AMERICAN INDUSTRIES, No. 40.

OLEOMARGARINE—HOW IT IS MADE.

The wholesomeness of beef fat as an article of food has never been questioned. It is always and unavoidably eaten with beef, however cooked; for the leanest meat not only has more or less fat mechanically attached to it, but also inseparably mixed with the muscular fibers. To insure a liberal incorporation of fat with the lean, our beef is, in one sense, always overfattened. While the lean flesh is receiving the desired admixture of interstitial fat, the animal is overcharged with it, storing up in various parts of its organism masses of clear fat largely in excess of the amount needed for cooking purposes. Until recently this extra fat has been lost to the food supply, being converted by rude processes into inedible though not necessarily unwholesome tallow, to be used in soap making, candle making, for lubricants, and so on.

About a dozen years ago M. Mége, a French chemist, commissioned by his government to investigate certain questions of domestic economy, was led to make a special study of beef fat to see whether a larger portion of it might not be preserved for dietetic uses. The horned cattle of France exceeded twelve millions in number, some millions of them being sent every year to the shambles; and it was obvious that if each were made to yield even a few pounds more of edible fat an enormous and valuable addition would be made to the national food supply. M. Mége began with a comparative study of beef fat and butter. The essential part of the latter, its oil, differs from the oil of suet in containing a percentage of butyric compounds which give to butter a part of its flavor, and in lacking the large proportion of stearine which gives to suet its hardness and rough grain.

