FIRST ANNUAL REPORT

OF THE

International Association of Dairy and Milk Inspectors

INCLUDING PAPERS READ AT THE ANNUAL
CONVENTION IN MILWAUKEE
OCTOBER 25-26, 1912

COMPILED BY
IVAN C. WELD, Secretary-Treasurer
1116 CONNECTICUT AVENUE
WASHINGTON, D. C.

Price One Dollar

THE SECOND ANNUAL CONVENTION

of the

International Association of Dairy and Milk Inspectors

will be held at

THE NATIONAL DAIRY SHOW

IN CHICAGO

FRIDAY AND SATURDAY, OCTOBER 24, 25, 1913

Every State or City Department responsible for Dairy and Milk Inspection should be represented at this meeting by its chief Dairy or Milk Inspector and one or more members of the inspection force. Papers on all phases of dairy and milk inspection will be read by the most competent authorities, and there will be ample opportunity for discussion. In addition to the information to be given and to be gained at this Convention, there will be a wonderful opportunity for dairy and milk inspectors to study the finest representatives of all breeds of dairy cattle at the Dairy Show, and also to become intimately acquainted with all that is newest and best in machinery and appliances incidental to the production, handling, and distribution of milk and milk products.

PLAN your affairs in a way that will enable you to attend the Second Annual Convention of this Association at the National Dairy Show in Chicago. Remember the dates, Friday and Saturday, October 24 and 25, 1913.

International Association of Dairy and Milk Inspectors

CONSTITUTION

NAME.

This Association shall be known as the International Association of Dairy and Milk Inspectors.

OBJECT.

The object of this Association shall be to develop uniform and efficient inspection of dairy farms, milk establishments, milk and milk products, and to place the inspection of the same in the hands of men who have a thorough knowledge of dairy work.

MEMBERSHIP.

The membership of this Association shall be composed of men who now are or who have been actively engaged in dairy or milk inspection. Any person who now is or who has been so engaged may make application to the Secretary-Treasurer, and if application is accepted by the Membership Committee, said applicant may become a member of the Association upon payment of the annual dues of five dollars ($5.00).

OFFICERS.

The officers of this Association shall be a President, three Vice-Presidents, a Secretary-Treasurer, and two Auditors, who shall be elected by a majority ballot at the Annual Meeting of the Association, and shall hold office for one year or until their successors are elected. An Executive Board, who shall direct the affairs of the Association when not in Annual Session, shall consist of the President, the three Vice-Presidents, and the Secretary-Treasurer.

AMENDMENTS.

This Constitution may be amended at any Annual Meeting by a two-thirds vote of the entire membership of the Association. Any member proposing amendments must submit the same in writing to the Secretary-Treasurer at least sixty days before the date of the Annual Meeting, and the Secretary-Treasurer shall at once notify all members of such proposed amendments. All members voting on such proposed amendments shall register their vote with the Secretary-Treasurer on blanks provided by the Association before the date of the Annual Meeting.

International Association of Dairy and Milk Inspectors

OFFICERS, 1912-1913.

President, C. J. STEFFEN.....Milwaukee.
Vice-President, A. N. HENDERSON.....Seattle.
Vice-President, WM. H. PRICE.....Detroit.
Vice-President, JAMES O. JORDAN.....Boston.
Secretary-Treasurer, IVAN C. WELD.....Washington.

COMMITTES.

BY-LAWS.

Dr. James O. Jordan, Boston, *Chairman.*
Dr. Hulbert Young, Washington, Ivan C. Weld, Washington.

DAIRY FARM INSPECTION.

Dr. Wm. H. Price, Detroit, *Chairman.*
Mr. J. A. Gamble, Springfield, Mass., Mr. Claude F. Bossie, Omaha.

CHEMICAL AND BACTERIOLOGICAL INSPECTION OF MILK.

Dr. James O. Jordan, Boston, *Chairman.*
Prof. Horatio N. Parker, Urbana, Ill., Mr. A. N. Henderson, Seattle.

THE CONTROL OF BOVINE TUBERCULOSIS.

Dr. George W. Gillie, Ft. Wayne, Ind., *Chairman.*
Dr. Wm. S. Gimper, Harrisburg, Pa., Dr. Harry E. States, Detroit.

MEMBERS

Babb, Geo. F.	Dairy and Milk Inspector	Topeka, Kan.
Bossie, Claude F.	Dairy Inspector	Omaha, Neb.
Burke, E. F.	Agent N. Y. State Dept. of Agriculture	Albany, N. Y.
Calkins, Fred P.	Milk Inspector	Tacoma, Wash.
Gamble, J. A.	Dairy and Milk Inspector	Springfield, Mass.
Gillie, Geo. W.	Meat and Dairy Inspector	Ft. Wayne, Ind.
Gimper, Wm. S.	Director of Milk Hygiene	Harrisburg, Pa.
Haggerty, A. L.	Chief Food Inspector	Augusta, Ga.
Henderson, A.N.	Chief Milk Inspector	Seattle, Wash.
Heurich, V. N.	Milk Inspector	Milwaukee, Wis.
Huxtable, F. L.	Milk Inspector	Wichita, Kan.
James, Irving L.	City Milk Inspector	Fargo, N. D.
Jordan, James O.	Inspector of Milk	Boston, Mass.
Keihl, Harry	Dairy and Milk Inspector	Milwaukee, Wis.
Krehl, Edward C.	Milk Inspector	Detroit, Mich.
Lane, C. B.	In charge Scientific Dept. Supplee Alderny Dairy	Philadelphia, Pa.
Lorenz, Albert	Milk Inspector	Milwaukee, Wis.
Leech, G. Ed.	Sec'y Minn. State Vet. Med. Asso.	Winona, Wis.
Maynard, L. H. P.	Bacteriologist	Philadelphia, Pa.
Palmer, Wm. P.	Chief Dairy and Food Div.	Baltimore, Md.
Parker, Horatio N.	Prof. Municipal Dairying, University of Illinois	Urbana, Ill.
Potter, Geo. C.	Milk and Dairy Inspector	Detroit, Mich.
Price, Wm. H.	Chief Dairy Inspector	Detroit, Mich.
Rive, Henry	Dairy Instructor	Victoria, B. C.
Roehl, John F.	Milk and Dairy Inspector	Detroit, Mich.
Rowe, Peyton	State Dairy Inspector	Fredericksburg, Va.
Sassen, J. Howard	City and State Dairy and Milk Inspector	Des Moines, Iowa
Smith, Eldon	Chief Dairy Inspector	Grand Rapids, Mich.
Smith, Russell S.	Dairy Inspector, State Dept. of Agriculture	Augusta, Me.
States, Harry E.	Dairy and Milk Inspector	Detroit, Mich.
Stahel, P. J.	Chief Dairy Inspector	Toogoolawah, Queensland, Australia.
Steffen, C. J.	Chief Dairy Inspector	Milwaukee, Wis.
Thompson, O. P.	State Dairy Inspector	Waterloo, Iowa
Weld, Ivan C.	Investigator for Chestnut Farms Dairy	Washington, D. C.
Young, Hulbert H.	Chief Food Inspector	Washington, D. C.

FIRST ANNUAL CONVENTION

The First Annual Convention of the International Association of Dairy and Milk Inspectors was called to order at 10 A. M., Oct. 25, 1912, in the auditorium of the International Dairy Show by President C. J. Steffen, who welcomed the Association to Milwaukee. President Steffen read a paper on the general question of Dairy and Milk Inspection and the work which this Association can and should accomplish.

Vice-President A. N. Henderson, of Seattle, in behalf of the Association, responded to the address of welcome, and read a paper on "Methods Employed and Results Obtained in Improving the Milk Supply of Seattle."

Mr. J. A. Gamble, of Springfield, Mass., was unable to be present, and his paper was read by President Steffen.

At the afternoon session, papers were presented by Inspector C. F. Bossie, of Omaha, Inspector George F. Babb, of Topeka, and Inspector Jas. O. Jordan, of Boston.

The Association took a recess at 4 o'clock to accept the invitation of Mr. John Le Feber, President of the Gridley Dairy Company, to visit that company's milk plant. Two hours were spent in looking over the plant, which was found to be of modern construction and especially well-kept. A vote of thanks was given Mr. Le Feber and the Gridley Company for the courtesies extended.

At the evening session, papers were read by Vice-President Dr. William H. Price, of Detroit, Prof. E. G. Hastings, of the University of Wisconsin, and Dr. William C. Woodward, Health Officer of the District of Columbia.

On Saturday morning, Oct. 26, the Association was called to order at 10.30 A. M. Papers were read by Dr. Hulbert Young, Chief Dairy and Food Inspector of Washington.

D. C., Prof. E. G. Hastings, of the University of Wisconsin, and Prof. W. J. Fraser, of the University of Illinois.

At the afternoon session, Mr. B. H. Rawl, Chief of the Dairy Division, U. S. Department of Agriculture, discussed "Dairy Inspection from the Standpoint of the Milk Producer." Mr. John Nichols, President of the International Milk Dealers' Association, read a paper on "Dairy Inspection from the Standpoint of the Milk Dealer." Prof. W. A. Stocking, of Cornell University, discussed "Points to be Especially Safeguarded in the Production and Handling of Milk."

The papers above referred to were discussed by Drs. Jordan, of Boston, Price, of Detroit, Woodward of Washington, Mr. Steffen, of Milwaukee, Mr. Kristoferson, of Seattle, Dr. Gillie, of Ft. Wayne, Mr. Huxtable, of Wichita, Dr. W. S. Gimper, of Pennsylvania, Mr. Leesburg, of Milwaukee, Dr. Babb, of Topeka, Dr. States, of Detroit, Dr. Young, of Washington, Mr. Bossie, of Omaha, Dr. Thompson, of Iowa, Prof. H. N. Parker, of Illinois, Dr. Palmer, of Baltimore, Mr. E. F. Burke, of New York, Mr. A. J. Glover (of *Hoard's Dairyman*), and others.

The business session was held on the evening of Oct. 26, in connection with a banquet for members of the Association and a few invited guests. The By-Laws Committee reported their work unfinished, and a committee consisting of Dr. Jordan, of Boston, Dr. Hulbert Young, of Washington, and the Secretary was appointed to consider the matter further and report at the next Annual Meeting.

The Secretary-Treasurer reported the total income of the year was derived from membership dues, which amounted to $70.00. Expenditures for Secretary-Treasurer's bond, stationery, printing, postage, and stenographer, amounted to $68.26, leaving a balance of $1.74, cash on hand.

Mr. A. N. Henderson and Dr. Wm. H. Price, who were appointed to serve as auditors, reported that they had examined the accounts of the Secretary-Treasurer, and finding them correct had approved the same.

The following gentlemen were elected to serve as officers of the Association for the ensuing year:

President, C. J. Steffen, Milwaukee.
1st Vice-President, A. N. Henderson, Seattle.
2nd Vice-President, Wm. H. Price, Detroit.
3rd Vice-President, Dr. Jas. O. Jordan, Boston.
Secretary-Treasurer, Ivan C. Weld, Washington, D. C.
Auditors, Claude F. Bossie, Omaha, E. F. Burke, Albany,

A communication was received from the Panama-Pacific Exposition inviting the Association to hold its 1915 Convention in San Francisco. After discussion, it was voted that the invitation be laid on the table for further consideration.

The following resolution regarding the death of Vice-President Dr. George M. Whitaker, was adopted:

Resolved: It is with deep regret that the members of this Association learned of the death of the late Dr. George M. Whitaker. Dr. Whitaker was a man of sterling worth, an untiring worker for the improvement of dairy conditions generally and particularly for the improvement of city milk supplies. In this work he was especially successful, and his labors, assistance, and advice were an inspiration and example to state and city dairy officials of the United States.

Dr. Whitaker's death is a loss to the nation and to this Association, and we the members of this organization desire to honor his memory and to extend our sympathy to the members of his family in this, their great bereavement.

A resolution was offered by Dr. Babb, of Topeka, thanking the International Dairy Show Association, and the citizens of Milwaukee, and all who have in any way helped to make the meeting a success.

A special vote of thanks was also extended to those members of the Association and to all others who contributed papers at this meeting.

It was voted that the time and place of the next annual session be left to the judgment of the Executive Board.

The President was authorized to appoint committees to make a general survey and report at the next annual meeting regarding the work accomplished along the lines of:

(a) Dairy Farm Inspection.
(b) The Chemical and Bacteriological Inspection of Milk.
(c) The Control of Bovine Tuberculosis.

PRESIDENT'S ADDRESS.

MR. C. J. STEFFEN, *Chief Dairy Inspector,* Milwaukee.

Wisconsin, the greatest dairy state in the Union, extends greetings to all associations whose purpose is the teaching of the gospel of sanitation and cleanliness in producing and marketing the products of the dairy cow. This Association, organized in this room one year ago by men who are actually engaged in advocating and insisting on cleaner methods in the production of our milk supply, marks an epoch in the development of dairy and milk inspection.

It is but proper to remind you, in coming to Wisconsin, that you are in the state which is the home of such pioneer dairymen as Hiram Smith, C. P. Goodrich, Stephen Fayle, and ex-Governor Wm. D. Hoard. These men many years ago organized the Wisconsin Dairymen's Association, and the place Wisconsin occupies today as a dairy state is due, to a large extent, to the untiring efforts of the members of that organization. They taught our dairymen the advantages to be derived from breeding and feeding better cows, and to exercise a greater care in handling the product of their herds.

Few questions are receiving greater attention today than the improvement of the milk supply. It is a lamentable fact in the great movement for a more wholesome milk supply that the producer, who should set a high standard and sell his milk on its merits, has done so only in a comparatively few instances. Milk consumers in general have shown the same indifference towards the question of clean milk by refusing to pay more for clean milk than for dirty milk, with the result that laws have been enacted by many states and cities compelling the dairyman to maintain his premises in a reasonably sanitary condition if he would market the product of his herd. States and cities have also enacted laws and ordinances pro-

viding that all milk sold within their limits must be of a certain composition and providing certain tests and minimum legal limits which the producer and milk dealer are compelled to meet before they can legally sell their products to the consumer.

The milk question, too, is so closely allied with questions of health that municipalities have been compelled to regulate the sale and distribution of milk in order to conserve the public health. Typhoid fever, diphtheria, scarlet fever, pneumonia, and tuberculosis are liable to be transmitted to human beings through the medium of milk supplies. The infant mortality of cities which directly and efficiently supervise the production and sale of milk has been greatly reduced during the past few years. This conservation of human lives and the prevention of disease is a most important factor in the conservation of the world's resources, and is a splendid tribute to the efficient work of dairy and milk inspectors.

The question of clean milk and the methods to pursue to obtain clean milk are questions which practically every city in the country is now attempting to solve. The systems and methods of inspection differ, and officials do not always agree as to the best methods of procedure. Practically every large city in this country has some form of dairy and milk inspection. In some cities systematic and efficient inspection has solved the question. In others, dairy and milk inspection is still regarded as a joke, and the milk inspector is appointed and holds office as a reward for his fealty to and service rendered the particular political party in power. In the past, it was not unusual to meet men who were called milk inspectors who had absolutely no practical or theoretical knowledge of the fundamental principles of milk production, transportation or distribution. I have known carpenters, locksmiths, ward politicians, plumbers, and a cobbler to be appointed as dairy inspectors. Is it any wonder our market milk producers refuse to be taught by such men? How can the standards of milk production be elevated by inspectors whose knowl-

edge of the dairy industry is less than that of the men whose business and premises they are appointed to inspect? Veterinarians having practically no knowledge of the dairy industry or of dairy sanitation have, in some places, attempted to monopolize dairy inspection, and have advanced rather flimsy arguments to bolster up their claims as being the only qualified men for this particular work. Ringbone, spavin, colic, hog cholera, and most other animal diseases are not difficulties that milk inspectors are called upon to diagnose or to cure. In the past, much of the bad feeling generated as a result of dairy and milk inspection has been due to incompetent inspectors. But the old-time political appointees and the old-time horse-doctors are disappearing from the work, and in their places we are finding specially trained and experienced men from the agricultural colleges. Instruction at the dairy farm by inspectors who are well informed regarding the feeding and care of cattle, the building or improving of barns for the housing of the herds, the proper construction and care and cleaning of dairy buildings, and dairy equipment, the best method of securing and handling milk, is more likely to secure the confidence and cooperation of the men on the farms who are daily engaged in this work, than in the more sensational wielding of the "big stick."

There are many details which I believe the milk producer, the student of the dairy industry, the teacher and investigator of our agricultural colleges and experiment stations and the well informed dairy inspector must study and must thoroughly understand—if we are to have a safe milk supply. The beginning of the milk industry is with the owner of the dairy cow, and the starting point to improve our milk supply is with the owner of the dairy farm. The demand for cleaner and more wholesome milk is universal. How to proceed to more completely safeguard the milk supply, and to encourage the employment of competent, experienced men as inspectors. and to standardize and make uniform our work, are some of the objects for which this Association was organized, and for

the accomplishment of which this Association will labor.

Dairy and milk inspection is today largely a question of education, supplemented by necessary legislation. Various methods are employed in different places. Some cities depend almost wholly on farm inspection to insure the purity of their milk supply. Others, again, rely more largely on the bacteria test. Still others rely solely on fat tests to indicate what constitutes lawful and wholesome milk, and still others see little need for anything but the application of the tuberculin test to all herds. The discussion of these and other problems will follow as a part of the program of this Convention and I hope the members will render every assistance in their power, through the agency of this organization, to bring about desired changes and reforms and a unification of methods and procedure. I trust the result of our work will be received by our superiors throughout this and other countries in the spirit and for the purpose for which this Association was organized, namely, to elevate and to improve the work and to place it in the hands of men who are best qualified and fitted to do the work. Let us labor to secure a purer and more wholesome milk supply for our people in general and for the babies in particular, thereby safeguarding the public health and promoting the best interests of all classes.

"The milk question pervades the whole domain of preventive medicine and touches many economic and social forces. There is no single problem in the whole realm of modern sanitation and hygiene so complex, so involved, so intricate and so harrassing."

—*Rosenau.*

METHODS EMPLOYED AND RESULTS OBTAINED IN IMPROVING THE MILK SUPPLY OF SEATTLE.

By A. N. HENDERSON, *Chief Inspector*, Seattle.

The object to be attained by milk inspection should, in every city, be to secure a wholesome milk supply. Milk to be wholesome must be produced and handled according to fixed fundamental rules and principles, which are the result of knowledge obtained through the advancement made in dairy bacteriology and sanitation. The methods adopted and used will naturally vary in detail to some extent. It is therefore desirable in applying these rules and principles to the milk industry to apply them in a way that will secure the maximum results in bettering conditions, and eliminating, so far as may be, those conditions that are harmful or dangerous.

Local conditions affecting the milk supply of the City of Seattle were first investigated before a system of dairy and milk inspection was inaugurated. This investigation included a study of:

1. Topographical formation of the milkshed.
2. The climatic conditions.
3. Location of dairies.
4. Means of transportation.
5. Water supply.
6. Character of people engaged in producing milk supply.
7. Type of cows.
8. Cost of production.
9. General market conditions.

The investigation brought out the following important facts:

That a large portion of the milkshed was low land, which for two months of the year it was impossible to adequately drain.

That climatic conditions were favorable to dairying was

self-evident. The only disadvantage being that nature provided no ice. The average mean temperature for the three winter months being 40 degrees. This mean temperature, however, allowed the construction of the open type of dairy buildings which practically solved the pure air question and also made possible the use of pastures for ten months of the year.

The larger percent of dairies were found to be located within a radius of thirty miles of the city.

Regarding transportation facilities, we found 20% of the milk supply was delivered by wagon and auto trucks; 20% by trolley lines; 5% by steamboat, and 55% by railroad, and that the entire milk supply was received by the milk dealers in the city within sixteen hours after production.

The investigation showed that it was possible and practicable to supply over 65% of the dairies with running spring water, with an average temperature of 55 degrees Fahrenheit and that the balance could be supplied with well water, with a temperature of not over 60 degrees Fahrenheit, thus insuring the practical use of milk coolers.

Undoubtedly the most important factor governing milk production in any city is the character of the people engaged therein. Our investigation clearly demonstrated three types of dairymen; the progressive dairymen who would invite and welcome practical and intelligent inspection; the indifferent dairyman who, in many instances, by proper instruction and diplomatic inspection could be transformed into a progressive dairyman, and the slovenly dairyman who loathed and detested inspection of any kind. It was, therefore, found advisable, so far as possible, to formulate a system of inspection that would coincide with the ideas of the progressive dairyman. The type of cows were found to be of the average grade of stock, running largely to Holsteins, with practically no registered herds or sires in the territory. The cost of production was unnecessarily high, principally on account of loose business methods and without definite knowledge of the course of profit and loss.

The investigation of market conditions clearly demonstrated that Seattle had very keen competitors in the condensed milk companies. These companies maintaing eight factories within our territory. As competitors on the one hand they may have, to some extent, helped to maintain active market conditions. but on the other they have been the largest single demoralizing factor with which our inspection has had to contend.

In discussing the methods employed and results obtained in improving the milk supply of Seattle, the subject logically divides itself into the following heads:

1. The Department of Milk and Dairy Inspection.
2. System of office records and reports.
3. Milk analysis.
4. Farm inspection.
5. Transportation inspection.
6. Milk plant inspection.
7. General store inspection.
8. The consumer.

