forced to return and take again the turn-

pike which years had hardened into safety. The great fear was of an oversupply. It was the croaker's harvest-time. Heads were shaken ominously, and so wide-spread was the distrust that he was accounted the wisest whose head was best balanced on its pivot. Progress was slow but certain, for the demand continued. Professor Willard, in his admirable volume on the practices of dairy husbandry, places the date at which dairying became quite general in the towns of Herkimer County north of the Mohawk River at 1830. "Up to this time and for several years later," says Mr. Willard, "little or no cheese was shipped to Europe. It was not considered fit for market until fall or winter. It was packed in rough casks, and peddled in the home market at from five to eight cents per pound. All the operations of the dairy were rude and undeveloped; the herds were milked in the open yard; the curds were worked in tubs, and pressed in log presses. Every thing was done by guess, and there was no order, no system, and no science in conducting operations."

Soon after 1830 this condition of affairs began to pass away. The profits gained from the business enabled the dairy-men to improve their facilities, and the enduring features which it assumed led to freer investment. The face of the county became dotted with dairy-houses as with corn-cribs. These were for the most part simple, unpretentious, one-story structures, distinguishable from the other out-buildings by the closely battened cracks and protruding stove-pipe. The apparatus was simple and rude, and the system of manufacture a family secret, imparted with wise looks and oracular phrase. Skill was vested in intuition; it was the maiden's dower, the matron's pride. The result of its exercise was a competence, in many cases without the strength to enjoy it. The work was severe and incessant. The dairy-men of Herkimer and surrounding counties were more prosperous than agriculturists generally during the thirty years of "farm-dairying," but their life was hard and their cares intense. It was during this period of severe application and large rewards that Herkimer County achieved that reputation for fancy cheese which is still her traditional right.

While this system of individual dairying was at its height there was, by chance, a convenient arrangement invented in Oneida County which in due time revolutionized the system of cheese manufacture, and has given the history of agriculture that method which is known as "the American system of associated dairying." As in the case of many an important innovation upon established customs, the inventor builded more wisely than he knew. Jesse Williams owned, in 1851, a private establishment for cheese-

making near Rome, in Oneida County, New York. He had achieved a reputation as a manufacturer of the best quality of cheese. To him, as to many others, this reputation was a direct money value upon the market. He could make a contract for a better price than others, and the demand for his cheese was greater than the supply. In the spring of 1851 one of Jesse Williams's sons was married and went to live upon a dairy-farm near his father's. The cheese from this farm Mr. Williams contracted at the same price as his own, but there was a necessity that it should be of the same quality. This was the quandary: how can the cheese be alike when the father is a skilled manufacturer and the son is not? This was the question which Mr. Williams had to answer. It first occurred to him that he could go each day to his son's dairy-house and try to impart to his son his own skill in manipulation. But this involved a great deal of trouble; and Mr. Williams's second thought was the principle of associated dairying, which will make his name endure. It was a happy thought—happy in its exceeding simplicity and in its fitness for universal application, as events have proved. Mr. Williams could not go to the milk; the milk must be brought to him. The success which he attained in his venture was the key-note of the success which has been gained by the wide application of his method. Skill can not act in many places at the same time, but skill is powerful over masses of material; one large establishment occasions less labor and expense than a dozen small ones, each doing one-twelfth of its work; all supplies are cheaper at wholesale. These are some of the advantages which have led to the wide adoption of the American factory system. They were not perceived at once. For three years Mr. Williams and those who brought milk to him profited by them. During the next five years only three or four establishments were erected each year. Since that time the growth has been rapid. In the year 1866 there were more than 500 factories in operation in New York State. The appreciation of the advantages of the factory system gave, at length, a marvelous impulse to the dairy industry. Cheese-making, which was once monopolized by the rich counties of Central New York, is now a flourishing specialty in half a dozen regions of the State. It has pushed westward, shaping the productive ability of the Western Reserve, finding favoring conditions for growth in Illinois, Wisconsin, Michigan, and Iowa, and gathering groups of dairies in almost every other Western State. It is just now spreading anew in Pennsylvania. To the eastward, Massachusetts and Vermont have given it heartiest welcome, and Maine, youngest of the dairy regions, promises to exert an influence upon the supply.



WILLIAMS'S ORIGINAL FACTORY.

When the abolition of the reciprocity with Canada threw the Canadians upon their own dairy resources, the development there was sudden and extended. In 1873 Canada manufactured 20,000,000 pounds of cheese by the American method, and is now our strongest rival in the English markets. The American factory system has obtained an enduring foothold in England, where an American, Mr. Schermerhorn, of Oneida County, was employed by English dairy-men to instruct them in its practice. It has been introduced upon the continent of Europe, and the latest tidings of its progress is that Russia has sent emissaries to borrow from England the associated idea which we implanted. The simple contrivance of the Oneida County farmer of 1851 has reproduced itself in at least five thousand establishments, calling to its uses an aggregate capital of at least twenty-five millions of dollars for working facilities alone, and placing each year upon the markets of the world a manufactured product worth one hundred and fifty millions of dollars. And the system is not yet twenty-five years old. When these facts are borne in mind, the site and building of the first cheese factory become vested with a deep historic interest. The landscape is not striking, but it is the home of an idea which is encompassing the world. The building in which Mr. Williams embodied his idea in practice is the oldest of the structures which now occupy the original site. It is thrown into the shade by the more pretentious buildings of the "Rome Association Cheese Factory," which is an outgrowth from it.