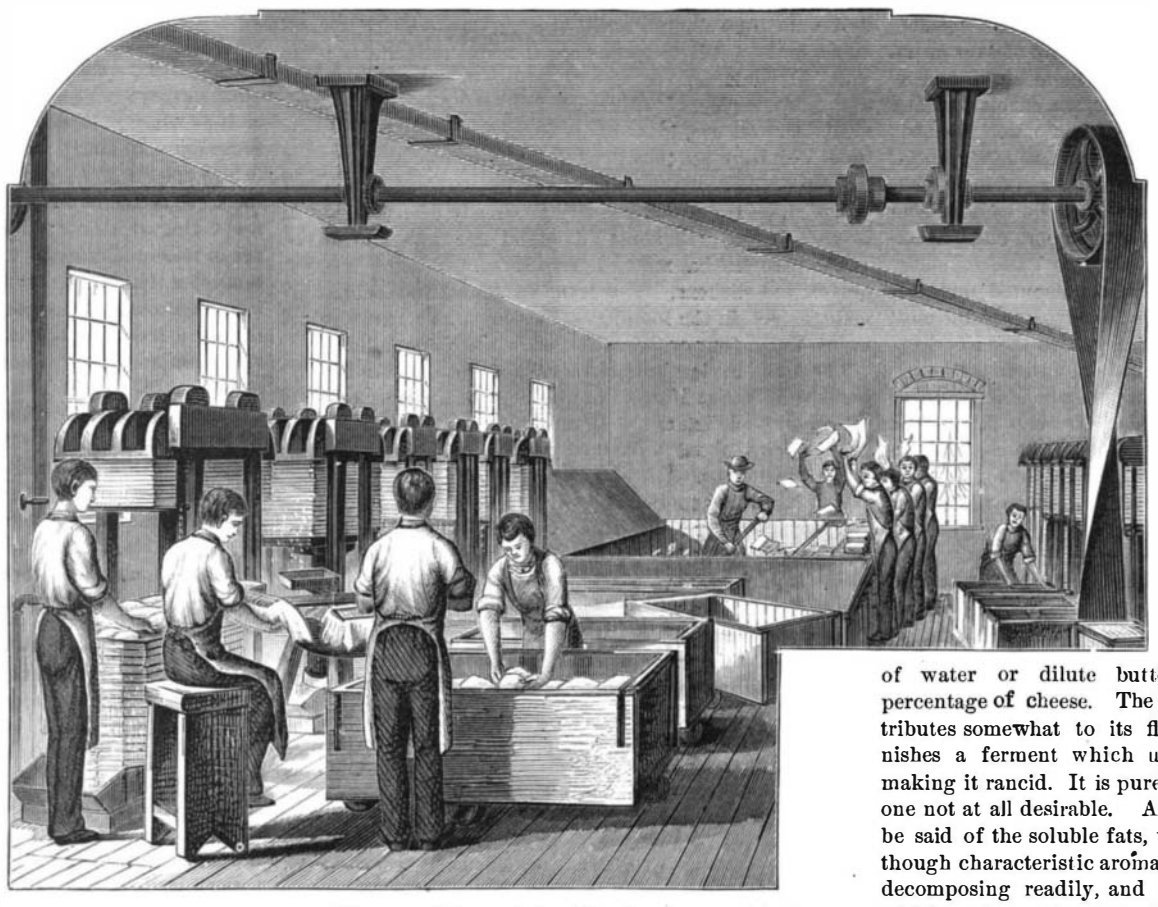


FIG. 5.—PORTION OF PRESS ROOM.

While investigating the origin of butter in the animal economy, M. Mége found that cows, when deprived of food containing fat, still continued to give milk yielding cream. The only possible source of the fat thus exhibited was the stored-up fat of the cow's body. Hence, beef fat could be converted into butter-fat. But how? Physiology taught that the change was wrought in the living organism through the withdrawal of the larger part of the stearine by respiratory combustion; the secretion of the remaining oleomargarine by the milk glands, and its conversion into butyric oleomargarine in the udder under the influence of mammary pepsin.

In the process of making butter by the ordinary method, during the process of churning the cream, the finely divided butter-fat is united in masses containing, by mechanical admixture, from twelve to fourteen per cent of water or dilute buttermilk carrying a fractional percentage of cheese. The latter ingredient of butter contributes somewhat to its flavor, and at the same time furnishes a ferment which ultimately spoils the butter by making it rancid. It is purely an accidental ingredient, and one not at all desirable. And to some extent the same may be said of the soluble fats, which give to butter its variable though characteristic aroma. They are unstable compounds, decomposing readily, and furnishing the acrid products which make so large a portion of the butter of the shops more or less unsavory and unwholesome.

To solve the practical problem set him by the French authorities, namely, to convert the surplus fat of beeves into a savory food product, M. Mége sought to imitate the processes of natural butter making, that is: (1) To separate

Fig. 9.—PACKING IN FIRKINS.

