freely interlarded. The whole mass has made No. 1 silage—about the best we have ever seen. Since an adequate stock has been fed, there has been practically no waste, even at the doors, and the silage is seemingly as good at the walls as in the center. The corn was cut in three-quarter-inch lengths. The cattle clean everything up, leaving neither butt nor cob, notwithstanding that the corn was matured to the late-dough stage. Fermentation in this silo is almost at a standstill, there being scarcely any heat noticeable when the silage is forked out, even in the center of the silo. The silo was built with cement-concrete, mixed eight of gravel to one of cement, was well watered for several days, and then washed both inside and out. Excepting, perhaps, the usual trouble from freezing of silage in severe weather, this silo is an unqualified success.

About $120,000,000 annually is spent in the United States for commercial fertilizers, of which more than 80 per cent. is spent in the South Atlantic States, and about 3 per cent. west of the Mississippi River. The use of fertilizers in Texas, Mississippi, and the citrous fruit regions of California has been increasing rapidly, however, in the last few years.

THE DAIRY.

What is Milk?

Abstract of an address given by Prof. R. Harcourt at the Western Dairymen's Association.

Starting with the fact we are most familiar with, we may say that milk is a food. It occupies an almost unique position among animal foods, for it contains in itself representatives of all three nutritive constituents, namely, protein, carbohydrates, and fat. It is palatable, easily-digested, and highly nutritious. It is not only the natural food of infants, but a most important food for children and adults. It is also an indispensable food in many, if not most, cases of disease where nutrition is impaired. Yet, while all this can be truthfully said about milk, it is not an expensive food when compared with meats or other forms of animal food. Too often it is regarded as a luxury, to be used only as a condiment with tea, coffee, fruit, and as an adjunct in cooking, when, as a matter of fact, a given amount of money spent on milk, at eight, or even ten, cents a quart, will furnish more flesh-forming materials, and will produce more energy in the body than if expended on meats, eggs, etc.

Naturally, milk is not as cheap as the cereals or vegetable foods in general, for these contain a large amount of carbohydrates, which are our cheapest energy-producers. Moreover, bread and milk, or oatmeal and milk, form about as complete a food as can well be devised. Consequently, when we put these two foods together, we not only have a palatable, nutritious diet, but an inexpensive one.

My next point is one that need not be dwelt on at any great length, namely, milk readily takes up odors, good or bad. Milk has a mild but decided odor of its own, and it is not improved by absorbing that of other materials.

Milk is also a particularly fine medium for the growth of bacteria, and, coupled with this is the fact that it is peculiarly liable to contamination. Consequently, it is evident that the greatest care should be exercised to exclude all forms of dust and dirt, and that the temperature of the milk be lowered as quickly as is possible. Suitable temperature and a moist condition are two essentials for rapid development of bacterial life. These are naturally supplied in fresh-drawn milk, and, as there is an abundance of suitable food, the organisms getting into the milk rapidly multiply. These organisms may be acid-forming and objectionable, though decidedly useful in cheese and butter making, or they may be the living germs of some of our most dreaded diseases.

But most of us are quite familiar with these points, so let us look at what milk is from the standpoint of composition. Very naturally, we expect to find variations in composition in the milk from various cows, but all milk contains water, protein, fat, sugar, and an incombustible ash material. Let us now look more closely at each of these constituents.

Water forms by far the largest proportion of the milk, and serves to hold some of the constituents in solution, and some in suspension. It is because the milk solids are either in solution or in a finely-divided suspended condition that milk is in the liquid form. A turnip contains much more water, and is a solid, bulky substance. Milk must be classed as a dilute and bulky food, but possibly we sometimes undervalue it because it is a liquid, and think of it more as a beverage.