Under the impulse of the factory system, cheese-making has become one of the leading industries of this country. Capital and labor have been drawn to it, and the growth is still in progress. The opportunity has been in the English demand for the product. Cheese is the English laborer's meat. It

is a concentrated food of great sustaining power. With his thick slices of bread-and-cheese and pots of beer, the English mechanic and common laborer can laugh at the elevation of prices which has come to butchers' supplies. The English demand for imported cheese is constantly increasing. This is the surety of the American dairy-men's success. The amount consumed in this country is but a fraction of the annual production. No better indication of the growth of the industry, and the increasing amounts which England has taken during recent years, can be obtained than in the following table, which gives the annual receipts from the interior and exports at New York city, which is the one great distributing cheese centre of this country:

Years.	Receipts.		Exports.		
	Boxes.	Pounds.	Boxes.	Pounds.	
1863	281,318	38,577,357	1869	1,338,305	48,675,610
1864	253,303	48,894,592	1870	1,149,507	56,782,543
1865	283,828	39,378,448	1871	1,459,623	68,732,623
1866	731,740	38,331,340	1872	1,718,732	66,757,492
1867	1,204,904	55,349,244	1873	2,007,663	89,477,483
1868	1,108,627	46,350,074	1874	2,204,493	96,834,691

The continued increase in cheese production and export is plainly shown in these records of the New York trade for the last twelve years. A box of cheese will weigh, on an average, sixty pounds.

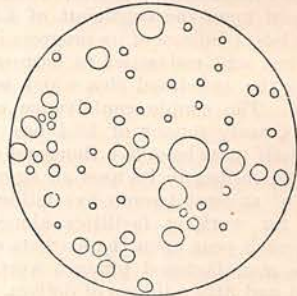
The census figures concerning the amount of butter produced in this country are regarded as defective by all in the trade. The best estimate of the annual production is that furnished by a committee of the leading merchants of the New York Butter and Cheese Exchange. They place the amount at 1,440,000,000 pounds a year. It is interesting to note the steps by which this estimate was attained. The committee believe that 5,000,000 of our population consume one pound each per week; 10,000,000, three-fourths of a pound; 10,000,000, one-half of a pound; 10,000,000, one-quarter of a pound. Thus 35,000,000 people would con-

sume 1,040,000,000 pounds each year for table use, and one-third as much for culinary purposes. This leaves 9,000,000 of our population as non-consumers. The exports of butter are 53,333,333 pounds, and this, added to the consumption, makes the annual production 1,440,000,000 pounds.

The process of dairy manufacture begins in the pasture. From this point onward until the finished product is placed upon the market the steps are such as require intelligence and skill, and prosper according to the degree in which they are applied. Every one knows that cows eat grass, and that man, when he draws the milk, turns to his own uses the rich fluid which nature designed for the nourishment of the calf. Thus the dairy-man obtains his material, but he does not pass even this first step unquestioned. He gives thought to his pastures. If the natural grasses are not abundant, he introduces new seed. Each year large quantities of seed are imported for this purpose. Pastures should be continuous. The grasses which spring first in the spring-time and those which linger latest in the autumn must be interwoven in the turf, that during each of the summer months the cows may regale themselves upon fresh verdure. Different conditions of soil demand different methods of pasture culture. There are pastures in Herkimer and Oneida counties which have not parted with their sod since the first clearing. For sixty years or more the cows have wandered over them, and still no fields in the country can surpass them in the sweetness and richness of the forage. On the other hand, there are light soils which will not sustain the enduring turf, and upon these breaking up and reseeded must recur at intervals. The question of the treatment of pasture lands is now one of the uppermost in dairy discussions. The cheese-making dairy-man demands quantity of milk; the butter-maker is most profited by quality. Do the newer fields, with their ranker growths of grass, yield more milk? and do the old, closely knitted turfs tend rather to richness, sweetness, and quality? Such intricate questions as these the dairy-man finds at the very foundations of his business. And in the selection of his herd, his milk-making machinery, are involved questions which call for the exercise of the best judgment and keenest observation. Is the trim little Jersey, with her little mess of milk charged with large oil globules, the best machine to manufacture the grasses of the butter-maker into a creamy milk? and is the larger Ayrshire, the Devon, the Holstein, better than the old "native" stock to furnish a milk rich in curd, and consequently better for the cheese-maker? These matters were little thought of when American dairying began, but now the stimulated production and awakened

intelligence of the industry call for the decision of a hundred knotty points which seem to hold the keys of future progress and success. Botanists, chemists, and biologists find their latest discoveries seized upon and put to practical use by the dairy-men. The capabilities of the industry invite much farther advancement in the way of a scientific explanation of its practices. Already it has reached the limit of existing chemistry and other sciences which are approaching a solution of the mysteries of vital forces and conditions, and nothing in its processes is yet fully understood. Its guide is empiricism, tending each year gradually from the ill to the better significance of the term. But the disposition of the American dairy-men is toward accurate knowledge and full understanding. The proceedings of their winter conventions show this, and it is necessary to remember the disposition and spirit of the men as we come more fully to consider the materials and agencies which they utilize in their practice.

The dairy-man's raw material is milk, and milk is a fluid of animal origin, varying, within certain limits, in the relative amounts of its component parts. It will be sufficiently accurate for our present purpose to say that one hundred parts of milk are composed of eighty-seven and one-half parts of water, three and one-half parts of butter, three and



BUTTER GLOBULES.

one-eighth parts of caseine or pure curd, five and one-eighth parts of sugar, and less than one part of mineral matter. In new milk the composing parts are in a state of solution, and all except the butter can be drawn from existing association only by agencies which change their form or composition. The butter is only held mechanically in the milk; it exists as an emulsion of oil and a heavier fluid, which is chiefly water and curd-forming material. When milk is examined with a microscope the globules of oil are plainly seen floating in the liquor. It is the art of the butter-maker to collect these globules into a solid mass. He generally waits for them to rise to the surface of the milk, which they do by virtue of their comparative lightness, and then shakes them

about until they collect more closely, divest themselves of all investing material, and take a mass form in the substance known as butter. His process is mechanical throughout. The cheese-maker's process is different from the outset. His first step is to change the form of the substance he seeks. He attacks the caseine or curd-forming part of the milk, changes it from a liquid to a solid, and endeavors to effect the change in such a way that the subtle globules of oil shall be held prisoners by the closing bonds of solidity. Thus he aims to fasten up