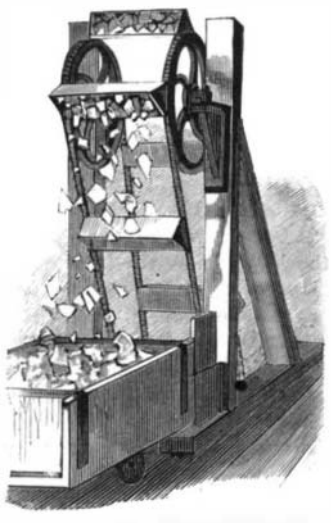
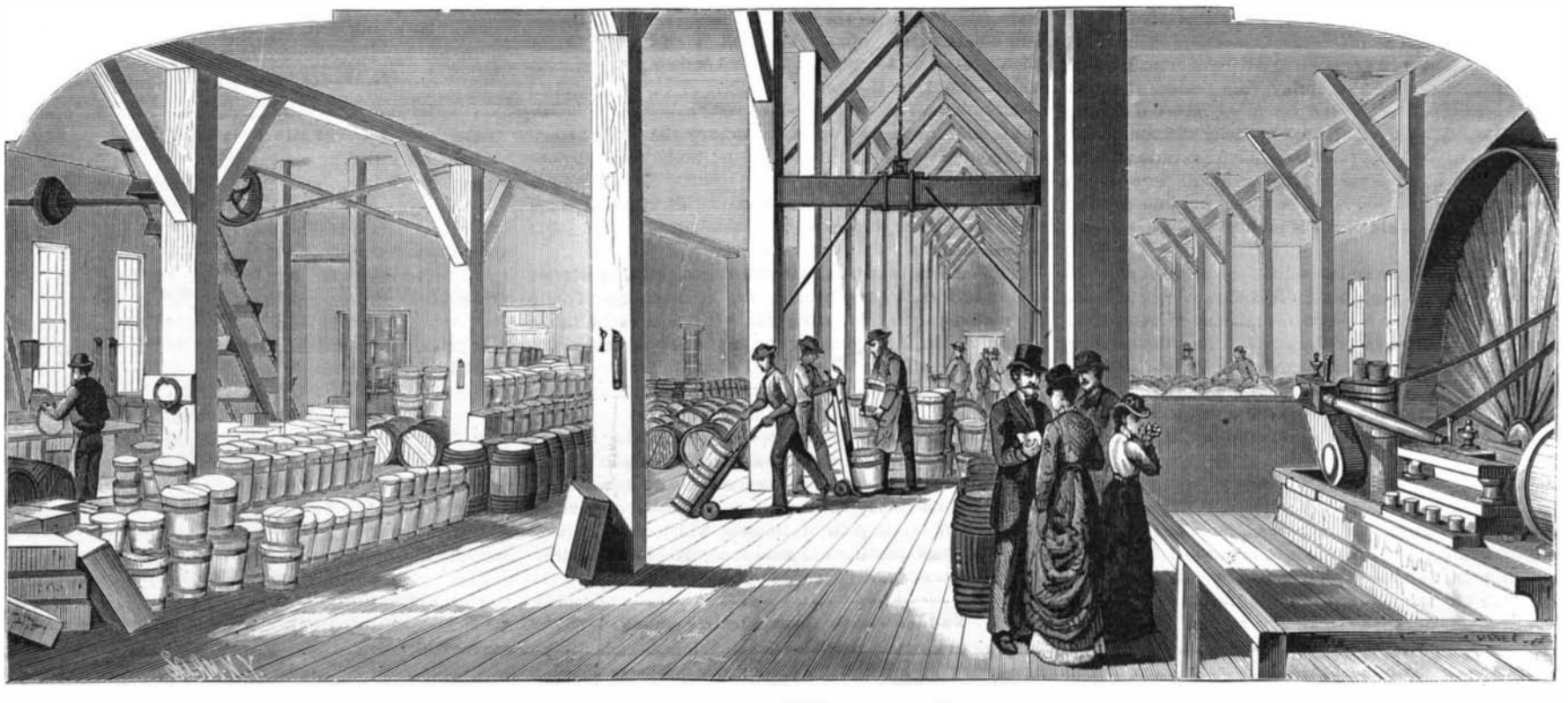


Fig. 7.—ICE ELEVATOR.

Fig. 8.—PACKING FOR THE RETAIL MARKET.



THE MANUFACTURE OF OLEOMARGARINE IN NEW YORK.—FIG. 6.—GENERAL DELIVERY ROOM.