Our present knowledge of the portein of milk is far from complete, though much work has been done on the subject. This is due to the fact that it is extremely difficult to obtain these compounds in anything like a pure state, and also to the ease with which they change when an effort is made to separate them from the milk. Authorities do not even agree as to the number of these bodies, and they have been variously stated at from one to eight by different observers. The most recent work has tended to reduce the number to four, and for all practical purposes we may consider only two. These are casein and albumen.

Casein is now thought to be an albuminoid body in combination with lime salts, or, more correctly, calcium phosphate, and in this state it is in solution or, at least, in semi-solution. In the presence of an acid, either added or developed in it, the union with the lime salts is broken up, and the casein separates as an insoluble substance. This is apparently what takes place when milk thickens through souring. Although this form of casein is quite insoluble in water, it is readily and completely soluble in weak solutions of caustic alkalies, or in solutions of washing soda and baking soda. Practical use is made of this property in determining the fat in thickened milk by means of the Babcock tester. If the clot that is formed in sour milk is allowed to stand, some of the clot, or casein, appears to combine with the lactic acid of the milk and gradually go into solution. Unfortunately, we have no recognized terms to distinguish these different forms of casein. Dr. Van Slyke, of Geneva Experiment Station, New York, has suggested the name of "Calcium casein" to designate the casein of normal milk, because here we have casein in combination with calcium. Then, as the calcium is separated in the clotting of the milk, he suggests the name of casein for this substance, and casein lactate for the material formed by the union of casein with lactic acid.

Casein of normal milk is also acted on by the enzyme of rennet with the formation of an insoluble product. Acidity and heat aid the rapidity of the action. The casein of this curd is not separated from the lime salts, and in this respect the rennet coagulated material differs from the clot of sour milk. Indeed, the presence of soluble lime salts is essential to the coagulation of milk with rennet. Consequently, as heating milk to near the boiling point renders some of the lime in it insoluble, pasteurization or sterilization cannot be practiced in the ordinary process of making cheese. The ripening of cheese, so far as the curd is concerned, is the breaking down of this insoluble rubbery curd into soluble compounds, much the same as would take place in the process of digestion in the body, and, as this is brought about by the ferments of the milk and rennet, and moisture and warmth are favorable to their action, the condition of the curd and the temperature of the curing-room are controlling factors in this ripening process.

The albumen of milk is a substance in many respects similar to the white of an egg. It is not coagulated by acid or rennet, as casein is, but is readily coagulated by heat.

The casein and albumen of milk are easily digested, and are very nutritious forms of protein, but, while very valuable in milk and cheese, their presence in butter is not desirable, as they furnish nitrogenous food for the organisms which may cause putrefactive changes and help to destroy the flavor of the butter.

The fat of milk is better understood than the proteins. Yet it is not a simple substance, but, on the contrary, a complex mixture of a number of fats. The fat of the animal body is a much more simple substance, and is made up of three different fats, known as palmitin, stearin and olein. The first is a comparatively soft fat; stearin is a hard material, so hard that it will break into lumps that will rattle in a bottle at ordinary room temperature; and olein is so soft that it is almost a fluid. The animal fats differ in the proportionate mixture of these three substances, and, consequently, in their hardness. Besides these three fats, the fat of milk contains several others that give to milk fat its characteristic properties. Chief among these is butyrin. If for any cause butyrin is broken up, the butyric acid liberated gives butter the odor common to rancid butter.

These fats of milk are all odorless under normal conditions, but they readily take up and retain undesirable odors derived from food surroundings, and these are naturally carried on into the butter. The hardness of the butter-fat is also readily influenced by the food of the animal. Thus, straw and other fibrous foods, cottonseed meal, etc., tend to produce hard fats; while pasture grass, linseed meal, etc., form softer fats, and these characteristics are brought out in the butter.

