



LIBRARY
OF THE
UNIVERSITY
OF ILLINOIS

630.7
I166
no. 61-84

AGRICULTURE



NON-CIRCULATING

CHECK FOR UNBOUND
CIRCULATING COPY.

UNIVERSITY OF ILLINOIS
Agricultural Experiment Station.

URBANA, FEBRUARY, 1903.

BULLETIN NO. 84.

DAIRY CONDITIONS AND SUGGESTIONS FOR
THEIR IMPROVEMENT.

BY WILBER J. FRASER, M. S., ASSISTANT PROFESSOR IN DAIRY HUSBANDRY, COLLEGE OF AGRICULTURE, AND CHIEF IN DEPARTMENT OF DAIRY HUSBANDRY, AGRICULTURAL EXPERIMENT STATION.

SUMMARY.

Investigation shows that from a sanitary standpoint there is need of improvement in many dairy conditions.

No other food will absorb bad odors so quickly as will dairy products, or deteriorate more rapidly under adverse conditions.

Milk being an excellent medium for the growth of bacteria, it is of special importance that it be kept as free from germs as possible.

No other food is produced under conditions where it is so difficult to prevent contamination.

Since the largest amount of contamination comes from the udder during milking it is important that all udders be washed before milking. In the production of milk for direct consumption this is imperative.

The average weight of dirt which falls from muddy udders during milking is 90 times greater than that which falls from the same udders after washing, and when udders are but slightly soiled it averages 22 times greater.

It is essential to the production of clean milk that the cows be kept out of the mud. The barn yard should have natural surface drainage and should be covered with a coat of gravel or cinders sufficiently deep to form a hard surface at all seasons of the year.

Stables of costly construction are not necessary, but they should be provided with numerous windows and an efficient system of ventilation which will furnish a good supply of fresh air without creating a draft on the cows.

Whitewash being one of the best disinfectants, the stable should be whitewashed at least once a year. In order to accomplish this successfully the sides and ceiling must have a firm tight surface to which the whitewash can be applied.

The floor of the milking stable should be smooth and solid. The platform on which the cows stand should be of such length that all droppings will fall into the gutter, thus preventing the cows from becoming soiled when lying down. The stables should be cleaned regularly each day.

As soon as drawn milk should be removed from the stable to a clean room provided for the purpose and aerated and cooled at once to 60° F. or below.

All dairy utensils and everything with which the milk comes in contact should be rinsed, thoroughly washed, and sterilized after each using.

Bottles used in delivering milk for direct consumption must be thoroughly washed and sterilized after each using to avoid the danger of carrying disease from one house to another.

Every creamery, cheese factory, dairy, and milk depot should have a solid impervious floor. The floor should be well drained by being properly pitched to a gutter which is connected with a good system of well trapped sewerage.

The walls for at least three feet above the floor should be of some smooth impervious material; if of wood above this, they should be kept well painted to facilitate cleaning.

Milk should be conveyed through open conductors whenever possible. When a pump and closed pipes are used they should be so constructed as to be easily taken down and cleaned each day.

Milk cans should be washed, and sterilized with steam at the factory, and some other receptacle should be used to return the skim milk or whey to the farm. If the cans are used for this pur-

pose they should, by all means, be emptied as soon as they reach the farm, thoroughly washed and scalded, and placed on a rack in an inverted position with the covers off.

Dairy markets should be developed by selling products of known standards put up in such forms that the consumer will get the original package and know its grade or quality.

PRESENT CONDITIONS.

The Department of Dairy Husbandry, of the Illinois Agricultural Experiment Station, has for the past six years been investigating the dairy conditions of the state. The results show that in some particulars the conditions are ideal while in others they are far below the proper standard. From a sanitary standpoint there is need of improvement in many of the dairy practices not only in Illinois but in all parts of the United States and, in fact, in all countries of the world.

Dairy products are not consumed to the extent they would be were it not for their too frequent poor quality. Under existing conditions it is, in many places, almost if not quite impossible to obtain on the open market any really good butter or cheese. It is also difficult to obtain milk that is produced in such a manner as to make it a safe and wholesome food for infants and invalids, if indeed for healthy adults. When milk is ordered even at our best hotels and restaurants, dirt is frequently found at the bottom if it is allowed to stand for a short time. This is not appetizing to say the least and many persons who like milk now use as little as possible on account of the careless manner in which it is produced and the fear that it may contain dirt if not disease germs.

The commercial value of dairy products is determined very largely by their flavors and odors. They are usually judged by the smell which is so extremely delicate that it takes but an exceedingly small amount of a substance giving off a bad odor to make the product of low or inferior quality. No food is more susceptible to defects or more subject to contamination than dairy products and yet the protection of their purity until they reach the consumer is nothing more nor less than cleanliness. This would seem to be a simple matter yet it is one greatly neglected but when faithfully performed will more than repay the efforts made.

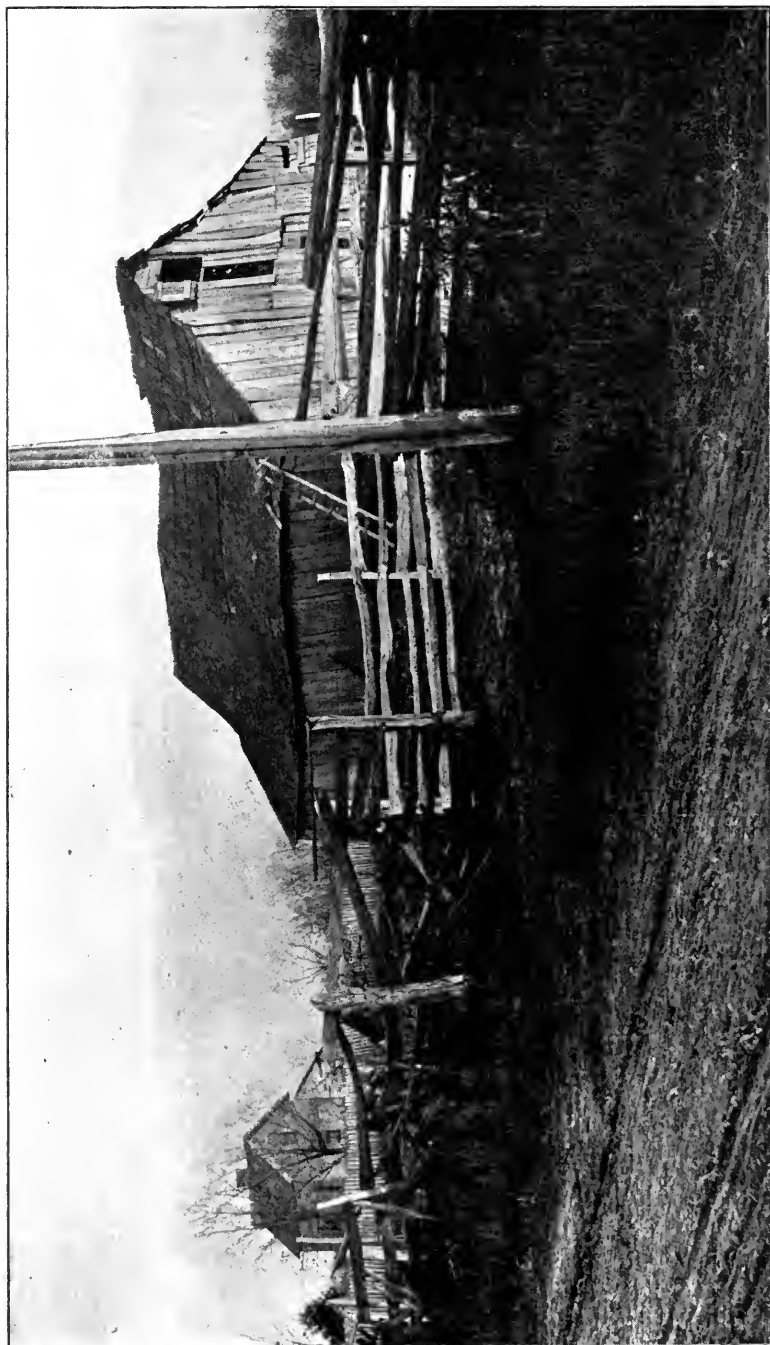
Many people when handling milk seem to forget that they are dealing with food products. There is a tendency for certain unfortunate practices to invade the dairy business. If filth is allowed to get into milk or it becomes tainted at any point of its production, no amount of care either before or after can make amends for the



CUT 1. AS EXPENSIVE BUILDINGS AS THESE ARE NOT ESSENTIAL TO THE PRODUCTION OF CLEAN DAIRY PRODUCTS, BUT THESE SHOW WHAT THE DAIRY BUSINESS WILL SUPPORT, AS NOTHING BUT BUTTER IS SOLD FROM THIS FARM.



CUT 2. A NEATLY MOWED LAWN AND BUILDINGS KEPT PAINTED AND IN GOOD REPAIR ON A DAIRY FARM DO NOT NECESSARILY MEAN THE PRODUCTION OF CLEAN MILK, BUT THEY INDICATE THE THRIFT AND INDUSTRY SO ESSENTIAL TO SUCCESSFUL DAIRYING.



CUT 3. CONTRAST WITH CUTS 1, 2, AND 4.



CUT 4. NEAT WITHIN AND WITHOUT.

difficulty. A man may be careful and correct in all of his dairy operations but one, and yet this one be the cause of his producing a low grade product. This one mistake not only injures his product but the dairy market as well. This being true, it is clear that the greatest care should be exercised in every step of production, manufacture, and delivery of dairy products to the consumer. Only those dairymen who exercise such care can hope to secure the trade of people who desire a product of superior quality and are willing to pay an advanced price.

The real foundation of the whole dairy business lies in the milk producer. The chief necessity then in improving the dairy conditions is to give the producer such a knowledge of the right methods of handling and caring for milk that he will not only see the necessity for such methods but may also know how best to accomplish this purpose.

Some dairymen think if they do not get a good price for their milk at the creamery that the fault lies with the creamery; but the patrons produce the butter, the creamery only separates it. Patrons should not forget that the interests of the creamery and their own are the same. Dairy education has benefited creamery operators more than it has the patrons. The statement was recently made by one of our best informed dairy and creamery men that,—“Milk does not come to the creamery in so clean a condition today as it did twenty years ago.” Before the day of the separator, milk was not accepted unless it reached the creamery in fairly good condition. Now, if it is not sour enough to clog the separator, it is received at the weigh-can of many creameries. When every man made his own butter on the farm and sold it himself, he came into closer touch with the trade and was more particular about the cleanly methods of its production. Since the creamery has come in between the milk producer and the butter market there is a tendency to become more careless in the production of milk. When milk is delivered in poor condition at a creamery or cheese factory, no butter or cheese maker however skilled can make the best product from it. If all of the patrons but one bring milk that is clean and in good condition, the man bringing dirty milk spoils the whole.

The condensing factories have been the greatest factor in raising the standards of milk production upon the dairy farms of the state. They make certain requirements in regard to the methods used in the production of milk delivered at their factories and have inspectors to see that their instructions are carried out.

The particular points touched upon in this bulletin are the ones found to be most commonly at fault in actual practice.

The object of this bulletin is to show how these may be remedied and to point out the essentials of good dairying. It must not be inferred, however that the Experiment Station recommends expensive buildings and equipment in the production of clean sanitary dairy products, for these are not essential. It costs little more to be clean than unclean. It does, however, require a little more labor.

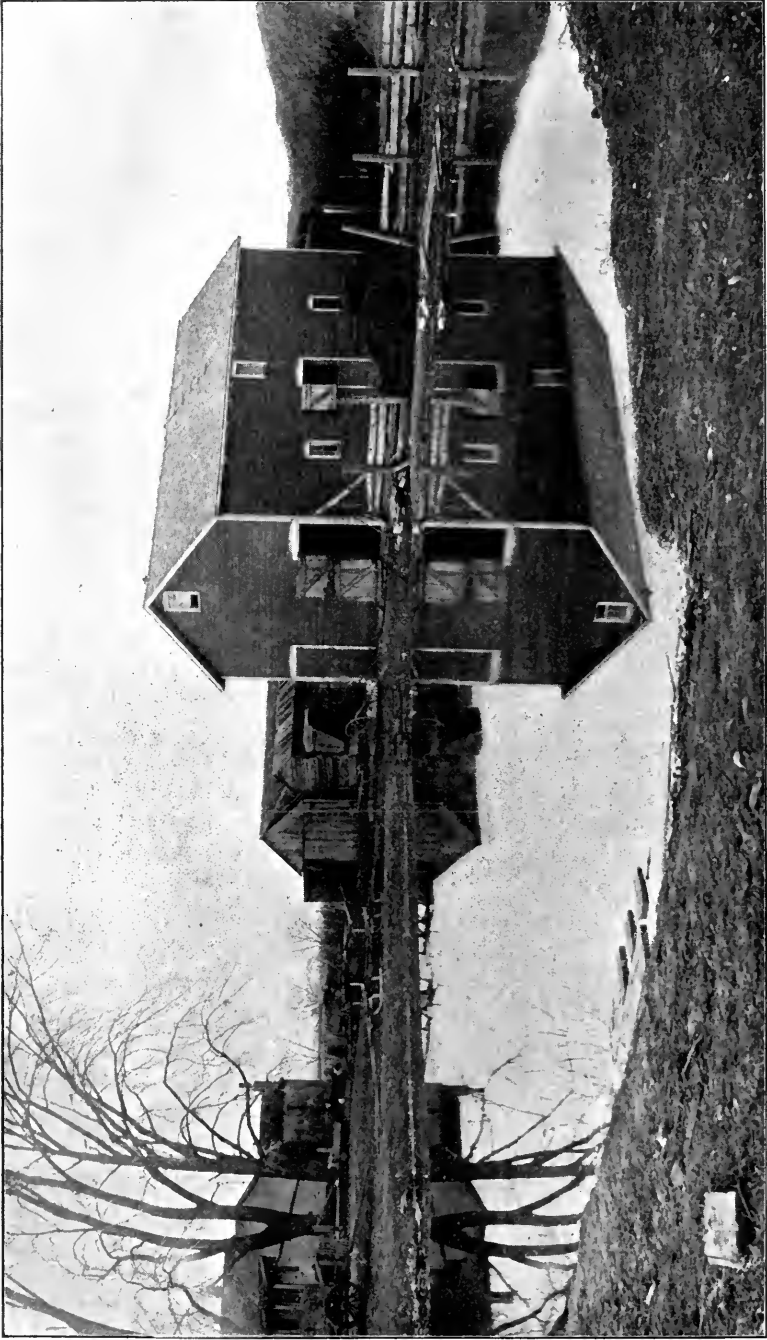
LOCATION OF BARN AND CARE OF YARD.

In the production of clean milk no one thing is of more importance than keeping the cows out of the mud. Many yards into which dairy cows are turned each day for their drink and exercise, are knee deep with mud and manure during the winter and spring, if not nearly the entire year. In summer when the cows are on pasture they would keep comparatively clean were they not obliged to wade through a filthy yard in going to the stable.