in the swiftly hardening curd that richness and fragrance which are characteristics of the butter oil, and which impart to the curd qualities which make it desirable for food material. The cheese-maker's operation is complex and is mechanical, not in its essence, but only in his furnishing conditions for the action of agencies and forces which are as far above and beyond mechanics as they are beyond his understanding. And not beyond his understanding only, but beyond the advanced science of the day. For to procure the coagulation of the caseine of the milk, or as the dairy-men express it, "making the curd," the cheese-maker pours into the milk a solution of rennet, which is obtained by soaking the stomach of a young calf in water or in whey, which dissolves from it the substance which enables the calf to do its own coagulation when the milk is taken into its living system. The cheese-maker transfers the digestive power from the stomach of the calf to his cheese-vat. Thus it appears how the cheese-maker's agency is beyond his understanding. The most advanced students of animal chemistry can not explain this digestive process. They have been able to imitate some of its transformations, but the philosophy of the process is beyond them. The use which the cheese-maker makes of this subtle power does not end with the first coagulation of the caseine. He believes it continues to act in the pressed cheese, and that the curing of the cheeses upon the



COLLECTING MILK.

shelves is but the further and natural continuation of the digestive process. Cheese is, then, in its best estate but milk partially digested.

The practice of dairying is made up of a series of interesting steps, and is accomplished with the aid of some of the most complex and delicate apparatus which the agriculturist has devised. Passing over the intricate questions of pasturage, and the breeding of cattle not only for milk, but for different qualities of milk, to which allusion has been made, we come to the drawing and manipulation of the milk after the cows have brought it from the pasture. Every dairy-farm has a dairy barn of greater or less excellence. This barn is not only the winter habitation of the cow, but, as the system of soiling is gaining wider introduction, becomes her summer residence as well. The dairy barn in its best estate is a large handsome building, oblong, two stories high, smoothly finished and painted, and surmounted by a cupola. It generally has a basement extending its whole length and breadth, and here the cows are kept, standing side by side in a long row, fastened by stanchions which close about each side of the neck, and allow up-and-down, but very little lateral, motion of the head. As one enters a dairy barn he sees a long row of horned heads, which calls to mind pictures of pillories. In this position the animals pass nearly all the time in winter, half an hour or so being allowed for a run in the

yard in mild weather. The milking is done while the cows are in the stanchions.

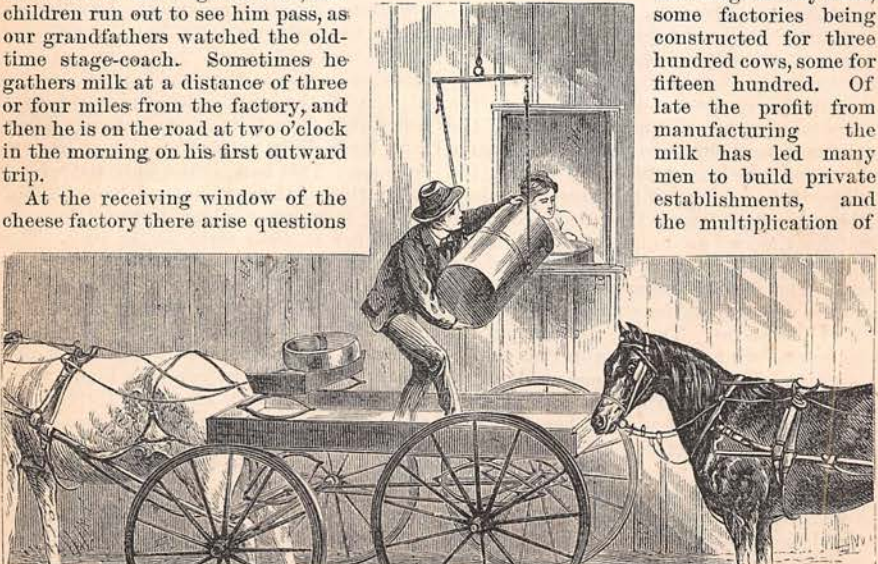
The dairy-maid going singing to the pasture with milk-stool and pail is either a myth or a tradition in the dairy regions. The milking is done chiefly by men, and amidst surroundings which suggest no poetry. As each man fills his pail he carries it to the can and pours it through a strainer suspended two feet above the mouth of the can. The airing which the milk obtains by falling in thin streams from the high strainer has been found very effective in ridding it of a part of its animal heat and odor, which hasten its decay if not removed. When the herd is milked, the cans are started off for the factory at once, where the system of single delivery is practiced. Here we may find, perhaps, the traditional dairy-maid transmuted into the Jehu of the milk wagon, for very often we find the pride of the dairy-man's family at the receiving door of the cheese factory. A more systematic milk delivery is in vogue in many factory neighborhoods. One man is employed to draw all the milk of patrons residing upon a single highway. Then each farm is furnished with a rude platform by the roadside, upon which the cans are placed to wait for the wagon of the man who "runs the milk route." The man of the milk route is often a creature of peculiar mould, and his horses are remarkable neither for speed nor beauty. Of necessity he must be a creeping animal, for the milk is not better for much shaking. His wagon is covered with a wide platform instead of a box, and the large cans are held by an encompassing rope. And yet the man of the route is a character in the neighborhood, and children run out to see him pass, as our grandfathers watched the old-time stage-coach. Sometimes he gathers milk at a distance of three or four miles from the factory, and then he is on the road at two o'clock in the morning on his first outward trip.