THE DIVISION OF MILK AND DAIRY INSPECTION.

The success or failure of any system of municipal milk and dairy inspection depends largely on three factors: first, the ability and attitude of the executive head; second, the political influence, and third, laws and regulations.

The progress made by the City of Seattle toward securing a wholesome milk supply is due to the splendid work of the Commisioner of health. Through his ability as an executive he has built up a department that is true and loyal to his every trust, that is above the influence of the politician and a department that is only controlled by such legislation as has as its object the protection of the consumer and the wellbeing of the milk industry.

Subordinate to the Commissioner of Health is a Chief Milk Inspector and two assistant inspectors, all of whom are

required by the State Law to be graduates of an agricultural college or to have completed a course in dairying in such a college; also a chemist and a bacteriologist, who are required to be graduates of their respective courses.

This entire force is under civil service rules and regulations; and the department has been built up by merit rather than by politics.

Subordinate to the Commissioner of Health in the Dairy Department are five physicians, who are members of the County Medical Society, whose duty it is to enforce the ordinance governing the production and sale of certified milk. The placing of the certified milk commission under the supervision of the Health Department is unusual, but in our city it has proven satisfactory for the following reasons: 1st, the analysis of certified milk and the veterinary inspections of certified milk herds are made by the employees of the Health Department, under the direct supervision of the certified milk commission, thus reducing to a minimum the operating expense of the commission; 2nd, all rules and regulations governing the production and sale of certified milk are formulated by the commission, who are guided entirely by the Association of American Medical Milk Commissions. Such rules and regulations as are adopted by the local commission are enacted into city ordinances, so that the commission has not only the power of the Medical Society behind them, but also that of the city judiciary; 3rd, by placing the production and sale of certified milk under the indirect supervision of the Commissioner of Health and by governing the production and sale of city ordinance, the responsibility for the character of this important product is not placed upon the shoulders of a possibly indifferent Medical Society, but is governed by a city official who has a sworn duty to perform. 4th, by subordinating the milk department to the County Medical Society, in governing certified milk, a closer cooperation is established in solving market milk problems.

SYSTEM OF OFFICE RECORDS AND REPORTS.

The City of Seattle consumes daily 18,000 gallons of milk, produced by 450 dairymen, distributed by 85 dealers and sold from 600 stores.

To have intelligent supervision over all branches of our milk supply, it is self-evident that a system of records, permanently maintained, having as the object an accurate record of all producers, distributors and dealers of milk in a convenient form for ready reference for comparing not only different dealers and producers, but the same dealers and producers at different times, and in such form that inquiring consumers may be informed concerning the dairy which supplies them with milk.

The first step toward acquiring such a system is in securing an accurate list of all persons engaged in the production, distribution and sale of the milk. This list has been obtained through the permit system, which requires every person before engaging in the production, sale and distribution of milk for city use, whether living within or without the city limits, to first procure from the Milk Department a written permit so to do and no permit is issued until such person has passed a satisfactory inspection. Before a dairy farm permit is issued the dairy must score at least 50% on the score card.

With such a list, and each permit holder given a number, it becomes an easy matter to provide a system recording the standing of every dairyman, dealer and store. The plan adopted by the Seattle department is that recommended by the United States Dairy Division, the essential feature being the use of County Maps upon which are shown the permit numbers showing the exact location of all dairies supplying the city with milk. Each map is also marked with horizontal and perpendicular lines which cross and form squares, each square having an indexed number. The index to the map consists of a loose leaf ledger, each dairyman having a page. The pages are arranged in alphabetical order and so ruled that the

months of the year will form a perpendicular line and opposite each, forming horizontal lines, space is allotted for the bacterial count, butter fat percentage, farm score, date of inspection, temperature of milk, number of cows milking, number of gallons produced, name of dealer receiving milk, date for re-inspection, indexed number to map and remarks. At the top of the page is the dairyman's name, address, permit number, average bacterial count, butter percentage and score of the previous year. A similar form is also kept of all milk dealers in the city. With such a system it is possible to give the exact standing of every producer and dealer month by month and for the previous year on a moment's notice, and also from this ledger a monthly report is made up giving the bacterial count, score and butter fat percentage of each dairyman and dealer for publication.

An alphabetical index is also kept of all score cards, permit applications and contagious disease as charged to each milk dealer.

The reports of the inspectors are made out daily and cover the following: City or County inspection, number of gallons of milk condemned, reasons for condemning, number of samples taken for chemical and bacteriological analysis, number of inspections of milk wagons, trains, dairies, milk plants, stores, restaurants and dairies closed. This report is made into a ten-day report and finally a monthly report. A special form has been adopted pertaining to the taking of milk samples which contains the name, address, temperature, visible sediment and sample number.

MILK ANALYSIS.

The chemical standard of all milk sold in the City of Seattle is fixed by ordinance as follows: Milk must contain at least 3.25% butter fat, not less than 8.75% milk solids other than butter fat, having an average specific gravity of 1.030.

The chemical analysis as carried on in the departmental lab-

oratory will not vary from that of any other modern city. In 1910, 10% of all milk analyzed was below standard and 2% of these cases were prosecuted. In 1911 9% of all milk analyzed was below standard and 3% of all these cases were prosecuted. In the first six months of 1912, 4% of all milk analyzed was below standard, and 50% of these cases were prosecuted. This high percentage of prosecution was the outcome of a state law passed by the 1911 legislature, making the sale of unwholesome milk in cities of the first class a misdemeanor and stating as one of the definitions of unwholesome milk, "milk that would not pass the required standard as set forth by the city ordinance." This law allowed the department as a private individual to prosecute cases beyond the local jurisdiction of the city in territories where such milk was produced.

In taking samples of milk for chemical analysis, the inspector is required to take two samples, sealing both and giving one to the person from whom the sample is taken. The method of sealing is the placing of a Florentine cap over the neck of a four ounce bottle, wrapping the wire which has attached the sample number around the neck of the bottle, passing the ends of the wire through a lead seal, and sealing the same with a departmental seal.

The result of all analysis of milk must be reported by mail within ten days to the person or firm from whom the sample of milk was taken. The legal bacteriological limit of all milk sold in the city, as fixed by ordinance, is not over 200,000 germs or bacteria of all kinds to the cubic centimeter. This provision, however, has not been enforced by the department for the following reasons: 1st, the enforcing of such an ordinance is very difficult; where it has been enforced the enforcing has been questionable; 2nd, a legal numerical limit of bacteria can under no conditions insure the wholesomeness of milk: 3rd, the use of a numerical legal limit for bacteria is likely to be unfair, condemning milk from sources that should

not be condemned and passing milk from sources that should not be passed.

The department does believe that a low bacterial count is of value as an index to the wholesomeness of the city's milk supply, but believes that the way to secure a low count is through education and not legislation; as fast as the dairymen can be taught to use better methods in dairying, so fast will the bacterial counts be reduced, but when a city tries to legislate the milk producer into combating an unseen enemy, it is placing upon the producer a burden that will cause antagonism and which may result in still higher, rather than lower, bacterial counts.

The bacteriological analysis as carried on by the department consists of making the total count and determining the percentage of liquifiers and acid colonies. When a large number of liquifiers are found, usually a filthy condition is found at the dairy, so the bacterial count is used largely as an index to general conditions. The inspector before going over a dairy section obtains samples of all milk produced in that section, three days in advance, a bacteria count is made of this milk and the percentage of liquifiers stated, so that the inspector has a record of the condition of the milk from every producer in the section to be inspected, which enables him to visit and instruct the dairymen having the high counts at the time of milking.

Since the 1st of January, 1912, the Stewart methods as modified by Hill and Slack for the determination of leucocytes and streptococci in milk, also the microscopic estimate of bacteria as recommended by the committee of the laboratory section, American Public Health Association, has been tried out, but it is impossible to say at present, owing to lack of time for a fair trial, whether this method will be of sufficient value to continue its use.

FARM INSPECTION.

Modern dairy investigations have shown the necessity of

farm inspection and the degree of success or failure in this most important branch of milk supervision will determine the wholesomeness of a city's milk supply. The Seattle department has recognized this fact and as making this branch of municipal control of paramount importance. The department in building up a system of farm inspection has kept three factors constantly in mind: 1st, the necessity of education; 2nd, the necessity of economical milk production; and 3rd, the necessity of establishing a friendly and sympathetic relation between the department and producer. These three factors are so closely connected that success in one means success in all, so that in discussing the methods used in trying to bring about these conditions they will not be separated. The first step taken by the department in educating the farmer is to make him think. If this can be accomplished without developing hostility, progress in better methods of milk production is insured and intelligent instruction is all that needs to follow. If the farmer, however, will not use his gray matter, without being made indignant and antagonistic, the inspector must use diplomacy. At all cost leave the farmer, even if he is indignant, in a frame of mind so that he will necessarily absorb some of the good points and will, after careful thinking upon the subject, be won over. But if no procedure known to the inspector will awaken the farmer to his opportunities, the case is hopeless; then legislation is applied and his product is eliminated from our city. After the farmer's interest has been aroused to the extent that he will make inquiries, the importance of reading and studying good dairy literature is shown. The habit of reading such papers as Hoard's Dairyman, Practical Dairying, etc., is gradually increasing and as this habit extends, the bacterial count decreases. One of the methods of cultivating the reading habit and practiced by the department is in the distribution of United States Dairy Division Publications. Through the kindness of the Division, the department has constantly on hand such bulletins as Bacteria

and Milk, Designs for Dairy Buildings, Economic Milk Production, Care of Milk on the Farm, etc. These bulletins are distributed through the territory one at a time, at different intervals, and we have observed that the farmers have requested other pamphlets of the Bureau of Publication. In the farm inspection work, the inspector is constantly reminded that the farmer is vastly more interested in successful financial milk production than in sanitary milk production and that one means of gaining sanitary improvements is by increasing the size of the farmer's bank account. Better business methods may also mean better sanitation.

The intelligent use of the dairy farm score card has been of great value, not only in producing a more wholesome milk, but in increasing the amount of production per cow. The State Agricultural College has also been of great help. When the dairyman reaches a point where he wishes to find out how his neighbor does things, the advantages in attending the short course in dairying and dairy institutes are pointed out. The habit of consulting the College on all perplexing dairy questions and the necessity for general interest in dairy conditions are emphasized. In every community there is one man a little more progressive than the others, who naturally becomes a leader. Upon this man we build our hopes and turn heaven and earth to make him our friend. He is our example to set before other dairymen. An example of this is shown in our competitive milk exhibit at this International Dairy Show. Two years ago, three men were picked to enter this exhibit. A year ago twelve dairymen entered. This year, twenty-five entered, each being the leader in his own community, and as such set an example before his fellow dairymen. So you see that the influence of this exhibit for good will be felt throughout our whole milk producing territory. On the economic side of the question, the department has tried to enforce only such regulations as will obtain the greatest good at the smallest cost, has encouraged the use of the scales, the building of

silos, and the purchasing of a registered sire, and has at all times offered to the farmer the benefits of the department's knowledge and the use of its laboratory.

The department for the last year has maintained a moving picture machine and a set of steriopticon views with which it has tried to present to the farmer as clearly as possible the disadvantage and financial loss of slovenly dairying. The results obtained by the department through its system of farm inspection have been very encouraging. In 1909 the average score of all dairies producing milk for sale in the City of Seattle was 46.7. In 1910, 56.9. In 1911, 60.5, and for the first six months of 1912, 64.2. In increasing this score from 46 to 64% during the years 1910-11 and the first six months of 1912, the number of dairies required to discontinue the sale of their product in Seattle was 107. Of this total, only eight dairy permits were revoked, however, during the first six months of 1912. From a financial point of view the following figures will show the farmers to be far better off now than during the first year of inspection. In 1909, 10,905 cows showed an average production of 2 gallons per day; in 1910, 16,827 cows showed an average production of 2.11 gallons per day, and in 1911, 21,433 cows showed 1.9 gallons per day; the drop here being due to shortage of pasture. In the first six months of 1912, 31,449 cows showed an average production of 2.27 gallons per day, with an average gain of 1½ cents per gallon received for their milk within the last three years, our producers cannot but look upon dairy inspection in a friendly spirit.

TRANSPORTATION.

The transportation problem has not been satisfactorily solved. We have not been able to secure the proper legislation or control over the question; but in the near future, however, we hope through the state railroad commission to obtain a more satisfactory arrangement with the railroad companies.

The transportation inspection consists of taking of samples for chemical and bacteriological analysis, the taking of temperature, sediment test and the inspection of milk cans. Approximately 20% of all milk condemned in the last two years was due to high temperature and of this amount the railroad companies were responsible for 50%, which could have been prevented by a small expenditure in securing proper storage. The inspection of milk cans has proven very profitable in not only preventing the use of battered and rusty cans, but in checking up the efficiency of the methods of cleaning and sterilizing of the same by the milk dealers.

The course followed in milk plant inspection has been similar to that of farm inspection, the keynote being EDUCATION, and where this has failed, Legislation and Publication. The inspection covers the general sanitary conditions of the plant and efficiency of cleaning and sterilizing utensils, methods of handling milk, character and efficiency of pasteurization, and system of storage and delivery. 75% of the city's milk supply is pasteurized, the retarding system being used.

STORE INSPECTION.

Store inspection has practically been eliminated by requiring all retail dairymen and merchants to sell milk only in glass bottles, bottled at the milk plant or on the farm. In doing away with dipping milk during the past two years, the average bacteria count of the city's milk supply has been reduced 20%. The sanitary conditions of the stores are under the supervision of the Sanitary Inspectors.

THE CONSUMER.

During the last year the department has centered its energy upon the consumer. Through the courtesies of fraternal organizations and the social societies of the city, the milk situation has been illustrated by means of stereopticon slides and

moving pictures. The care of milk in the home has also been taken up by the department through the Women's Clubs and a course in elementary milk inspection is now being taught in the High School Domestic Science classes. In taking up the subject of milk with the consumer, three things are emphasized: 1st, the care of milk in the home; 2nd, that it is impossible to produce good milk at a poor price, and that the only hope for a better quality of milk is that the consumer should pay a price sufficient to reimburse the producer for the extra care necessary to produce it; 3rd, to ascertain the source of their milk supply. Through these relations with the consumer the department has, to a certain extent, eliminated slovenly competition and obtained a better condition of all close-in dairies.

A part of the results obtained in improving the milk supply of Seattle are indicated by the constantly decreasing death rate among infants as shown in the following table:

BACTERIAL COUNT.

Year:	Samples under 10,000 *per cent*	Samples 10,000 and 50,000 *per cent*	Samples 50,000 and 100,000 *per cent*	Samples 100,000 and 250,000 *per cent*	Samples 250,000 and 500,000 *per cent*	Samples 500,000 and 1,000,000 *per cent*	Samples over 1,000,000 *per cent*
1909 . .	25	30	10	8	6	4	17
1910 . .	28	32	13	10	6	3	8
1911 . .	28	35	13	7	5	2	10
1912 . .	30	25	15	14	3	2	11

Year:	Average Minimum Temperature	Average Dairy Score	Total Infant Births	Total Infant Deaths by Year*	Deaths Per Thousand Births*
1909	49.7	46.5	3913	90	23
1910	50.9	56.9	4389	79	18
1911	50.2	60.5	4448	55	12
1912	49.5	64.2	2312	15	6†

* Infants under two years diarrhoea and enteritis..
† First six months 1912.

"The great high-road of human welfare lies along the old highway of steadfast well-doing: and they who are the most persistent, and work in the true spirit, will invariably be the most successful."

—*Samuel Smiles.*

METHODS EMPLOYED AND RESULTS OBTAINED IN IMPROVING THE MILK SUPPLY OF SPRINGFIELD, MASS.

By J. A. GAMBLE, *Milk Expert for Department of Health,* Springfield, Mass.

The campaign for cleaner and better milk for the city of Springfield began in the Summer of 1908, with the adoption of the score-card system of dairy inspection of all dairies sending milk into the city, and has been carried on in a systematic manner ever since. The problem of supplying milk to 100,000 people daily is surrounded by a great many difficulties, and, in undertaking to improve the sanitary conditions of the milk supply, the whole subject has been gone into very thoroughly so that the large financial interests involved in each part of the business should be fairly dealt with in making the changes demanded in the modern methods of producing, handling, storing and delivering milk.

INTRODUCTION OF THE SCORE-CARD AT THE FARM.

The introduction of the score-card at the Farm requires no little tact and judgment on the part of the Dairy Inspector. For decades dealers had bought the milk from the different dairies at their own price, making no distinction between clean and unclean dairies. As long as the milk was white, or nearly so, it was saleable and all alike to them and all producers received the same price. No distinction was made as to the particular shade of white produced, and no credit was given to the naturally careful man, who prided himself on the appearance of his cows and the cleanliness of his dairy. Those naturally careful farmers received no credit or better price for their product than the most shiftless ones. The argument advanced by the clean dairyman that he took extra pains with his milk and ought to have extra compensation, had no effect, as far as the price was concerned, upon the contractor. The result of this was that most of the natural high grade dairy

farmers were in time forced to adopt the cheaper methods of producing milk or get out of the business. This was the state of affairs that confronted the Inspector on his first visit.

CONDITIONS FOUND AT THE DAIRY.

The Dairy Inspector found the dairies would fall into three distinct classes: those having a score or rating above 70% perfect; those between 60% and 70% perfect and those rated under 60%. Dairies scoring below 50% were given a chance to make alterations at once. In those cases where there appeared to be no chance of this taking place, the dairy was immediately eliminated.

The first class dairies or those scoring 70% and higher were few in number and limited to the farms of those natural dairymen who, possessing sterling qualities, had the ability and enthusiasm to maintain clean places in spite of low prices received for milk. The second class dairies or those between 60% and 70% were found more often. This was especially true in dairy sections where high grade barns had been built to hold the abundance of hay and grain. With an improvement of methods these dairies would all have been found within the first class or scoring 70% perfect or higher.

The majority of all dairies were found in the third class or those dairies scoring less than 60% perfect. The conditions existing at those dairies was the result of general farming and low prices. Cows were kept to eat hay and produce fertilizer in the barn and the herd made work for the proprietor and hired men night and morning, and rainy days.

On the first visit of the Dairy Inspector, a score card was given to each dairyman as his dairy was being scored. He also was invited to accompany the Dairy Inspector and ask questions about a number of points given each subject in scoring. This gave him an opportunity to become familiar with the working of the score card and he quickly saw its usefulness in getting at the exact standing of his dairy. In each case

the Inspector pointed out the defects noted, and explained to the dairyman the effect these had on the quality of his product. He offered suggestions for the correction of these defects and gave general advice as to how the dairy and milk house could be made cleaner and do more effectual work.

At first a great deal of confusion existed in the minds of dairymen as to the practical value of this new system of dairy inspection. Gradually, however, they became acquainted with the requirements of what constituted a dairy suitable for the production of high grade, market milk, and the score card which at first had seemed complicated, became a source of inspiration to them. Dairymen began to realize that an improvement of their dairies and the correction of defects, as pointed out by this score card, gave them a better product.

IMPROVEMENT NOTED AT THE DAIRIES.

On later visits of the Dairy Inspector, he noted that the first class dairymen had taken early advantage of suggestions. To them the value of high grade milk was no new thing and anything which would tend to improve their product was at once adopted. At the second class dairies, the barns began to look a little better. The cow stables had lost its neglected look. Cobwebs had been swept down, floor and mangers improved and the stable given a good coat of whitewash. The manure had disappeared from the flanks of the cows and they looked more clean and healthy than at the first inspection.

The condition of many of the third class dairies showed little improvement. A few had taken time to do some fixing up, but in a majority of cases very little had been done. There seemed to be several reasons for this, as: some of those dairies were on hired farms, with the farmer struggling along the best he could under adverse conditions; not owning the farm, he was reluctant to change or in any way improve the property. In other cases, the farms had been handed down from generation to generation and the methods practiced were

grandfather's and "good enough" for the present incumbent.

It was apparent to the Dairy Inspector, after visiting all the dairies sending milk into the city, that for the third class dairies, if improvement were expected and the dairies lifted to a position where they could produce ordinarily clean milk, frequent inspection was necessary. He rapidly saw that these third class dairies would demand the most attention from the Health Department. It has been found, in some cases, that by writing to the owner of the property, that the Inspector has been able to get improvements on those farms which have been leased. In many of these places, too, the situation has called forth very little work to improve them; it was simply a case of tearing down useless partitions, and letting in more light and air.

To ascertain the percentage of general improvement, fifty dairies having an average score of 53 11/100 on the first inspection were taken by the Department. These were scored again on a later inspection. The average score of the fifty dairies on this second inspection was 59 59/100 or an improvement in equipment and methods of 12 15/100%. These figures illustrated to the Department, the value of the dairy score-card system of inspecting dairies and afforded definite knowledge of the efforts made by the producers in improving the sanitary conditions attendant on the production of market milk and at the same time pointed the direction in which further improvements could be made. One year later, in order to find the average percentage of general improvement in dairies as indicated by the use of the score-card, one hundred and fifty score-cards were taken in the order in which they had been visited and scored by the Dairy Inspector. Of this number of dairies twenty-four were found to have decreased in standing, but the general average improvement of the one hundred and fifty was a trifle over 7%. Twenty-five of these dairies showed an average improvement of 24 8/10%; five dairies an average increase of 43 7/10% and one dairy a gain of

55 3/10%. To find what effect this yearly increase in the dairy score card had on the bacterial count of the milk, twenty samples were taken from twenty ten-quart cans coming from the different dairies on August 23, 1910. On July 27, 1911, or almost one year later, with the atmospheric conditions surrounding the taking of the samples as near similar to the first as possible, twenty samples were again taken from these dairies.