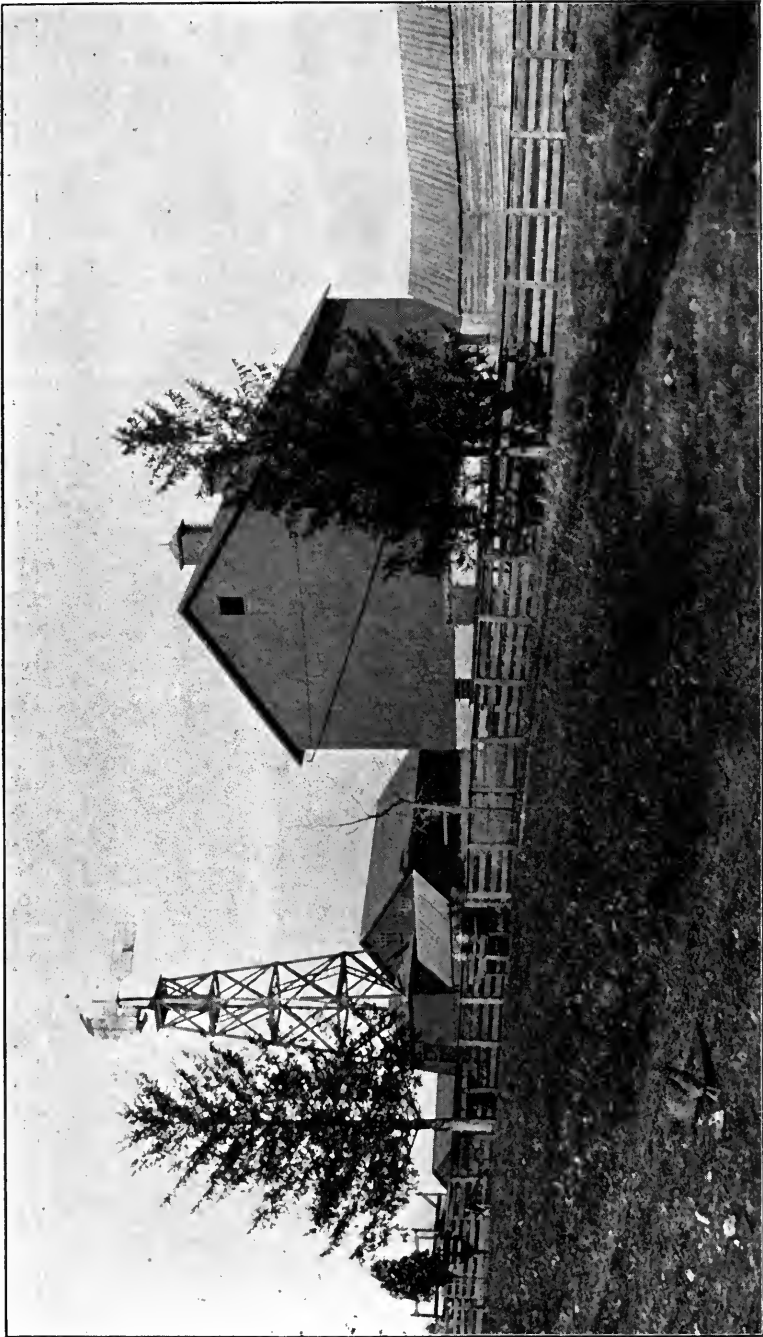
In locating a dairy barn care should be taken to have a gentle slope from the barn in at least one direction, affording good natural drainage for both barn and yard. If the barn is already built and poorly located, draining and grading will do much to remedy the evil. In most cases it would take but a small amount of labor with plow and scraper, when the ground is in suitable condition to handle, to give the surface of the yard a slope from the barn sufficient to carry off the surface water. Even if dirt has to be hauled in from outside the yard to accomplish this it will not be expensive. Tile drainage alone under a yard is not sufficient as the tramping of the cattle soon puddles the surface, preventing the water from passing down to the tile.

After the grading is done the yard should be covered with gravel or cinders. By putting the coarser in the bottom and the finer on top a good hard yard can be obtained and at a comparatively small expense where material of this kind is available. If this cannot all be done in one year, it is of the utmost importance that a beginning be made by grading and graveling a portion of the yard next the barn, so that the cows may have some place on which to get out of the mud and filth. By grading a part of the yard each year and applying a thick coat of gravel or cinders to the graded part, the entire yard will, in a few years, be in good condition. When gravel does not contain enough clay to pack hard, a small amount of clay should be mixed with the top layer. It will then form a firm surface.

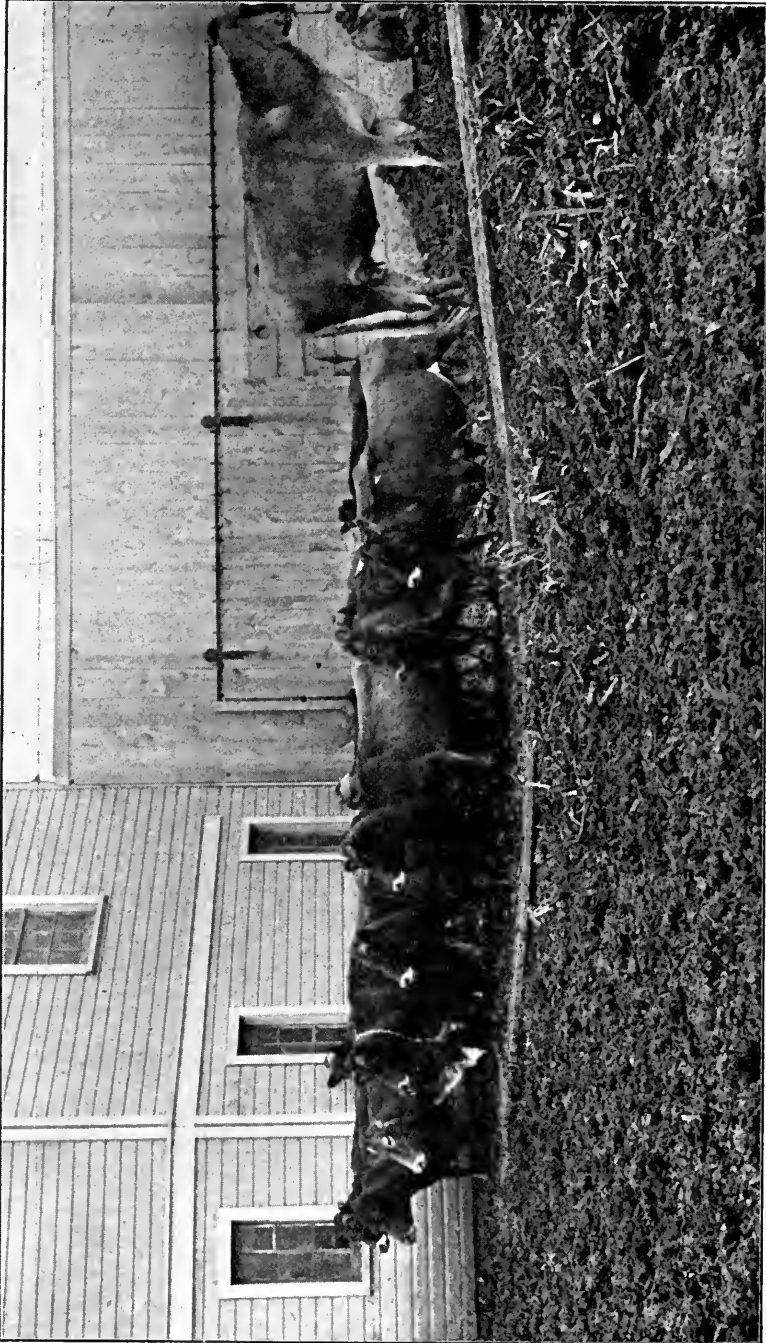
A portion of the yard should be bedded, thus affording the cows a place to lie in the open air on pleasant days. If straw is



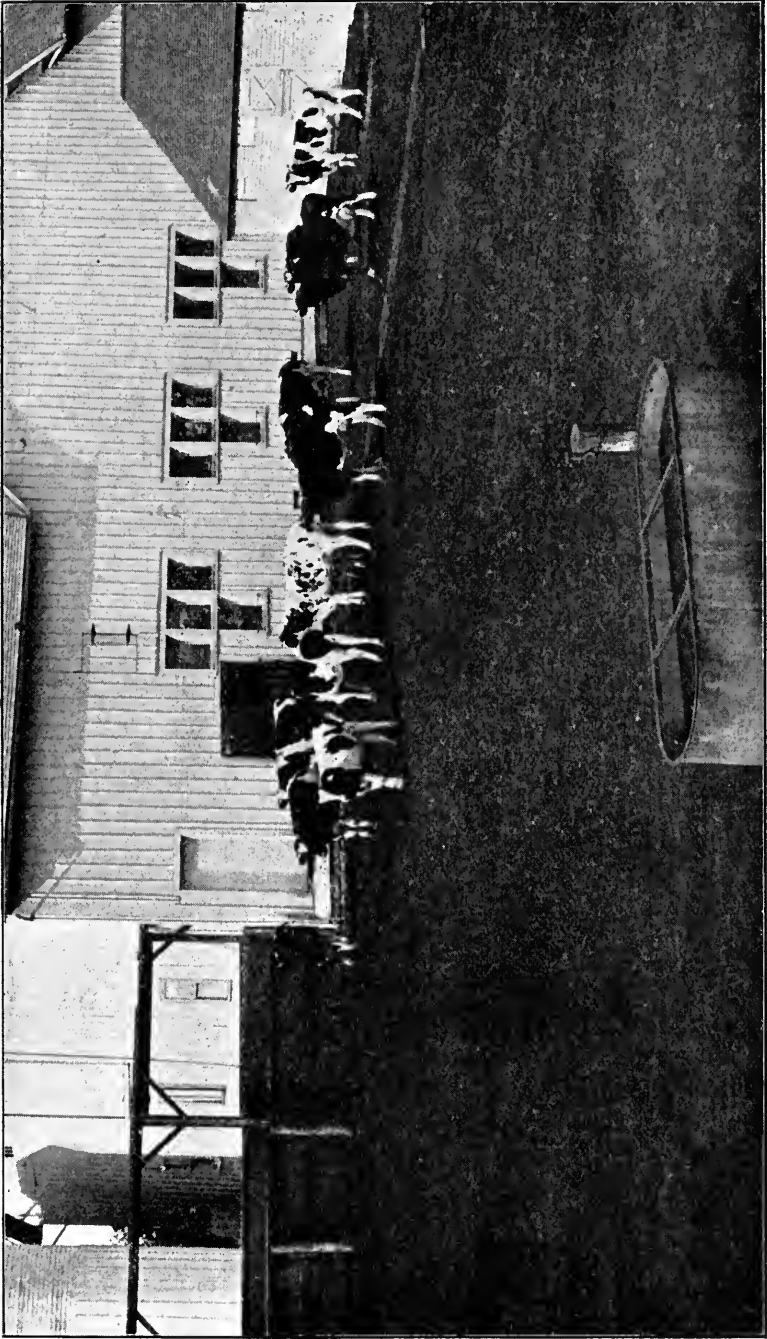
CUT 5. A POORLY LOCATED BARN; THE POND SHOULD BE DRAINED AND BARN YARD GRADED TO SLOPE GENTLY FROM THE BARN.



CUT 6. A WELL LOCATED DAIRY BARN.



CUT 7. COWS KNEE DEEP IN MANURE AND MUD. MANURE SHOULD BE HAULED OUT, YARD GRADED TO SLOPE FROM BARN, AND SURFACE COVERED WITH CINDERS OR GRAVEL.



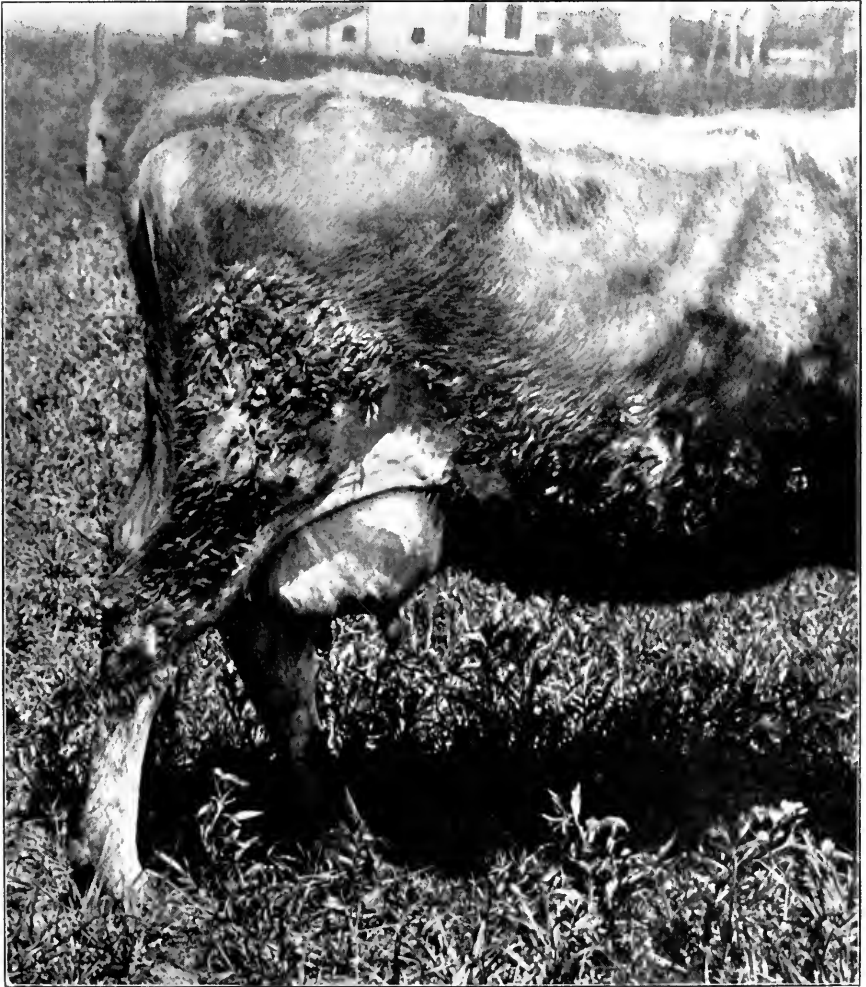
CUT 8. TWO YEARS AGO THIS YARD WAS IN AS BAD A CONDITION AS THE ONE SHOWN IN CUT 7. TWO DAYS WITH TEAM AND SCRAPER AND TWELVE DAYS HAULING CINDERS MADE THE TRANSFORMATION.

scarce the cleanest of the soiled bedding from the stable will answer for this purpose. When the straw and manure on this bedded portion of the yard become too deep and soft it should be hauled into the field and the bedding commenced again on the solid yard.



CUT 9. A SOURCE OF HUMAN FOOD. CLEAN EVEN IN MID-WINTER.

It is advisable to haul the manure directly to the field from the barn, but if this is not feasible it should be removed at least 100 feet from the barn. In no case should it be allowed to accumulate against or near the dairy barn and no swine pen should be nearer than 200 feet on account of the odors being readily absorbed by milk.

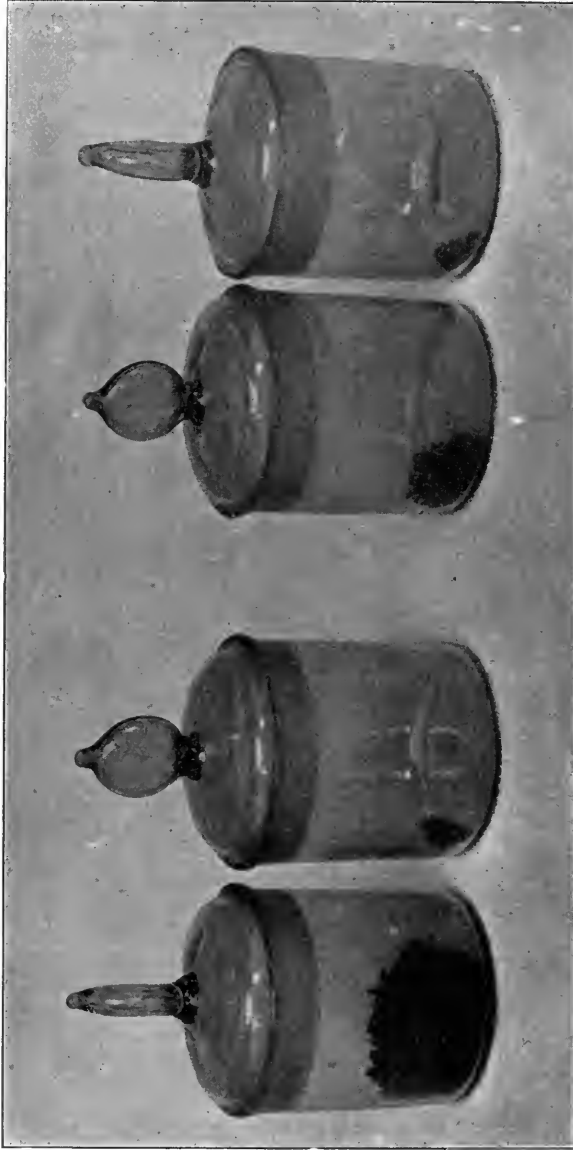


CUT. 10. AFTER A RUN OF THREE WEEKS ON PASTURE. IMAGINE THE FILTHY CONDITION DURING WINTER.