At the receiving window of the cheese factory there arise questions

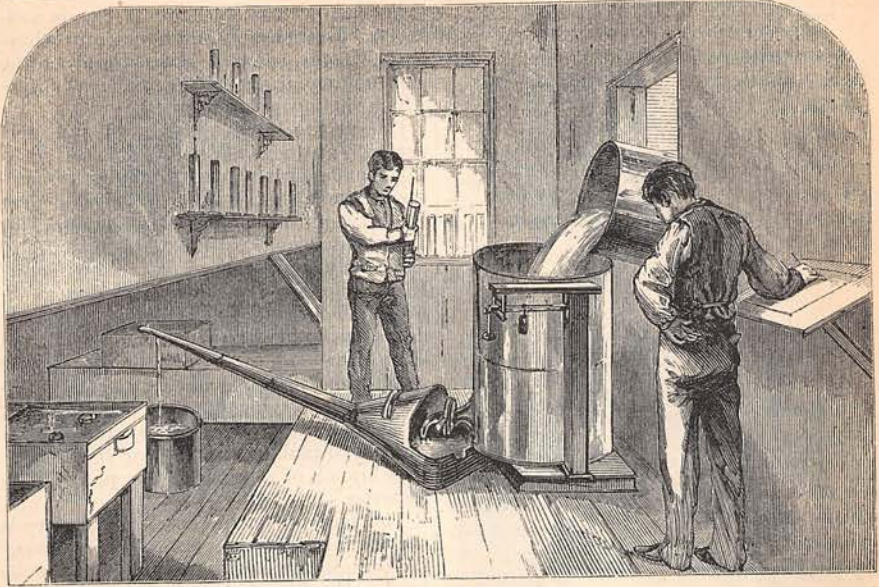
which end sometimes in ill temper, sometimes in the courts of law. All is not milk which comes in cans, and all milk is not good milk. In this State there is a stringent law against watering milk or otherwise interfering with its natural quality. Sometimes the proof is easy, as when small fish are found in the can. Sometimes the proof is more difficult. Each factory man has an instrument for testing the weight of the milk as compared with the weight of water, and he has graduated glasses for showing the percentages of cream which rise. A patron found guilty of watering his milk is denied the privilege of the factory, and often has to pay damages at law. Sometimes milk is spoiled by standing in the sun or being so closely covered that the animal odor can not escape. The cheese-maker must be able to discover this at once, for one can may taint a whole vat as soon as it is introduced. Some makers claim to have olfactories so keen that they can detect a taint before the can is removed from the wagon. If the milk be satisfactory, the faucet of the weighing can is opened, the milk flows through a long conductor into the cheese-vat, and the number of pounds is credited to the patron upon the factory milk book.

As the fundamental idea of the American cheese-factory system is association, the early factories were generally built with capital subscribed by a neighborhood of dairy-men, who became stockholders in the property of buildings and apparatus. The amount of money required to build and equip a factory ranges from two to five thousand dollars, according to the number of cows kept upon the tributary farms.

The range is very wide, some factories being constructed for three hundred cows, some for fifteen hundred. Of late the profit from manufacturing the milk has led many men to build private establishments, and the multiplication of



THE DELIVERY OF MILK AT FACTORY.



RECEIPT OF MILK AT FACTORY.

the factories has naturally reduced the amounts of milk which each receives. The spirit of competition between adjacent factories is very strong, and each strives, by showing a high average return per pound of milk, to draw to its vats milk which usually seeks rival establishments. During the winter the factory man makes an

active canvass among the dairy-men, and, throwing his results upon the market, endeavors to gain pledges of their support for the coming season. Generally speaking, the requisites for the establishment of a cheese factory are the surety of a sufficient number of cows and an abundance of good water. For the latter nothing is better than a gen-



THE RIDGE CREAMERY.



A CHEESE-MAKER.

erous flowing spring, and this, if it be accessibly located in a dairy region, is a thing for which large sums of money are frequently paid.

One meets an almost endless variety of structures and internal arrangement in a tour through the cheese factories of any county or State. As might be expected, the oldest factories are the poorest in every way. When the system began its hurried advance, it pressed into its service buildings which had served other useful purposes. Bankrupt cooper shops and surplus barn room, occasionally dilapidated country stores, were transformed, and even deserted churches substituted curd for catechism. Many of these are still retained, patched and enlarged to meet newer demands. But there has been a constant development in factory building, and some of the recent establishments are models in useful architecture and convenient furnishing. Occasionally the visitor comes upon a factory fragrant as a meadow within, and surrounded with flowers and shrubs. In such a one there is a family residing, and the genius of the place

is a woman. The opposite extreme is a dilapidated building with broken and whey-soaked floors, with an aroma tainting the surrounding air, and with a quality of cheese which the buyer turns from.

One of the latest constructed and most perfectly arranged cheese manufacturing establishments in the State, if not in the country, is the "Ridge Creamery," located near the city of Rome, in Oneida County, New York, and owned by the "American Dairy and Commercial Company of New York." It embodies some of the latest and most approved ideas in factory building. Its exterior is tastefully painted and adorned, and is an ornament to the neighborhood. We select from it such main features for illustration as are common to the cheese factory in general, adding thereto the arrangements for butter-making which are common to that branch of the industry as practiced in factories.

The main room in the cheese factory is the manufacturing-room, or "make-room," the term in common acceptance. Here the hard work of the factory is done. Here the vats are located into which the milk is received as it comes from the farms of the neighborhood.

The curing-room is generally a large, plain apartment furnished with long narrow tables, which in the busy season are covered with continuous rows of cheeses, each day's "make" stenciled with the month and day. The walls are tight and the windows curtained. Arrangements are provided for heating, for an equable temperature is essential in the curing.

The butter-room in a creamery, or the "churn-room," as it is generally called in factories which make butter alone, is a clean apartment furnished with large power churns and machines for working the butter. The working is generally accomplished by a corrugated lever, which is pressed down upon the butter, or rolled over it. Into this room is brought the cream, and from it goes the butter, salted and packed for the market.

Many factories have living-rooms, which are occupied during the spring, summer, and fall months by the cheese-maker and family. In the best establishments there is a room for a small steam boiler and engine and a store-room for general uses.