The average temperature of the first samples was 62 degrees Fahrenheit and the average of bacteria per sample 577,000. On July 27th the next year, the average temperature, was 46 degrees Fahrenheit and bacteria per sample 130,850. It will be noted, in the second column, that the bacteria in dairies Nos. 2, 3, 4, 9 and 19 are higher than in the previous year. In no cases, however, was the increase in the number of bacteria per sample as great as the decrease noted in Nos. 12, 13 and 15. This would seem to indicate that even those dairies which showed no improvement did not deteriorate enough to materially affect the general improvement of dairies sending milk into the city. Samples were taken with conditions as near alike as possible. It is seen that the average temperature of the twenty samples taken in 1910 was 62 degrees Fahrenheit and the average bacteria count 577,000 per CC. The average temperature of the samples taken the following year from the same dairies and under the same conditions was 46 degrees Fahrenheit and the average bacterial count 130,850 per CC; a decrease in temperature of almost 26% and a decrease in bacteria of over 75%. It is safe to assume from these facts that the decrease in the number of bacteria was due in part to an increase in the efficiency of equipments and methods at the dairies where the milk was produced as well as the decrease in temperature.

Those taken August 23, 1910.			Those taken July 27, 1911.		
Sample	Temperature	Bacteria	Sample	Temperature	Bacteria
		per CC			*per CC*
1	64	70,000	1	46	10,000
2	64	320,000	2	46	400,000
3	64	10,000	3	46	460,000
4	64	20,000	4	46	370,000
5	64	50,000	5	46	10,000
6	64	460,000	6	46	140,000
7	64	130,000	7	46	27,000
8	64	110,000	8	46	60,000
9	64	10,000	9	46	50,000
10	64	400,000	10	46	250,000
11	64	160,000	11	46	10,000
12	64	2,000,000	12	46	40,000
13	64	6,000,000	13	46	460,000
14	64	40,000	14	46	40,000
15	64	1,200,000	15	46	10,000
16	56	80,000	16	46	10,000
17	56	330,000	17	46	40,000
18	56	70,000	18	46	40,000
19	56	20,000	19	46	140,000
20	56	60,000	20	46	50,000
Average temperature, 62 derees F. Average Bacteria, 577,000 per CC.			Average temperature, 46 degrees F. Average Bacteria, 130,850 per CC.		

VALUE TO THE HEALTH DEPARTMENT.

Score cards from each dairy were kept on file at the laboratory for the information of the Department and general public. These cards gave the location of each dairy, the number of cows kept and the breed, and stated whether ensilage or brewer's grain was fed, and the number of quarts produced at that dairy. It gave the name and address of the dealer to whom milk was shipped and also a complete score of the equipment of the methods practiced at the dairy.

Each dairy scoring over 50% perfect was given a permanent dairy number and the regulation made that these numbers should appear on all cans coming from that dairy. This number made possible the quick identification of milk from any dairy, and enabled the Department to trace back any complaint of contamination, disease, bitterness, ropiness, sourness, dirt or other trouble in the milk. Samples for chemical analyses are taken every thirty days from the milk from each dairy, and, in the warm summer months, bacteriological samples taken from the different dairies as the milk is being sold

upon the streets. On file, then, at the Department is the exact standing of the dairy, regarding its sanitary situation, its equipment and the methods practiced; the chemical and bacteriological analysis of its milk. This information has built up a Bureau of Information for the Department and consuming public which gives the actual condition under which the milk is produced and setting forth the care it has had since that time. Any consumer by calling at the Department can find out anything they wish to know regarding the dairy from which their milk was obtained.

VALUE TO THE FARMER.

Here for the farmer is rated the standing of his dairy, the amount of milk produced, the location and exact standing of his plant and product, so that Doctors and Mothers may have exact knowledge of the merit of that product; this gives the producer the benefit due his endeavors, and a chance for subsequent patronage and an advanced price for his product. Each dealer, before taking on any dairy, must first make application to the Health Department for the taking on of said dairy. Thus the Department knows at all times who is handling milk from the different dairies. At the department the producer may also get reliable information regarding the standing of any dealer. This system credits good, rich, pure and therefore long-keeping milk to the careful, industrious dairyman to whom the credit of producing such a high grade milk belongs.

DOES IT PAY?

"The production of milk is purely a business proposition and it is hardly to be expected that any producer will be interested in producing clean milk unless he can obtain a fair recompense for the time involved and capital invested and it is an evident injustice to compel him to assume additional expense, labor

and detail, involved in the production of clean milk and then refuse to pay him for it." To find if any relation existed between the quality and price, a canvass was made of the price paid for all milk coming into Springfield, from all three classes of dairies. It was found that the average wholesale price of milk received by first class dairies was 4 7/10¢ per quart; that the average of all the second class dairies was 4⅛¢ per quart, and that the average price received at third class dairies was 3 9/10¢ per quart.

The average price received by the third class dairies was greatly increased by those third class dairies near the market who received a correspondingly higher price because of their nearness. It will be seen that the difference between the first and second class dairies is only 22½/100¢ per quart per day, but assuming that the dairy produces 200 quarts, the advance became 45¢ per day and this amounted to $164.25 per year. An advance from the third to the first in price and standing would be 8/10 of a cent a quart and for a 200 quart dairy $1.60 per day which amounted to the astonishing sum of $584.00 a year. From the second to the first, would be an advance of 6/10 of a cent a quart; this in a like dairy of 200 quarts would mean $1.20 a day or $438.00 per year.

It is noted that the score card, although it may not be perfect, is the most tangible means we have of getting exact relative standing of dairies. It points out the defects and leads to the improvement of the dairies and their product and at least in the case of one city, has assisted the farmer to get a corresponding price for increased quality of milk.

"Every addition to true knowledge is an addition to human power."
—*Horace Mann.*

METHODS EMPLOYED AND RESULTS OBTAINED IN IMPROVING THE MILK SUPPLY OF OMAHA.

By CLAUDE F. BOSSIE, *Dairy and Milk Inspector,* Omaha, Nebraska.

"Publicity" was the keynote of success in dairy inspection, and our greatest asset in Omaha. The daily papers of Omaha deserve much praise for their willingness to publish reports monthly, and other information I desired to acquaint the public with concerning the Omaha milk supply.

About 65% of the milk supply of Omaha is produced, bottled and distributed from about 85 dairy farms operating 95 wagons. All these dairies deliver raw milk. They are situated within a radius of nine miles from Omaha, and each dairy is inspected and scored monthly. The remaining 35% of our milk is produced within a radius of 30 miles from the city, is hauled by motor trucks and inter-urban car lines, is delivered to wholesale dealers and pasteurized. This class of dairies I have been unable to inspect as yet, owing to lack of funds in our department to carry on the work. Prior to September, 1910, the raw milk dairies were, I believe, as filthy as any I had ever seen. At that time, owing to an outbreak of typhoid fever due to these dairies (over 125 cases being reported) the City Health Commissioner was given complete supervision of Dairy Inspection. Previous to that time the Mayor and City Council were responsible for the appointment of a Dairy Inspector and the Health Commissioner was powerless. At the time I was appointed to the position with but few exceptions not a milk house was screened or provided with proper utensils to wash bottles and cans, neither was proper drainage provided. Coolers and small top milk pails were unknown. Manure had accumulated until in some instances 1,000 loads were within a few feet of a barn. The barns were without proper ventilation or drainage and had never been white-

washed. The cows apparently had never been groomed, nor their udders washed. Milk stood in the barn until the herds were milked, and in some cases the milk was bottled in the cow barn without being cooled, milk houses in the latter cases being conspicuous by their absence.

These were the conditions as I found them in September, 1910. After many conferences with the Health Commissioner, I decided to score these dairies on a government score card and publish the results monthly. The dairymen were notified personally and by mail of my intention and they were given until January 1st, 1911, to prepare for scoring. In the meantime I gave all my time in becoming acquainted and explaining what I desired of them. The newspapers gave their space and hearty cooperation and printed the scores monthly. The public, after having scores and the meaning of same explained to them many times through the press, urged their respective dairymen to raise their score under threat of buying elsewhere. The dairymen, at first a little reluctant, began to heed the admonitions of their patrons. They eventually became involved in a friendly contest for the highest number of points on the score card. At this time without exception they are equipped with proper cooling facilities; with three exceptions they have small-top milk pails; barns are properly ventilated, and whitewashed; lime is scattered daily in gutters, and drainage is provided both from milk house and barn. Milk houses are provided with proper equipment to cleanse bottles and other utensils. In fact we feel there is much reason to be proud of the progress made in two short years.

In addition let me add, that while the majority of our dairies are located on leased ground, obtainable only from year to year, and our barns in some cases are of cheap construction, I assure you that these can be and are kept just as clean as more expensive barns.

In my judgment the proper cleaning of utensils, grooming of cows, milking in clean clothes with clean hands, prompt re-

moval and cooling of milk taken from each cow, sufficient ice in summer months to keep milk at a low temperature while in storage and delivering, are more essential than expensively constructed barns without these modern methods.

It is a well known fact that many cities have now adopted the bacteriological test as a means of identifying clean milk, and have also fixed a maximum legal limit. To prove our claim to clean milk, over 70% of the samples examined this year have shown a count of less than 100,000 bacteria per cubic centimeter; over 90% less than 200,000, and in but a very few instances has the count exceeded 500,000. This I claim is excellent evidence of the cleanliness of our milk supply.

To further substantiate the claim of a pure milk supply, I will quote a few figures on infantile mortality from statistics furnished by the United States Government. These set forth the fact that the city of Omaha has the lowest death rate among children (especially under one year of age) of any city in the Union. The rate for the year 1910 was 12.3% and for the year 1911, 8.3%. Thus you will note a 4% reduction within a year after the Health Commissioner was given absolute power to appoint and remove his Dairy Inspector, and to establish the policy of publicity in connection with a modern system of Dairy Inspection.

In the city of Omaha the publishing of scores monthly has proved more effective than all the fines that could be imposed by any court. It has also increased by at least 10 to 30% the business of every dairyman producing, bottling and distributing his own product.

In conclusion let me add that all of the raw milk sold in the city of Omaha is produced from tuberculin tested cows. A test of each dairy herd is compulsory every spring before the first of May. Of some 3,000 cows tested this year, less than 4% reacted, all of which were removed from the herds and slaughtered within 48 hours.

The city administration of Omaha, that apportioned the funds for the year 1911 and 1912, did not have sufficient money to increase the Health fund for these years, they being handicapped by a state law that prohibits the city of Omaha from spending beyond a given sum each year. This, however, will be remedied under the present form of government, known as the "Commission Plan," as the people now have an opportunity to make their own charter, thereby creating a new system of taxation that will provide at least sufficient funds for current expenses. The Dairy Department will be enabled to extend its inspection to the remaining dairies not now inspected or scored because of lack of funds, but which ship or haul their product to the Dairy Companies in the city.

The largest Dairy Company operating in the City of Omaha, has within the last two years employed an Inspector of its own, who has to a certain extent induced the farmers supplying the Company to correct some of the evils that prevailed among them previous to his visits.

As to the regularly inspected dairies, porducing 65% of the milk supply of Omaha, I will illustrate the benefits derived from the score card and publicity system.

For instance, the average bacteria count of these 85 dairies, for the year 1910 was approximately 150,000 per C. C. or just within the requirements of the city ordinances. The infantile mortality rate was 12.3%, based upon the birth rate.

The year 1911 was the first year of the publicity system, the average dairy farm score was 60.2, the bacteria count was reduced to 109,000, and the infantile mortality rate was reduced to 8.3%. The first eight months of the present year show an average dairy farm score of 75.2, a bacteria count a little less than 100,000 per C. C., and the infantile mortality rate I hope to see decreased correspondingly.

In addition to the publicity given the dairy farm scores, I have induced each and every of these 85 dairymen, to adopt

galvanized iron cases and pack milk in ice while delivering during the warm period. Of the many temperatures taken during June, July, August and September, 1912, I failed to find any above 50° F., and in some instances the temperature of milk on delivery wagons was as low as 38° F.

"An intense hour will do more than dreamy years."

METHODS EMPLOYED AND RESULTS OBTAINED IN IMPROVING THE MILK SUPPLY OF TOPEKA.

By GEORGE T. BABB, *Dairy and Milk Inspector,*
Topeka, Kansas.

It is a matter of but about five years since the milk supply of Topeka was characterized as uninspected, dirty, watered and preserved. Conditions were such that it was very difficult to secure good milk. "They all did it." Today the citizens of Topeka are served with milk that is clean and milk that satisfies the accepted definition of milk. In butter-fat content, it averages around 4%, the law requiring 3.25%.

I am well aware of the fact that the conditions surrounding the milk supply of a city of 50,000 population are far different from those to be met with in a larger city and that the position of Dairy and Milk Inspector might seem to be a sinecure. Let me assure you, however, that it has been only by hard work that any measure of success has been attained. We believe that we have one of the best ordinances of any city of its class, and that we also have as good a milk supply as can be found where similar conditions prevail.

I will pass over the trials attendant upon the inception of milk inspection in Topeka. Summing it all up, I believe that the chief means may be well expressed by the word "publicity" with a liberal supply of tact and diplomacy in handling the producers and the public. We have the hearty co-operation of the local press and our monthly reports are eagerly looked for by all. One of these reports was not issued this past summer and the scores of inquiries received relating to it showed conclusively the general interest in them.

Each month at least one pint bottle of milk is secured on the street from the delivery wagon of every distributor. These samples are taken to the laboratory as collected and there examined for cleanliness, butter-fat content, possible

adulteration and preservatives. The examination for cleanliness is made by passing each pint of milk through the cotton filter of a Milk Sediment Tester. This filter, which will contain in visible form on the cotton all the insoluble dirt in the pint of milk, serves as the means of classifying the same as to grades I, II or III, clean, slightly dirty or dirty. If any dealer's milk falls in class II or III, his piece of cotton is pasted on a printed form calling his attention to it, and mailed to him. Sometimes the Inspector carries his sediment tester with him and makes the examination for dirt in the presence of the dairyman himself. The other tests are carried out according to approved methods.

On the first day of each month, the local press publishes the record of butter-fat content and grade of milk of each distributor along with whatever the Milk Inspector may wish to say to the public or dairymen on matters pertaining to milk.

Irregular inspections are made of conditions at the dairies, scoring the same on official score cards. Sometimes these scores are made public in the regular reports.

Occasionally, complete scoring of the milk as taken from the wagons is made by a disinterested judge and these scores published.

Frequently, culture plates are made from samples, more for securing information as to character of bacterial flora than for actual count value.

The Inspector has endeavored to avail himself of all the means provided to aid in systematizing his work, and making it effective. The monthly publication, containing records and results of work done, has been productive of results where other methods would have failed.

We are handicapped by insufficient funds and cannot prosecute the work as vigorously as could be desired.

"The end of government is the happiness of the people."

—*Macaulay.*

METHODS EMPLOYED AND RESULTS OBTAINED IN IMPROVING THE MILK SUPPLY OF BOSTON.

DR. JAMES O. JORDAN,

Boston Board of Health, Bureau of Milk Inspection.

The primary factors in improving Boston's milk supply upon the sanitary basis were the enforcement of the regulations of the Boston Board of Health, limiting the number of bacteria to 500,000 to the cubic centimeter, and requiring all milk offered for sale to have a temperature not higher than 50° Fahrenheit. Other local regulations which have been important aids are those governing the production of milk at the dairy and its subsequent handling prior to delivery to the consumer; that prohibiting traffic in "loose milk" in shops; that dealing with testing of milk by tasting by dealers, and that requiring the cleansing of all milk containers as soon as emptied, whether by consumer or dealer. There are other regulations which have been important features in modernizing conditions, but those detailed above have been the principal ones. The contest waged for improvement has not been confined to the enforcement of regulations, and some of the endeavors which have been put forth in other directions will be detailed in the course of this paper. The enforcement of milk laws and many of the regulations of the Board of Health, the collection of all samples and the chemical testing thereof rests with the Bureau of Milk Inspection; the bacteriological examinations are made in the Bacteriological Laboratory of the Board of Health; the supervision of dairies, milk handling plants and methods of transportation is vested in the Dairy Division, and the condition of shops and of the attendants is under the control of the Sanitary Division.

The employment of the bacteriological and temperature regulations began in 1904 and has been continued to the present time. Beginning with 1905 results of the bacteriological

examinations have been recorded, samples having been procured at the railroads as the milk cars arrive in the city, from wagons, and from stores. The results with the number of specimens examined each year follow:

Table I.

Bacteriological examination of milk samples from contractors. Taken from cars on arrival. This represents the freshest milk.

Years.	Under 500,000 Bacteria per c. c. Per cent.	Above 500,000 Bacteria per c. c. Per cent.
1905	87.60	12.40
1906	89.98	10.02
1907	83.70	16.30
1908	86.42	13.58
1909	88.62	11.38
1910	86.51	13.49
1911	89.70	10.30

While these results fluctuate slightly for the various years, it can be said that there has been a constant gain each year in the percentage of samples with less than 200,000 bacteria to the cubic centimeter.

The samples from wagons are of milk which is ordinarily 24 hours older than that procured at the cars.

Table 2.

Bacteriological examination of milk samples from wagons.

Year.	Under 500,000 Bacteria per c. c. Per cent.	Above 500,000 Bacteria per c. c. Per cent.
1905	54.40	45.60
1906	52.21	47.99
1907	59.73	40.27
1908	72.15	27.85
1909	75.39	24.61
1910	83.42	16.58
1911	81.43	18.57

Naturally the oldest milk is that sold in shops, and it is subjected to the most handling. Despite this fact, improvement was noted and this was particularly marked in 1910, when the bottle regulation governing the sale of shop milk was enforced.

Table 3.

Bacteriological examination of milk samples from stores.

Year.	Under 500,000 Bacteria per c. c. Per cent.	Above 500,000 Bacteria per c. c. Per cent.
1905	28.50	71.50
1906	18.99	87.01
1907	36.00	64.00
1908	43.41	56.59
1909	54.74	45.26
1910	77.80	22.20
1911	76.83	23.17

It has also been the policy of the Board to exclude milk from gargety cows or animals with udder abnormalities. This was indicated by a microscopic examination of milk sediments, and where streptococci and streptococci and pus, or samples having fifty or more pus cells to the 1/12 immersion field, i. e., about 500,000 pus cells to each cubic centimeter, were found, such milk was ordered excluded from the market. The following figures represent the results from this method.

Table 4.

Year.	No. Samples Examined	Per cent. Strep., Strep. and Pus, and Pus Samples.
1905	5,559	10.48
1906	5,007	4.90
1907	4,609	1.10
1908	5,843	1.83
1909	6,344	0.91
1910	6,657	0.53
1911	7,311	0.23

Approximately 15,000 temperature tests are made annually, the bulk of these examinations (excepting the specimens to be tested bacteriologically, when temperatures are taken at all times) are made during the warm months of the year. Warnings are issued upon specimens which exceed the legal limit of 50° Fahrenheit, and where there are subsequent violations with wagon or shop milk, the offenders are prosecuted. In all, during the years 1905 to 1910, both inclusive, 106 such actions were brought to the attention of the courts, convictions resulted in nearly every instance, and the fines ranged from five to twenty-five dollars.

Because of these regulations and their enforcement, the wholesale dealers in milk made marked changes in their methods of transacting business in the endeavor to have the milk sold in Boston comply with these requirements as to bacteria and temperature. Bacteriological laboratories, now numbering seven, were established by these concerns, and the extent of the work carried on in these laboratories can be seen from the results in 1911, when 90,207 bacteriological tests were made. Dairy inspection was also established, and this not only included scoring the dairies supplying these firms with milk, but also the instruction of the farmers by lectures and printed matter in the production of a higher grade of milk, both from the standpoint of cleanliness and refrigeration. In this branch of improvement alone the wholesalers expended thousands of dollars. Refrigerator cars were procured to replace the old thin-walled type, and now a majority of the cars are of modern construction. The former practice of sending milk cans to the country unclean was abandoned, and now all cans are washed and steamed before shipment. The 8½ qt. can closed with the objectionable wooden stopper, used in the transportation of milk from the country and peculiar to New England, has been replaced to a considerable extent by cans of a larger capacity and closed with tin covers. Many milk plants have been remodeled, and modern equip-

ment installed in all of them, thereby affording much better facilities for handling milk.

On June 15, 1910, after much opposition, the regulation requiring the sale of bottled milk in shops became operative. As rapidly as possible the majority of the dealers complied with the requirement, but a few dealers determined to test its legality. The regulation was enforced by the Board of Health by the revocation of the licenses of those shopkeepers who persisted in the sale of "loose milk," and with excellent results. Finally, to obtain a ruling from the Supreme Court as to this regulation being legal, a test case was instigated by a dealer who was prominent in opposing the Board's policy. The court finally decided that the Board had exceeded its authority in adopting this measure.