AMOUNTS OF DIRT CAUGHT UNDER WASHED AND UNWASHED UDDERS DURING MILKING. THE GLASS WEIGHING TUBES SHOWN BELOW ARE NATURAL SIZE.

UDDER MUDDY.
BEFORE WASHING. AFTER WASHING.

UDDER SLIGHTLY SOILED.
BEFORE WASHING. AFTER WASHING.



CUT 11. THE AVERAGE WEIGHT OF DIRT WHICH FALLS FROM MUDDY UDDERS DURING MILKING IS 90 TIMES AS GREAT AS THAT WHICH FALLS FROM THE SAME UDDERS AFTER WASHING, AND WHEN UDDERS ARE SLIGHTLY SOILED IT IS 22 TIMES AS GREAT.

CLEANLINESS IN MILKING.

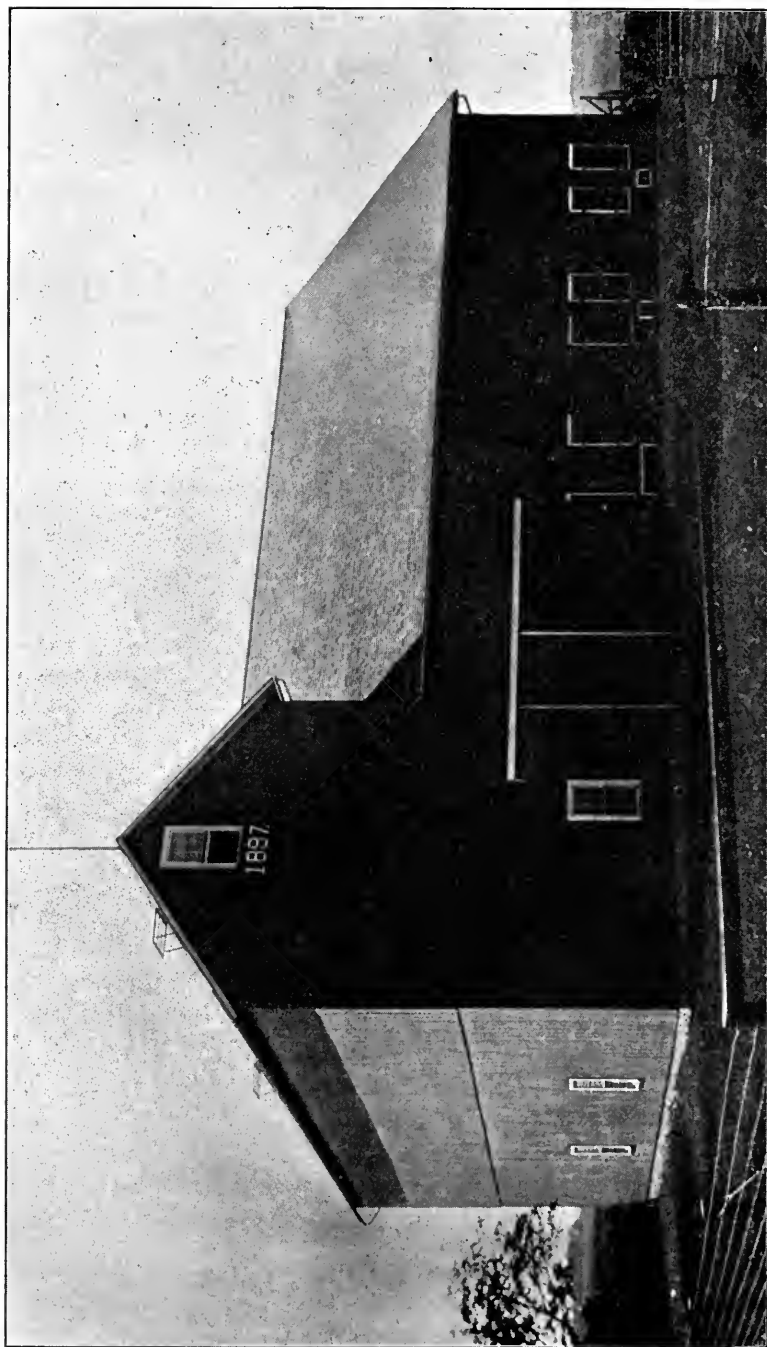
To determine definitely the amount of filth that gets into milk during the process of milking and how much this can be lessened by washing the udders the following work was done:

It was determined after several trials with three different milkers on thirty cows that it requires an average of $4\frac{1}{2}$ minutes to milk a cow. A glazed dish eleven inches in diameter, the size of an ordinary milk pail, was placed in the top of a pail and held under a cow's udder in the same position as when milking. For $4\frac{1}{2}$ minutes the milker then went through motions similar to those made in milking but without drawing any milk. The amount of dirt which fell into the dish during the operation was, of course, approximately the same as would have gone into the milk during the milking process. The dirt caught in the dish was then brushed into a small glass weighing tube, the udder washed and the process repeated. The dirt which fell from the washed udder was also carefully brushed into a weighing tube. Both tubes were then placed in a desiccator and after drying twenty-four hours were accurately weighed on a chemical balance.

Sixty trials were made at different seasons of the year. With udders that were apparently clean it was found that an average of $3\frac{1}{2}$ times as much dirt fell from the unwashed udders as from the same udders after they were washed. With soiled udders the average was 22 and with muddy udders the average was 94 times as much dirt from the unwashed udders as from the same udders after washing.

BARN AND STABLES.

Costly barns or stables are not essential to the production of clean milk or to the maintenance of a dairy herd at its highest efficiency. To obtain the best results it is important, however, that the cows be kept comfortable at all times. To do this there are several essentials with which a barn must be provided. It must have a roof that does not leak; sides that do not allow the wind to blow through; and doors that will close tightly.



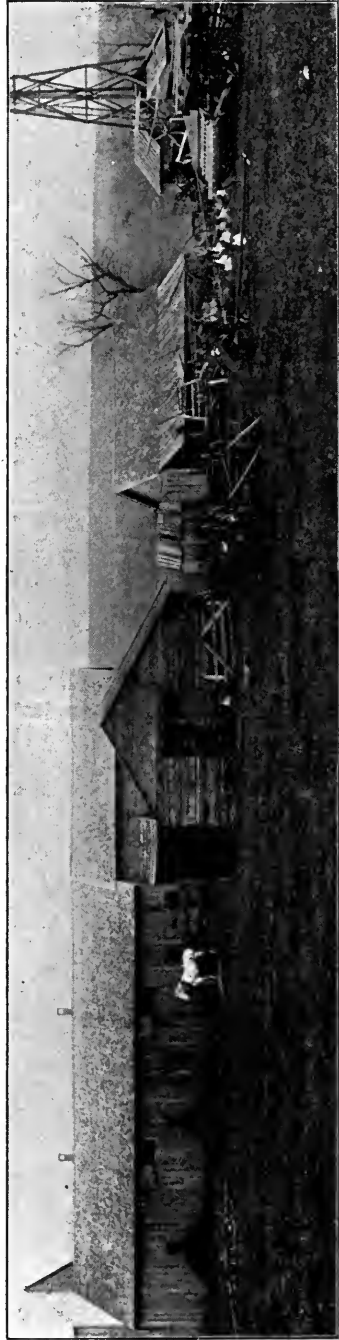
CUT 12. A COMPARATIVELY CHEAP DAIRY BARN, YET ONE OF THE BEST LIGHTED, BEST VENTILATED AND MOST SANITARY IN ILLINOIS. SILOS IN PORTION ON LEFT, COW STABLE ON RIGHT. INTERIOR SHOWN IN CUT 43.



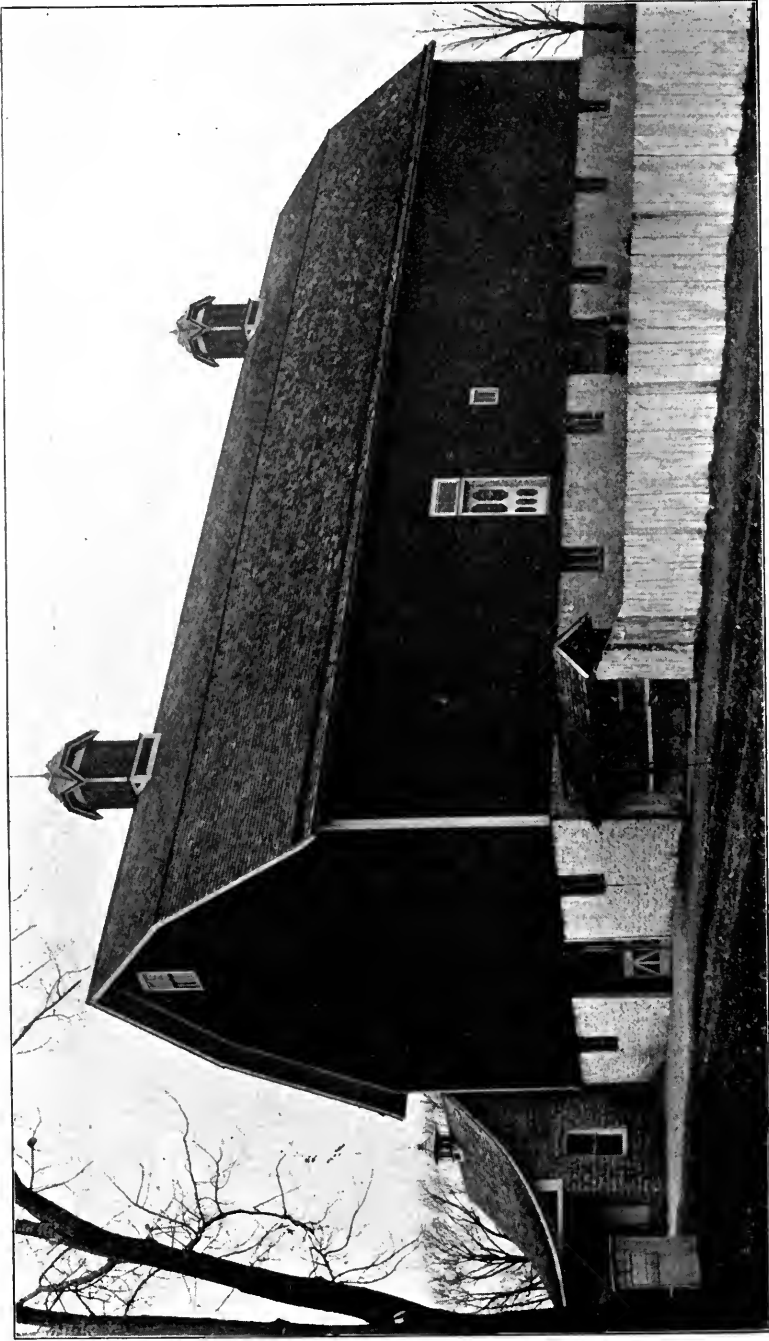
CUT 13. PORTION OF BARN ON RIGHT IS A STABLE FOR 36 COWS. NO PROVISION FOR LIGHT OR VENTILATION; OPENINGS SHOWN ARE COVERED WITH BOARDS IN WINTER. MUD HOLE IN YARD; MARKS ON BARN SHOW WHERE MANURE HAS BEEN PILED.



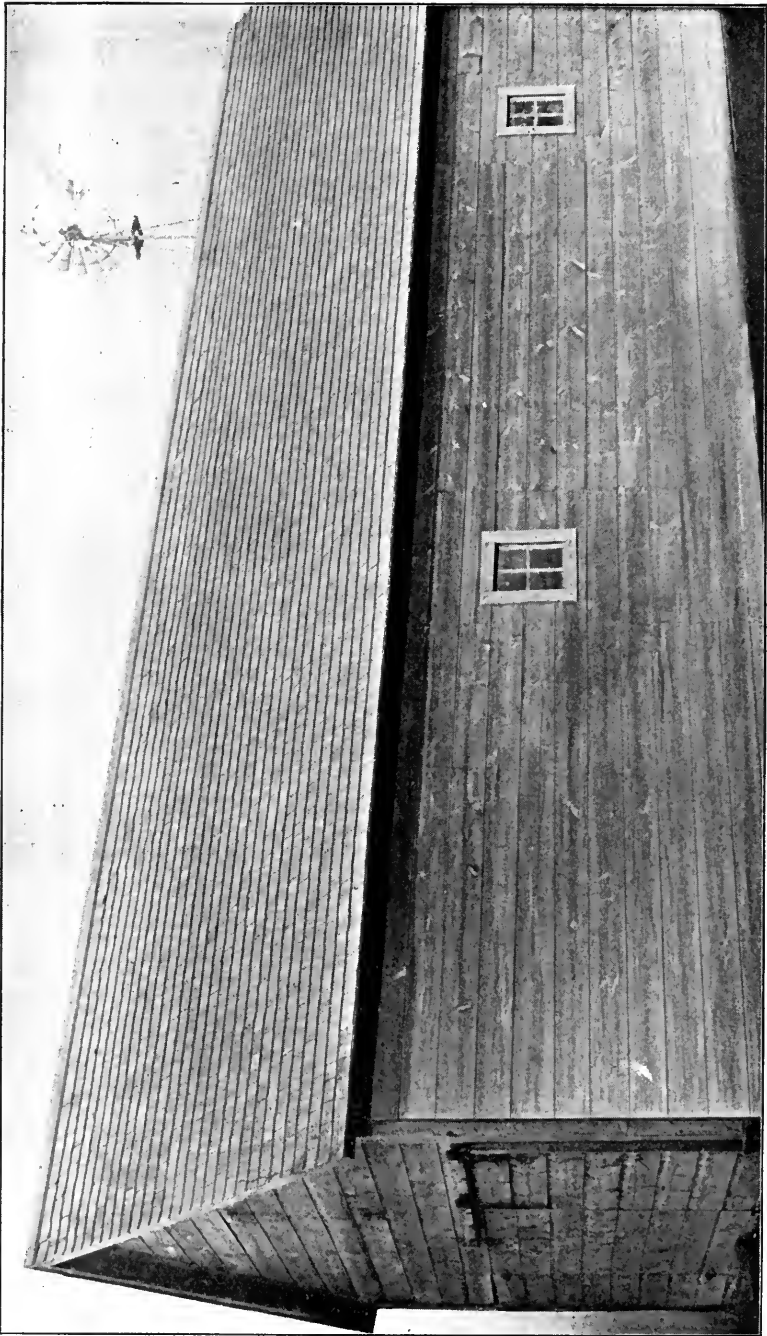
CUT 14. CONTRAST WITH CUT 15.



CUT. 15. MILK IS PRODUCED HERE FOR DIRECT CONSUMPTION FROM DAIRY OF 40 COWS. BARN HAS LITTLE PROVISION FOR LIGHT, AND MANURE IS LEFT IN PILES AT THE OPENINGS, CONTAMINATING THE AIR AND TAINTING THE MILK.