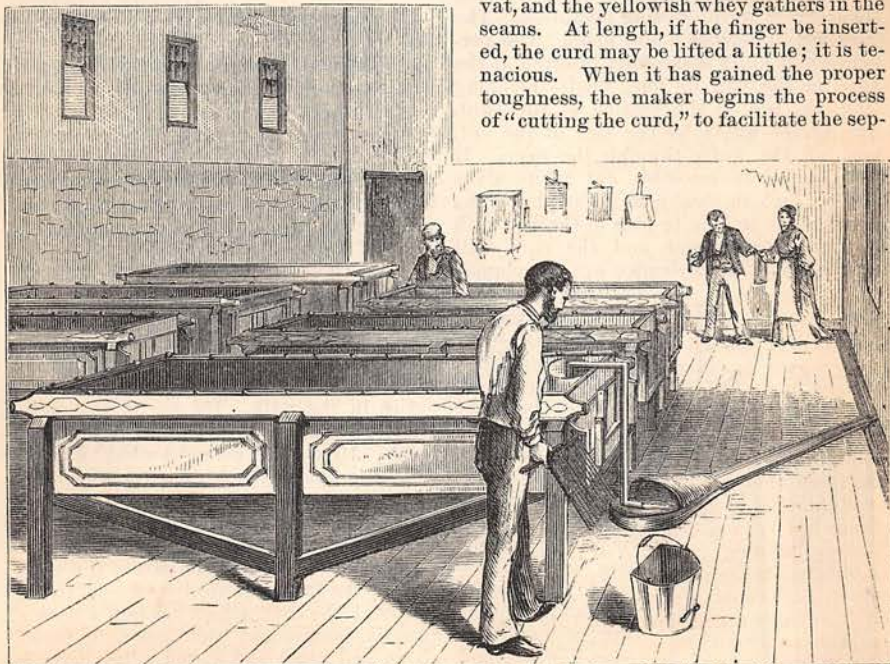
If one enters the make-room of a cheese factory between eight and ten o'clock in the morning, he is quite sure of finding the cheese-maker at his vats. He is the ruling power in the building, and his wife is next to him in authority. Sometimes these relations are exactly reversed, for there are many women who can manipulate the milk as well as men. The one possessing the skill wields the sceptre and gains the high wages; the other submissively works under orders. The average cheese-maker is a per-

son of considerable intelligence and of neat personal appearance. His manner of greeting visitors depends in part, of course, upon his natural disposition, but in no small degree upon the condition of his make-room. If it is the morning after a thorough cleaning of the premises, he is apt to be cordial and pleased to see you. There is no point, generally, concerning which the cheese-maker is so nervous as cleanliness. Milk is a most sensitive material. It gathers all odors, and these influence the quality of the product. It is a business necessity that the factory should be sweet and clean. Hence it is that the cheese-maker does not welcome you cordially when he is conscious that the discipline of mop and scrubbing-brush has been relaxed. The cheese-maker is educated far beyond the average agriculturist. He reads closely all that appears in dairy newspapers and convention reports concerning the sciences to which his industry is appealing for more light. When he is not busy, he will talk intelligently of spores and molecules. His business leads him to exact observation. He often watches for the changes which may result in his vats from a change of a single degree in temperature. The thermometer is his yard-stick.

At about nine o'clock in the morning enough of the morning's milk has arrived to begin the process of cheese-making in one of the vats. The night's milk has been lying in the vats since the previous evening,

cooled by a stream of water running between the inner and outer surfaces of the vat. The modern cheese-vat is quite a complex apparatus. It is in reality a large square tin, pan, holding in some cases six hundred gallons, resting in a water-tight wooden box mounted on six legs. Between the pan and the box there is a space filled with water, in which steam-pipes circulate. Nearly all cheese-making is thus done in what chemists call a "water-bath." This is the case both in the steam-vats and the "self-heaters," which are heated with a fire-cylinder running through the water-vat.

When enough morning's milk has been received to fill the vat, the cheese-maker turns the steam into the pipes. He watches the milk closely as it is heating, and plunges his thermometer into it frequently. While it is heating slowly he pours into the milk a bright yellow coloring matter (annotto), and stirs it in thoroughly. This gives the cheese its rich color, as most frequently seen in the markets. When the milk reaches a temperature of eighty-four degrees, the rennet is added, in the form of a whitish liquor, and the coagulation or separation of the curd from the whey begins. The time requisite to form a perfect curd depends upon the amount of rennet introduced: it may be in ten minutes or an hour, as the maker pleases. The milk begins to thicken gradually. It becomes of the consistency of cream, then it assumes the characteristics of solidity. The white mass shrinks from the sides of the vat, and the yellowish whey gathers in the seams. At length, if the finger be inserted, the curd may be lifted a little; it is tenacious. When it has gained the proper toughness, the maker begins the process of "cutting the curd," to facilitate the sep-



THE "MAKE-ROOM."

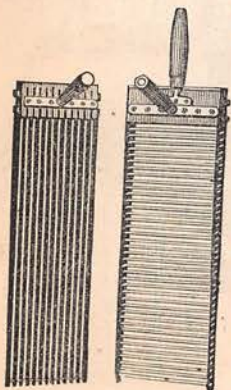


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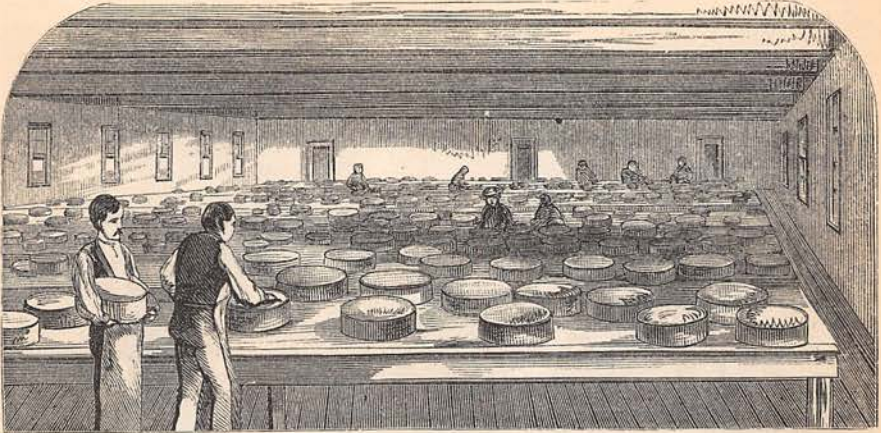
aration of the whey. The curd knife is a compound instrument composed of a number of fine cutting edges set half an inch apart, and varying in length. There is the "perpendicular knife," in which the cutting edges are moved at right angles to the bottom of the vat, and the "horizontal knife," in which they are parallel to it. "Cutting the curd" is an interesting operation. The curd lies in a dense white mass. The perpendicular knife is carefully inserted at the head of the vat, its long blades reaching from the top to the bottom of the curd. The maker walks by the side of the vat, pushing the knife through the mass. It then stands in smoothly cut white slabs half an inch in thickness. Next he works crosswise from side to side of the vat with the same instrument, and the curd still stands, but it is in slender square columns