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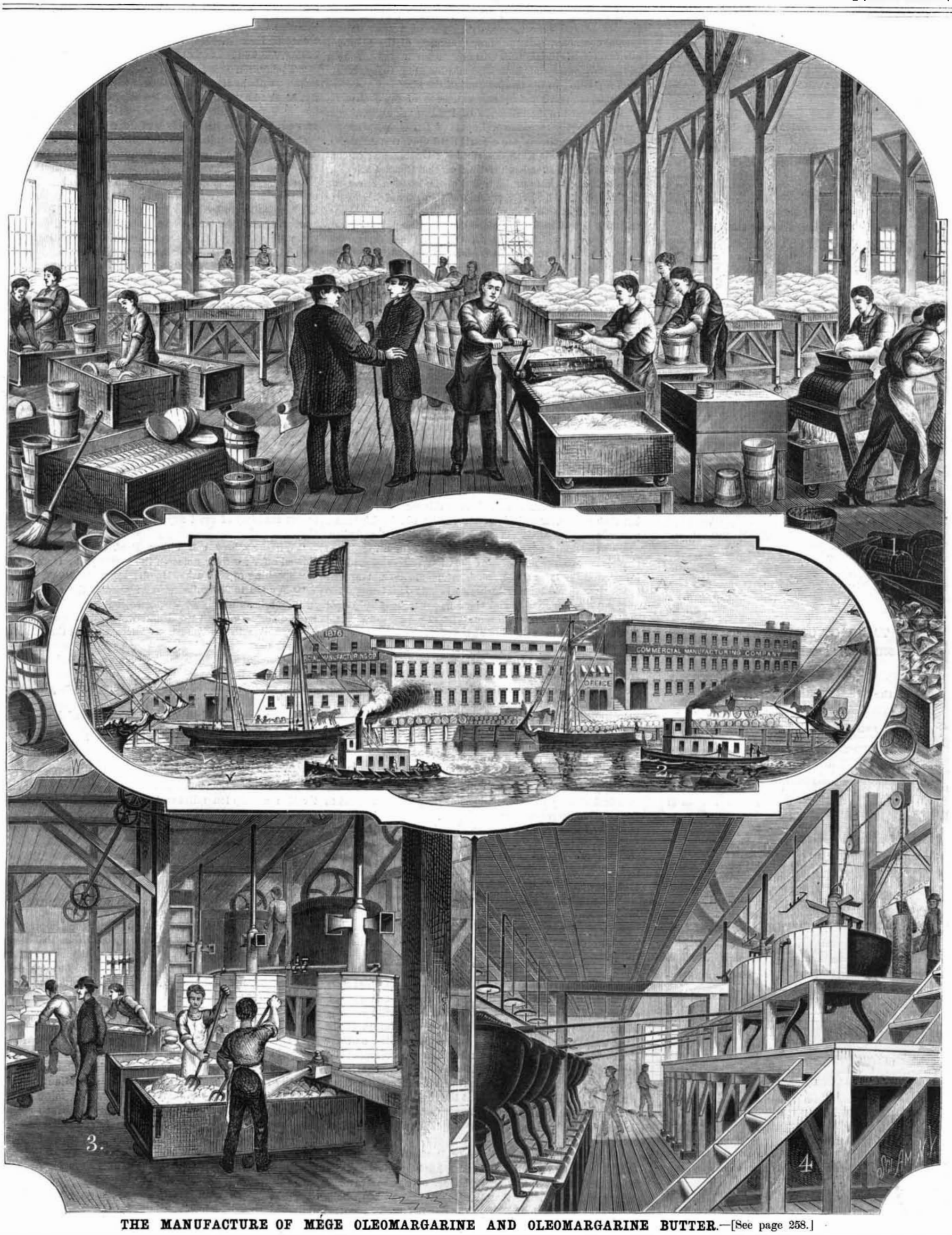

THE MANUFACTURE OF MÉGE OLEOMARGARINE AND OLEOMARGARINE BUTTER.—[See page 258.]

Fig. 1.—One Day's Churning,—Butter Working and Salting. Fig. 2.—View of Commercial Manufacturing Company's Works. Fig. 3.—Churning Room. Fig. 4.—Melting Room.

from the oily fat of suet the cellular tissue and excess of stearine; (2) to add to the oil a sufficient proportion of butyric compounds to give the necessary flavor; (3) to consolidate the butter-fat without grain, and to add, at the same time, the requisite proportion of water, salt, and coloring matter to make a compound substantially the same in composition, flavor, and appearance as butter churned from cream; all this without adding to the original fat anything dietetically objectionable, and without subjecting it to any process capable of impairing its wholesomeness.

The method developed by him in this commendable undertaking can best be appreciated by following it step by step through the extensive works of the Commercial Manufacturing Company of this city, at West 48th street, North River, where it is practiced on a large scale, with such improvements as experience has proved to be advantageous. Our artists' abundant illustrations will make any elaborate description of the several operations quite unnecessary.

At an early hour each morning the selected fat from the several abattoirs about the city begins to come in. The fat being received within a few hours from the time of killing, it is and must necessarily be fresh. After being weighed the fat is thrown piece by piece into large vats of tepid water; any pieces showing blood stains being thrown into a special vat for extra washing. After soaking for an hour in the tepid water, the fat is thoroughly washed with cold water and then covered with fresh cold water and left another hour to soak. It is then assorted. The pieces rich in oil are severed from the rest by a skillful cut, the assorter throwing the finer pieces into an adjoining tank for another washing, and the pieces less rich in oil into tubs to be transferred to the tallow factory. The fat for butter making is now carefully washed a third time, then elevated to the floor above for hashing and melting. The object of hashing is to disintegrate the fat, thoroughly breaking up the tissues so that the oil will separate therefrom at a low temperature. This is necessary to prevent the development of the rank tallowy flavor which results from the action of a heat, such as was heretofore used for the melting of tallow before the Mége discovery.