CUT 16. THIS DAIRY BARN, FINE MILK HOUSE COSTING \$1000, AND GOOD FARM OF 186 ACRES HAVE BEEN PAID FOR FROM THE SALE OF MILK.



CUT 17. A GOOD CHEAP STABLE FOR 14 COWS. THIS STABLE 16x42 FEET WAS BUILT IN 1897. THE MATERIAL COST \$120, AND THE WORK WAS DONE BY THE OWNER. INTERIOR SHOWN IN CUT 18.



CUT 18. INTERIOR OF CUT 17. ALL THIS CHEAP COW STABLE NEEDS TO MAKE IT SANITARY IS A TIGHT FLOOR OVERHEAD, THE INTERIOR WHITEWASHED, VENTILATORS, AND MORE WINDOWS, ALL OF WHICH COULD BE DONE AT AN EXPENSE NOT TO EXCEED \$30.

Exterior and interior views of a cheap stable are shown in cuts 17 and 18. This stable is 16x42 feet with ten foot posts and will hold 14 cows. It was built in 1897, the material costing \$120.00. This stable was built by the owner; had the work been done by a carpenter the expense would not have exceeded \$50.00 making the total cost \$170.00.

What this stable needs to make it sanitary is a tight floor overhead, ventilators, five times the amount of light and the interior whitewashed, all of which could be done at an expense not to exceed \$30.00. Making the total cost of a sanitary stable for fourteen cows \$200.00.

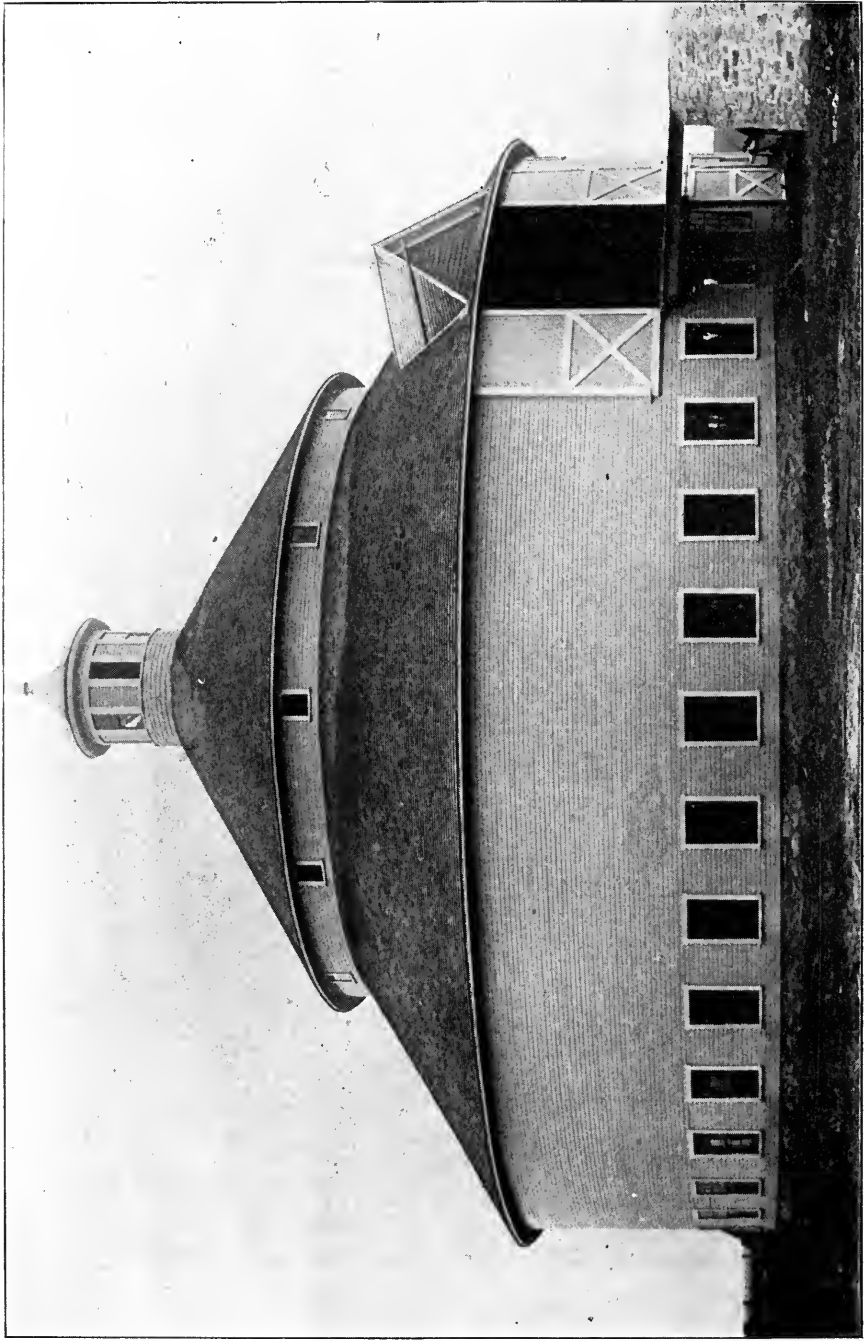
A stable for a double row of cows could be built cheaper in proportion; for it would not be necessary to have it twice as wide, the same feed alley answering for both rows. If more loft room is desired for storage of rough feed, this could be provided by putting the roof higher at but slight additional expense.

Two things almost universally lacking, or at least inadequately supplied, in dairy barns are light and pure air. These are easily obtained and although absolutely essential to the best health of the herd and the economic production of clean milk they are rarely appreciated.

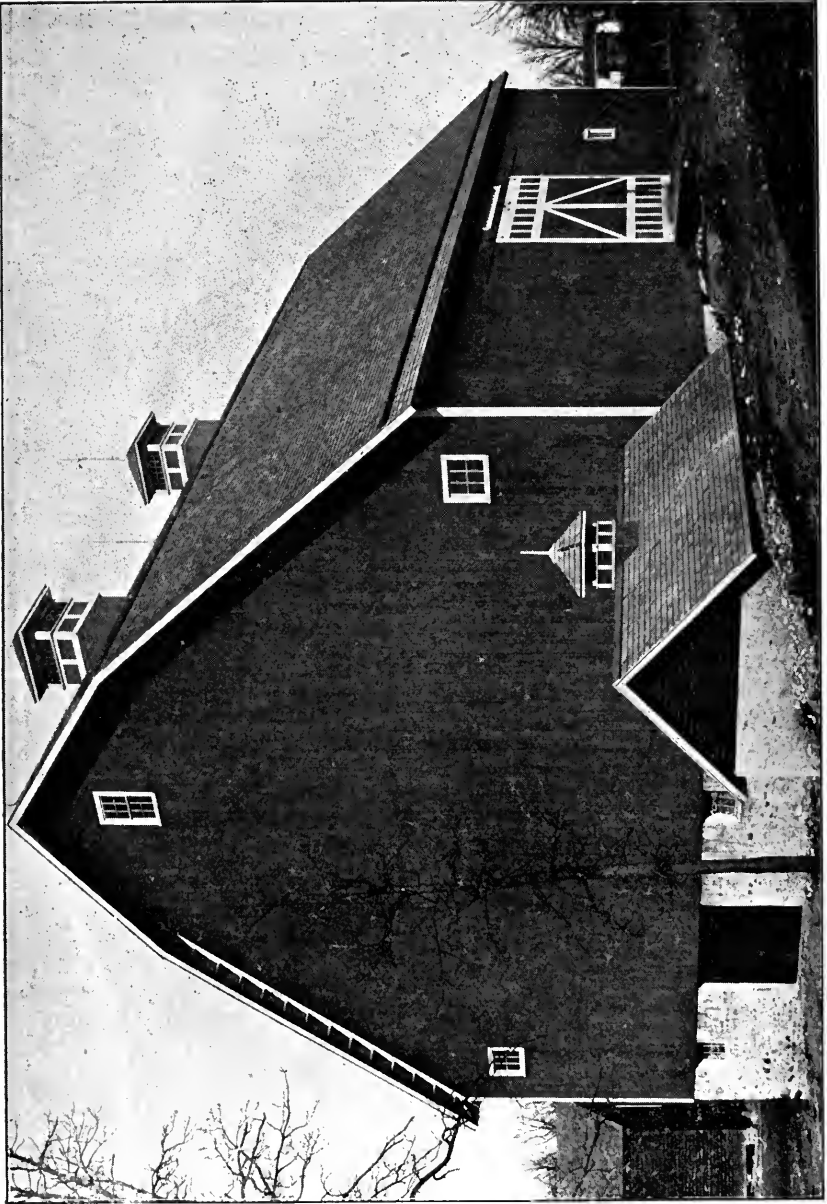
Cuts 12 and 19 show dairy barns containing sufficient windows. These are in striking contrast with others shown in this bulletin and seen throughout the State. If a barn is already built and has insufficient light more windows can easily be provided. There should be from three fourths to one and one half square feet of glass for every linear foot of outside wall in a dairy barn.

Many barns are not provided with any system of ventilation whatever, as but few dairymen realize that pure air is just as essential to the economic production of untainted milk as is the feed a cow consumes. Digestion and assimilation, like the burning of coal in a stove, are processes of combustion. The stove may be filled with coal but if the drafts are kept tightly closed the coal will not burn, as sufficient oxygen is not provided. Neither can a cow's feed be properly digested and assimilated without an abundance of oxygen, and unless this is supplied a great waste of food as well as impaired health of the cow will result.

Much has been said about the number of cubic feet of air space that should be allowed for a cow, but this is of little consequence in comparison with the more important question of ventilation, or change of air. In order not to get a greater degree of impurity in the air than is permissible with good results each cow should be supplied with 3,540 cubic feet of air per hour. The size of the



CUT 19. A CIRCULAR DAIRY BARN ADMIRABLY LIGHTED AND HAVING THE KING SYSTEM OF VENTILATION.



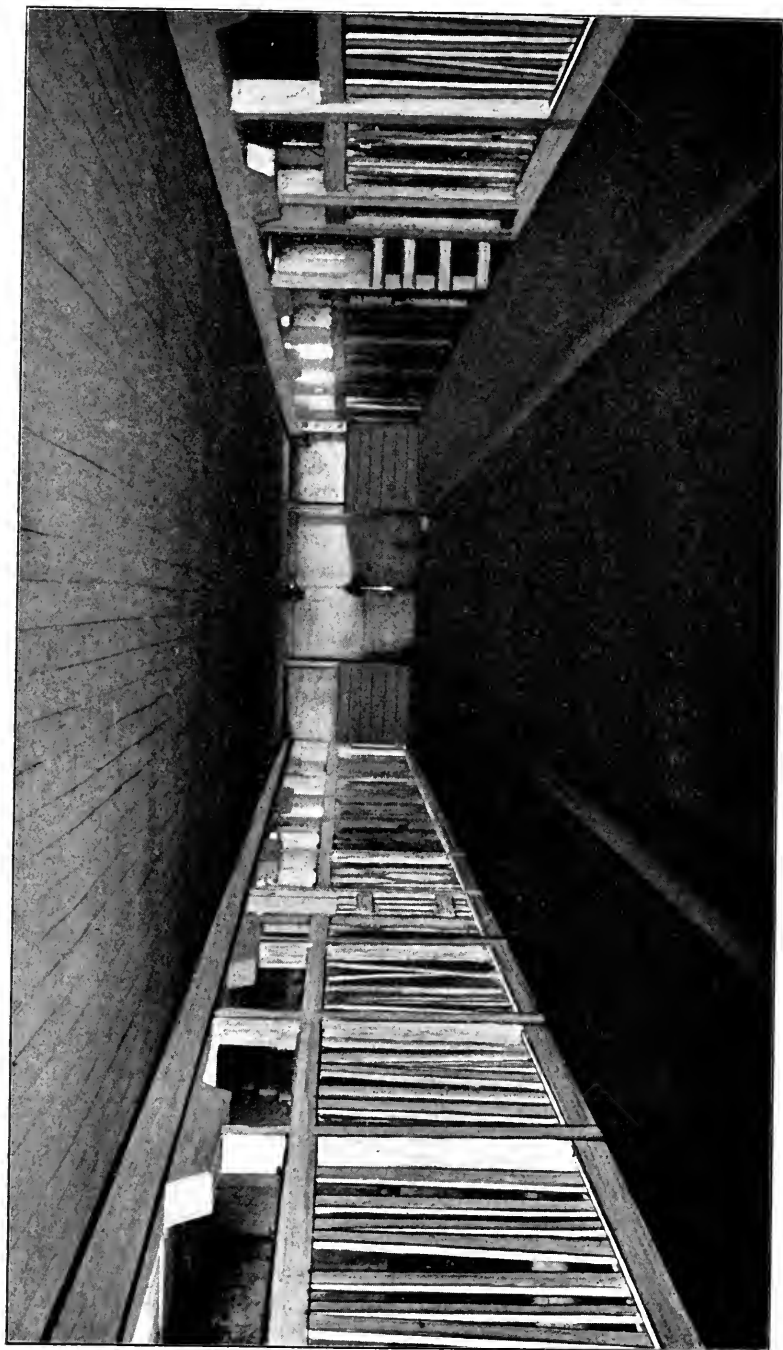
CUT 20. A DAIRY BARN AND MILK HOUSE ADJACENT. AS EXPENSIVE A BARN AS THIS IS NOT ESSENTIAL TO THE PRODUCTION OF CLEAN MILK BUT THIS SHOWS WHAT THE DAIRY BUSINESS WILL SUPPORT AS THE FARM HAS BEEN A STRICTLY DAIRY FARM FOR THIRTY YEARS.



CUT 21. THE KING SYSTEM OF VENTILATION IN DAIRY BARN, SHOWN IN CUT 20. FRESH AIR IS CARRIED BETWEEN JOISTS OVERHEAD TO CENTER OF BARN; FOUL AIR DRAWN OUT FROM NEAR FLOOR BY FOUR LARGE VENTILATORS CARRIED ABOVE ROOF, CAUSING A CONTINUOUS CHANGE OF AIR WITHOUT CREATING A DRAFT ON THE COWS. VENTILATOR SHOWN AT "A."

ventilating flues to be provided will depend upon the number of cows in the stable. About four square feet is a good size for a ventilating flue and if so constructed as to cause the air to travel 300 feet a minute this will furnish ventilation for twenty cows. Two flues this size would be sufficient for forty cows and five would be required for one hundred cows.

To be sanitary a dairy barn should be whitewashed at least once a year. An interior like the one shown in cut 23, with a few boards laid overhead at irregular intervals, with hay hanging through and with the sides in no better condition, cannot be properly whitewashed. The ceiling should be tight, excluding all dust and chaff from above, and sides smooth, thus affording a firm surface to which the whitewash can cling.



CUT 22. A SANITARY COW STABLE; FLOOR KEPT CLEAN, CEILING OVERHEAD, AND WHOLE INTERIOR WHITEWASHED.



CUT 23. WHILE THIS STABLE IS IN BAD CONDITION IT COULD BE MADE SANITARY AT BUT SLIGHT EXPENSE BY CEILING THE INTERIOR TO MAKE A SMOOTH, FIRM SURFACE, WHITEWASHING SAME, PUTTING IN WINDOWS AND VENTILATORS, AND KEEPING CLEAN.

It is not necessary to ceil the barn with surfaced lumber, in fact, the whitewash will adhere better if the surface is not too smooth. The boards must, however, be reasonably clean before the white-wash is applied, otherwise it will be of little use for it will soon shell off with the filth; and besides this, filth simply covered is not removed.

Whitewash is one of the cheapest disinfectants and can be easily and rapidly applied with a spray pump. It must be carefully strained before using in the pump as any lumps will clog the spray nozzle.

A cement floor is the most sanitary for a cow stable and when put down it should be left rough under the float to prevent the cows from slipping. An objection often made to cement floors is that they are cold in winter, but as the temperature in a dairy barn should never get below 40° F. this objection is largely overcome, if the cows are properly bedded. When a plank floor is used it must be renewed as fast as it wears or rots out.