Olein is not only a soft fat, but it is an unsaturated substance; i. e., when exposed, it will take up something from the air and change in nature. A more pronounced example of this unsaturated condition is linseed oil. This is known as a drying oil, because, when used to oil a floor, for example, it dries and hardens, whereas olive oil would not harden, as it is a saturated substance. Olein forms 30 to 35 per cent. of the butter-fat, and the fact that it is unsaturated possibly furnishes one of the reasons why it is necessary to place butter away from the air and light. There are, however, other changes that take place in butter that are associated with the loss of flavor and quality, but none of these have been studied out. Indeed, it is not known exactly what gives the desired delicate aroma to good fresh butter, and it is probable that it will be a long time before science will be able to separate and identify this elusive material.

The sugar in milk has apparently been placed there more as a food than as a condiment. It is not nearly as sweet as cane sugar; if it were, we would probably soon take a dislike to milk; but it is easy of digestion, even by young children. It does not, like most sugars, readily undergo alcoholic fermentation, but it does break down into lactic acid with comparative ease. Thus, the sugar is the material from which the acid of the milk is formed, and must decrease as the milk sours. However, as the lactic-acid organisms cannot live in more than a small amount of acid, the action cannot continue, unless some substance, such as baking soda, be added to neutralize the acid formed. This is the principle underlying the use of soda in preserving milk. The action of most of the other preservatives is to destroy, or hold in check, the action of the organisms which break down the sugar into acid. Both forms of treatment are objectionable.

The mineral constituents of milk, like some of its other constituents, have not been fully studied, but part of these substances must be in organic combination, as with casein, and part as complex salts that are influenced in holding normal milk in the condition we have it.

From the foregoing, it is quite evident that milk is not a simple substance. Its elaboration in the animal is largely a mystery to us, and the same may be said regarding the details of its composition. An enormous amount of time and money has been spent in studying it, but we are still without definite data on many points. Indeed, we have still much to learn about how to practice and how to handle milk properly in order that we may get this valuable food in its most wholesome form.

Dairying District of Ingersoll.

Editor "The Farmer's Advocate":

Since subscribing for "The Farmer's Advocate," several years ago, I cannot remember, even once, of seeing an article written about the Ingersoll dairy district, or the handling of milk for a condensing factory. If we had a Peter McArthur or a Dr. Robertson here, you would doubtless hear from them often. Possibly it may not be interesting to the majoirty of your readers, but the work incurred by the handling of milk in this district is certainly very interesting to about ninety per cent. of the farmers dwelling in the heart of Oxford County—The Ingersoll Dairy District. When the St. Charles Condensing Company first established its plant here, it was surrounded by good cheese factories, many of which have disappeared, until now only one or two are within a radius of five miles of Ingersoll. The increase in the price of milk paid by the Condensing Company was partially the cause of this. The strict rules of the Condensing Company regarding the care of milk have been of an educational value to the producers, and this district has made a great advancement since the factory began operations. Dairymen, ten or twelve years ago, lost a considerable amount of milk from different causes, whereas now but a very small percentage is refused at the receiving room of the condensing factory, where, even in the month of October, this year, from 120,000 to 130,000 pounds were taken in on Monday mornings, and 80,000 to 90,000 pounds daily. Surely this is a land flowing with milk and honey (the honey is certainly coming in the near future—after the short courses are held at Guelph). Several dairymen boast that they have not lost a can of milk since becoming condenser patrons. This is something worth boasting about, if they have been patrons for ten years. But wait. "Brag is a good boy: Holdfast is better." You might lose a double dose some Monday morning soon, and then how inquisitive one gets.

Patrons are bound by a contract every six months, the terms of which are too lengthy to give here, but it deals with the care of the dairy barn, the feeding of the cattle, the milking, the care of the milk, and the price per hundred pounds for each month. An inspector is appointed by the company, who calls around (you can't tell when), inspects your premises, and reports conditions to the company. If everything is satisfactory, the patron hears nothing; but if unsatisfactory, a nicely type-written letter is addressed to the patron, requesting him to remedy the wrong.

Of course, when a high price is paid for milk, dairymen are anxious to make their cows produce as much milk as they can, and this has certainly