Although defeated on the legal issue, from the moral and educational basis a positive advance was made. By reason of the contest to secure the adoption of this measure, and the stand taken by the authorities regarding the sale of shop milk in accordance with its provisions, a majority of both consumers and storekeepers became convinced of the advantages resulting from the sale of bottled milk in shops. At this time, although there is no regulation regarding it, the bulk of shop milk (probably on a conservative estimate from 60 to 70%) is sold in bottles, and to the great satifaction of both the public and store owners. That this will be a permanent condition appears assured. Thus the legal victory for the defense was from a practical basis fruitless, for the principle, for which those favorable to the regulation were contending, has so impressed itself upon a majority of citizens as to give it the force of a law through the agency of custom, long before the court's decision was rendered. Even those dealers who were most strenuous in their opposition to the regulation are less firm in their belief in the advantages accruing from the sale of "loose milk" in stores, and it is known that the insanitary features governing the sale of "loose milk"

in shops have never so impressed themselves on this class of dealers as since this finding of the Supreme Court. It is believed that a satisfactory solution of the problem involving the loss from bottles which results from the sale of shop milk in this manner, or the use of a satisfactory single service container would, even with this minority of dealers, cause a complete cessation of the sale of "loose milk" in shops.

Partially through the sale of more milk from tanks and coolers since this decision, there has been an increase in the number of store milk specimens with high bacterial content. The sale of milk in this manner is also responsible for a larger number of samples of milk from shops being materially deficient in milk solids and fat than were found while milk was sold in bottles.

Briefly the advantages to the consumer from the sale of bottled milk are, a supply less likely to infection, cleaner, and with a lower bacterial content, and more uniform in respect to its chemical constituents; for the shopkeeper the plan provides a method for the handling of milk in a cleanly manner and one which is less likely to involve him in conflict with the authorities, either from the sanitary condition of the milk or through lack of the legal requirements for milk solids and fat, which latter is likely to result through the imperfect mixing, which often accompanies the sale of "loose milk" in stores. For the shopkeeper the only disadvantage is one for which he alone is responsible; namely, the loss from non-return of bottles.

To lessen the infection of milk by the organisms of infectious disease, the Board of Health regulated the manner of testing milk by tasting, to determine whether or not the milk, from the standpoint of sweetness and flavor, is salable. Formerly this was ascertained either by the application of the tongue to the milk end of the can stopper, and then returning the stopper to the can, or by conveying some of the milk to the mouth by means of a spoon, the spoon being employed

repeatedly without cleansing. Regardless of danger, such testings were extremely filthy, and under the provision now governing this work a spoon, piece of wood, cardboard or other article once used for this purpose cannot be again so employed or brought in contact with milk until after being thoroughly washed and sterilized. All violations of this regulation have been prosecuted, and in every instance a finding of guilty has been rendered. In one case the maximum penalty of one hundred dollars was imposed.

In the endeavor to further improve the condition of milk vessels, the Board adopted a regulation requiring the cleansing of all cans and bottles as soon as emptied. This applies alike to consumer and dealer. This regulation has been enforced by legal measures, and with results favorable to the government and beneficial to the condition of the containers.

The misuse of milk vessels is regulated by law and also by a regulation of the Board of Health, and an earnest attempt has been put forth to lessen this evil, the belief being held that the use of such containers should be restricted to milk products, or water or other cleansing agents. Many of the misused bottles become stained and discolored when employed for foreign substances, and the adhering compounds are not readily removed by cleansing, and if their condition escapes detection by the dealers, the foreign deposits are especially noticeable to the householder who receives them from the milkman, the presence of the adhering substance usually being made especially pronounced by the white background of the milk. Legal measures, publicity, pictures of misused bottles, and circulars have been employed to lessen this evil, and these efforts have been productive of much good. The use of the following circular, distributed to the extent of 150,000 to consumers by dealers, and dealing with the above and kindred subjects, has proven an effective aid.

HEALTH DEPARTMENT,
BUREAU OF MILK INSPECTION,
30 Huntington Avenue, Boston, Mass.

A regulation of the Board of Health requires all milk vessels (bottles, etc.) to be cleaned as soon as emptied, and by the person who pours out the milk.

A state law prohibits the use of milk vessels (bottles, etc.) as containers for substances other than milk, skimmed milk, cream, buttermilk, or water or other cleansing agent.

Will you not comply with this regulation and law by cleaning all milk vessels as soon as emptied, and return them promptly to the dealer or shopkeeper, and thus aid the movement for better milk, and assist the Board of Health in its effort to further improve the supply of this city?

JAMES O. JORDAN,
Inspector of Milk.

The subject of dirt in milk has received attention, and where warnings were found ineffective in bringing about an improvement, prosecutions were instituted upon the allegation that dirt was a foreign substance. These cases were decided against the defendants on rulings from the Supreme Court. This has caused the exercising of more care at the dairy and cleaner milk for the consumer.

In 1910 the regulation of the Board dealing with the production and subsequent care of milk was revised and amplified, and the work of dairy inspection was undertaken actively by the Board. This caused a partial abandonment of farm inspections by the wholesalers. This work is now under the supervision of Health Commissioner Dr. P. H. Mullowney. There are about 6,700 farms supplying market milk to Boston, and these are located in Massachusetts, Maine, New Hampshire, Vermont, Connecticut, and New York. The territory is divided into districts, and the Inspectors change districts every two months. The United States Government score card is used, and the scoring is done in the presence of the producer or his representative, and an attempt is made to create a desire on the part of the producer to obtain an increased rating. The score is made in triplicate, the original being kept by the Dairy Division, a copy is left with the producer, and the third copy is mailed to the wholesaler. A standard of 45% of the perfect score must be obtained before

the dairy is considered to be in a satisfactory sanitary condition. Where this percentage cannot be given on the first inspection, time is allowed, usually two weeks, to bring the dairy to the required standard. If no improvement is shown on the second inspection, the sale of the milk is prohibited in Boston.

A system of interchange of information as to unsatisfactory conditions of dairies was inaugurated, in order to prevent, as far as possible, the sale of milk from excluded dairies in other cities or towns. Such data is supplied and received from fourteen cities and towns in the attempt to prevent traffic in insanitary milk.

During the year ending February 1, 1912, 9.356 dairies were scored; of these 7,834 were satisfactory and 1,522 were unsatisfactory, and the product of 500 of the latter was permanently excluded from Boston by reason of unwillingness of the owners to co-operate with the Board in the production of sanitary milk. The product of twenty-five dairies was excluded temporarily by reason of the existence of communicable disease upon the farms.

At 3,691 dairies milk rooms were installed during the year, and in 2,411 stables manure was found in or about the tie-up. This latter condition was corrected in every instance. The use of sand and horse manure as bedding for cows was stopped. Where pigs, hens, and privies were found in the tie-ups, their removal was immediately required. Additional light and ventilation has been provided in 2,178 stables; at 315 places the practice of cooling milk in troughs from which cattle and horses drank was discontinued. At 3,634 places the insanitary custom of straining milk in the tie-up was either stopped at once or the sale of milk was prohibited in Boston. In 1,060 stables faulty construction was corrected, and at 2,013 dairies the cows were required to be cleaned; 4,636 tie-ups were whitewashed by orders from this division; at 177 places the milking utensils were found unclean, and at

238 dairies the utensils were not properly inverted. The holding of the milk at 735 farms for from twenty-four to thirty-six hours before delivery by the producer to the collector was promptly checked or the sale of the product was prohibited.

Milk handling plants in the country have been inspected and objectionable methods stopped. Of 281 places shipping cream to Boston, 233 were found satisfactory and 48 in a condemnable condition. The insanitary features were subsequently remedied. The inspectors take the temperature of the milk at the dairy and during transportation, in the endeavor to have greater care used in the refrigeration of this product.

This division also inspects the plants of all licensed dealers, and the recommendations following this oversight have resulted in the installation of many improvements for the care of Boston's milk supply.

The shops in Boston selling milk number about four thousand and the responsibility for their condition rests with Mr Thomas Jordan, Chief Sanitary Inspector. These stores are inspected once a month, and where nuisances exist reinspection follows every five days until the objectionable features are corrected. The Board of Health requires that running water with properly trapped sinks be provided for the cleansing of utensils. Water-closets are not permitted to open directly into a room where milk is sold, and the lighting and ventilating of these closets is also demanded. The drainage of ice-chests and coolers receives careful attention, and in this respect the conditions are invariably satisfactory. The greatest difficulty is from lack of cleanliness on the part of attendants of small stores, and the neglect of these places from the standpoint of general sanitary conditions. These features are especially pronounced in basement stores, where occupied living rooms are located in the rear. Fortunately these places are few in number, and they are subjected to very

frequent inspections, in order that they be kept clean and to compel compliance with the regulations of the Board.

The various activities detailed above have been followed by pronounced and lasting improvements to Boston's milk supply, and it is the belief of the writer that in the purchase of no other commodity is the consumer so certain of obtaining the value of his money as in the buying of milk produced and handled under prevailing conditions.

"Our knowledge is the amassed thought and experience of innumberable minds."

—*Emerson.*

METHODS EMPLOYED AND RESULTS OBTAINED IN IMPROVING THE MILK SUPPLY OF DETROIT.

WILLIAM H. PRICE, M. D., *Chief Dairy and Milk Inspector,* Detroit, Mich.

The subject, "Methods Employed and Results Obtained in Improving the Milk Supply of Detroit," involves a consideration of three different stages of the work.

First, previous to 1901 a man seventy years old was employed as milk inspector. What consideration led to his employment I do not know. His method was to rise early in the morning, go upon the streets and engage in bitter warfare with whatever milkmen might be abroad, who reciprocated in kind. Because of lack of preparation his complaints were thrown out of court. I believe that he earned his salary. I believe, also, that he delayed the upbuilding of Deroit's milk supply several years.

Second, in July, 1901, a new Board of Health employed two medical doctors, of whom I was one, with instructions to bring about sanitary reform in the milk supply of Detroit. There was at that time no Market Milk Section of the Department of Agriculture and no Dairy Inspectors Association who might be appealed to to furnish a systematic plan for such an undertaking. The plan followed consisted in taking samples, investigating complaints and correcting the more gross defects of city milk plant sanitation of which there were many. Practically every small dealer combined his milk handling room with his horse stable or kitchen. Attempted prosecutions were unsuccessful on account of the unwarranted procedures of our predecessor. The Corporation Counsel refused to accept our complaints on the ground that "milk cases had been tried out and would not hold." Newspapers gave no support.

It was fully a year before, largely through personal influ-

ence, we were able to partially win a case against a dealer for adulteration, but from this feeble beginning progress was rapid in that sort of cases and skimming and watering were reduced to a low percentage and formaldehyde was eliminated. In 1904 was secured the passage of an ordinance similar to those used in most cities at the present time, requiring Board of Health inspection and approval before a revocable license was issued. This ordinance took the decision of what is sanitary and what not out of the hands of courts, which meant the sending of a policeman to decide the contentions between inspectors and dealers, and put it into the hands of the Board of Health. Again from feeble beginnings, success was achieved until it came to be assured that the dealer without a license was certain of conviction.

From a point several degrees below zero the regulations of the Board of Health came to command the utmost respect, both from the fact that they were upheld by the courts and also because it was ever the policy of inspectors to tell dealers only the truth regarding what would be insisted upon. The utmost that could be enforced was demanded and no more. No extravagant claims were made to bring discredit on the Department through lack of ability to enforce them. In issuing licenses the personality of the dealer received more consideration than any other one feature. Confirmed obstructionists and men incapable of understanding what clean milk is were refused licenses on that ground alone, and this justification has been upheld by the courts, who have often remarked from the bench that such and such a defendant "is not fitted to engage in the milk business."

Under this regime adulteration was practically eliminated and a fairly sanitary system was built up inside the city limits. Also a feeling of co-operation between inspectors and dealers was fostered. During this period, in 1906, the practice of dipping milk in stores was stopped. All store dealers were and are required to purchase their stock of milk in bottles. It

is, of course, required to be bottled in places designated and licensed by the Board for that purpose. The bottle system now includes the whole supply. Also back yard dairies were eliminated so far as their contributing to the city milk supply is concerned. These places were kept by people of a low order of intelligence, were hopelessly unsanitary, and by littering up the alleys formed a fertile breeding place for flies. No trouble was experienced in effecting these two reforms. In 1908, two inspectors, one a veterinarian, were appointed, to undertake the inspection of the two-thousand farms then sending milk into Detroit. They used a score card of the four page order, classified under the excellent, good, fair, and bad system. Needless to say two men were insufficient to make any real impression on the quantity of work they were supposed to accomplish.

It cannot be said that any real system prevailed during this second period, 1901-1910. Abuses and insanitation were combatted. Reforms, sanitary methods and co-operation were instituted. But a definitely forethought and pre-arranged project covering a period of years for the future did not obtain. This was of course largely due to lack of help and poor support to the movement. It was also due to the absence of supervision of our Department from the outside, which would add broad and general advice to our knowledge and experience of local conditions and possibilities.

The third period of the work began in July, 1910, with the visit to Detroit of Mr. Ivan C. Weld, representing the U. S. Department of Agriculture. Since that time the work has consisted chiefly of a progressive educational campaign directed at producer, country contractor, transportation company, distributor and consumers, and has been materially furthered by the assistance of other representatives of the Federal Departments, notably the late Dr. Whitaker and Mr. Earnest Kelly. Two additional inspectors were appointed in July. Another was added in 1911, and two more in 1912,

making a total of 9 at the present time. On the farm, the system is centered around the score card of the National Dairy Division, which is immensely superior to any other, and the bulletins of the same Department, notably "the Score Card System of Dairy Inspection," by Lane and Whitaker, "Extra Cost of Producing Clean Milk," by Whitaker and "Important Factors in the Production of Sanitary Milk," by Webster. Of course there is a certain list of exclusions and changes to be insisted upon regardless of the score card, but these are of the more gross nature and doubtless pertain to every city. Chief among them is the reporting of contagious disease which we believe is almost invariably done. We have found the advantages of the Federal Score Card to all persons concerned to be all that its advocates claim for it. We believe that its efficiency in Detroit has been increased 100% by giving to each producer a duplicate carbon copy. In doing this, the inspector projects his influence beyond his visit. The producer has constantly with him a detailed summary to study at his leisure, talk over with his family and compare with his neighbors. With it he is in a position to raise his low score in the places where it will be easiest for him or sell the product of his high scoring dairy to advantage. Further, efficient inspection brings objections from producers and these objections are often neither just nor logical. In Detroit a farmer is required to base his objections on his duplicate score card, on which is written all the requirements made of him, as well as the detailed score. Knowing this, he studies his card very carefully before writing his grievances on it, and in studying the score card these grievances fade.

The first complete scoring of all Detroit's twenty-five hundred farms was completed in July, 1911. The average score was thirty-seven (37). Following a circular letter last fall to all producers stating what would be required in 1912 including a minimum score of forty-two (42), and the reduc-

tion of temperature immediately after milking to such a degree as would bring it into Detroit below 60° Fahrenheit, about one-half of our producers organized to fight the Health Board. Doubtless much of the ill feeling reacted from the high cost of production that obtained at that period. A score card on white oil cloth, nine feet long, was prepared and with it meetings were held with the producers all through our territory. These meetings were always arranged by the producers which assured a good attendance. The score card was explained, and all questions and objections were answered. It was frankly admitted that the new order of things involved extra work on the part of the producers, but it was successfully maintained that the system employed was the fairest possible and reduced the hardship to a minimum. The opposition organization collapsed. On July 1st, this year, the average score of all Detroit's dairies was 47, an increase of ten points or 27% in one year.

Sixty receiving stations in the country receive milk for cooling and re-shipment into the city. Cooling here does not obviate the necessity of cooling on the farm. It is required to be brought to these stations at a temperature below 60° F. Realizing that the personality of the men in charge of these stations has much to do with the quality of Detroit's milk supply, a meeting of these men was called last fall at the Board of Health Building. Practically all attended. The farm score was explained and also the sanitary reforms that would be required in conducting receiving stations, which are similar to those required in city milk plants. It was also indicated that no opposition on the part of these men to our work among the farmers would be tolerated. Further, each receiving station manager is required to send in weekly a copy of the report which is appended hereto.

(Weekly Report)
BOARD OF HEALTH
DEPARTMENT OF MILK INSPECTION
DETROIT, MICHIGAN

Receiving Station at.....
Thursday, ...
(Date)

CHIEF MILK INSPECTOR, *Detroit Board of Health,*
Detroit, Michigan.

DEAR SIR:

I have made diligent inquiry of all patrons supplying milk to this Receiving Station, and of all employees of this Station, and in so far as I am able to learn, no tuberculosis, typhoid, scarlet fever, diphtheria, or any other contagious disease exists among them, or their families, or associates, or on any of their farms, except:.....
.....
.....

The following course has been pursued regarding the milk supply of these exceptions:
.....

We have taken on the following new patrons since last week's report:
.....
.....

The following patrons have been discontinued since last week's report:
.....
.....

Yours truly,
.....
In charge of Receiving Station at
.....

It is required that one of these reports properly filled out shall be mailed to 233 St. Antoine Street, Detroit, Michigan, on Thursday of each week.

Detroit's milk supply comes from within a radius of sixty miles and does not involve a haul of more than three hours. It is not hauled in refrigerator cars but covered platforms are provided by the transportation companies and milk cars run on express car schedules.

The National Dairy Division Score Card for city milk plants was adopted in Detroit last fall. It was not used earlier because it was deemed desirable to introduce it only after personal instruction by an expert of the Dairy Division, so that no mistakes in interpretation would be made that later would have to be retracted. On March 25th of this year a complete scoring of the 156 different city milk plants gave an average score of 46. A meeting was called of city dealers, the score card was explained, a requirement of a minimum

score of 50 was made and on July 1st, this year, on the completion of a second scoring, every plant stood above 50 and the average was 56, a gain of ten pionts or 21% in three months. A duplicate copy is, of course, left in each instance. Meetings of the city milk dealers are called twice yearly, at which the requirements and policies of the Board of Health are explained, including farm scores, city scores, contagious disease, hygienics and sanitation. Sediment tests and bacteria counts are explained and furnished the dealers and these play an important part but chiefly as an index of the reliability of the various score cards which are much more easily understood. City dealers who do not pasteurize are required to visit their producers at least once a month to personally inspect their equipment and methods and protect themselves, as well as their customers against contagious disease. The co-operation which we deem so essential and which is the means of eliminating an immense amount of time spent in court rooms was further augmented by the city score card. Last May there was presented the perhaps unusual spectacle of a large number of dealers appearing before the Common Council, every one advocating the passage of an amendment to the milk ordinance to give further authority to the inspectors and to further restrict the city dealers. They declared that milk inspection is an advantage to the dealer and essential to anyone wishing to conduct an upright, straightforward business.

The consumers of Detroit have been furnished copies of the Federal Bulletin on "Care of Milk in the Home." Also at our Annual Milk Shows conducted by the Board of Commerce under the direction of the U. S. Department of Agriculture and Board of Health, the whole year's work is summed up. These shows have been of material benefit and enlightenment to all persons concerned. Further, encouragement and recognition have been accorded the more progressive dairymen, an advantage both difficult and essential in the furthering of milk reforms. These shows have fur-

ther illustrated the advantage of conducting the dairy business on score card principles, high scoring milk samples as a rule being produced on high scoring farms.

It is perhaps peculiar to Detroit that the certification of milk was first taken up and carried through to completion by the Board of Health. The first dairy certified by the Board sold its entire daily output of 600 quarts inside of two months. Under the new state law the Medical Milk Commission is appointed by and reports to the local Health Board. One of our certified dairies was recently scored 96.25, by a representative of the Market Milk Section of the National Dairy Division, the other, 97.85. A special permit is now offered to Detroit dairymen who will comply with the requirements for what will be known as the Board of Health Class A milk. The requirements for Class A will be the following:

1st. A dairyman and distributor in whom the Board has especial confidence.

2d. Score of 70 or more, of which 42 must be secured on methods.

3d. Produced from tuberculosis-free animals.

4th. Milk to be cooled to 45 degrees immediately after milking and bottled on the farm.

5th. Bacteria count below 40,000 when offered to the consumer.

No dairyman has yet taken advantage of this offer. The principal objection has been the requirement of farm bottling. It is only a question of a short time before this grade will be available. Possibly a number of farmers may be allowed to operate a central bottling plant in the country convenient to all. These are the only three grades proposed for Detroit, that is, Certified, Class A, and Market Milk. It seems that the consumer should be able to supply his wants from these three. We believe that the bewildering array of grades offered in some places is confusing and unintelligible to the ordinary purchaser.

Compulsory pasteurization is not part of the project in Detroit, though we voice no opinion of what the exigencies of the situation demand in other places. We believe that the reduced bacteria count which is claimed by advocates of this process, and which we believe is questionable as ordinarily practiced, is more than offset by the dirty methods which this practice sometimes permits.