It is of the utmost importance in keeping cows clean that the platform on which they stand be of the proper length. If it is too short the cows cannot lie down comfortably and if too long the droppings will fall on the rear of the platform and the cows will become soiled when lying down. As cows vary in length the platform should be longer, from the manger to the gutter, at one end of the barn and gradually taper to six or eight inches shorter at the other end. When large herds are kept the platform on one side of the barn may be longer than on the other side and the cows arranged accordingly. A still better arrangement is some form of movable manger so that the length of the platform can be adjusted to suit each individual cow. With this arrangement all can be lined up on the gutter, which will be a great help in keeping the cows clean.

THE CARE OF MILK.

As soon as it is drawn milk should be removed from the stable to a place provided for the purpose and there aerated and cooled to 50° or 60° F. This should be done either by setting the cans into a tank of cold water and stirring occasionally or by passing the milk over a cooler. The latter method is to be preferred if the cooling can be done in a pure atmosphere free from dust. It is of great importance to have a small milk house or some clean room away from the odors of the stable in which to care for milk. A good cheap milk house is shown in cut 37.

The sooner milk is thoroughly cooled after it is drawn, and the lower the temperature to which it is taken, the better. Bacteria that get into milk during the process of milking develop very rapidly so long as milk remains at about the temperature at which it was drawn, but as soon as cooled to 60° they develop slowly, and if cooled to 40° their action is almost entirely stopped. Milk cooled to this temperature as soon as drawn and held there will remain sweet and in good condition much longer than if cooled to only 70° or 75° .



CUT 24. DAIRY UTENSILS IN THE BATTERED CONDITION OF CAN ON LEFT, AND WITH TIN OFF IN MANY PLACES INSIDE, CANNOT BE KEPT CLEAN AND SHOULD BE DISCARDED.

CARE OF DAIRY UTENSILS.

One of the first essentials in keeping dairy utensils clean is to have a smooth surface. This fact should be kept in mind when purchasing, and if all seams are not flushed smooth with solder

this should be done. As soon as the tin is worn off on the inside, exposing the iron, the utensils should be discarded, for they cannot be properly cleaned when in this condition. All utensils should be washed as soon as possible after using since the longer the milk remains on them the harder they will be to clean. They should first be rinsed with lukewarm water to remove the milk, then washed with hot water and soap or some alkali, and scalded with boiling water, or with steam if it is available. Cans should never be tightly closed when not in use and should be placed on a rack in an inverted position so that dust cannot blow into them. If possible they should be placed where the sun will shine on them as that will do much toward keeping them pure and sweet.

Bottles used to deliver milk for direct consumption must be taken to the dairy after each using and thoroughly washed and sterilized to kill all disease germs. If this is not done disease may be carried from one house to another by means of the bottles. The practice some dairymen have of bottling milk in the wagon on the route, using bottles collected from houses just visited, cannot be too strongly condemned and should be prohibited by law.

THE FEED OF COWS.

Sudden changes of feed should be avoided, especially if very marked, as in changing from dry to green feed. Special care is required when cows are put on pasture in the spring and when first turned on rye or clover. Only a small quantity of green feed should be given at first, the amount being increased as from day to day the dry feed is reduced. If care is not exercised at such times the cow's system is likely to become deranged and the milk will then have a peculiar, disagreeable odor, but if this method is followed the system gradually becomes adjusted to the new conditions and no bad results follow.

When feeding turnips or cabbage the difficulty is frequently experienced of having disagreeable odors in the milk. This difficulty may be largely if not entirely avoided by feeding after milking rather than just before, as the peculiar odor produced by these feeds will then leave the cow's system before the next milking time.

CREAMERY.

The location of a creamery should be such as to insure good drainage. The ground surrounding it should be seeded and the road graveled that so far as possible dust may be prevented from blowing into the building. Cleanliness at a creamery should prevail without and within, not alone because neatness is essential to the production of the highest grade of butter but also because of its

effect upon the patrons. Every creamery should be a nucleus for high standards in dairying. The creamery operator cannot expect his patrons to bring clean milk properly cooled and cared for if the creamery is in a neglected condition, as it would be evident that under such circumstances all care on their part would be lost.

Every creamery, cheese factory, dairy, or milk depot should have the floor, and the walls to the height of at least three feet, of some impervious material. Cement makes the best and cheapest floor when properly laid. Faulty cement work can only be remedied by replacing with another floor.

To carry off more readily the water, the floor should pitch to the gutter. The distance to the gutter should not be more than twelve feet; if it is greater the water will not be carried off rapidly enough. The gutter should pitch to the sewer which should be well trapped and constructed of glazed sewer tile for a distance of at least two hundred feet from the building. At the end of the glazed tile a silt basin should be built of brick, stone, or cement, and ten or twelve inch porous tile laid from this into some well drained ground. From the large tile small laterals should be laid; the number and length needed will depend upon the amount of water to be disposed of and the character of the ground in which the system is laid. If the system is put in and found to be inadequate it can easily be extended by putting in more laterals or making them longer.

If the ground is naturally wet the system can be made much more efficient by laying drain tile among these to drain the ground, never getting closer than ten feet to the porous tile carrying the sewage. Much of the solid material in the sewage may be prevented from getting into the porous tile by frequently cleaning the silt basin.

Where no siphon is used between the silt basin and the porous tile there is a slow continuous flow of water into the tile which would seep out into the ground near the silt basin and deposit the solid material in the tile close to the basin. Where a siphon is used large quantities are carried over at one time, thus taking the solid material farther down into the porous tile. In time the tile nearest the silt basin will become filled up with solid material and may have to be cleaned out, but if large tile are used and the silt basin kept clean this system will prove satisfactory.

A CLEAN AND PROSPEROUS ILLINOIS CREAMERY.

The following twelve cuts show the interior of an Illinois creamery just as it appears every day when the regular work is in progress. No special cleaning was done before taking the photographs.

This sanitary creamery while not expensively built will remain in good condition for many years, as there is almost nothing about it to decay. The entire building, including partition walls, is of brick painted white. The building is provided with cement floor throughout and is neatly ceiled overhead. All win-



CUT 25. ENTRANCE TO A CLEAN, PROSPEROUS ILLINOIS CREAMERY; COUNTER ON RIGHT FOR RETAIL TRADE. THE FOLLOWING EIGHT CUTS ARE VIEWS IN THE SAME CREAMERY.



CUT 26. OFFICE. DOOR OPEN INTO ENTRANCE, SHOWING COUNTER, AND GLASS DOORS IN REFRIGERATOR.

dows and doors are screened in summer and fly paper is freely used to catch the few flies that find entrance. Cement walks are provided to prevent tracking in during wet times as much as possible. There is a cement platform on which the wagons stand while receiving skim milk from the weigher; at the close of the day's run this platform is swept and flushed off with the hose, thus removing any skim milk that may have been spilled and keeping everything, even around the skim milk tank, sweet and clean.

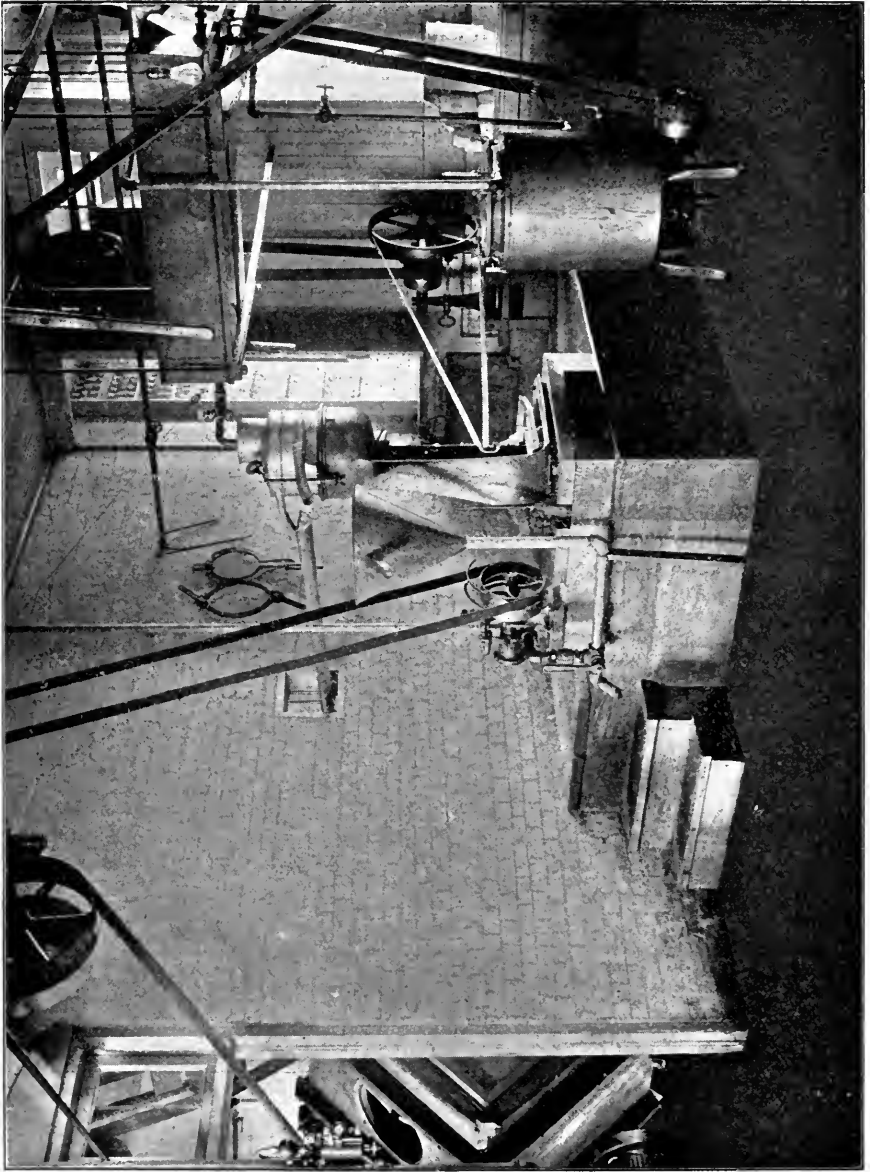
Not a can of milk is received at this creamery that the cover does not go to the nose of the man at the weigh-can before it is emptied and all milk that is not in good condition is returned.



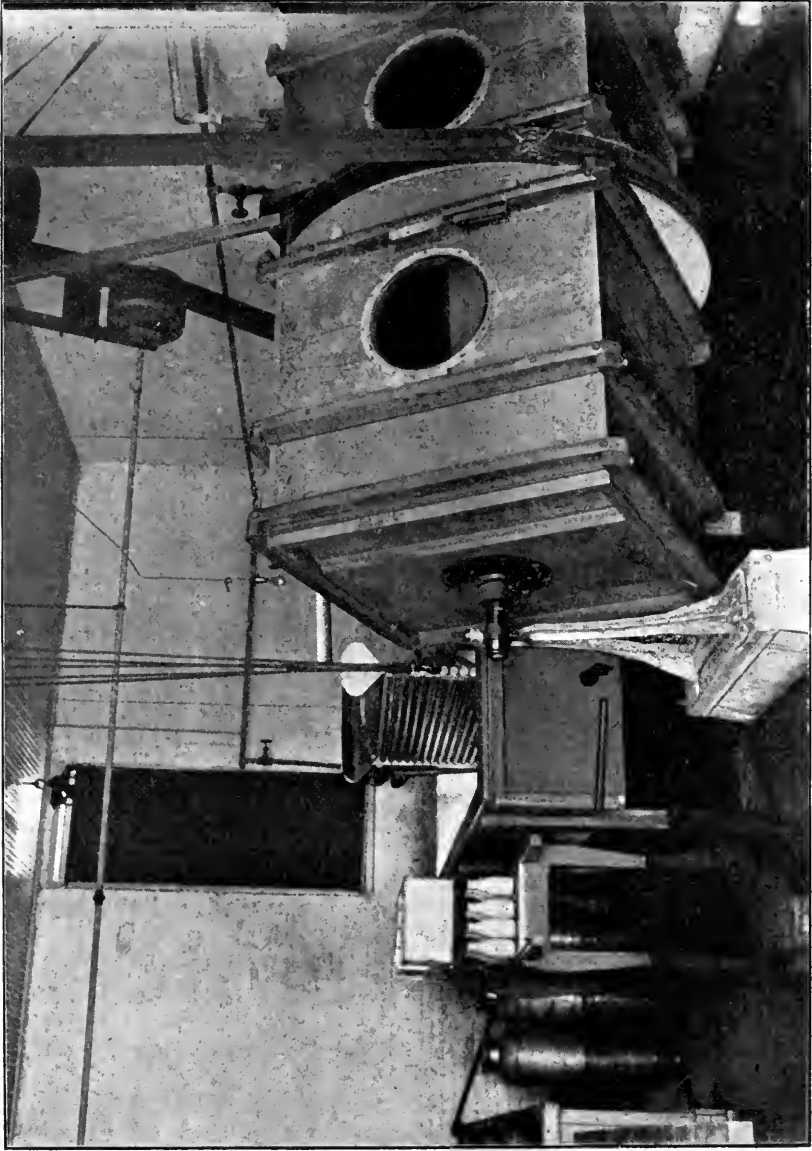
CUT 27, RECEIVING-ROOM. WEIGH-CAN, SCALES, SAMPLE BOTTLES, FLOOR, AND WALLS KEPT CLEAN. CLEANLINESS HERE IS OF THE UTMOST IMPORTANCE, AS IT IS THIS PORTION OF THE CREAMERY OR FACTORY THAT THE PATRONS SEE EVERY DAY, AND FROM IT MANY FIX THEIR STANDARDS.



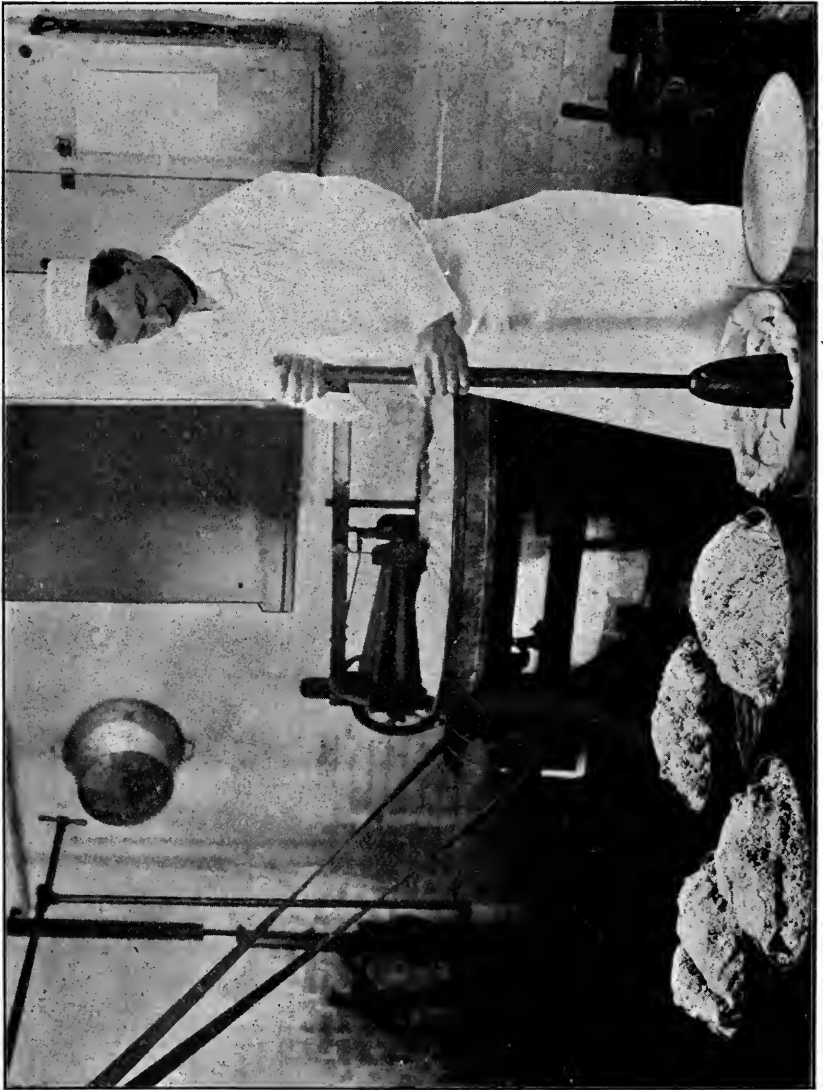
CUT 28. RINSING, WASHING, AND STERILIZING THE PATRONS' CANS AT THE CREAMERY.