half an inch thick and wide. Already the yellowish whey has appeared, flooding some parts of the vat, but the curd is still visible. Next the horizontal knife is introduced and drawn through the slender pillars, and the mass becomes reduced through its whole extent to the form of half-inch cubes, like dice, and there is nothing to be seen in the vat

but a sea of yellow whey. Then begins another operation, known as "cooking the curd." More steam is admitted to the pipes, and the temperature is gradually raised to ninety-eight degrees. This is done very slowly, the range of time being from one to three hours with different makers. While the "cooking" is in progress the curd must be frequently stirred to prevent baking at the bottom of the vat. This is done sometimes by hand, sometimes with a light wire gridiron called an "agitator," which is pushed under the curd and lifted, the material escaping in desiccated form. While the heating is going on, the curd becomes sensibly sour. When the proper moment has arrived, the whey is drawn off, and the curd is heaped up to drain along the sides of the vat. The development of the acid continues so long as the heat is applied, and one of the most important questions in the whole process is the proper moment to lift the curd from the vat. Each maker has a time of his own, and different times for different conditions which he may notice in the milk. He smells and tastes his curd as accurately as a cook tests her broth. He can not describe what he tastes or smells exactly, but there is something which is conclusive to his mind, and the curd is shoveled into the curd-sink, which is a long box with a perforated bottom, through which the greater part of the whey held in the lumps of curd escapes. In the curd-sink the curd, which has now a coarse, granular shape and rich color, is tossed about and aired and salted. The next is the final step in the manufacturing department. The curd is dipped into a metallic



CURD KNIVES.



THE CURING-ROOM.

ring lined with muslin, which becomes the bandage. It was the old plan to press each cheese in a wooden hoop by itself with a perpendicular screw. It is now possible to press a long row of cheeses by tightening a single screw. The apparatus is called a "gang press," and when the cheese-maker has his curd tightened up in the press it is often well along toward evening, and the hard work of the day is over. The cheeses remain in the press until the next morning, when they are placed upon trucks and wheeled into the curing-room.

Such is a general outline of the process of making cheese in a factory make-room. It is impossible to formulate the method exactly. Almost every step must be begun or arrested as the judgment of the maker dictates. There are so many mysterious forces at work in his material, so many influences operating, and so diverse conditions resulting, that in any single case there must be a hasty diagnosis and an effective prescription. A little too great acidity developed will make a cheese hard and give it a cracked surface, too little will make a cheese soft and unsafe to handle, unless a special market demands it. The maker must vary his process according to the season and the temperature, according to the richness of the milk and its purity or impurity. He has often to meet tendencies toward impurity, which may be implanted and fostered on the farm, by conditions which arrest them and disguise their work. Two makers will talk of how such a vat "worked" as two doctors will consult about a patient. The cheese-maker must regulate his process according to the market which he wishes to please. Cheese made for the English trade is very different from that most popular in our groceries. And even in the English trade there are distinguishing marks between the Liverpool, Manchester, and London demands. All these things demand that

the cheese-maker be a man of skill and information. His wages are those of a skilled laborer; and modern reformers should be pleased to know that women gain as high wages as men, and often lead the pay-rolls in establishments in which several men are also employed.

When the cheese reaches the curing-room



FEMALE CHEESE-MAKER.



THE STREET CHEESE MARKET AT LITTLE FALLS.

the process of ripening begins, and it is promoted by carefully watched temperatures. The time required to ripen a cheese may be regulated by the process of making, and it often depends, besides, upon the condition of the atmosphere. The time usually allowed is from twenty to thirty days, but during the summer of 1874 the makers in some of the dairy counties fitted their cheese for market in ten days. This is done mainly by the introduction of larger quantities of rennet, the theory being that the digestion of the curd is thereby accelerated. It may be said, however, that a cheese which an exporter will desire should remain three weeks on the shelves. While the cheeses are in the curing-room they are turned from side to side each day, and the surfaces rubbed over with grease. When a sale is made the boxing takes place, and early the next morning half a dozen farmers' teams may be seen at the factory loading up the "shipment" for carriage to the freight dépôt.

Some of the largest and best-furnished milk manufacturing establishments in the country are called "creameries." They differ from the old orthodox cheese factories in the fact that both butter and cheese are made from the same milk. The operation requires more machinery and a more complex establishment. The milk, as it is received from the farmers, is poured into "coolers," or deep pails, and placed in a "pool" or shallow cistern of running water until the cream rises. The cream is removed with a funnel-shaped dipper, which