Compulsory tuberculin testing is not part of the project of the Detroit Board of Health and this is said with a full realization that the tuberculin test is absolutely reliable when properly performed and is one of the greatest medical discoveries of the age. The human race is not threatened by an invasion of bovine tuberculosis, at least not to any such extent as from other forms of filth borne in milk. The eradication of bovine tuberculosis is a cattle-man's proposition, and the sooner he looks upon bovine tuberculosis as a disease contagious to his herd, the sooner he will get returns from his cattle and dairy business. With a supply of Certified or Class A grade sufficient to provide for infancy and early childhood, we believe that there is no pressing need to sacrifice ordinary sanitary reforms to the tuberculin test, at least in so far as municipal boards are concerned. The tuberculin test, however, is strongly advocated and demonstrations are given of its reliability. Gradually our stronger and more progressive dairymen are being induced to adopt it. When a fair working majority of our producers thus voluntarily appreciate its advantages it is very probable that the tuberculin test will be placed on the general order of requirements.

The project in Detroit consists of a gradual but limited advancement of farm scores to perhaps a minimum of 50, which will include an inexpensive milk house and the small top pail, and an advancement of city milk plant scores to perhaps a minimum of 60. At the same time a vigorous educational campaign on bacteria counts and sediment tests,

which are the final indices of results, is being conducted. This by furnishing to individuals their counts and tests, thereby checking up the efficiency of their equipment, methods, cooling, speed in handling, etc. By the time the above minimum scores are achieved it is believed that the bacteria counts and sediment tests and their application will be well enough understood to enable us to make them the chief basis of inspection work, though even then continuous scoring of methods and equipment will be essential. This program rceognizes the economic side of the milk problem, for it cannot be successfully argued that the above named scores will increase the price of market milk to any appreciable extent. As city consumers recognize the economic value of a higher grade of milk the demand for Class A and Certified, at an increased price sufficient to cover the extra cost of production, will increase, and it will be part of the work of the Health Board to see that this economic value is recognized.

This project is, of course, based on conditions existing at the present time. Both it and our views on pasteurization and the tuberculin test will change at any time that it can be shown that such change is desirable for the best interests of the people of Detroit.

"In too much controversy the truth is lost."

THE VALUE OF CHEMICAL AND BACTERIOLOGICAL EXAMINATIONS IN MILK CONTROL.

By Prof. E. G. Hastings, *College of Agriculture,* University Wisconsin.

The value of the chemical examination of milk as a factor in milk control has long been recognized. Its basis is to be found in the fact that the mixed milk from a number of cows varies in its content of fat and of solids-not-fat within rather narrow limits. The limits within which variations may occur and the product still be considered lawful have been established by state and municipal governments. The consumer is unable to fully protect himself in regard to the composition of the milk delivered to him. This is a duty which the municipality must assume and through its milk inspectors see that the milk sold in the city conforms to the standards established.

Milk may be adulterated by the addition of water, by the removal of fat, or by the addition of preservatives. The sophistications may be made by the producer, by the wholesale or the retail dealer, or by the cow herself. In attempting to breed animals that produce great quantities of milk, the composition of the milk has been lost sight of, until today some of the strains of Holstein cattle produce milk that falls below the minimum legal limit of many cities. Some seem to think that the milk produced by any cow, no matter how low its content of solids, should be considered as lawful milk. The injustice of this view from the standpoint of the consumer can be easily seen.

Until all men follow the golden rule, the necessity for the chemical control of milk will remain. I believe, however, that this phase of milk control is becoming less important because of the constantly increasing concentration of the milk business in the hands of the large dealers. The milk inspector has thus a smaller number of points to watch, and a smaller number of samples need be taken. Again, the large dealer cannot

afford to risk his reputation by being convicted of selling adulterated milk.

There is no difference in opinion concerning the value of chemical examinations, but concerning the value of bacteriological examinations there is far from a unanimity of opinion. Many claim that the examination of milk as now carried out in the bacteriological laboratory is of doubtful value. Others, and especially the bacteriologists themselves, claim that more information concerning the way in which milk is produced and handled can be obtained by a bacteriological examination than can be obtained with a like expenditure of money and labor in any other line. I am a bacteriologist and shall present their point of view.

As all well know, milk undergoes decomposition with often astonishing rapidity. This is due to the fact that its physical and chemical composition is such as to fit it admirably as a culture medium for almost all bacteria, and to the fact that during its production it becomes seeded with large numbers of bacteria from varied sources.

In this talk I shall limit myself to raw milk, and thus what I may say in regard to the value of a bacteriological examination of milk should not be applied to the pasteurized product. I shall not consider the pathogenic bacteria, but limit myself to those forms concerned in the spoiling of milk. I am sure that all will agree that fresh milk is the best milk. The "freshness" of milk is not measured by its age. Indeed, milk several days old may be less changed from the condition in which it was at the moment of its withdrawal from the udder than another sample but a few hours old. In other words, the amount of decomposition in the first is less than in the second. Since the decomposition changes that go on in milk are due to bacteria, and since their increase in numbers runs parallel to the amount of decomposition, at least within the limits in which milk is considered fit for use, it is evident that if we can determine the number of organisms present we shall

be able to tell much concerning the freshness of the milk. We shall not go far astray in making the statement that the wholesomeness of milk for huamn food is dependent on the number and kind of bacteria it contains. This statement is true whether we consider the value of milk to be measured by its keeping quality, by its taste and odor, by its healthfulness, or by a combination of all.

The question arises as to whether the bacteriologist can determine the number of those kinds of bacteria of greatest importance in the spoiling of milk. He certainly can do so.

Those forms of greatest importance can be divided into four classes, each of which has, in a general way, specific sources. The class of greatest importance includes the lactic bacteria, the kind that are largely concerned in the souring of milk. The second class comprises the gas-forming organisims so much dreaded by the cheese maker. The third class includes the putrefactive organisms, that is those that do not act on milk sugar and produce acid, but rather act on the casein and albumen of the milk. The fourth class is made up of those bacteria that have but little action on milk, and hence are often called the "inert" bacteria. By a careful determination of the relative numbers of these different classes of bacteria in a sample of milk, the experienced analyst has presented to him a picture of the methods used in the production of the milk.

The presence of dirt in milk is incompatible with a low bacterial count. Thus low numbers of bacteria can only mean milk produced under good conditions. In such the bacteria are largely those from the interior of the udder. High numbers of lactic bacteria are indicative of milk produced under fair conditions, but which is old and in which the lactic bacteria have had an opportunity to grow. High numbers of the gas and putrefactive bacteria are signifiicant of dirty methods. Along with these gas-forming and putrefactive bacteria are introduced some lactic organisms, which find far more favor-

able conditions for growth in milk at ordinary temperatures than do the other forms; hence, if in any sample of milk great numbers of the gas-forming and putrefactive organisms occur, it is certain that the milk has been grossly polluted.

Milk that has just been drawn, but into which large amounts of manure, mud, dust, etc., have been introduced is not to be considered as fresh milk, since the number of organisms thus introduced will be so great as to cause a rapid spoiling of the milk. The freshness or whether milk has undergone any degree of decomposition is measured more accurately by determining the number of bacteria than by any other method.

Knowing the number of bacteria that are introduced into milk under such conditions of cleanliness that are to be considered as reasonable and easily attained by any producer, and knowing the conditions of transportation as to time and manner, any city can establish bacterial limits that shall be just to the producer and to the consumer. Such limitations will, of course, vary with local conditions.

The enforcement of reasonable limitations tends to improvement in production and handling. It is recognized that the product of no farm should be condemned on the basis of one or two examinations, but rather that such a number of examinations should be made as will indicate without question the method employed on the farm. If the combined results of a quantitative and qualitative examination show that any producer is unable to grasp the essential points in the production of clean milk, no reason remains why his milk should not be excluded from the market.

It is recognized that the application of bacterial limits in the control of milk supplies must always be supplemented by farm inspection and the education of the producer. The bacterial examination picks out the farms to which attention need be directed, and thus enables the inspectors to concentrate their work. Farm inspection sometimes tends to measure equipment rather than methods; the bacterial examination meas-

ures methods rather than equipment. In the production of clean milk methods are of greater importance than equipment, for no equipment, no matter how elaborate, can take the place of cleanly methods; while correct procedures will prove efficient, no mtater how meager the equipment.

I am aware that many objections have been interposed to the use of bacterial examinations and limits. One frequently heard is, that in the examination the kind of bacteria are not taken into account. I can only reply that the experienced analyst will be guided in his conclusions by the kind of organisms present and his knowledge concerning their sources. I am also aware that the objectors often refer to the presence of pathogenic bacteria. Protection here must be along other lines than laboratory examination of the milk or farm inspection. It is also urged that the examination does not protect the consumer as far as the particular sample of milk is concerned, since the milk will be consumed before the results of the examination can be obtained. The reply is that the examination is not made for the purpose of protecting the consumer as far as the particular sample of milk is concerned, but rather is made to determine the methods of production on any particular farm. These methods do not vary widely from day to day, but are fairly constant. A farmer that is using dirty methods today will do so tomorrow.

It is true that methods of control will differ in different localities, and especially between large and small cities. Mere publicity of farm conditions will prove most effective in small places, but are of small effect in large cities.

In closing I can only say that I am fully convinced of the value of bacterial examination in the control of milk supplies, but, as with everything else, judgment must be used in their application.

"A single fact is worth a ship-load of argument."

METHODS EMPLOYED AND RESULTS OBTAINED IN IMPROVING THE MILK SUPPLY OF WASHINGTON.

By Dr. Hulbert Young, *Chief Food Inspector,*
Washington, D. C.

In the District of Columbia, municipal regulation of the milk supply practically began with the passage of what is termed our milk act, on March 2d, 1895. Briefly, this act provides that all persons who maintain a dairy or dairy farm within the District of Columbia shall apply to the Health Officer for a permit so to do, such permit to be issued after an examination of the premises which it is intended to use in the maintenance of such dairy or dairy farm, by the Health Officer or his representative, to ascertain whether the premises conform to the regulations governing dairies and dairy farms, such permit being subject to suspension or revocation at any time without notice whenever the milk supply from such dairy or dairy farm is exposed to infection by Asiatic cholera, diphtheria, typhoid fever, etc. Further a similar application is required from persons who desire to bring or send milk or cream into the District of Columbia from without its jurisdiction, such permit to be issued after an examination of the application, the applicant to be governed by the regulations for the government of dairies and dairy farms within the District, when such regulations do not conflict with the law of the state in which the dairy or dairy farm is located, the premises to be inspected at any time without notice by the Health Officer or his representative, and the permit being subject to suspension or revocation in the same manner as previously mentioned and also whenever the Health Officer is not satisfied that the milk may be brought into the District of Columbia for sale or consumption without danger to the public health.

This act further defines the standard for skimmed milk, to

wit: that it shall contain not less than 9.3% of milk solids, inclusive of fat, requires that all dairy wagons shall display the name of the owner and the number of the permit thereon, requires the display of a statement as to the name and address of the source of the milk supply dispensed in groceries, lunch rooms, etc., prohibits the working in or about the dairy of any person suffering from any dangerous contagious disease, prohibits the sale of milk from any cow within fifteen days before and ten days after calving, of milk from any cow known to be suffering with tuberculosis, anthrax, or any general or local disease which is liable to render her milk unwholesome, makes it the duty of the Health Officer, under the direction and supervision of the Commissioner, to make and enforce regulations to secure the proper water supply, drainage, ventilation, air space, floor space and cleaning of dairies and dairy farms and to carry into effect the provisions of the act, gives the Health Officer or his duly appointed representative the right to enter, without notice, any dairy or dairy farm for the purpose of inspection and defines the procedure of prosecution to be brought against offenders under the provisions of the act. The penalty clause further provides that upon a second or subsequent conviction, the permit of the person so convicted shall be cancelled and no permit shall be issued to said person for a period of six months.

The regulations promulgated under the provisions of the act provide for the proper location and construction of dairies in a general way, require the provision of suitable milk containers, their proper cleaning, prohibit the filling of any vessel with milk or cream which is to be delivered to a consumer except in a properly constructed dairy, require the provision of a sufficient supply of pure water for use in a dairy or on a dairy farm, require cow stables to be well lighted, ventilated, drained and constructed, to have 600 cubic feet of clear air space and at least three and one-half feet

width of space from each cow, the separation of the stable from privies, manure pits, etc., that horses, sheep, goats, hogs and chickens be not stabled therein, the provisions of manure bins when necessary, the cleaning of the cattle, the whitewashing or painting of the buildings, their good repair, the cleaning of the stables, the drainage of the cow yards, the proper feeding and watering of the cows, the report of the existence of any contagious or infectious disease among the cattle, the maintenance of strict cleanliness of milkers, and defines the procedure of prosecution of offenders against the provisions of said regulations. Further, by order of the Commissioners approved November 5th, 1910, amendments to the regulations were adopted, requiring all cattle on farms the applications for which are received after Oct. 1st, 1910, and all cattle to be added to any herd after that date, shall be demonstrated to be free from tuberculosis by the application of an official tuberculin test, and that all cattle which present physical evidence of tuberculosis shall be either immediately killed, removed from the dairy farm, or be segregated from the herd and tuberculin tested.

Standards for milk and cream, to wit: for milk, 3.9% of butter fat, 9.00% of solids not fat and not more than 87.5% of water, and for cream, not less than 20 of fat, were embodied in an act approved February 27th, 1898. Although the Federal Food and Drug Act, June 30th, 1906, applies specifically to the District of Columbia, our Courts have held, however, that the specific standards set forth in the previously mentioned act are still in full force and effect. The standards for milk and cream adopted under the authority of the Food and Drugs Act are, of course, enforced in connection with the milk product imported into our jurisdiction from the states.

Several branches of the Food Inspection Service of our Department are concerned in the enforcement of the previously mentioned laws and regulations, to wit: the dairy farm inspection service, the dairy inspection service, the chemical laboratory and the bacteriological laboratory.

The inspection of our dairy farms began shortly after the passage of the milk act. At first, the inspections were made by the District Veterinarian during his spare time. The year following, the services of a veterinarian were secured as inspector of live stock and dairy farms, in 1900 a second veterinarian was appointed as an inspector of dairy farms and in 1901, the services of three additional veterinarians were secured. Several years later one other veterinarian was added to the service, so that our present force consists of six veterinarians, two of whom are stationed in Washington, one in Virginia and three in Maryland.

During the year 1896-1897, 405 inspections of dairy farms were made. The conditions found as the result of these early inspections showed in many cases entire ignorance of the most rudimentary sanitary principles connected with the production and marketing of milk. The stables were small, poorly lighted, without any special provision for ventilation and mostly undrained. Milk was cooled on but few farms, and was stored on many farms in kitchens, living rooms and musty cellars. At the time of my appointment to the service, in 1900, considerable improvement in the condition of the farms in and about Washington had been brought about by their inspection. After a tour of inspection with the then only dairy farm inspector, I was detailed to an inspection trip in Maryland and a little later on a similar trip into Virginia. I found the stables to be mostly of the bank barn type, unlighted, except on the lower side, floored with clay and absolutely without any provision for drainage or for special ventilation. On each of these I found not one single herd of tuberculin tested cattle and during a three weeks' stay in Virginia I was compelled to condemn thirty-six animals for the exhibition of physical symptoms of tuberculosis or for diseased udders. Five tuberculous animals were found in one herd of twenty.

From the annual report of the inspector of live stock and dairy farms for the fiscal year ending June 30th, 1903, it is

noted that during that period, 244 cattle were condemned on dairy farms, mostly for tuberculosis. It is further noted in this report that 79 new stables were constructed and 269 partially built or remodeled to comply with the regulations and that 81 new dairies or milk rooms were constructed on dairy farms. During that year, the Department adopted the policy since always carried out, of making an actual inspection of each farm for which an application is received prior to taking any action on such application. Considerable difficulty had been experienced in accomplishing the revocation of a permit once issued and the rejection of the applications usually brought about the desired changes in construction or location without further parley. Our form of application has been changed several times, not always from necessity, but to suggest new features of dairy practice; as, for instance, the addition of such questions as "To what temperature do you cool your milk?" and "Do you use the small mouth milking pail?" The improvement brought about by this means is problematical. Occasionally however ,it is evident that these suggestions lead to a desire for further knowledge and the result is the production of a cleaner milk product. Our form of report has also changed. Until our Health Officer, Dr. Wm. C. Woodward, originated the score card system of report, since copied throughout the continent, our report was a brief summary of the result of an inspection, as, farm good, fair, or poor, cattle (blank) number, clean, or dirty, condition fair, water supply from well, etc. Our present score card differs from practically every other in use in that the farm equipment and methods of milk production are scored on one side of the sheet and the cattle are scored separately on the reverse side. Printed forms which may be filled in by the inspector are used to notify the farmer of the existence of any insanitary condition found on the farm, setting forth the nature of the condition to be corrected, and the time in which it is expected to be done. Copies of the score card report of the farm are

ordinarily left with the dairy farmer or some one on the premises in order that he may see wherein his equipment or his methods are faulty and our inspectors are every ready to explain the various items for his information. It has been our experience, however, that the average milk producer is entirely satisfied with the result of the inspection provided no prosecution is contemplated or no proceedings are to be instituted toward the revocation of his license, no matter what his rating. We have endeavored to overcome this apathy in various ways, by circular letters, by appeals to their pride, and whenever possible, by appeals to their pocketbooks. The proprietor of but one of our city milk dairies keeps himself well informed as to the ratings given the farms from which his supply is drawn and consistently pays a higher price for the product from those which receive the highest ratings. Several others occasionally inquire as to the ratings given the farms from which they receive milk products or from whom they hope to receive such product, and occasionally do pay a higher price for milk from exceptionally well equipped and managed farms. In the matter of an appeal to the personal and local pride of the farmers in his inspection district, one of our inspectors has been singularly successful, and many improvements have been made on his farms because of the fact that a neighboring farmer was receiving a higher rating.

We have not as yet arrived at any definite standard of rating which must be attained by any dairy farm or dairy. So many factors enter into the production and distribution of milk and the individual variation of the inspectors is so great that we have considered this matter worthy of further study before proposing such standards. This individual variation we have endeavored to overcome by means of monthly conferences between the administrative officers of the Department and the inspectors in the field and by periodic trips to certain selected farms. At each of these visits, each inspector makes

his individual rating and these are discussed and compared on the premises in order to get every possible point of view and opinion as to the relative value of each item of the farm equipment and their methods of milk production. For the present, at least, I am of the opinion that no set standard of rating may be used with justice to the Department, the producer, the dealer, or the consumer.

The solution of the problem of the tuberculous cow is now, we believe, with us well under way. To the best of my knowledge, there were in 1900 no officially tuberculin tested cattle on any farm on which milk was produced for sale in our city. At the close of the fiscal year ending June 30th, 1912, 5,871 of the 17,457 cattle on our dairy farms had successfully passed a tuberculin test within the previous year. We are indebted to the officials of the Bureau of Animal Industry, U. S. Department of Agriculture, in a very great measure, for this result. The officials of that Bureau have performed the larger part of the work in connection with the application of the test to this number of animals and their cooperation in educational work among our farmers and in securing the necessary regulations to eradicate bovine tuberculosis from the District of Columbia, together with the use of their funds to reimburse the owners of tuberculous cattle within the District, have been of very material assistance. We recognize as official only such tests as are made by the officials of that Bureau of our Department, or by veterinarians acting under the authority of their respective State Veterinarian, provided, in the latter case, the cattle are properly tagged or marked for identification and copies of the temperature readings are submitted for our approval. Aside from the number of cattle officially tuberculin tested, many other herds have been submitted to private tests, and our inspectors have estimated that fully 4,000 cattle have been tested in this manner within the past two years. It may be noted that we have no law nor regulation that requires a retest of such animals as are tested on

account of the fact that the owner filed an application to ship milk into our city since Oct. 1st, 1910. As in any dairying section, many of the herds on the older dairy farms are badly infected by tuberculosis. This problem we approach by means of animal inoculations. Samples of the milk from a special herd are secured under the direction of our bacteriologist, are inoculated into guinea pigs after suitable preparation and the results are reported to the Health Officer. If positive, the owner of the herd is immediately notified that his permit is suspended or his application rejected, as the case may be, is further informed of the reason for this suspension or rejection and is advised that he must have his herd officially tuberculin tested before he will be permitted to resume the shipment of milk into our jurisdiction. This work was begun but a little more than a year ago and thirteen positive reports have been made with the following results:

Herd No.	No. Cattle.	Reacted.
1	56	16
2	41	27
3	48	41
4	16	dispersed by sale, not tested.
5	50	36
6	136	83
7	68	58
8	56	14
9	78	66
10	24	1
11	100	dispersed by sale, not tested.
12	46	11
13	30	no action as yet.
Total....	608 tested	353 reacted, or 58%

These herds, however, are not representative, but are the ones in which animals had previously been found exhibting physical symptoms of tuberculosis.

Dairy Inspection. The inspection of our city dairies was begun immediately after the passage of the milk act. Theoretically, at least, no city, with its dust laden air, is a fit place for the location of any structure wherein milk must be handled. Practically, however, we all find them a necessity. Although Washington bears the reputation of being as clean as any city, and we hope this reputation deserved, we find that the location and the cleanliness of our milk distributing plants quite a problem with respect to at least 50% of them. One handicap under which our dairy inspection work has struggled was on account of the fact that many licenses were issued shortly after the passage of the milk act for the conduct of this business in a number of premises in most undesirable locations, as, for instance, in close proximity to stables. Partly by reason of competition, partly by the attitude of the general public toward such places and partly by reason of the later attitude of our Department, most of them have been moved to more sanitary and more desirable quarters or have retired from the business. At the present time, of our fifty-two dairies, or city milk distributing plants, at least 50% are in quarters either specially constructed for the purpose or so reconstructed; and at least three-fourths of the city's milk supply is dispensed from dairies of this type.