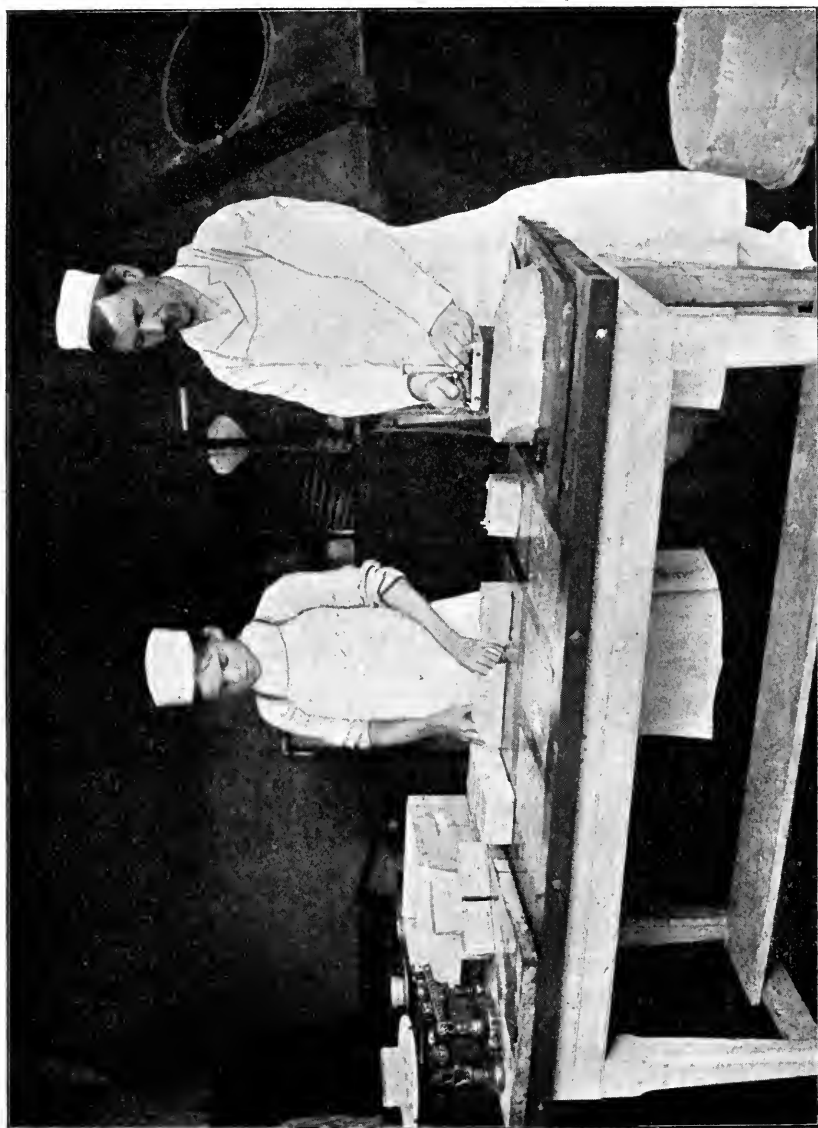
CUT 29. SEPARATING ROOM. FLOOR AND PLATFORM FOR SEPARATORS OF CEMENT; BRICK WALLS PAINTED WHITE; VATS, PASTEURIZER, SEPARATOR, MILK PIPES, AND PUMPS KEPT SCRUPULOUSLY CLEAN.



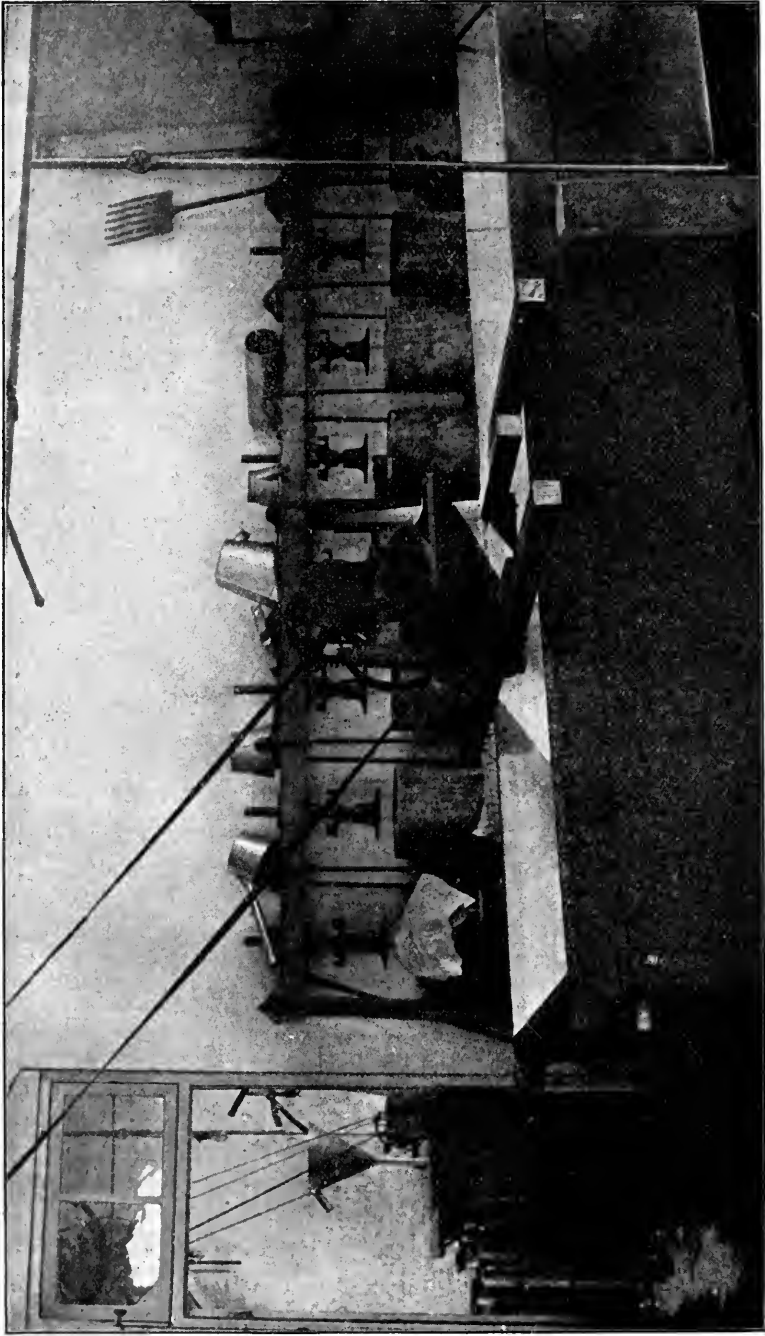
CUT 30. CHURN ROOM. NEATLY CEILED OVERHEAD; SIDE WALLS BRICK PAINTED WHITE; FLOOR AND BASE FOR CHURN CEMENT; CHURN, VATS, CREAM COIL, AND ALL UTENSILS KEPT CLEAN.



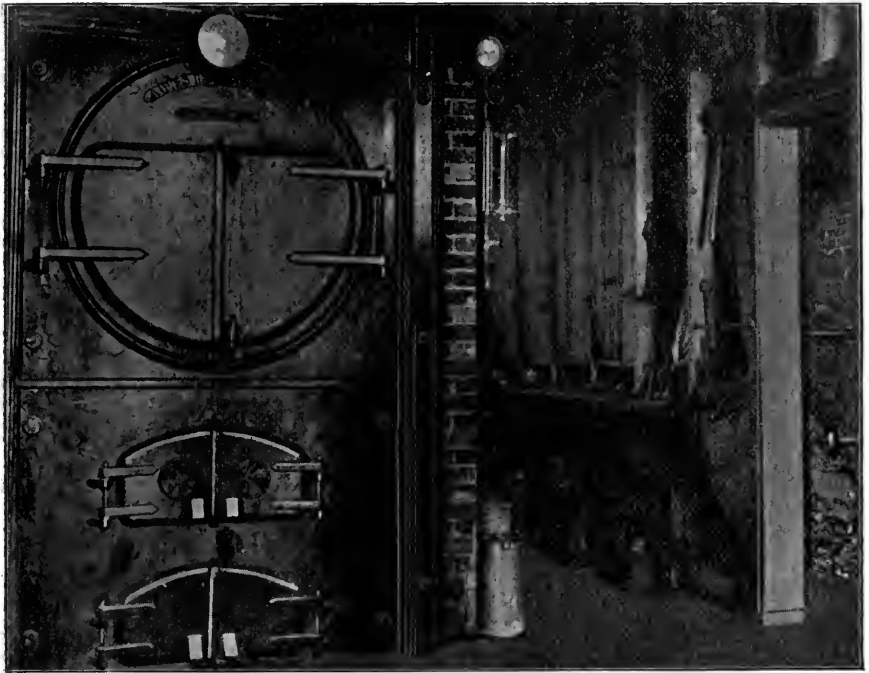
CUT 31. WORKING AND PACKING THE BUTTER.



CUT 32. PRINTING BUTTER; STAMPING THE NAME INTO EACH POUND SO THAT THE CONSUMER MAY KNOW WHERE IT WAS MADE.



CUT 33. CHEESE ROOM. VATS, CURD MILL, UTENSILS, AND EVERYTHING IN ROOM, INCLUDING CEMENT FLOOR, WALLS, AND CEILING, KEPT CLEAN.



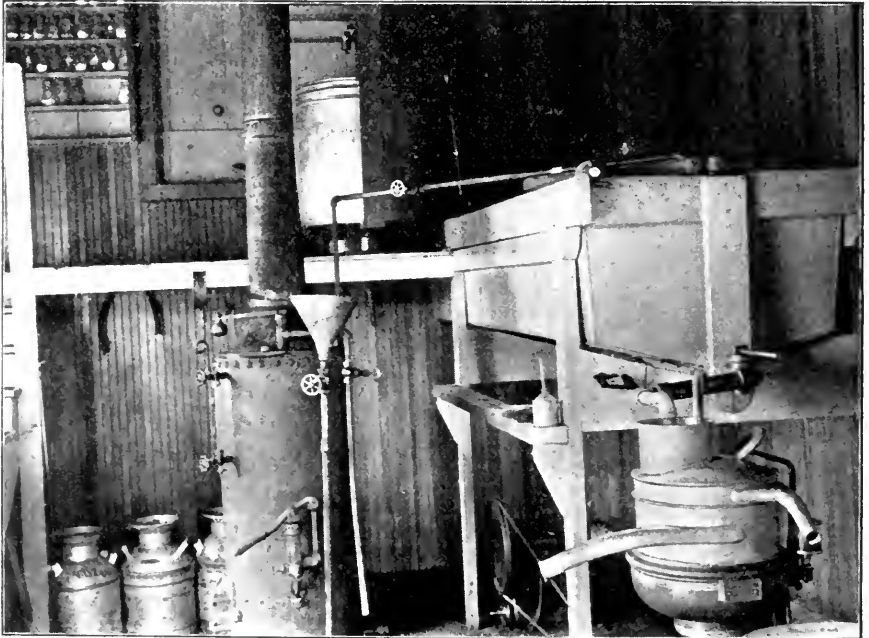
CUT 34. BOILER ROOM. TOOL CUPBOARDS AND WORKBENCH ON RIGHT; CLEAN CEMENT FLOOR EVEN IN COAL BIN; NO ASHES OR COAL DUST ALLOWED TO ACCUMULATE.

MARKET CONDITIONS.

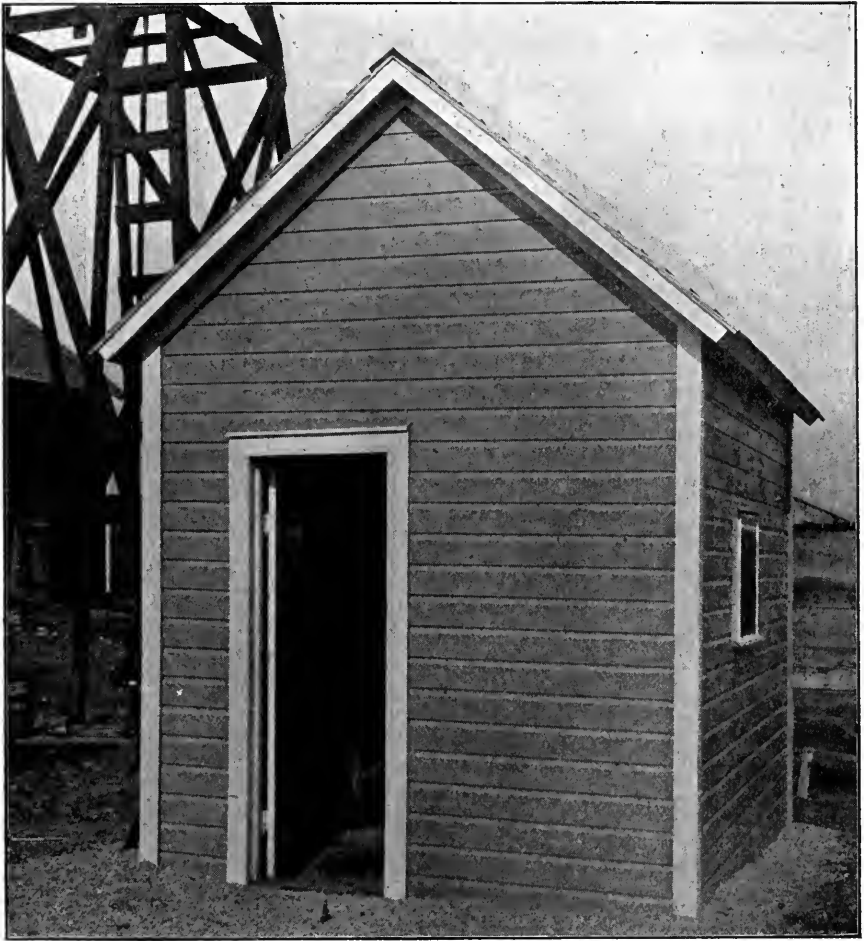
In nearly all towns and cities of Illinois it is difficult to buy in the open market any really good butter or cheese. What little cheese is manufactured in the state is largely consumed in the immediate vicinity of the factories. Many dairy products are not up to modern standards because of unsanitary conditions. The public is becoming more intelligent and demanding better food products and dairymen should raise their standards and supply existing demands for products of good quality. Dairy products are of such a nature that people can and will do without them unless they are of good quality.



CUT 35. A SKIM STATION, OF WHICH THERE ARE FIVE, BELONGING TO CREAMERY JUST DESCRIBED.



CUT 36. INTERIOR OF SKIM STATION SHOWING WEIGH-CAN, RECEIVING VAT, SEPARATOR, AND SMALL BOILER. ALL OF WHICH, INCLUDING THE FLOOR, WALLS AND CEILING, ARE KEPT CLEAN.