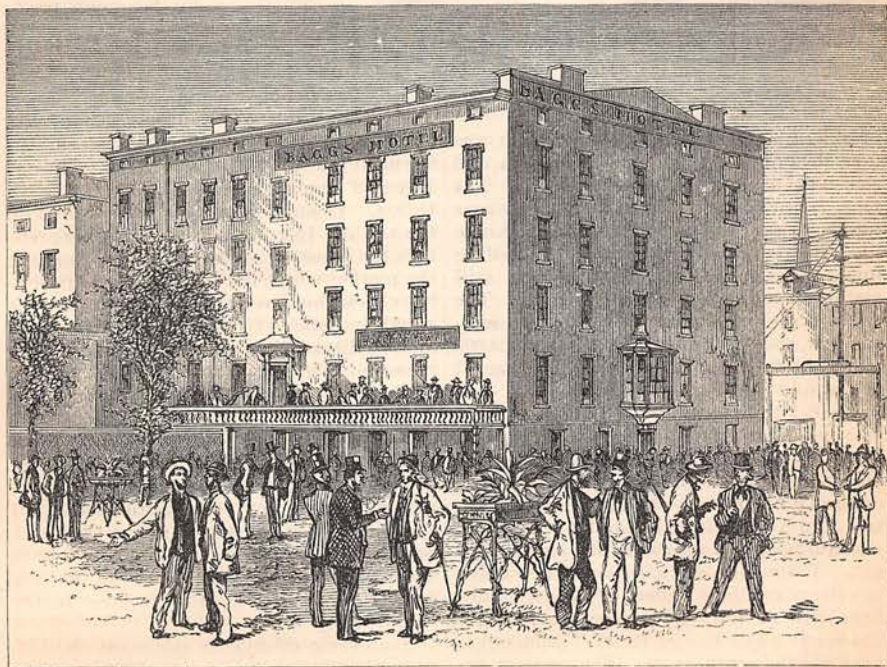
is pressed down into the cooler until the rich cream overflows its upper edge and fills it. This is the prevailing method of gathering the cream. There are other plans by which the milk is set in large shallow pans, around which a stream of cool water runs. A still later arrangement is shown in the make-room of the Ridge Creamery, by which the cream is allowed to rise in the raised vats to the right, and the skim-milk is drawn thence directly to the cheese-vats below. The idea is the same in all—to gain the cream for butter, and manufacture the balance into cheese. Creamery butter is the very finest grade of butter now made in large quantities in this country. In the New York market "creamery pails" occupy the position once held by "Orange County butter," the latter having become a traditional article because of the immense quantities of milk and cream taken from those who formerly were butter-makers, and shipped each day to the New York milk dealers.

As creamery butter meets such a profitable demand, those dairy-men who have been engaged in creamery practice have obtained the largest returns from their milk. For two or three years there has been a wide tendency toward the building of creameries, and the season of 1875 finds an increased number of them in operation. This growth has been fostered by the increased success which makers have attained in making a good, wholesome cheese from partially or wholly skimmed milk. The old-fashioned "skim cheese" is a drug in the market and

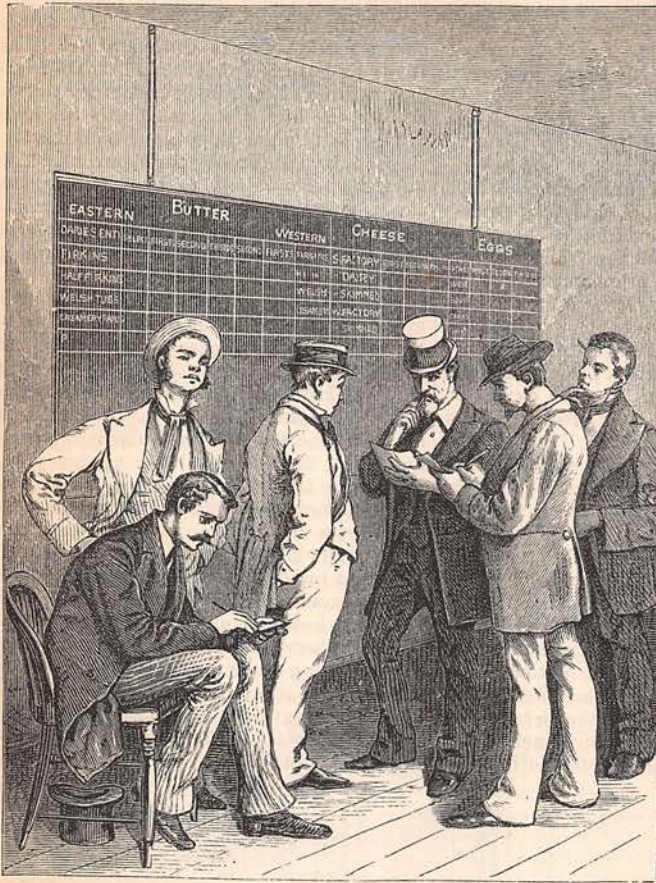
an embarrassment to the trade, but the modern skimmed cheese approaches very closely to the full cream article. In this branch of the manufacture there is a tendency toward the introduction of novelties. Henry O. Freeman, of Chenango County, New York, has invented a method by which the curd from skimmed milk may be enriched by substituting a cheaper oil for the cream which has been removed, and this process has been practiced with remarkable success in a number of establishments. The commercial problem involved in creamery practice is simple. The money received for the butter nearly equals the usual receipts from the milk, and the cheese returns are additional. So long as such a condition prevails, a tendency toward creameries may be expected, although the followers of the orthodox manufacture denounce it heartily.

The business of dairying is twofold. Part first begins in the pasture and ends when the cheese is boxed; part second begins at the boxing and ends upon the dinner table. The former is manufacture; the latter, trade. The various phases of the trade in dairy products are of interest. In the factory associations the power to sell the cheese is vested in a single man, and he is generally the best business man of the neighborhood. The salesmen of the different factories meet the buyers from the distributing centres at a stated place once each week, and the cheese is bought and sold in large

quantities. These points of meeting are called the interior markets. The oldest cheese market in the United States is at Little Falls, in Herkimer County. On Monday morning of each week from April to December one of the streets of this thriving village is filled with wagons loaded with cheese boxed and ready for shipment. The buyers go from load to load, lifting the covers and plunging their sharp steel "triers" into the cheese. Bids are made and "raised," and a couple of hours are passed in bantering. Before noon generally the cheese has all changed hands, and is piled up on the platform of the freight-house waiting for the regular "cheese train" upon the New York Central Railroad. This morning trade is, however, but a small part of the day's business. The cheese thus sold is made in the few "private dairies" which have thus far withstood the tendency toward the factory system, and ranges in amount from five hundred to eight hundred boxes weekly. In the afternoon the great trade takes place. The salesmen of fifty to a hundred factories come upon the market and are met by New York dealers or their purchasing agents. In this trade seldom any cheese is shown, the quality of each factory being known to the buyers either from examination at the factory or by the general reputation of the establishment. In 1871 a "Dairy-men's Board of Trade" was established, and Hon. X. A. Willard elected



DAIRY-MAN'S BOARD OF TRADE, UTICA.