For several years past, two inspectors have been detailed to the work of dairy inspection, one devoting practically all of his time to inspections alone, and the other devoting his time primarily to the collection of samples of milk for analysis and secondarily only to inspection work. Since the establishment of the bacteriological laboratory, two years ago, more time has been devoted to the collection of the increased number of samples of milk examined. A score card form of report is used and copies are left with the dairymen as in dairy farm inspection work. With one exception, however, no considerable interest is manifested by the milk dealers in the ratings received. A printed form, similar in all respects to the

one used in dairy farm inspection, is used to detail the insanitary conditions found upon inspection and to give due notice as to the time in which we expect the condition remedied. For the existence of a serious insanitary condition, no time notice is given, the case being referred to the Assistant Corporation Counsel for prosecution at once upon the basis of the inspector's report. Also, if it is found upon a reinspection that the conditions complained of in the time notice have not been remedied, a prosecution is immediately requested. In general, the inspection of our dairies has brought about a vast improvement in their condition and in their methods of handling milk.

The inspection of milk. During the fiscal year ending June 30th, 1895, 545 samples of milk and 20 of cream were examined chemically. During the year ending June 30th, 1912, there were examined nearly 6,000 samples of milk and cream. Of the samples examined during the first mentioned year, 18% were either skimmed or watered or both. Of the samples examined during the last fiscal year, less than 6% were below standard or adulterated. It may be seen, therefore, that while not all of the milk sold in Washington is unadulterated, there has been a vast improvement in this respect, and the use of preservatives and coloring material is now practically unknown.

Samples for examination purchased from vendors of the product, including stores and lunch rooms, are, so far as possible, secured in the original container. This is, of course, impossible in collecting samples from the railroad milk platforms at the time of its arrival from the farms and these are had after a thorough stirring of the contents of each can from which a specimen is desired. Local vendors of visibly unclean milk, or milk in dirty bottles or in containers showing sediment or of a product found to be adulterated or below standard, are prosecuted in the District branch of our Police Court, upon information filed with the assistant Corporation Counsel.

When a sample found to be adulterated was had from a product shipped into our jurisdiction from a neighboring state, proceedings are instituted under the Federal Food and Drugs Act, the shipper being first cited for a hearing, and, if prosecution is to be instituted, the case is referred to the United States District Attorney and the shipper is requested to appear to plead to an information. If this request is disregarded, the Attorney is requested to proceed by indictment and requisition. About one year ago, after considerable pressure from our Department, four such indictments were returned and the offenders were brought into our jurisdiction for trial, a fine of $25.00 being imposed in each of three cases and a fine of $50.00 in the fourth. Since that time, most of those requested to appear and plead to an information have done so. Before the local court, fines of $5.00 to $10.00 are usually imposed and about double that amount before the U. S. branch of the Court.

Our Chemist is assisted by a sanitary and Food Inspector detailed for that purpose.

Our bacteriological laboratory is the baby of the Department in milk work but bids to outgrow all other branches except the dairy farm inspection. Started but two years ago, the bacteriological examination of specimens of milk has created considerable consternation among the producers and dispensers of a dirty milk product and this in spite of the fact that prosecution based on a bacteriological examination of such specimens are practically at a standstill pending the result of an appeal of one such case from the decision of the Police Court. In this case, it was charged that the product was composed in part of filthy, decomposed animal and vegetable substances, and, after hearing the evidence, the Court rendered a verdict of guilty and suspended sentence pending the hearing of the appeal in the higher court.

Specimens intended for examination in this laboratory are either collected in the original containers or are transferred

to a sterile container by a sterile pipette, in either case are then marked for identification, packed in cracked ice in a refrigerator basket, and delivered to the laboratory as soon as possible. Every effort is made to advise the interested parties of the result of these examinations, as soon as possible, whether legal proceedings are to be instituted or not. Although over 2,000 samples have been examined, the period covered by the work has been so short that comparisons are almost impossible. As a result from these examinations, there have been installed six new pasteurizers, equipped with holding devices, in as many city plants.

As we have no law nor regulation establishing a bacterial limit for the permissible total number nor the permissible number of any specific kinds of bacteria which may be contained in a specified quantity of either raw or pasteurized milk or cream, it has been our practice to institute proceedings only against the vendors of the product or products showing the highest counts or the greatest index of fecal contamination.

Supervision. The Chief Food Inspector is directly in charge of the milk inspection service and is directly responsible to the Health Officer, through the Assistant Health Officer. In the inspection of dairy farms, as already noted, six veterinarians are employed, four of whom devote their entire time to the work, the other two being employed also in the inspection of slaughter houses and live stock and in the investigation of contagious diseases of animals in the District.

Approximately one-fourth of the time of the Chemist is employed in the examination of milk or milk products and approximately three-fourths of the time of his assistant. In the bacteriological laboratory, the bacteriologist devoted approximately one-fourth of his time to the examination of specimens of milk and cream and all of the time of his assistant is so used.

Results. The results of operations of the milk inspection service are, of course, to be measured by the efficiency with

which it prevents sickness and saves human life, not by the number of sanitary buildings constructed to house cattle or to handle milk products or by chemical analysis or bacterial counts. The death rate of infants is the commonly accepted standard by which the efficiency of milk inspection in any community is measured and we are rather proud to submit a statement of such rate in Washington as an index of what has been accomplished.

Averages for 5 Years.	General.	1 Year and Over.	Under 1 Year.	From Diar. Diseases Under 2 Years.
1880-84	23.85	17.54	6.31	1.62
1885-89	23.48	17.27	6.21	1.68
1890-94	23.95	17.70	6.25	1.75
1895-99	20.59	15.77	4.82	1.35
1900-05	19.68	15.73	3.95	1.09
1905-10	18.69	15.38	3.31	0.91
1910	18.69	15.62	3.07	0.86
1911	17.80	15.10	2.70	0.73
1912*	17.73	15.50	2.23	0.53

* Compiled since January 1, 1913.

Aside from this the milk inspection service has assisted the Department in discovering outbreaks of typhoid fever and scarlet fever due to milk infection and has usually located the very focus of infection in time to take effective action to cut short the outbreak. Of these, eight of typhoid and two of scarlet fever are matters of record and are usually listed with their attendant details in publications bearing on that subject.

"The indefinite improvement of humanity and the cause of the little child are inseparably bound together."

BOVINE TUBERCULOSIS, ITS ERADICATION OR CONTROL.

By Prof. E. G. Hastings, College of Agriculture, University of Wisconsin.

One of the important problems that presents itself to the milk inspector is the control of the health of the cows supplying milk to his people. Since health and disease are relative terms, it is often very difficult to draw the line and to determine what animals shall be excluded from the milking herds. Especially is this true with such diseases as tuberculosis, for it is well known that some tubercular animals furnish as healthful milk as any non-tubercular animal.

Tuberculosis presents an especially difficult problem because it has both sanitary and economic aspects, and in some respects these run counter to each other.

I wish to assure you that I have no solution to offer to the vexing problem that confronts us in the control of milk supplies as far as bovine tuberculosis is concerned. I do not think that anyone sees clearly the solution. Some may think they do, but I believe it is because they do not consider all phases of the problem.

Long before the discovery of the tubercle bacillus in 1882 by Robert Koch, bovine tuberculosis was considered to be of sanitary significance, and rules had been drafted concerning the use of the meat and milk of tubercular animals. With the discovery that apparently the same organism is found in the bodies of the various kinds of animals that are subject to attacks by this disease, the supposition came that undoubtedly the disease was transferable from one kind of animal to another and from animals to man. The regulations concerning meat and meat inspection thus became more stringent. In 1901 Koch announced that he did not believe there was any danger of man acquiring tuberculosis from cattle, and that sanitary regulations concerning the use of meat and milk from

tubercular animals were unnecessary from the public health point of view, no matter how desirable from the aesthetic side. Koch based his conclusions largely on the fact that he had been unable to produce the disease in cattle by inoculation with organisms from a human source. Many did not accept Koch's conclusion as correct, and during the last eleven years more work has been done in all parts of the world in the solution of the problem of the relation of bovine tuberculosis to public health than has been done in a like period in the solution of any other question of public health. The general conclusion from all of this work seems to be that as far as tuberculosis in adults is concerned, bovine tuberculosis is practically negligible. While it is true that the bovine type or organism has been found in adults suffering from tuberculosis of the lungs, it is also true that such cases are vary rare indeed.

In the case of children the story is far different. It is thought that about 10% of the tuberculosis in children is due to bovine infection. The bacteriologist has methods at his command by which he can differentiate quite accurately whether a given pure culture came from a bovine or human source. Applying these methods to the study of large numbers of cultures from all ages of human beings and from all types of tuberculosis, the above conclusions have been arrived at. There remains no doubt but that bovine tuberculosis is of sanitary importance and its control is a legitimate part of the work of the milk inspector.

An animal becomes infected with tubercle bacilli. For a longer or shorter period of time the distribution of the tubercular lesions or the stage of the disease is such that no tubercle organisms can be eliminated from the body. This is called "closed" tuberculosis, and an animal with this form of the disease is not dangerous to the other members of the herd or to people consuming her milk. Sooner or later the disease progresses until the organisms are given off in the sputum, feces, or milk. At that moment the cow becomes a menace

to public health and to other cattle. It is possible to tell by a long, detailed, and costly series of examinations whether a cow is eliminating tubercle organisms or not. The precedure is so involved that such examinations cannot be made use of in routine investigations of milk supplies. Positive results are of value, but negative results are of small value, since the milk of a tubercular cow may be free from the organisms this week and contain them next week.

The only way in which we can insure the freedom of raw milk from tubercle bacilli is to provide that only cattle that do not react to the tuberculin test shall be used for the production of market milk. Public health officials feel the need of the removal of all known tubercular cattle from the milk-producing herds, and I believe that they are justified in this view.

From the information obtained on the slaughter floor it is not probable that at any one time over one-fourth of the cows are afflicted with the disease in such a form that they eliminate the organisms. The general health is often not influenced and they might remain profitable producers for an unknown period. In the great milk producing sections of the country it is probable that fifteen to twenty-five per cent of the cows are tubercular. Their removal and slaughter places a great economic burden on the farmer, so great that he will not bear it. So, however desirable may be the removal of the reacting animals, the public health officials encounter the economic problems and progress stops. If any city or state desires to have the tubercular animals removed, they must be willing to stand a fair portion of the loss. It is probable that on the average this will amount to three-fourths the value of the cows as producers of milk. The farmer often considers that he should receive compensation for breeding value. It is clear that the consuming public is not interested in this, but only in the production side and in justice cannot be asked to compensate the farmer for breeding value. The farmer should be willing to stand one-fourth the loss entailed by removal of the reacting

animals, since on the average it is of economic importance for him to have removed from his herd all animals eliminating tubercle bacilli.

In justice to all, each herd should be considered as a unit and the owner compensated according to the conditions found on slaughter. If all the animals are badly diseased, their value to the farmer is small, while if nearly all show but minor lesions, he should receive more than three-fourths of their value. Such a sliding scale of recompensation gives chance for endless trouble and hence is not likely to be considered with favor by the public health official.

In areas where the disease is not widespread, total elimination of tubercular animals has met with fair success. To be applied with any hope of success, it must be accompanied by the education of the farmer so that he recognizes the economic importance of the disease. He must be acquainted with the essentials in maintaining a healthy herd, which is no simple problem because that most valuable diagnostic agent, tuberculin, is not able to separate all tubercular from all healthy cattle with absolute accuracy, and, even when the test is constantly used, there is danger of introducing the disease into a herd into which animals are constantly being brought.

The education of the public must be undertaken, so that it shall be willing to pay its share of the loss, either in the form of taxes or in the form of increased price of milk, but not both.

If the farmer can be made to see his interest in the disease, he is usually willing to attempt to maintain a healthy herd and to enforce the sanitary regulations himself which otherwise the city would attempt. To enforce the tuberculin tets against unsympathetic producers of milk is no simple problem. The question of dishonesty presents its own difficulties. The writer has in mind a city that requires the tuberculin test. Several thousand cattle have been tested by a veterinarian and no reactors found in a region where tests by other men have shown tuberculosis to be present.

The ordinances usually demand an animal test. Where the farmers are not attempting to keep their herds free on their own volition, animals introduced will not be tested until the regular test. This means that anywhere from ten to twenty-five per cent of the cows furnishing milk at any one time have not been tested.

The large cities that have attempted to put tuberculin test ordinances in force have usually failed, and they have been forced to resort to pasteurization to insure the freedom of the milk from pathogenic organisms.

I am aware that the enthusiast in sanitation and public health claims that dollars and cents should not stand in the way of progress. The economic wall has always stood in the way and always will. Many lives now lost in numerous ways could be saved if the economic side of modern life was not considered.

As I stated, I have no solution of the problem of bovine tuberculosis which affects so vitally the producer and consumer of milk. All I can say is that in attempting its solution the interests of all must be considered and each side must stand ready to pay its share of loss this disease places on the milk and animal industry of this country.

ECONOMIC MILK PRODUCTION.

By Prof. Wilber J. Fraser, *University of Illinois,* Champaign, Ill.

This subject is so great no self-respecting dairyman can afford to ignore it. Milk production is a responsible business, because one-fourth of the infants die before they are five years old. It is a sad fact that the consumer does not understand that it costs more to produce clean milk than it does to produce dirty milk. The public cries against dirty milk, but it is not willing to pay the extra cost necessary to produce clean milk. At present the price of unclean milk is too high and the price of clean milk is too low. In order to have the production of clean milk increased it is even more necessary to start a campaign of education among the consumers than among the producers. Dairymen producing milk for the large cities at present prices and with the kind of cows used and method of production now in practice, are just receiving pay for feed and labor at market price with little if anything left for profit.

The results obtained from three test associations in Illinois containing 998 cows show that it costs $1.44 to produce a hundred pounds of milk testing 3.6 per cent butter fat. Dairymen shipping milk to Chicago at that time received for it $1.55 per hundred pounds, leaving a margin of profit of 11 cents. Health authorities and milk inspectors must realize the small profit there is left for the milk producers under present conditions before they can hope to secure the desired cooperation from the dairymen. If more requirements are added without raising the price of milk many of the present milk producers will simply be forced out of the business. There are but two solutions for the present situation. One is to raise the price of milk and the other is to instruct the dairymen to produce milk more economically. In many cases this latter cannot be done without getting more intelligent producers.

Much can be done, as I will attempt to show later, in producing milk more economically with better cows and better feed, but these require a high grade of intelligence to carry out.

The actual relation of the efficiency of the individual cow to the real profits in dairy farming is a matter little realized by the people depending upon this occupation for a living. The profits on the average dairy farm today can be easily doubled.

THE COW IS THE MARKET.

A dairyman considers his market to be the place where he disposes of his milk, cream or butter and in one sense this is true, but the place where he markets such of the products of his farm as grain, hay and silage, is the dairy cow. The efficiency of the cow consuming these must therefore bear a vital relation to the dairyman's profits. If in a town having two grain elevators, one paid one-half cent a bushel more for grain than the other, no farmer would be foolish enough to sell his grain to the one paying the lower price. Yet dairymen will persist in keeping cows year after year that are paying them only twenty-five cents a bushel for grain, while others in the same herd, or that can easily be obtained at a reasonable price, will pay fifty cents a bushel or even more for the grain they consume. The difference in price which individual cows are paying for their grain is not so apparent as the difference at the elevators, but it is none the less actual and affects the pocketbook just as surely in the end.

The Department of Dairy Husbandry purchased the best and poorest cows from six different herds. These were shipped to the University and a careful record kept of all feed consumed and milk and fat produced. The record for an exact year of ten of these cows from five of the herds is given below; showing the cost of milk and fat produced by the different cows at market price for feed.

BEST AND POOREST COWS IN FIVE HERDS.

No. cow	Lbs. milk	Lbs. fat	Cost per 100 Lbs. milk	Cost per 1 Lb. fat
83	11,794	382.4	$ .61	$ .19
84	8,157	324	.87	.21
85	9,592	406.3	.75	.18
86	3,098	119.2	1.56	.40
93	9,473	358.6	.76	.20
94	7,846	282.1	.87	.21
95	14,841	469	.56	.18
96	7,686	324.1	.80	.22
97	8,563	291	.78	.23
98	1,411	52.8	2.77	.74

Compare the amount of milk, fat, and cost of same. This shows in a striking manner the difference in earning capacity of the different cows. The best cow of all produced over ten times as much milk as the poorest cow, and produced it at 56 cents per 100 pounds, in marked contrast to the $2.77 required by the poorest cow to produce the same amount.

GREAT ECONOMY OF EFFICIENT COWS.

The following figures, taken from Agricultural Experiment Station Circular No. 134, Cow Index of Keep and Profit, are based upon the value of the cow, milk, butter, fat, calf, and manure, and also upon the cost of feed, labor, depreciation on cow, interest, taxes, housing, etc. The results show that, under ordinary farm conditions, and with the product sold on the common creamery market, a cow must produce approximately 4,000 pounds of milk and 160 pounds of fat to pay for feed and labor. In other words, this is the dead line. Cows producing less than this are kept at a loss. For every 1,000 pounds of milk produced above this, the cow returns a profit of $10.

DOUBLING THE PRODUCTION GIVES SIX TIMES THE PROFIT.

A cow producing 5,000 pounds of milk brings in a profit of

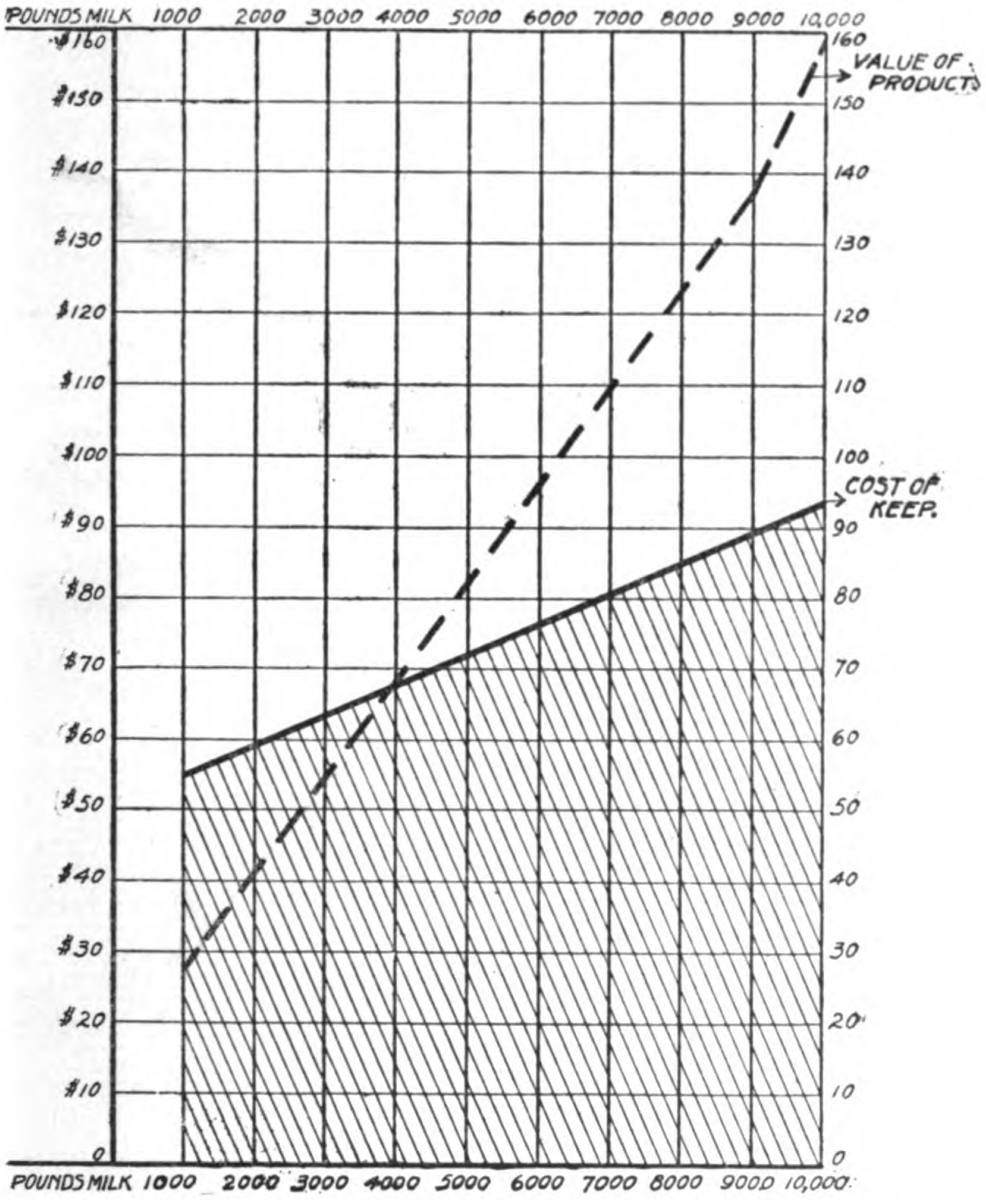
$10, while a cow producing 8,000 pounds of milk returns a profit of $40, or four times as much. In other words, ten cows producing 8,000 pounds of milk would return as much profit as forty cows producing 5,000 pounds of milk, but the former involves only one-fourth the labor. Herein lies the great advantage of keeping a herd of high average production, even though the herd be small.