CUT 37. MILK HOUSE ON FARM SUPPLYING MILK FOR CREAMERY ABOVE DESCRIBED. AS SOON AS DRAWN, MILK IS RUN OVER A COOLER AND INTO CANS WHICH ARE THEN PLACED IN A TANK OF COLD WATER UNTIL TIME FOR DELIVERY.

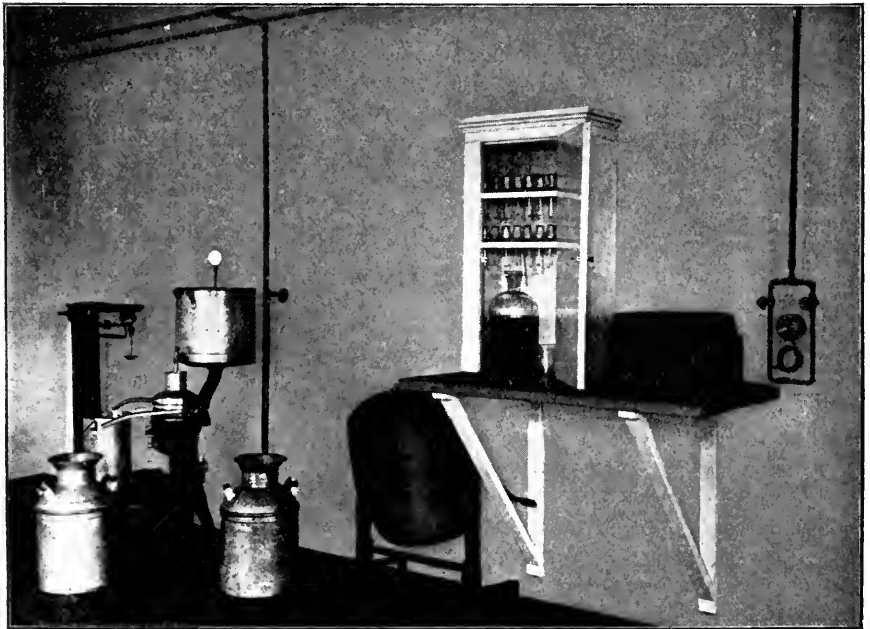
One of the weak points in dairying, and in fact the whole of agriculture, is not having the products properly graded before they are sold. Dairy products are placed upon the market and as a rule sold under one of three names, milk, butter, or cheese. The purchaser has not the slightest idea when or under what conditions they were produced or manufactured. The result is that quality does not count for what it should and goods of high quality help to sell the poor. In other words good and poor products sell for too nearly the same price.



CUT 38. A WELL LOCATED CREAMERY HAVING GOOD DRAINAGE, A CEMENT FLOOR, STONE WALLS, AND EVERYTHING KEPT IN A CLEAN AND SANITARY CONDITION.



CUT 39. HAULING MILK IN SPRING WAGON WITH CANS PROPERLY COVERED TO PROTECT FROM DIRT AND SUN.



CUT 40. A FARM DAIRY WITH CEMENT FLOOR, BRICK SIDE WALLS AND CEILING PLASTERED AND PAINTED WHITE.

If the quality of the goods is thoroughly acceptable and the consumer knows that the products are made in a sanitary manner and that their quality can always be depended upon, there will be no difficulty in securing a ready market at an advanced price.

The practical question then is, "What can be done to develop the dairy market?" As an answer to this the following is offered:

First and foremost produce a high class article.

Put up dairy products in such a manner that the consumer will get the original package.

Standardize and sell by grade and brand. Practice honesty and have grades exactly as represented.

Guarantee standards and invite inspection.

Publish the exact meaning of different grades and make people intelligent by putting out literature freely to educate them.

All places where dairy products are produced or manufactured should have standards of cleanliness and be open to inspection.

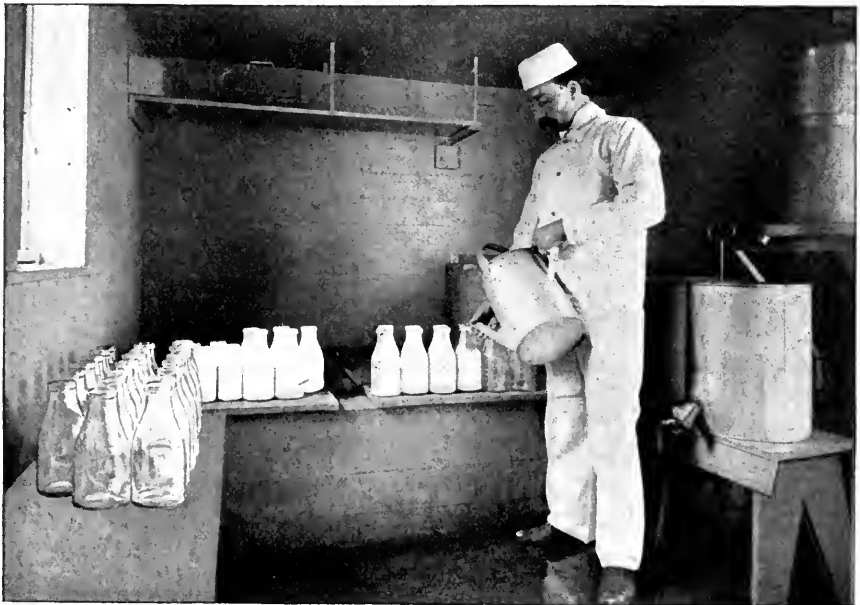
CLEAN MILK.

Milk free from dirt and in which the bacterial content is exceptionally small is essential for infants and invalids. A small amount of this kind of milk is produced and sold at present and the demand is constantly increasing as people learn of its advantages. There is no secret connected with the production of such milk. Cleanliness in every operation from first to last and thorough cooling as soon as drawn are the only requisites. The result is nothing more nor less than simply *clean milk*.

In the production of such milk all of the essentials mentioned in this bulletin in regard to the care of the cows, stables, utensils, and milk must be strictly followed. Before milking, the udders of the cows are always washed whether they appear soiled or not and the milkers put on clean suits kept for the purpose. As soon as cooled the milk is standardized, to whatever per-cent. of butter-fat it is guaranteed to contain, and immediately bottled, which prevents any further contamination taking place until it reaches the consumer. As soon as bottled it is either packed in ice or placed



CUT 41. MILK BOTTLES AND DAIRY UTENSILS ARE WASHED AND RINSED IN SINK ON LEFT, THEN PLACED IN BRICK STERILIZER ON RIGHT, DOOR CLOSED AND LIVE STEAM TURNED IN FOR 20 MINUTES.



CUT 42. MILK BOTTLING ROOM. A SMALL ROOM WITH CEMENT FLOOR; EVERYTHING KEPT NEAT AND CLEAN.



CUT 43. A SANITARY DAIRY BARN FOR THE PRODUCTION OF CERTIFIED MILK. CEMENT FLOOR, IRON STALLS, SIDES WHITEWASHED, WELL LIGHTED AND PROVIDED WITH A GOOD SYSTEM OF VENTILATION. EXTERIOR SHOWN IN CUT 12.



CUT 44. WASHING UDDERS BEFORE MILKING.



CUT 45. THIS WAGON ADVERTISES THE KIND OF MILK DELIVERED.

in ice water to keep it at a low temperature until ready for delivery.

This careful method of producing milk reduces the contamination to a minimum and the sudden cooling to so low a temperature almost entirely prevents the further development of the few bacteria that gained access to it, thus insuring at all times a milk of low bacterial content which is so essential for infants and invalids and has been the means of saving many lives.

In the production of such milk as above described is a promising field for financial gain which is as yet almost wholly undeveloped, for there are but few cities in the state where milk of this character can be obtained; while after people learn of its advantage there is an increasing demand for it at an advanced price. In some places it sells as high as twelve cents a quart.

Instances are known where a quart of this kind of milk was shipped a long distance daily by express for feeding an infant and cost the consumer thirty-five cents a quart.

REFRESHMENTS SERVED IN DAIRY BARN.

At the meeting of the Illinois State Dairymen's Association held recently at the College of Agriculture, refreshments were served in the dairy barn. The object being to impress upon the dairymen of the state the fact that dairy barns are places where human food is produced and that they should therefore be fit places in which to prepare and eat food as well.

The following are extracts from toasts made on that occasion :

WHY NOT?

Mr. H. B. Gurler, DeKalb, Illinois.

"Why not have this time together in the cow stable when it is in such condition that there is nothing objectionable,—and why not elevate the whole dairy business? Now we cannot get up to the standards that they have here all at once, but we can go gradually step by step until we reach this point—until the stable is in fit condition in which to prepare the food we eat. There is no article of food that will absorb impurities quicker than milk.

* * * * *
 "I cannot say half that I feel along this line. This great improvement is a gratification to me. I am proud of it. It shows that we are developing and it shows the practicability of this work."

CAGED.

Dr. T. J. Burrill, Vice-President, University of Illinois.

* * * * *
 "I do not know that these good housewives of ours are doing unnecessary things in keeping the rooms, tables, etc., clean, but after all in a great many instances we are leaving the things undone toward cleanliness that we ought to



CUT 46. SERVING A DAIRY LUNCH TO THE STATE DAIRYMEN'S ASSOCIATION IN UNIVERSITY OF ILLINOIS DAIRY FARM, JANUARY 6, 1913.

look after. Now I take it that this is the first time in American history that luncheon has been served with such attendants on either side. If we can have our milk free from taint, as it ought to be, the barn will be this kind of a place. I do not know that we shall have set the fashion of making the cow barn the dining room, but I do believe that we have come to the time when the product from the cow stable shall be fit for the dining room."

ROOM AT THE TOP.

Prof. E. Davenport, Dean, College of Agriculture.

"Really there is nothing remarkable about this matter after all. I noticed as people came in that some of them grinned a little out of the corner of their eye a few turned up their noses, and some looked as unconcerned as if they had done this a hundred times before.

"I submit the proposition that any place that is fit for the manufacture of food ought to be a fit place in which to eat it. Now in all of this talk about 'room at the top' there is no question about it in this business. I am bound to say that in my opinion none of us has commenced to realize the upper limit of the dairy business.

* * * * *

"All this business needs is that we stick to it with a determination to reach the top. There is too much bad butter—there is too much filthy milk. I hope that Illinois will take the lead in getting near the top in this business.

* * * * *

"There are more people than there used to be—more people to spend money—let the dairymen get a little of this money that men are spending so lavishly."



INDEX.

	PAGE		PAGE
Addams, Jane.....	288	Injury to corn	443, 446, 447, 450
Alfalfa, bacteria, inoculation with..	315	Life history	446, 450
Field experiments.....	326	Little brown, injury to corn....	441
Fixation of nitrogen in.....	342	Life history	438, 442
Growth of, directions for.....	347	Bill-bugs, corn in Illinois.....	435-461
Effect of nitrogen, phosphorus, and potassium on	322	Injury to corn	435, 436, 437
Hay, how cured.....	332, 333, 335, 336	See also under <i>Sphenophorus</i> .	
On Illinois soils	311	Life history	436
Plot experiments, plan of.....	327	Measures against	436, 437
Pot culture experiments.....	312	Recent bibliography.....	457-461
American trotter	26	Blair, J. C.....	351
Ammoniacal copper carbonate solu- tion	186	Bordeaux mixture	176
Method of preparation	186	Method of preparation	180
Apples, bitter rot of.....	351-366	Details in	184
Appearance of	365	Mixing outfits for	181
Canker	356	Burrill, T. J.....	351
Dissemination of	365	Bus horses, description of.....	23
Gleosporium stage	198	Butcher stock. See Cattle, market classes and grades of—	
Gnomoniopsis stage	206	Cabbage worms, hellebore for.....	10
Losses caused by	365	Cab horses, description of.....	23
Mummies	354	California and Oregon washes for San Jose Scale—	
Prevention of	357, 366	As affected by water sprays and rains	243, 246, 264
Black rot	192	Comparison of respective values.	261
Blotch	190	Effectiveness and expense as com- pared with other insecticides..	264, 267
Brown rot	190	Experimental details—California wash	248, 255
California wash on for San Jose Scale	248, 251, 252, 253	Oregon wash.....	256-261
Kerosene emulsion on.....		Field use of California wash 1901- '02	488-492
.....	482, 484, 487, 493	Formula for California wash....	489
Oregon wash on	256, 261	General results of experiments with California wash.....	255
Scab of	109	Insecticide effect of.....	262, 267
Bibliography	126	Practical conclusions concerning.	263
Fusicladium stage	113	Preparation of	246, 489
Illustrations, explanation of....	137	Superiority of California wash.	492-493
Injury from	110	Tent experiment with.....	262
Prevention of	112	Use in the east.....	242
Venturia stage	121	In Illinois	242-268
Apple trees, canker of.....	225-239	In Pacific states	241
Injury to	232	Calves, average daily ration fed to..	272
Prevention	234	Cattle, market classes and grades of.	367
See San Jose Scale.		Index of same	369
Baby beef. See Cattle, market classes and grades of—		Cattle, market and slaughter tests of	558-562
Baker, I. O.....	73	Celery, brief notes on culture.....	11
Baldwin, T. A.....	46	Methods of storing	16
Beagley, J. H.....	43	Cherry, effect of kerosene emulsion on for San Jose Scale.....	485, 488
Beal, A. C.....	503		
Beef cattle. See Cattle, market classes and grades of—			
Bill-bug, blue grass. See Bill-bug, little brown—			
Clay-colored, descriptive notes...	451		