The hashing machine is simply a series of knife blades revolving in an iron cylinder; the fat being fed in at one end, and, after disintegration, forced out at the other end through a perforated iron plate. From the hashers the fat is conveyed to the melting tanks, a series of caldrons, jacketed and surrounded with water. The water is heated by steam, and in turn heats the fat, which is melted at a temperature of from 122° to 124° Fah. When the fat is thoroughly melted the mechanical stirring is suspended, the particles of membrane settle to the bottom, forming "scrap," and a thin film of white emulsion of water and oil forms on the top. The latter is removed and the clear yellow oil is drawn off into wooden tank cars, which are sent into the "seeding" or press room to rest while the oil is granulating by the crystallization of the stearine. The melting process occupies from two to three hours, and the granulation fully twelve times as long, the temperature of the room being kept at 85° Fah.

The refined fat is next pressed, when the excess of crystallized stearine is removed by straining under pressure. The fat is now packed in cloths set in moulds (as shown in the foreground of Fig. 5) to form packages about the size of a common brick, the packages being placed on galvanized iron plates in the presses on the left. When a press is entirely filled the packages are subjected to a slowly increasing pressure, under which the fluid oil flows out until the stearine cakes are left dry and hard, when they are removed by an adroit flirt of the canvass wrapper, as shown in farther corner of the press room. The larger area of this room is occupied by cans of crystallizing fat.

Two important steps in the butter making process have thus been completed. The thoroughly washed suet has been deprived, first, of the inclosing cellular tissues, and next, of the excess of stearine. We have now a limpid amber-colored oil, perfectly sweet, and substantially the same as the oil of butter. When cooled this oil, or oleomargarine, is slightly yellow in tint, melts in the mouth like butter, and has an agreeable taste. At this stage it furnishes an excellent fat for culinary purposes, and may be kept for a long time without risk of becoming rancid. This makes it much preferable to ordinary butter for naval uses. In the works of the Commercial Manufacturing Company, the larger part of the butter oil formerly did not go beyond this stage, being drawn off from the press room into casks for exportation. At present the company cannot supply the demand for butter.

To convert the butter oil into butter, it is necessary for it to undergo the processes by which fat is converted first into cream and then into butter, in the udder of the cow and in the churn. For this purpose so much of the daily product of the Manufacturing Company as is needed for home consumption is forced through pipes to the churning room. In the cow's udder the fat which is to be converted into cream is divided into minute globules, in other words, emulsionized by the action of the mammary pepsin in the milk. To accomplish the same end in the factory the butter oil is churned with milk for about twenty minutes, when the oil is entirely and minutely broken up. At the same time a small quantity of the solution of annatto is added, as is commonly done in ordinary butter making, to heighten the color of the product. The churning ended, the mixture is withdrawn from the churn into a tub of pounded ice, as shown in Fig. 3. The sudden cooling causes the emulsionized oil to solidify without crystallization. After remaining for two or three hours in contact with the ice, the butter-like oil is worked over by hand and the pieces of ice removed. The product has now the appearance of freshly churned butter, but it is deficient in the soluble butyric elements which give to creamery butter its delightful odor and flavor, and, it must be added, its tendency to become rancid with age. To supply these essential elements of savory table-butter the product is churned a second time with nearly an equal weight of milk, during which process it takes up a sufficient quantity of milk to make it to all intents and purposes the same as dairy butter; not so delightfully fragrant, it is true, as the finer grades of creamery butter, but much more attractive to the senses of taste and smell than the average butter of the shops.

After the second churning the butter undergoes substantially the same operations of working over to press out the excess of milk, salting, packing, etc., as are practiced in our dairies; in these, as in the preceding operations, scrupulous cleanliness being a characteristic feature.