A cow producing 10,000 pounds of milk returns a profit of $60, or six times as much as a cow producing 5,000 pounds of milk, yet the production is only twice as great.

Profit or Loss from Cows of Different Productions.
In Round Numbers.

Lb. Milk.	Lb. Fat.	Loss.
2,000	80	$18.00
3,000	120	9.00
4,000	160	0.00
Dead Line		Dead Line
		Profit.
5,000	200	10.00
6,000	240	20.00
7,000	280	30.00
8,000	320	40.00
9,000	360	50.00
10,000	400	63.00
11,000	440	76.00
12,000	480	89.00
13,000	520	102.00
14,000	560	115.00
15,000	600	128.00

A CHART THAT SHOWS THE RELATION BETWEEN THE INCREASED VALUE OF A COW'S PRODUCT AND THE INCREASED COST OF HER KEEP. (VALUES BASED ON MILK CONTINING 4 PERCENT BUTTER FAT.)



UPHILL PATHS OF DIFFERENT ANGLES, AND WHAT THEY MEAN.

A cow that produces a large amount of milk may require considerable more feed than the cow of low production, but the increase in the cost of feed, labor and other expense for

one year is nowhere near in proportion to the increase in the value of her product. The actual results as based upon many tests and careful estimates, are made plainer and more emphatic by the accompanying chart, in which each square from the bottom to the top represents $10, in cost of keep or value of product, and in which each square from the left to the right represents 1,000 pounds of milk produced. The heavy line at the left and the heavy line at the botton each stand for zero. The diagonal lines represent the cost of keep and the value of the product.

The distance from the heavy base line at the bottom to the gently ascending, heavy black line, represents the cost of keep for the various yields of milk. The distance from the heavy base line at the bottom to the heavy dotted line represents the value of the cow's product. The distance from the heavy line on the left to the intersection of either of the ascending lines represents pounds of milk produced. For example, the cost of keep for a cow producing 2,000 pounds of milk is $58, as shown at the intersection on the 2,000-pound line, while the cost of keep for a cow producing 7,000 pounds of milk is $80, as indicated by the heavy line where it is intersected by the horizontal and vertical lines running from the "$80" and "7,000 pounds," respectively, on the margins. The heavy dotted line, ascending at a much greater angle, shows how much more rapidly the value of the milk increases than the increase in cost of keep.

WHERE IT ALL HINGES.

The heavy line and heavy dotted line intersects where the production is approximately 4,000 pounds of milk, and the cost of keep $67. This is the danger point, and means that at this amount of production there is no profit or loss on the cow—the milk just paying market price for the feed, labor, etc., leaving no balance for the dairyman's living or bank account. For yields below this, the distance between the heavy

continuous and dotted lines represents loss. For yields above this, the distance between the heavy continuous and dotted lines represents profit for head work above pay for the feed and labor at the market price.

The question is frequently asked, "How can it be true that such a large percentage of dairymen are keeping cows at a loss, as is shown by the above chart and the cow census work of Hoard's Dairyman"? There are two reasons for this. One is that the dairyman may be keeping his cows at a loss, over the cash value of the feed, yet he is making a little profit on the crop side of his business, which enables him to exist. If a man is not making a profit in manufacturing or mercantile pursuits, he cannot long hold the business together, but is soon closed out. The other reason why a dairyman may conduct this kind of business and still continue to get an existence is that he may be taking it out of his family by having the children do a large amount of work for which they receive no pay whatever. But this is not the slightest excuse for conducting dairying in this manner. Such an existence is worse than failure, as it means lack of schooling for the children, and ruined lives.

We have seen the tremendous difference in individual cows. Let us now look at the efficiency of the different crops raised on the dairy farm. The only comparable basis on which to judge these is the digestible nutrients produced by each crop per acre. The total digestible nutrient is shown in the right hand column of the following table:

YIELDS OF CROPS RAISED, BUSHELS, POUNDS AND DIGESTIBLE NUTRIENTS PER ACRE.

Crop.	Yield per acre:		Digestible Nutrients.			
	Amount	Lbs.	Prot. Total	Carbo. Total	Fat x 2.25 Total	Total per Crop.
Oat (grain).....	50 bu.	1600	147	757	151	1055
Oats straw.....	1600 lb.	1600	19	618	29	666
			166	1375	180	1721
Corn (grain).....	55 bu.	3080	240	2054	297	2591
Corn stover.....	2 T.	4000	68	1296	63	1427
			308	3350	360	4018
Timothy hay.....	1-1/2T.	3000	84	1302	95	1481
Clover hay.....	2-1/2 T.	5000	340	1790	191	2321
Alfalfa hay.....	4 T.	8000	880	3168	216	4264
Pasture	.....	....	160	585	101	846

It will be seen from this that corn, fed in the form of silage so that the whole crop is consumed, and alfalfa are the two crops producing by far the most digestible nutrients per acre. A 50-bushel yield of oats where the grain alone is fed produces only about one-fourth as much digestible nutrients and pasture only about one-fifth.

Where the right kind of crops are combined with the right kind of cows the best results are obtained.

"Looking a difficulty squarely in the face will often kill it."

MILK INSPECTION FROM THE STANDPOINT OF THE PRODUCER.

By B. H. RAWL, *Chief, Dairy Division.*

Milk is perhaps of all foods the most difficult to control. It is important from the health officers' standpoint because it may be a disease carrier. It is important from the Inspector's standpoint because it is easy to adulterate and the adulteration is hard to detect. Great advances have been made in milk control during recent years, but notwithstanding this fact there is still need that more attention be given to milk than to any other single foodstuff on the American market. Its satisfactory control requires not only good laws well enforced, but a great educational campaign as well, because milk can never be controlled until the consumers contribute their due support to that control.

In some states one officer looks after the adulteration of milk and another is responsible for its sanitation. In other states the same officer looks after both lines. In some states the state commissioner approves the appointment of all local or city inspectors, while in others this is entirely under the city health officer. But in none of the states are there sufficient means available for adequately safeguarding the public against the dangers and the frauds that are associated with this commodity. Since the question of milk control involves the state dairy and food commissioner, the state health officer, and all the city health officers, and because milk production is inseparably connected with milk control, it is impossible for me to discuss the subject from any one particular standpoint. With your permission, therefore, I shall consider it from a general standpoint, hoping thereby to bring out some of the requisites of a system that will satisfactorily safeguard the public so far as this commodity is concerned.

If you will agree that there are not at present sufficient facilities for properly looking after the milk supplies of the

country, then you agree also that all those who are charged with this work should act in harmony for one common end. This should be done for the sake of economy, even if it were not necessary for other reasons.

But what is this common end that we are all seeking? It is a clean, unadulterated, and safe milk supply. Is it not, therefore, essential to the best results that there should be uniformity of action, not only among the states, but more particularly among the cities of a state? The state official, whether required by law or not, should occupy a position of leadership in this matter. To him is entrusted the enforcement of state laws under which the city laws must be made. He, as a representative of the state, is a representative of the cities as well, and why should not the authority of state and city be harmoniously distributed in this as well as in other governmental matters? I do not undertake to say how this should be done, but we cannot but realize that as a general thing there is not enough harmony and cooperation between the two classes of officials, neither of which can get the best results without the assistance of the other. In taking this position with reference to state officers, I am assuming that they have as much interest in the work of the dairy farm inspectors employed by the cities as have the city health officers.

It is a deplorable fact that the average dairy farm inspector is incapable of properly performing the duties of his position. This inefficiency is often due to such positions being used as a means of paying off political debts. So long as the public is willing that a department charged with such important duties shall be misused for political purposes, just so long must it pay the penalty.

But inefficient inspection is not due to politics alone. True it is that there is almost always a lack of men who are qualified as dairy farm inspectors. But this is due largely to the fact that there is not a demand for men with such qualifications. The appointing officers often do not themselves recognize what

qualifications are necessary for this work, nor is it to be expected that they should, for men capable of performing all the duties of health officers (and such appointments are often made by them) should hardly be expected to have also a practical knowledge of dairying. But there is a way to overcome this difficulty, and I shall refer to it later.

Without properly qualified inspectors, dairy farm inspection amounts to naught. Suppose building inspectors knew nothing about building construction, or elevator inspectors knew nothing about elevators, or engine inspectors knew nothing about engines, what would all that inspection amount to? Likewise the inspection of dairy farms by men who know nothing about them amounts to nothing. Suppose, as is often the case, that an inspector goes to a farm and tells the farmer that his permit is revoked because of this or that, and then is not able to tell the farmer how he may, in a practical way that the farmer is able to employ, remedy the difficulty; what will be the outcome? The farmer will likely get indignant and denounce all inspection as a fraud and a menace to honest business. The farmer usually manages in some way to get another permit and goes on selling the same kind of milk that he sold before, or else he goes out of the business; in either event, what has been accomplished in the interest of good milk? The dairy farmer must be taught; if he cannot or will not be taught, then he must be prosecuted.

It is not necessary for all inspectors on a force to have thorough scientific knowledge of milk or of sanitation, for one thoroughly trained chief inspector can in a short while, if the force is not too large, give them training in these two subjects that will enable them to become efficient inspectors. But they must have practical knowledge of the fundamentals of economic milk production; first, because by this means more than by any other are they able to get the farmer's confidence, and, secondly, the giving of assistance of this kind helps to keep down the cost of good milk, which is directly in the inter-

est of the consumer, whom the inspector represents. Such training can best be had at the dairy schools. Often a short course of two or three months is sufficient, and some of the dairy schools are now giving such courses for milk inspectors. The others will probably give them just as soon as there is sufficient demand for them. Inspection, it seems to me, is inseparably connected with production, so far as the control officer is concerned.

Milk producers may be divided into two general groups; first, those who produce good milk, and second, those who produce bad or unsafe milk. The first group I shall pass by. The second may be subdivided into two classes; first, those who are dishonest and are not willing to recognize that they have a right to produce milk only when they comply with the law and supply an article that is safe for consumption; second, those who are honest, are not wilful law-breakers, and would not intentionally do anyone injury, but who are probably prejudiced and ignorant of the dangers that may accompany milk and who think that most of the modern requirements of health officers and food officials are nonsense. For the first class there is but one remedy, the strong hand of the law. They should be put out of the business of milk production as quickly as possible, for the good of consumers and producers as well. For this class the inspector must be a police officer. The second class contains, in my opinion, the majority of the average milk producers of the country. Many of them have been in the business for years and it has grown steadily less profitable to them by reason of the higher cost of feed and labor, stricter sanitary requirements, lack of advance in the price of milk that is in keeping with the increased cost of feed and labor, and the absence of progress in economical production. But it is this class that must, in the main, furnish us with good milk if we ever get it.

The fundamental problem, therefore, that underlies the whole milk question is: "How are we going to get the average

dairyman to produce good milk that can be used with safety"? Can it be done by force? No. It must be done largely by education, and the inspector should be the educator. The consumers must realize, however, that it costs more to produce good milk than bad milk. Much harm to the cause of good milk has in many cases been done by those who, while very zealous in the interest of the consumers, have been unfair to the producers in demanding of them more than was warranted by the prices received for the product. The qualified inspector begins his work with the full realization that he must make himself sufficiently helpful to the farmer to obtain the farmer's confidence and friendship. His first object, therefore, is to determine how this can best be done, and usually the quality of the herd is the first thing that should be taken up, because the average herd is producing little more than half what a good herd will produce. The value of herd records can be explained and sample sheets supplied. The farmer soon learns from his records, and to his surprise, that some of those he regarded as his best cows are unprofitable. The inspector is often able to suggest a change of feed that will bring better results at a smaller cost. I have seen the profits of a herd doubled in this way, even in a very short time. Of course while this is going on minor improvements in sanitary conditions can be secured if the inspector uses tact, but just as soon as the dairyman realizes that the inspector is helping him to make his business more profitable the real work of improving the sanitary conditions can begin, and then the progress along sanitary and economical lines should go hand in hand. The inspector must at all times be careful not to attempt to lead the farmer faster than his means will permit him to follow.

A very large part of the sanitation that is necessary for clean milk is also necessary for the most economic production, and the farmer is much more willing to provide it in the latter case than in the former. For example, a good clean barn that is well lighted and ventilated is just as essential for eco-

nomic production as for clean milk. Let this educational work continue until the farmer becomes a first-class dairyman, and most of the troubles with sanitation are over so far as the producer is concerned.

Each force of inspectors should work under a chief inspector who is thoroughly trained. It should be his duty to select inspectors and train them. The inspectors should be brought together at least once a month for a conference, practice work in scoring, etc. In fact, the chief inspector should be responsible for the milk inspection service. In towns or cities where there are not sufficient funds available to employ chief inspectors, the state department should cooperate with the city department and supply a part at least of such service as would be rendered by the chief inspector. Once a year all of the inspectors of a state should be brought together for a weeks' meeting, so that the whole service could be steadily improved.

If the consumer is to get good milk, it is of course necessary that the farmer produce good milk. But this alone is not sufficient, for suitable methods of transportation and distribution are equally essential. Delayed transportation in hot railroad cars is of course very bad, and distributing plants are often sources of contamination and adulteration. Thorough inspection of these is of course necessary, but it is less difficult than the inspection of the farms.

The consumer must bear his part of this burden. It matters not what kind of inspection is provided for, unless the consumer does his part, the inspection is not going to secure good milk. He must recognize that good milk costs more than bad milk and that the producer is entitled to a fair profit. In the large cities the producers get just about half what the consumers pay for milk. At the present the average consumer takes milk from the man who will sell it to him the cheapest, without any regard to its quality. Many physicians even do this. The farmer, therefore, who goes to the expense of supplying clean and safe milk, gets no more for it, as a rule, than the one who produces milk in the cheapest possible way.

The public must therefore be educated. The schools offer one of the best opportunities for this, but the school teachers must first be taught, and here again comes in the work of the health officer and the chief milk inspector. The consumer must be taught how to properly care for the milk in the home, for much harm results here.

There is not enough educational work in our milk inspection nor is there enough harmony of purpose and action in it. This organization can do much to improve milk and dairy farm inspection and to bring about a better understanding between the producer and consumer.

"When any great design thou dost intend,
Think on the means, the manner and the end."
—*Denham.*

DAIRY INSPECTION FROM THE STANDPOINT OF THE MILK DEALER.

By JOHN NICHOLS, *President International Milk Dealers' Association,* Cleveland Ohio.

Your Secretary in assigning me this subject failed to say what particular kind of milk dealers he referred to, and you know there are two kinds. There is the conscientious, honorable milk dealer, who is using his best efforts to serve the consuming public with only the best possible product that can be had, and who is spending not only his time that he may study the best method to safeguard the public health, but is spending liberally of his good money to equip his business with twentieth century machinery in order that he may follow the new ideas that are brought forth by our chemists and bacteriologists. He surely is in favor of Dairy Inspection; not only does he want Dairy Inspection for his places of business, both in the city and in the country, but he is also anxious for Dairy Farm Inspection, that he may know the farms from which he secures his supply are in the best possible condition.

Then there is the other kind of milk dealer, who does not care what kind of products he sells, so that he can sell at a margin, regardless of the source or condition of the milk. His equipment is just as good as it has to be in order to pass inspection and no better, and he does just what the inspector asks him to do while the inspector is with him, and when the inspector has gone he does just as little as he can, because, regardless of results, it is cheaper. Such a dealer does not like inspection.

Dairy Inspection from the standpoint of the producer, the dealer, and the consumer is very important, but far more important to consumers, for they are not often in a position to know much of the conditions under which their milk is produced or how it is handled by the distributor. They can only depend upon its appearance, and appearance is sometimes a poor thing by which to judge either milk or men.

One of the most unfortunate features of the milk industry is that all milk looks very much alike. When the consuming public is asked to pay a different price for milk that is produced under clean conditions, handled by conscientious dealers with modern equipment, that they may pay the producer a price that will leave them a margin, after paying a small interest on their investment in land, buildings, cattle, and equipment and a reasonable salary for the farmer and his wife, and leave a margin of profit for the dealer, they question the price and seem to regard all milk as the same, and one product worth no more or less than another. But how different when our ladies go to the grocery to buy peaches and find three baskets, one at $1.30, one at $1.50, and the other at $1.70. She takes her choice at the price that best suits the condition of her pocket-book and goes home satisfied. If there are any bad peaches in this basket she can sort them out. How different with milk, and there is just as much bad milk upon the market today as there is bad peaches. There is not much danger of spreading typhoid fever or tuberculosis through the channels of the peach basket, but there is danger in spreading both of these diseases unless this milk is properly produced and handled in a proper manner. In my judgment, much milk is unsafe for use unless perfectly pasteurized, and I believe it would be much better for the consuming public were all dealers compelled to pasteurize their milk by the use of a retarding system under the supervision of competent inspectors.

Shoes can be bought from $1.00 per pair to $5.00, $6.00, or even $8.00 per pair, and the ordinary consumer cannot tell where the difference in value lies and oftentimes the consumer who puts from $5.00 to $8.00 into a pair of shoes depending upon the reliability of the dealer as to quality will insist on buying milk from an unknown source if the price is a cent or two per quart lower than is asked by a reliable concern. You go to your merchant tailor and he will show you three or four different pieces of goods, and the suit when made up will vary

in price from $25.00 to $40.00, and it is pretty hard for the most of us to tell where the value is, and we have got to depend upon the reliability of the dealer.

I hope to live to see the time when the consuming public will look upon the distribution of milk as a reliable business and will give some of the milk distributors credit for being honest and intelligent and that they will wake up to the fact that there is just as great difference in the quality of milk as there is in other commodities. At the present time, however, the consuming public seems to think that milk is milk and that it must sell at one price. I believe there is no one thing that can be done that will bring about the results we would like to see quicker than thorough Dairy Inspection. I believe that I can right when I say that Dairy Inspection is of more importance to the consumer than to anyone else, for the conscientious dealer who has the interests of his customers at heart fully appreciates the importance of sanitation and will buy only from producers who are making a sanitary article. Dairy Inspection is equally important to the better class of producers, better for him for financial reasons if nothing else, for if the inspector's report shows he has a well-constructed stable and that he is keeping it in a sanitary condition, the dealer will pay him more money for his product than he will for milk produced under unsanitary conditions. I regret that conditions at the present time are such that it is not possible for the dealer to make the difference in price for the producer that should be made, but in my opinion this will eventually come about.

There are dealers, I regret to say, who will buy milk of questionable character if the price is low enough to enable them to sell their product to ignorant consumers for less money than the more conscientious dealer who pays for quality can sell for.

Dairy Inspection from the standpoint of the dealer, I may say the better class of dealers, is very necessary and of vast

importance. There has been some antagonism between dealers and inspectors, and there probably always will be. However, I am glad to say that our experience at home, as a whole, has been agreeable and pleasant, and we are working with our inspectors all the time to better the quality of Cleveland's milk supply. Some inspectors are not what we would just like them to be, and we think some of them are not just qualified to fill the position they occupy. However, we hire men that look good to us at the time to fill a certain position, but later on they prove to be unsatisfactory and what is true in our case may also be true in the case of the Inspection Bureau. The position of Dairy Inspector in my mind is one that is hard to fill. He must be a man that is broad and diplomatic. He must be one that understands the Dairy Business from the standpoint of the producer, as well as from the standpoint of the dealer and consumer. He should be one that understands something of feeds and feeding, in order that he may be of help to the producer and by so doing will get the confidence and cooperation of the man who makes the milk. It is no easy matter in thousands of cases to secure improvements, for the producer today is making milk with but little if any profit and were you to insist on immediate changes, in thousands of cases Mr. Producer would tell you that he would stop making milk and this in my judgment is something that must be avoided. When we stop to realize how rapidly the dairies of this country are decreasing in number, it looks serious to me. There is but very little milk today being shipped into our city that is not produced under very good conditions. The inspectors have done their work in a nice way and have been able to secure the cooperation of the producer without driving many of them out of the business.

I had a little personal experience sometime ago with an old producer in a new territory. The good old man had an old barn in which he had been making milk for probably 40 years. and when it was built, undobutedly was the envy of the neigh-

borhood, but today dirt floors will hardly do. He could not see the necessity for more light, and ventilation had never entered his mind. He could not see the necessity for putting in more windows, as he had always been able to find his cows in the dark, and he did not propose for me or for any Dairy Inspector to tell him that he would have to build a milk house, for "By Gosh, he could sell his cows and go out of the business;" to cap the climax, the good old mother, who sat under the apple tree preparing potatoes for dinner said, "Mister, 'nother thing, the Humane Society are going to come out here and make you fellows take out all of these here cement floors. They won't let the cows lay on those hard cold floors any longer." Now I would like to ask you what under the sun can the Inspector do to convert hardened sinners like this pair of good old Western Reserve farmers. You know there are none so blind as those that will not see.