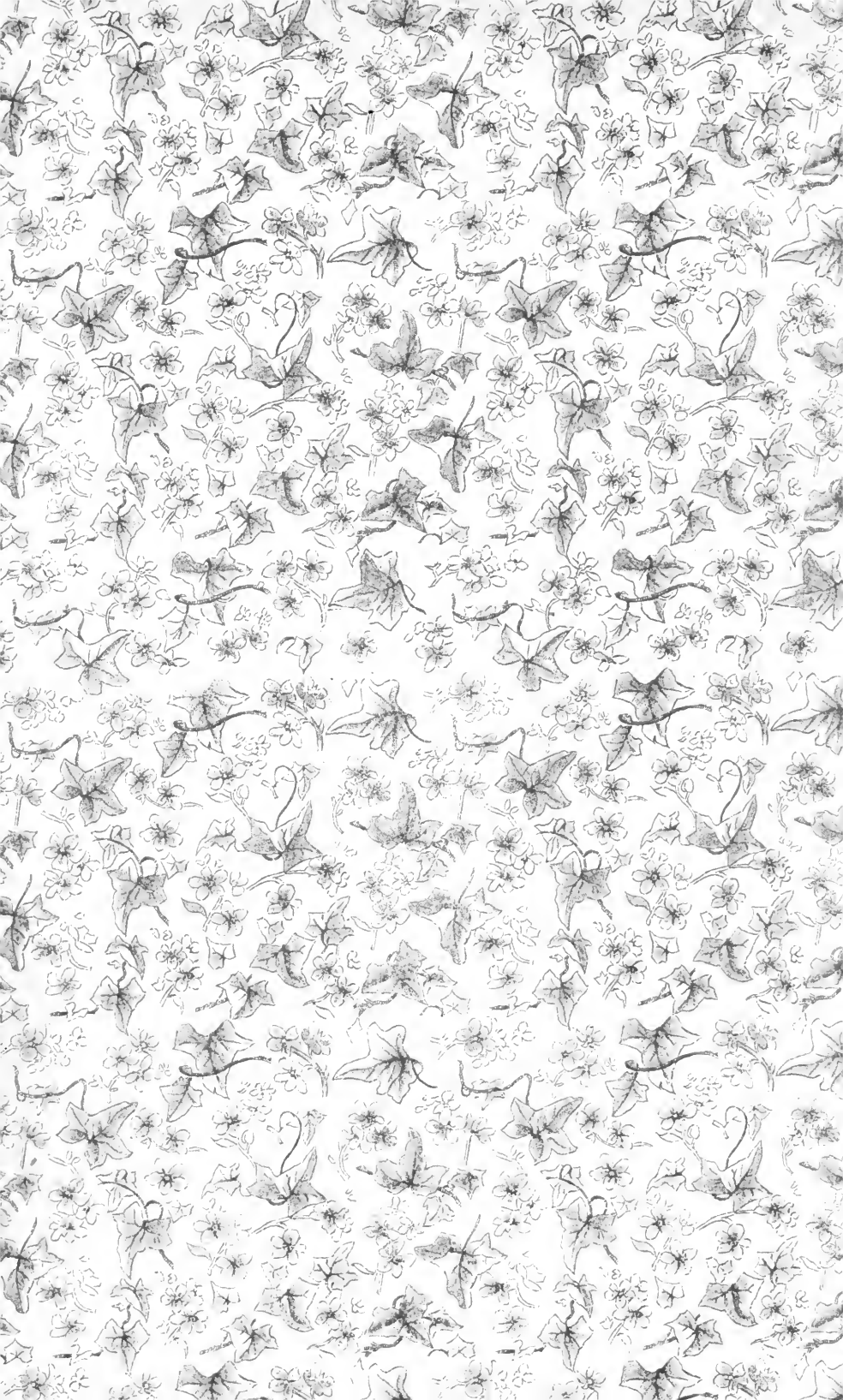
	PAGE		PAGE
Chester, E. E.....	55	Crown	80
Classes of sprav mixtures, how di- vided	158	Drainage	75
Clay, Robison & Co.....	544	Surface	80
Clinton, George P.....109, 189,	354	Tile	76
Coach horses	19	Embankments, how built.....	75
Condensing factories agents in rais- ing milk standard.....	584	Grades	75
Cooke, Elizabeth	289	Location, points to be considered	74
Coolidge, J. H.....	55	Maintenance of	82
Corn and clover hay ration effect- ive for beef production.....	557	Pathmaster for	92
Corn bill-bugs in Illinois. See un- der Bill-bugs and <i>Spheno-</i> <i>thorus</i> .		Elements of plant food	313
Corn breeding, methods of.....	525-539	Erf, Oscar	297
Corn composition, improvement of..	531	Experiment in individual differ- ences, value dairy cows.....	97
High oil	531, 534	How fed	99
High protein	531, 534	Export cattle. See Cattle, market classes and grades of—	
Performance records	536	Feeding experiments, conditions sur- rounding	546, 547
Physical characteristics of.....	35, 37	Plan of	270
Standard varieties for Illinois—		Results of feeding different rati- ons	272
Boone County White	54	Feeding steers, method of.....	548, 550
Golden Eagle	43	Feed lots, comfortable, important in fattening steers	551
Iowa Silver Mine	43	Condition of, affecting gains....	551
Leaming	48	Location of	547
Reid's Yellow Dent	40	Feeds supplementary to corn for fattening steers	541-576
Riley's Favorite	46	Financial aspect of.....	563
White Superior	46	Food stuffs and rations.....	547
Cows, individual records of.....	104	Forbes, S. A.....241, 265, 435, 463	
Profitable standard of production.	104	Formalin treatment to prevent oat smut	66
Proper feeding of.....	608	Cost	67
Cream, cost of on butter-fat basis..	308	Result of	67
Creamery, location of.....	608	Fraser, Wilber J.....95, 283, 577	
Crops other than corn required to supplement silage	280	Fumigation with hydrocyanic gas. See orchard fumigation—	
Cultivator, narrow tooth.....	8	Fungus, description of.....	159
Cutters and canners. See Cattle, market classes and grades of—		Funk, E. D.....	269
<i>Cyperus strigosus</i>	446, 453, 454	<i>Gamasidæ</i>	438
Dairy conditions, investigations of.	284	Garden, The farmers'.....1-16	
Suggestions for improvement.....	577-631	Labor on	13
Dairy cows, differences in the value of	95-108	Products of	13-15
Dairy products, commercial value of	579	Profits from	16
Dairy utensils, care of.....	607	Glucose Sugar Refining Company..	526
Dallenbach, W. C.....	545	Goodwin, W. R. Jr.....	344
Davenport, E.....	17	Grindley, H. S.....	288
Distillers. See Cattle, market classes and grades of—		Haines, C. A.....	343
Draft horse, description of.....	24	Hasselbring, Heinrich	225, 354
Dressed beef cattle. See Cattle market classes and grades of—		Hedges, care of. See earth roads, maintenance—	
Dungan, W. S.....	54	Hellebore, application of, for cab- bage worms	10
Earth roads	73	Highway commissioner, office of..	92
Administration	88	Hopkins, Cyril G.....311, 525	
Cash vs. labor tax.....	89	Horses, Class 1. Road, carriage, and coach	19
Contract system	90	Class 2, cab	23
Construction of	74	Class 3, bus	23

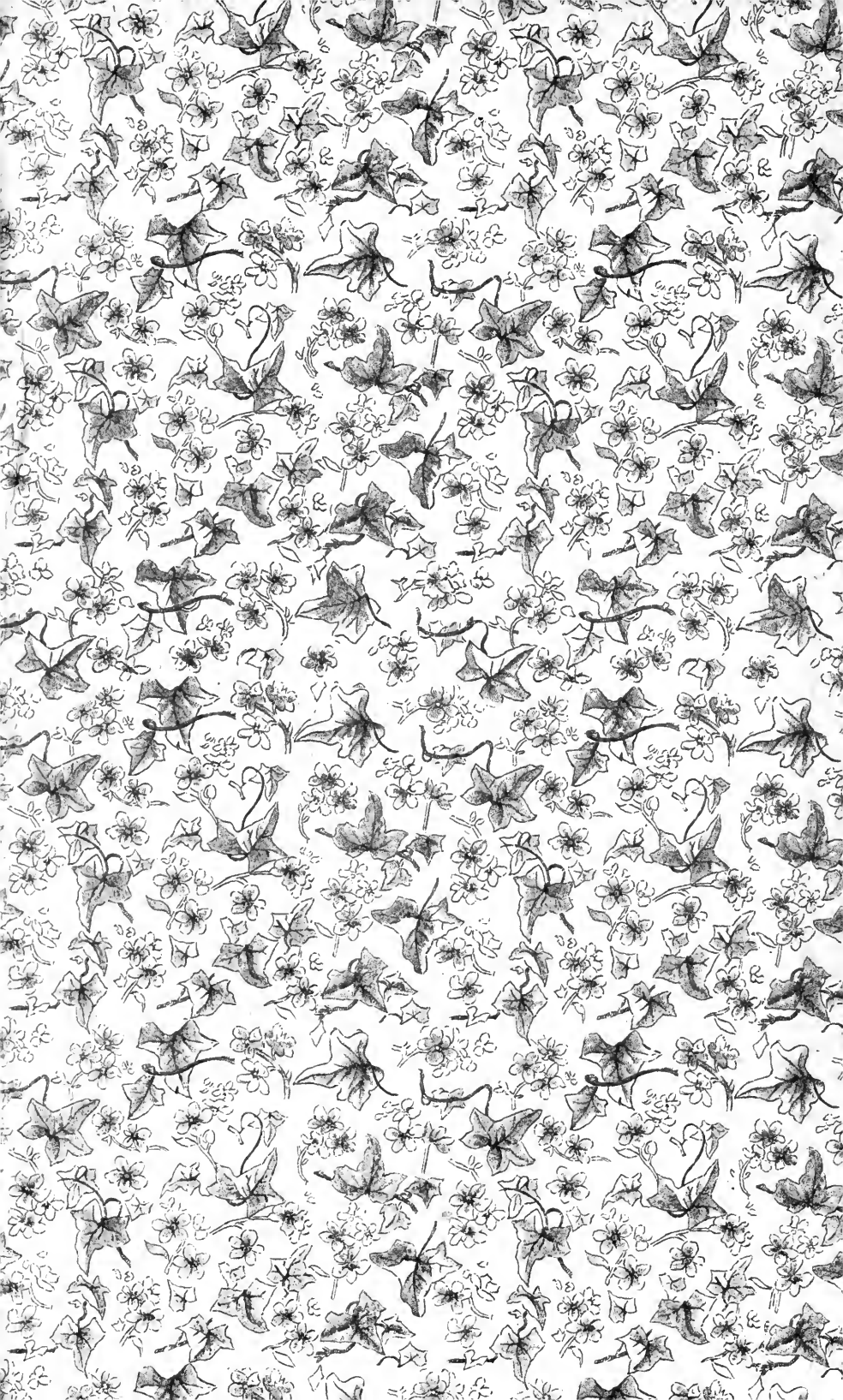
	PAGE		PAGE
Class 4, draft	24	At Richview	474-479
Class 5, American trotter...	26	Cost	479, 493
Market classes, fixed on utility.	19	Equipment	467
Not continuous	19	Operation	468
Miscellaneous	26	Restrictions in application....	492
Production of by classes.....	18	Insecticide treatment of.....	463
"Unclassed"	17	Experience with kerosene emul- sion in	481-488
Hydrocyanic acid gas for San Jose scale. See under orchard fumi- gation—		Treatment of, with whale-oil soap	480
Illinois creamery, prosperous.....	610	Paris Green	170
Illinois Seed Corn Breeders' Assoc- iation, constitution of.....	55	Allowable limi ^t of uncombined ar- senious oxid	174
Irwin, John	566	Ammonia, color, and microscopic tests	171, 172
Kerosene emulsion, cost of orch- ard treatment with, for San Jose scale	482	Commercial substitutes for.....	176
On various fruit trees for San Jose scale	481-488	Effect of addition of lime.....	175
Laws affecting milk standard.....	293	Objections to use of.....	175
Leaming, J. S.....	48	Requirements of	175
Lice on steers, spraying for.....	550	Substitutes for	176
Lime, sulphur and blue vitriol for San Jose scale. See Oregon wash—		Pathmaster, office of	92
Sulphur and salt for San Jose scale. See California wash—		Peach, California wash on for San Jose Scale	251, 255, 481, 488
Lloyd, J. W.....	1	Effect of kerosene emulsion on..	482, 484, 485, 486, 403
Location for dairy barn.....	585	Whale-oil soap on.....	242, 493
McMahan, H. F.....	54	Kerosene sprays on	242
Market classifications of cattle, im- portance of	370	Oregon wash on	259, 260
Market conditions regarding butter and cheese	619	Pear, kerosene emulsion on, for San Jose Scale.....	482, 483, 486, 487, 488, 493
Market quotations of cattle.....	367	Perry, H. B.....	43
Manure from silage convenient to handle	278	Petroleum crude, for San Jose scale	464
Marker, home made for vegetable gardening	5	Phosphorus, effect on alfalfa.....	321
Maurer, J. E.....	566	<i>Phragmites communis</i>	444
Milk, care of.....	606	Pigs, a factor in economical pro- duction of beef	278
"Clarified"	298	Following calves on silage.....	273
Cleanliness in handling.....	593	Following steers, gains in weight	553
Collecting samples of for analysis	288	Plum, California wash on for San Jose Scale	481
Composite sample test.....	106	Effect of kerosene sprays on ...	242
Apparatus for	107	Whale-oil soap solution on....	242
Composition of	286	Potassium, effect of on yield of hay.	322
Food value of.....	286	Quince, kerosene emulsion on for San Jose scale	488
Millet injured by clay-colored bill- bug	445	Rations fed to Hereford and grade Shorthorn calves	271
Mumford, Herbert W.....	269, 367, 541	Reid, James L.....	40
Nitrogen and bacteria, effect of....	321	Rhoades, A. C.....	40
Added to soil increases growth... 316		Riley, James	46
Atmospheric, fixation of.....	337-339	Road administration	88
Notes on steer feeding experiment..	587	Advantage of good.....	87
<i>Nummularia discreta</i> . See Apple- trees canker of—		Earth	73
Oat smut, amount of in different varieties	59	Sand	86
Nature of	59	Taxes	89
Orchard fumigation	464	Wasted	92
At Sparta	470-474	Root crops, method of storing.....	16
		Root tubercles, abundance of.....	332
		Sammis, J. L.....	290
		San Jose scale, detachment of, by rain and water sprays	243-263

PAGE	PAGE		
Experimental use of California and Oregon washes for.....	241-268	Apparatus	305
Field use of same	488-493	Milk and cream	297-309
See also under California and Oregon fumigation for. See under Orchard fumigation spontaneous death of.....	243	Methods	298
Winter application for, cost, safety, etc	492	Standardizing milk and cream.	294-297
Schwarzschild & Sulzberger Co.	566	With skim-milk.....	302
<i>Scirpus fluviatilis</i>	444, 450	With whole-milk	303
Seed corn	29	Standards in sale of milk.....	287
Chemical selection of.....	528	Steers, market and slaughter tests of	558
How to grow.....	33	Methods of feeding and marketing	542
Pedigree	31	Stockers and feeders. See Cattle, market classes and grades of—	
Physical selection of.....	527	Storment, W. P.....	355
Uniformity	29	Striped cucumber beetle, methods of combating	10
Vitality	30	Stubenrauch, A. V.....	157
<i>Setaria</i>	445	Texas and western range. See Cattle, market classes and grades of—	
Shamel, A. D.....	29, 57	Tomatoes, forcing—	
Shelter for calves and pigs	270	Benching	508
Reasonably warm, economical....	271	Diseases	513
Shipping steers. See Cattle, market classes and grades of—		Fertilizers	508
Silage and shock corn, relative merits of	260	Green houses for	504
Silage fed steers meat producers... 278		Handling small plants	505
Siloing corn	278	Insects	512
Simple solution spray mixtures.... 167		Market for	523
Simpson, R. A.....	355	Midwinter crop	516
Snout-beetles. See Bill-bugs—		Pollination	509
Soil, effect of lime and phosphorus upon	332	Soil	505, 508
Sperry, P. R.....	46	Spring crop	520
<i>Sphenophorus cariosus</i> , description of larva	455	Temperature	508
Life history	454	Training	10, 509
Taken on corn	453	Varieties	518, 523
<i>Ochrus</i> . See Bill-bug, clay colored—		Watering	509
<i>Parvulus</i>	437, 456	Yield	513, 515
See also Bill-bug, little brown—		Treatment oats for smut.....	57-72
<i>Pertinax</i>	449	Cost	64
Injury to corn	452	Hot water	63
Life history	453	Precautions	63
<i>Placidus</i> , injuries and life history	442	<i>Typha latifolia</i>	452
<i>Robustus</i> , destructive in south... 456		Value of dairy cows, individual differences	95-108
<i>Scoparius</i> , taken on corn and grass 456		Veal calves. See Cattle, market classes and grades of—	
<i>Sculptilis</i> , injuries to corn in other states than Illinois.....	456	Varieties corn adapted to Illinois conditions	37
Taken on timothy	456	Vegetables, list of varieties for farmer's garden	2-4
<i>Zea</i> . See <i>Sphenophorus sculptilis</i> —		Von Schrenk, Herman	355
Spraying, agitators, description of. 162		Warner, F. A.....	55
Importance of	158	Weather, effects of on feeding silage 278	
Mixtures, physical properties of.. 162		Weight of cows	103
Stags. See Cattle, market classes and grades of—		Weight of steers,—fed on silage.... 274	
Standard milk and cream.....	283-206	fed shock corn	274
Standardization of cream.....	305	Whale-oil soap for San Jose scale.. .. .	464, 480, 487, 493
		Cost and effectiveness.....	267, 480, 481, 493
		Yield of silage per acre.....	271
		Shock corn per acre	271









UNIVERSITY OF ILLINOIS-URBANA

Q.630.71L6B

C001

BULLETIN. URBANA

61-84 1901-03



3 0112 019528782