The works of the Commercial Manufacturing Company are three stories high, and cover an area of 22 city lots—about 1½ acres. Our illustrations give some idea of the magnitude of the operations carried on in them. From an average of 100,000 pounds of fresh caul fat received daily, from 40,000 to 50,000 pounds of butter are produced—equivalent to the yield of nearly as many thousand milch cows. From 20 to 25 pounds of beef oil suitable for butter making is obtainable from each of the 12,000 beeves killed every week for the requirements of New York and the adjoining cities· an annual addition to the food supply of this port of not less than 12,000,000 pounds of pure food, having a dietetic as well as a commercial value of from 15 to 20 cents a pound. The possible annual gain to the whole country from Mr. Mége's discovery runs high among the millions.

For those who are curious to know the comparative compositions of natural and artificial butter, the following analyses are appended. It is proper to add that owing to differences in cattle, in their food, and in the common processes of butter-making, natural butter is somewhat variable in composition. The figures given below, however, may be taken as a fair average.

ANALYSIS OF NATURAL AND OLEOMARGARINE BUTTER, BY DR. H. A. MOTT.

Constituents.		No. 1. Natural Butter.	No. 2. Oleomargarine Co. Butter.
Water		11·968	11·203
Butter solids		88·032	88·797
		100 000	100·000
Insol. fats	Olein, Palmitin, Stearine, Arachin, Myristin	51·422	56·29
Sol. fats	Butyrin, Caprion, Caproin, Caprylin	7·432	1·823
		23·824	24·893
Casein		·192	·621
Salt		5·162	5·162
Coloring matter		Trace.	Trace.
		88 032	88·797

The low percentage of the bracketed compounds in artificial butter may be regarded both as a defect and as a merit, inasmuch as they give to natural butter much of its savor and fragrance, and at the same time furnish the elements of its speedy spoiling. Lacking them, oleomargarine butter does not easily become rancid, and is, therefore, pleasanter and more wholesome when long kept.

Considerable misapprehension exists as yet in the public mind regarding the merits of this article as a food product, owing doubtless to its being comparatively new and to the misrepresentations which have been made regarding it. That there are two sides to this, as with most other questions, is evident; thus far only the interests of dairymen have been heard of. Producers of butter urge that oleomargarine injures their profits by preventing high prices for butter. If this be so, it argues good to consumers, whose interests must also be considered.

Another important benefit to consumers is that oleomargarine chiefly interferes with the sale of common grades of butter, to which it is far superior, and it is mainly dealers in this grade of butter who raise an outcry against the new product; although this outcry has been taken advantage of by parties outside of the dairy interest to curry favor with dairymen and serve their own selfish ends.

The complaints of farmers against oleomargarine are unfounded in fact and are kept up only by appeals to unthinking prejudice. Oleomargarine is as much a farm product as beef or butter, and is as wholesome as either. It is as legitimate a commercial product as tallow or lard, which might be as well proscribed as oleomargarine.

The only argument advanced by its opponents which has any validity is that it is sometimes sold as butter; this practice, however, has been greatly exaggerated; wholesale dealers sell it for what it is, and the number of retail dealers who do the same is daily increasing. It should of course be sold as oleomargarine, and the influence of the Commercial Manufacturing Company and of its sales agents, Messrs. Thurber & Co., has been steadily exerted to that end. Apparently some of those who are loudest in their outcry against oleomargarine cannot comprehend that it is better to have it handled openly and above board by such firms, than by irresponsible and unscrupulous parties who might adopt the opposite course and encourage retail dealers to sell it as butter. Oleomargarine is a *fact* in the commercial world and must be treated as such.

RECENT INVENTIONS.

Mr. Charles H. Dederer, of Jersey City, N. J., has patented an improvement in the manufacture of horn buttons. The object of this invention is to utilize a portion of the horn not heretofore used for buttons, to render the buttons more ornamental, to manufacture large horn buttons, and to produce them cheaply.