I would like to see more uniform rules for inspection; especially is this true in territory like that surrounding Cleveland, where we have competition from several other cities. Pittsburgh, for instance, has taken out of Cleveland's milk producing territory thousands of gallons of milk, that was excluded from Cleveland's market by the Cleveland Inspectors. It makes it hard to buy good milk when one city is lax in its inspection and the other is more rigid. In fact, one of our suburbs has no inspection at all. One of the producers shipping milk into this suburb told me about 10 days ago that he would not sell milk in Cleveland, for if he did, he would have to build a new milk house and fill in his barn yard, as it is very muddy, and he would sooner sell 2% per gallon less and ship where he was shipping than sell to me and have some inspector come out and tell him what he could and what he could not do. There seems to be an impression with some that Federal or State Inspection would be better, but of this I am not sure. It surely would mean another mix-up between the authorities and the producer, and our conditions as they

exist in Cleveland today are such that the trouble is nearly over. The inspectors do not now wear armor plates, nor do they carry with them Winchesters and bull dogs. The producer has taken the shells from his trusty gun and they seem to understand one another better and are working along the same line with but one thought, and that is to improve Cleveland's milk supply and to decrease infant mortality.

The inspector is making the producer understand that quality counts and that his product will be worth more and will find a more ready sale if produced under sanitary conditions than it will be if he continues in his old methods. I cannot close without saying that from the standpoint of the distributor, I believe inspection a good thing, if he is conscientious and the same is true of the conscientious producer, for it forces the careless and indifferent producer out of competition, and last but not least, is very important, and in my judgment, absolutely necessary, to protect the consuming public against impositions of the most dangerous kinds.

In conclusion, let there be only the most friendly cooperation between the dealer, the producer and the inspector, and there can be but one result and that result will be beneficial to all parties concerned. I would only ask that great care be used in the selection of the inspector. I wish his title could be changed to that of Instructor. The title of Instructor (had he the necessary qualifications to be worthy of that title) would be taken by many with better grace. The title of Inspector has a tendency to frighten some people, they seem to think that the inspector comes only when they have fractured some of the laws and ordinances. I believe it would be made easier for the inspectors and their work would be more efficient were their titles changed to Instructors. I do not wish to leave the impression that all producers are bad, or that all milk is unsanitary or dangerous, far be it from my thought. The majority and the large majority of the producers are doing what in their judgment is right. They are doing the right, as

the Lord gives them the light to see the right, and their products are far from being dangerous; but by further study they can, in many instances, be made better. What they need, in my judgment, is a sufficient compensation for their labor to get them really interested in their work

Dairy Inspection is important at the producing end of the dairy game, but I believe it is vastly more important at the distributing end, for there are today in the United States. thousands of so-called milk peddlers with almost human intelligence, who do not know or believe in the first principles of sanitary science, and will not do the things that are necessary to do to assure the consuming public that this delicate food product is handled in a sanitary way. Many of them have not the mental capacity to know how it should be handled and many of them have so little regard for the rights of others that they would not do what was right to do if they could make a dollar by doing otherwise. With this class of milk peddlers the Inspection Bureau should put their best men and keep them eternally at work until they have converted them, even if they have to use the same method that the Irish Ferryman did when he converted the Jew. The Irishman was about to die, his priest stood watching over his last hours. Just before Patsy passed to the Great Beyond, he said, "Patsy, at the best you have but a few hours longer to live. If you have anything to say you had better be saying it. If you have any sins to be forgiven you had better have them forgiven now." Patsy said. "There is but one thing, Father, and if you are sure I am going to die, I will tell you what it is, but if I am not going to die, I don't dare tell you." "Patsy, you have but a few hours longer to live, you had better make confession and make your peace with God." "Well, Father, I once converted a Jew." "Well, Patsy, that is no sin." "Well, Father, wait until I tell how I did it. I was ferrying this big, fat Jew across the river and he fell overboard. I reached out and grabbed him by the hair of the head and I pulled his head up out of the water and I said: 'Do you believe in the Holy Cath-

olic Church?' and he said, 'No, sir,' and I shoved him under a bit, and I pulled him up again and I said, 'Do you believe in the Holy Roman Catholic Church?' and he said, 'No, sir,' and I shoved him under again, and the third time I pulled him up I said, 'Do you believe in the Holy Roman Catholic Church?' and he said, 'Yes, sir,' but I could not believe the damn Jew, so I shoved him under." In my judgment, if you want to convert thousands of America's milk-peddlers you must use the Irishman's treatment.

"It is much easier to be critical than to be correct."

POINTS TO BE SAFEGUARDED IN THE PRODUCTION AND HANDLING OF MILK.

By W. A. Stocking, Jr., *Professor of Dairy Industry,*
Cornell University.

I wish to congratulate this association upon its organization and the success of this, its first convention. The prime purpose of milk inspection is, to provide as pure a milk supply for the city consumer as it is possible to get under our present industrial conditions. Milk in its purest form is represented by this product as it comes from the udder of a healthy cow, drawn under clean conditions, handled by healthy attendants in sterile utensils, cooled promptly to a point which prevents rapid bacterial increase and delivered to the consumer in the shortest possible time. The agitation for pure or clean milk has become so general and there has been so much discussion on the subject that it is well for us to take account of stock occasionally and keep clearly in mind the fundamental conditions governing the food value of milk.

There are three prime factors governing the food value of milk and these are not materially different from the factors governing the food value of other products. First of all, the food value of milk is dependent upon its chemical composition, primarily upon the percent. of fat and solids it contains. In our inspection work we must not overlook the fact that different qualities of milk represent different amounts of food, just as different cuts of meat represent varying amounts of food. Milk containing 4 or 5% butter fat with its normal solids not fat contains considerably more food than does milk with 3% of butter fat with its normal solids not fat. This is a factor which is sometimes overlooked in our milk inspection work and we have not always made the effort that we should to make the consumers and dealers recognize this point in the purchase and sale of milk.

The second factor influencing the food value of milk is the

amount of decomposition which has taken place in it. This is primarily dependent upon the micro-organisms which it contains. Both the total number and the types of organisms are important factors in this connection. Certain forms of decomposition in their early stages are not normally considered injurious to the adult consumer. This is illustrated by the fact that sour milk is considered wholesome and is frequently prescribed by physicians for persons suffering from digestive troubles. From the standpoint of ordinary commercial milk, however, even this form of decomposition is not desirable. Other forms of decomposition may be produced by other types of bacteria. These changes may not result in definite poisons, but to a greater or less extent lessen the nutritive value of the milk. Bacteria cannot grow in milk without using portions of it for their life processes and of necessity affect its composition.

The third important factor to be considered in the food value of milk is the presence or absence of harmful substances. This may be the presence of definite disease organisms such as typhoid fever, tuberculosis or scarlet fever, or it may be the addition of chemicals or preservatives intended to prevent the decomposition of the milk by checking the growth of the micro-organisms. The use of chemicals is so generally forbidden by law that their use need not receive serious consideration here. This is not so true, however, with regard to the presence of disease producing organisms. The introduction of these disease organisms must be carefully guarded against by the milk inspector.

Kinds of Contamination Affecting Milk.

Milk is subject to different kinds of contamination which must be considered by the careful milk inspector. They may be considered under the following heads:

(a) Insoluble dirt. It is not necessary for me to elaborate upon this point. All of you are familiar with the common

methods of milk production and handling and know the source and the various forms of insoluble dirt which may get into milk.

(b) Soluble dirt. This form of contamination is also understood by you. It differs from the first form in that it cannot be removed from the milk by straining, in any appreciable degree. It is as completely a part of the milk as is the sugar which has dissolved in your cup of coffee. The insoluble dirt may be more objectionable to the eye and is sometimes a serious fault in the mind of the consumer. But the soluble dirt may cause much more serious injury to the milk because of undesirable tastes and odors which it introduces and because it adds materially to the germ content of the milk.

(c) Micro-organisms of various forms gain access to milk which is produced under normal conditions. This form of contamination may include spores of mould plants or dried yeast cells and an indefinite number of forms of bacteria. From the standpoint of their action upon the quality of the milk, this kind of contamination is much more important than either of the first mentioned, because they do not increase in quantity after the initial contamination, while this form, unless held in check by extremely low temperatures, increases in quantity as time goes on . A moderate initial contamination may result in a very large one by the time the milk reaches the ultimate consumer.

(d) By-products of bacterial action. Under this head I wish to include not the disease producing products already mentioned, but simply those which injure the quality of the milk as indicated by the senses of the consumer. Many of the undesirable flavors and odors found in milk are the direct result of bacterial growth. They increase in strength with the growth of the bacteria as the milk increases in age. It will be seen, therefore, that this last form of contamination is really dependent upon the third and that it is the bac-

terial contamination which must be most carefully guarded against by the inspector who wishes to give to his city consumers the best possible quality of milk. I would not be understood as intimating that any of you men are not as well or better versed in this subject as I am, and yet, like the ten commandments, it is well to go over the matter frequently in order to keep clearly in mind and be able to recognize at their face value, the essentials for the production and handling of clean milk.

The chief sources from which milk receives its bacterial infection may be grouped as follows:

1. The udder of the cow. The amount of infection coming from a healthy udder is too small to be regarded seriously for ordinary market milk. For the production of high grade certified milk, it is a source of infection which may be taken into account. The organisms commonly coming from the healthy udder are so few and of such types that they produce little appreciable effect upon the milk during the period which it is commonly held before consumption. If the udder be diseased, however, or the cow is suffering from generalized disorders, the infection taking place in the udder may be extremely important. I believe the milk inspector should give very careful attention to the general health of the cow and especially to the udder, which should be carefully examined at frequent intervals for the presence of any disorders which may carry into the milk disease producing germs.

2. The surface of the cow's body is probably under ordinary conditions one of the most serious and important sources of contamination. The number of organisms getting into the milk from this source will be dependent upon the condition of the cow's body and the form of pail used for milking. Any number of different forms of the common saprophitic organisms get into the milk from this source. For clean milk it is highly essential that the body of the cow shall be kept reasonably clean and so treated just before milking

that the amount of dust falling into the pail shall be reduced to the minimum. The simple process of wiping the flank and udder with a damp cloth just before putting the milk pail into position will very materially reduce the amount of dust and the number of organisms falling into the milk from the cow's body.

3. Another important source of contamination is the atmosphere of the stable, which should be kept as free as possible from dust at the time of milking. Such operations as brushing the cows, sweeping the stable, feeding dry feed, should not be done *immediately before* milking. If done at all they should be done long enough before milking to allow the dust and bacteria to settle out of the atmosphere. If it is impossible to do this, it probably is better, under ordinary conditions, to leave these operations until after the milking has been done. The use of a small top milk pail is extremely efficient in reducing the contamination from this source and also that from the body of the cow.

4. It sometimes happens that the milker himself is a serious source of contamination, the amount depending upon the dirt on the man's hands and clothing at milking time. It is not necessary to call your attention to the fact that milking with wet hands should never be permitted. Neither should the milker be allowed to agitate the cow more than necessary. It has been found by careful trials between men milking in the same barn under identical conditions, that one man may normally obtain milk with six times the germ content that another man obtains.

5. Sometimes the dairy utensils prove to be a bad source of bacterial contamination. The structure of the utensils and the method of cleaning should be carefully watched by the inspector. They should have no open seams or cracks where milk may lodge and not be completely washed out each day. The use of steam for sterilizing all dairy utensils is, of course, the method par excellence, but boiling water may give just

as efficient results if properly used. The strainer cloth should receive special attention since this is one of the most difficult utensils to wash clean and frequently does not get sufficient exposure to boiling water or steam to kill the large number of organisms which collect in it.

Regulation of Sanitary Conditions for Milk Production.

In our attempt to determine and control the sanitary quality of milk, two general procedures have been developed. One of these has to do with the sanitary conditions existing at the farm and the places where the milk is handled. The other aims to determine the actual quality of the milk by a laboratory study of the milk itself as it is delivered to the consumer. Both of these methods are valuable and in the hands of a careful worker may go far toward providing the city dweller with a safe milk supply. In the sanitary inspection and control of conditions of production, we have worked on the assumption that the real quality of the milk is dependent upon these conditions. In order to have some *measure* to work by, we have developed and are now relying to a large extent upon some form of score card on which we record certain specific conditions existing at the farm and give these conditions a numerical value, and then we assume that the sum total of these conditions represents the quality of the milk coming from the farm.

The score card has been one of our most efficient means for improving our milk supply and I would not in any way detract from its value. I wish, however, to call attention to the fact that the score card, even in its present well developed form, does not necessarily give us an index to the real sanitary quality of the milk. A little reflection upon the way in which the score card has been developed will make this matter clear.

So far as I know, the first form of the score card which is now in general use was developed by a few dairy experts putting their heads together and arbitrarily deciding what

points shqould be considered and the relative value they should carry for the production of sanitary milk. This served as a starting point for our present score card, which has been changed from time to time and improved materially until we now have our present card in its highly developed form. Originally the value of the different factors included in the card was of necessity determined arbitrarily, and while later work has modified the relative importance of certain factors, it is still true that the relative importance of the different items on the card is in a considerable degree based upon opinion and not upon accurate research or knowledge. For example, why should we give 40 points to equipment and 60 to methods? Who knows the relative value of these two divisions? Or why should we give 6 points to "tuberculin test" and 4 points to "construction of stable?" Again why should we allow 5 points for use of a small top pail when the investigation work which has been done would indicate that from 50 to 75% of the bacteria may be kept out by the use of this device? I call attention to these points not to discourage the use of the score card but that we may keep clearly in mind its real value and avoid drifting into the habit of considering it an infallible measure of the sanitary quality of the milk. The following examples will indicate the discrepancies which may sometimes occur between the score of the farm and the actual bacteria counts of the milk produced:

Farmer A.

Sanitary score of Farm:

Equipment	27.4	
Methods	48.5	
	——	Total score.. 75.9

Bacterial counts of milk as delivered to consumers:

Date.	Bacteria per cc.
April 17	3,250

April 20	2,250
May 2	2,250
June 20	4,500
July 23	6,500
Sept. 5	8,500
Oct. 10	500
Or an average count of	3,960

for the summer's milk.

Farmer B.

Sanitary score of Farm:

Equipment	33.5
Methods	54.5
Total Score	88.0

Bacterial counts of milk as delivered to consumers:

Date.	Bacteria per cc.
April 4	105,000
April 30	404,000
April 30	191,000
Aug. 1	85,000
Aug. 1	76,250
Or an average count of	172,250

for the summer's milk.

I could give you other illustrations of the discrepancy betweeen the score of the farm and the actual bacterial content of the milk, but this is sufficient to illustrate my point. I wish simply to point out the fact that we must use the score card, valuable as it is, for what it is worth and not fall into the error of believing that it is the final measure for the sanitary condition of the milk. To my mind the chief value of the score card is in its educational effect on the milk producer. The fact that the relative value of the various items

may not be absolutely accurate does not prevent the card from being of educational value. It enables the producer to get at least a general idea of the conditions which should prevail for the production of clean milk and indicates to him those places where improvement can be made. I am sure that as time goes on we shall come to know more definitely the comparative value of the various items on the score card and that the card will continue to improve in its working efficiency. At present it is the best measure we have of the conditions desirable for the production of clean milk and we must use it for what it is worth.

Regarding the laboratory examination of milk, I can say only a word. You are all familiar with the opinion of our leading bacteriologists regarding the value of bacterial counts of market milk. We all recognize that with our present methods it is not possible to obtain as accurate data on the germ content of a given sample of milk as we would like to do. If, however, we assume that the sanitary quality of milk is dependent upon its germ content, then I think we must admit that a carefully made bacteriological analysis gives us the most accurate measure of this. This is especially true if the laboratory worker determines not only the total count as obtainable by definite, uniform methods but also determines the relative prevalence of certain types of organisms. True it is that the presence or absence of those species which we most fear cannot be determined by the plate method, but the presence of active disease organisms is comparatively infrequent in milk while the presence of those forms causing digestive troubles in children is probably much more frequent and on the whole probably causes more deaths than all of the epidemics of specific diseases put together. Should we not recognize the value and short-comings of both of these methods and combine the two for the best results?

Another point which I wish to call to your attention and which I think is an important one in our present educational

campaign toward cleaner milk is the *misbranding* and use of *misleading terms* by our milk dealers. The common use of the word "aerated" displayed upon the sides of milk wagons is without any meaning and simply serves to confuse the milk consumer. The use of terms indicating the cleanliness of the milk, such as clean milk, pure milk, clarified milk, etc., frequently represent no virtue in the milk but sometimes the opposite.

An illustration of this misbranding was seen in the milk exhibit held at the International Dairy Show. In scoring the exhibits for cleanliness and flavor, I came to a bottle bearing on the cap "Pure Milk Produced Where Cleanliness Is Paramount." Imagine my surprise and disgust when, upon looking at the bottom of the bottle, I found it one of the dirtiest in the entire exhibit, comprising 175 entries. The bottom was literally covered with sediment. When consumers purchase milk bearing such a label as this and find that it is full of dirt, they lose all confidence in the use of descriptive terms and any term indicating sanitary quality fails to carry with it the idea of greater food or commercial value. I believe this custom of using such terms incorrectly is a decided draw-back to our progress toward clean milk and is a matter which should be carefully considered by you milk inspectors with a view to correcting this bad practice in your own communities.

Another point which I wish to call to your attention is the quality of the milk inspector himself. If all our milk inspectors were of the tpye of those before me, I would not waste your time by what I am now going to say, but we know that in many places milk inspectors have been appointed by local authorities, who had no training or special qualifications for the work, frequently being appointed as the result of a political deal. We are all of us too familiar with the disastrous results following the work of such inspectors. I believe that much progress has been made in the last few

years toward the employment of men with at least some degree of fitness for the inspection work. You men recognize the importance of this matter and would appoint only inspectors of ability. The public, however, does not yet recognize the importance of this question. This is indicated by the type of men who are applying for the position of milk inspector both under the National Government and for local cities.

It was my duty a short time ago to grade the papers of a large number of applicants for positions as milk inspectors, some for government positions and others for particular cities. The candidates for these positions included men of varying amounts of education and training, a number of them having degrees from institutions of learning. I wish to read to you a few of the questions and answers included in these papers simply to indicate the type of men who are still applying for positions as milk inspectors.

Question: (a) Name the constituents of milk. (b) Give the percentage of each in normal milk.

Answer: (a) Fat, albumen, ash, bacteria. (b) Fat should at least contain from 3 to 4%. Albumen should not contain any more than 5% and no less than 3%. Ash will not contain any more than 5% if the milk is said to be pure and clean. Bacteria will contain from 75 to 85%.

Question: Name four breeds of dairy cattle and give the characteristics of each.

Answer: Four breeds of Dairy Cattle are: English variety is the Highness, a long horn cow. Scotch variety, large and dark brown with white faces. English variety, short horn Heresford.

Question: Discuss changes in milk due to bacteria action.

Answer: Milk that is dirty and the sediment which appears on the bottom of bottle or vessel is a

sure point that their is scarlet fever or many other germs of which lead to dangerous diseases especially among infants feeding on such milk not knowing the difference between the good and bad unhealthy milk as its appearance is a watery dirty color.

Question: In establishing a dairy farm what steps would you take to put it on a profitable basis?

Answer: In establishing a dairy farm, buy cattle which gives abundance of milk and breed that give more cream than milk.

Question: (a) Define pasteurization. (b) Name the advantages and disadvantages of pasteurization.

Answer: (a) Pasteurization is a field of grass where a cow may be turned out to get fresh air, its eating for the day and its necessary rest. (b) The advantages derived are that a cow getting plenty of grass, the necessary rest and water, it will produce wholesome milk, that is, it will contain all the parts and come up to market requirements. The disadvantages are that a cow while out in pasture will wander and probably enter a garden where onions and the like are raised and possibly eat some of the onions and in that way the milk would not come up to the standard, that is, it would have that onion taste. Another disadvantage is that a cow lying down in a field is apt to lay on some stones and hurt the udder, which is dangerous.

These answers, of course, have their humorous side, but to me they are far more serious than funny because they indicate the standard which is still prevalent in the public mind regarding the type of men employed for the sanitary inspection of our milk supply. Not until the public realizes that this type of men cannot secure positions, will they have the confidence in the work which is necessary for its ultimate success. You men are in a position to influence materially public opinion in this respect and I leave it with you to con-

sider with that degree of seriousness which the circumstances justify.

Just one more point I wish to mention and that is the economic side of the milk problem. No industry can exist unless it rests upon an economic foundation which gives to all persons connected with it a fair degree of financial success. This is not true in all sections of our country at the present time in regard to the milk industry. In some sections the milk producers are going out of business because they claim there is no money in its production. In other sections the milk dealer, especially the small dealer, is being forced out for the same reason. The ultimate success of the milk industry is, I believe, assured because of its economy of production. We sometimes forget the fact that one good dairy cow will produce in her year's milk as much food as will be produced by five or six steers during the same period. At the same time the dairy cow will eat little more food than will each of the steers. The same thing is true when we compare the production of milk with our other animal foods. At present the dairy products cost the consumer less per unit of food than does any other animal food. Whether or not it is necessary to raise the price to the consumer, there is not time to discuss here, but I believe we should keep clearly in mind the fact that both producer and dealer must find in the milk business a fair return on his capital and labor, and we must not overlook the fact that our progress along the line of improvement in the sanitary quality of milk is dependent upon this fact. It costs more to produce high grade goods of any sort than it does low grade and the industry must be reimbursed for this additional cost. No industry can be developed beyond the point where it returns a reasonable profit to those engaged in it. Let us not overlook this fact in our efforts to improve the quality of our milk supply.

"Other men's sins are before our eyes; our own behind our back."

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