THE BUTTER AND CHEESE EXCHANGE IN NEW YORK—A HEAVY OPERATION.

president. A very elegant trade-room was furnished by the citizens of Little Falls, and this is the head-quarters of the board. The room is provided with all the conveniences for business, but the men trading at Little Falls had become so accustomed to trading upon the street that the curb-stone still maintains a firm hold upon the traffic. The trade is in large amount during the mid-summer, sometimes 10,000 boxes, or 600,000 pounds, \$90,000 in value, being transferred at a single meeting.

In 1871 there was also a Board of Trade established in the city of Utica, in Oneida County, and T. D. Curtis was the first president. Before this time the trade had been done at Little Falls for all the region of Central New York. In 1874 the trade in Utica was quite equal to that at the pioneer market. There were no traditions in Utica, and the Board of Trade system of sale flourished from the outset. Accessible trade-rooms are occupied in Bagg's Hotel. Each salesman as he comes to the city records the amount of cheese he has for sale upon the

register of the board. Upon the walls are bulletins giving the current values of cheese in Liverpool, London, New York and other American cities, and the amounts received and exported during the preceding week. The state of the trade at every point is shown by the advices of the board. Buyers and salesmen are alike members of the organization, but it is in essence a producers' organization—a movement of producers to possess equal information with the men who buy from them. There is no other trade in agricultural products which has attained such a perfection of system as the trade in cheese. Upon this point the words of ex-Governor Horatio Seymour, president of the American Dairy-men's Association, will have due weight. In an address before the

Ninth Annual Dairy-men's Convention Mr. Seymour said: "The blackboard in our Board of Trade rooms is a wonderful institution. Upon it are recorded the prices of the world. In grain, cotton, and other products the question is, What are they worth at the market where they are offered? In selling cheese, however, it is asked, What is this worth in London? The cable, freights, and metropolitan prices all regulate sales. The reason of this is that the dairy-men are more perfectly organized. There is no other instance where men are educated as you are educated. You are educated to the laws, habits, and wishes of other people. This intelligence is, therefore, more broad and varied than of any other agriculturist. I speak of this because it is a just source of congratulation in the present and pride in the future, and productive of hopes that the dairy interest will be the greatest in the country."

The cheese offered for sale upon the Utica market during the season of 1874 reached a value of two and three-quarter millions of

dollars, and at Little Falls the amount was similar. There are also regular open markets at half a dozen other points in New York State. At Elgin, Illinois, is the great dairy market of the Northwest. The tendency is constantly toward an aggregation of producers at the recognized interior markets, and each year Governor Seymour's words concerning the intelligence of this class of our agricultural population become more true and wide of application. The general tendency toward a systematic trade in dairy products has achieved results in the metropolis as well as in the interior. New York city has been, since the beginning of the dairy industry, the great distributing market for its productions. In 1873 a movement which had been for some time agitated among the butter and cheese merchants operating upon the New York Produce Exchange culminated in the establishment of the Butter and Cheese Exchange of New York. There were several reasons mooted for the existence of the new commercial organization. The ostensible advantage of the step was in its ability to remove a trade friction occasioned by a useless and expensive storage and transfer of agricultural productions, and for this purpose the new exchange was located in Stuart's Building, at the corner of Greenwich and Reade streets, adjacent to the piers of the Hudson upon which the goods arriving from the interior are landed. The exchange was formally opened for business September 10, 1873, and Walter S. Fairfield, Esq., was elected president. During the session of 1874 the Legislature of New York State granted the exchange a liberal charter. In its first annual report the organization claimed to represent more than one hundred millions of the city's commerce in agricultural products. Its meetings are held each week-day, and its daily quotations are printed in a trade circular known as the *Commercial Record*, which is regarded in the interior as the most trustworthy daily record published of current values for dairy productions.

From the 1st of April to the 1st of December is the dairy-man's time of action. On the farms the care of the soil, the gathering of his supply of hay, corn fodder, root crops, and other growths for the winter maintenance of the herd, the incessant milkings, the cultivation of a few small crops which he undertakes in connection with his dairy—all these occupy his attention and make him a busy man. The salesman of a factory adds to his other employment a daily study of the market quotations and tendencies, and sharpens his wits by weekly contact with the buyers upon the country markets. The treasurer of the factory association each time a sale is made withdraws from worrying his hired men, and

gathering about him the solitude of the "front-room" in the farm-house, scratches his head and rubs his slate until he concludes that it has taken $9\frac{7}{1000}$ pounds of milk to make a pound of cheese, and that each farmer who has delivered at the factory one pound of milk is entitled to receive from him $1\frac{27}{1000}$ cents. Even to this accuracy must his tardy fingers attain. In the factory the maker finds opportunity while working the most obstinate curd to pump a visitor, if perchance he can learn from him what price was gained at the last sale by his rival factory at the next four corners, and is happy in the face of difficulty if his rival has fallen one-eighth of a cent behind him on the market.

The winter brings a change to all. The snow drifts around the factory; the cows are in the stanchions. The small messes of milk are carried to the farm-house, and the dairy-man's wife assumes the care of its churning, from which during the long summer the factory has happily released her. But there are leisure days to all. The varied experience of the summer invites relation, comparison, and discussion. These are found in the winter conventions. They are held in all the dairy regions. There is the Convention of the American Association, which is held each January in Utica. Each dairy State has an association bearing its name, and there are local tributary organizations. The disposition of the dairy-man is to act, and then to talk about the deed, and to listen to others who speak from practice and experiment. Thus, profiting by every lesson, he has advanced his industry and improved himself. He believes in the future success of his business.



"HALF POUND, PLEASE, SIR."