An improvement in plows, patented by Mr. George Watt, of Richmond, Va., relates to the manner of attaching to the standard of a plow the point and share, the mould board (which may be in two detachable parts), and the sole or wearing piece of the land side. The attachment is effected by means of two bolts and by projections or knobs and hooks, or equivalent devices, which are cast solid with or riveted to the several parts.

An improvement in endless chain horse powers, patented by Mr. Harrison Y. Krauss, of Kraussdale, Pa. It consists in the combination, with the shaft that carries the sprocket wheels and the shaft that carries the belt wheel, of a set of gearing constructed to run the belt wheel in either direction.

Mr. John Baughman, of Indianapolis, Ind, has devised an improved belt tightener for drawing the ends of belts together for lacing or riveting. The invention consists in connecting a tightener with the belt by wedge-shaped cross bars, so that the tightener may be separated from belt by the blow of a hammer, and all screws, stirrups, etc., dispensed with.

Mr. Josephus Craft, of Worthington, Minn., has patented a compound for preserving fresh fruit, composed of bisulphite of calcium and biborate of sodium dissolved in glycerine and sirup.

Mr. Aaron B. Hartman, of Onawa, Iowa, has patented an improved iron fence post which may be made of such materials as may be obtained in nearly every section of the country, and requires no transportation of waste material.

An improved end gate for wagons has been patented by Mr. Jesse S. Howey, of Lexington, Mich. The object of this invention is to facilitate the removal of the end board or gates and coupling rods of wagons.

An improved belt fastener, which is simple in construction and convenient and reliable, has been patented by Hoffman G. Redsecker and John T. Redsecker, of Athens, Ill. The invention consists in a belt fastener, having a curved plate, provided at its opposite ends with internally beveled loops and grooves, in combination with toothed fastening bars.

Machine and hand taps to be used in cutting internal or female screw threads, has been patented by Mr. William Kenworthy, of Brooklyn, N.Y. It consists in a tap having two or more threaded sections, separated by clearance spaces, or spaces without threads, the object being to facilitate the escape of chips from the tap and from the threads being cut.

An improvement in traction engines or road steamers, intended to draw loads on ordinary roads, and to be used for thrashing, corn shelling, wood sawing, and kindred pur purposes, has been patented by Mr. Oliver H. Burdett, of New Athens, O. The object of the invention is to squeeze the dirt between diagonal bars, and leave the face or outside of the wheels clean; also, to give elasticity to the axle frame; also, to hold the boiler securely in place on the engine, and to secure the steam cylinder to the under side of the boiler.

Mr. Henry C. Bowen, of New York, City, has patented a method of determining the temperature of gas retorts and progress of distillation within the same, so as to enable the operator to control the decomposition and secure greater uniformity in the quality of the gas It consists in recording upon a piece of paper or other equivalent material the richness of the gas in carbon by condensing upon the paper, from time to time, spots or surfaces caused by the impact of a jet of the crude gas, which evidence by their depth of color or proportion of carbon, the activity of decomposition, and correlatively the heat of the retort, so that the latter may be controlled in temperature to secure uniformity in the product.

MACADAMIZED roads were never intended for the metropolis and for large towns, and in such places we must hope that their days are numbered. For constant and heavy traffic combined with high speed, as it occurs in all important towns, a macadamized road becomes a nuisance; it requires everlasting repairs, and consequent stoppage of the traffic; it damages and wears out the better class of vehicles passing over it to an alarming extent; and is dirty, unwholesome, and unpleasant in all weathers.—(Inaugural Address of Joseph Bernays, delivered before the Society of Engineers.)

TRANSPLANTING THE TULIP TREE.—The *Rural New Yorker* states, from trials, that young tulip trees may be easily and safely removed by cutting back the entire stem within two or three inches of the neck, leaving only neck and roots to be set out. Hundreds of trees thus treated mostly grew vigorously, sending up from near the roots new and straight stems.

A FEW years ago Mr. Gideon Bantz, of Frederick, Md., invented what he terms a "fold-skin leather," which he has manufactured successfully during the past five years. The chief advantages of Mr. Bantz's leather consists in its waterproof and enduring qualities, which render it specially useful for hunters, fishermen, coachmen, and others, whose occupation exposes them to the weather.