Proceedings of the nineteenth annual convention of the Southern Wisconsin Cheesemakers' and Dairymen's Association held at Monroe, Wisconsin, Thursday and Friday, March 13 and 14, 1919. 1919

Southern Wisconsin Cheesemakers' and Dairymen's Association
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MEMBERSHIP

Of the Southern Wisconsin Cheesemakers' and Dairymen's Association, 1919.

A.

Acherman, Peter ..... Darlington, Wis.
Ault, Ren, Route 3 ..... Monroe, Wis.
Arn, Adolf ..... Monticello, Wis.
Altman, Paul J. ..... Monticello, Wis.
Arn, John ..... Monticello, Wis.
Acherman, Joseph ..... Monroe, Wis
Aeschlimann, J. J. ..... Monroe, Wis.
Atherton, O. H. ..... Monroe, Wis.
Aeschlimann, John Z. ..... Monroe, Wis.
Arthur, Frank ..... Monroe, Wis.
Abplanalp, Adolf, Route 1 ..... Juda, Wis.

B.

Baebler, Albert Jr. ..... Monroe, Wis.
Buergy, Jacob ..... Monticello, Wis.
Burkhalter, Gottlieb ..... Monroe, Wis.
Bushnell, Edgar, Route 4 ..... Monroe, Wis.
Burkhalter, John ..... Monroe, Wis.
Ball, Chas. ..... Monroe, Wis.
Brunkow, W. F. ..... Monroe, Wis.
Burkhalter, Fred, Route 1 ..... Monroe, Wis.
Bridge, C. B., Route 2 ..... Orangeville, Ill.
Beyerhofer, Theo ..... Monroe, Wis.
Brodhead Cheese & Cold Storage Co. ..... Chicago, Ill.
Brodhead Cheese & Cold Storage Co. ..... Brodhead, Wis.
Buholzer, Xaver, Route 4 ..... Argyle, Wis.
Buholzer, Emil, Route 2 ..... Monroe, Wis.
Burcalow, B. S., Route 1 ..... Monroe, Wis.
Brown Bros., Route 2 ..... Monroe, Wis.
Blumer Ezra, Route 4 ..... Monroe, Wis.
Bontly, W. E. & Co. ..... Monticello, Wis.
Babler, P. J. ..... Monticello, Wis.
Bank of Monticello ..... Monticello, Wis.
Bernet, Peter ..... Monticello, Wis.
Baebler, Henry B. ..... Monroe, Wis.
Beyerhofer, Ed. ..... Monroe, Wis.
Bennett, Dr. C. W. ..... Monroe, Wis.
Benkert, Jacob ..... Monroe, Wis.
Benkert & Stauffacher ..... Monroe, Wis.

Baltzer, M. E. ..... Monroe, Wis.
Buehler, Frank ..... Monroe, Wis.
Becker, Wm. Co. ..... Monroe, Wis.
Boss, Fred ..... Monroe, Wis.
Bucher, Jacob ..... Monroe, Wis.
Blum, Sam ..... Monroe, Wis.
Bobb, H. C. ..... Monroe, Wis.
Becker, Dave ..... Monroe, Wis.
Bear, Dr. W. G. ..... Monroe, Wis.
Bolender, J., Dry Goods Co. ..... Monroe, Wis.
Buehler, Chas. H. ..... Monroe, Wis.
Burke, Peter ..... Monroe, Wis.
Blumer Sales Co. ..... Monroe, Wis.
Benkert, F. E. ..... Monroe, Wis.
Booth, Max G. ..... Monroe, Wis.
Ball, Henry ..... Monroe, Wis.
Barlow, C. L. ..... Monroe, Wis.

C.

Campbell, Harry J. ..... Royal Oak, Mich.
Collentine, John ..... Monroe, Wis.
Cornish, O. B. ..... Ft. Atkinson, Wis.
Clark, Chas. ..... Monticello, Wis.
Clark, M. Earl ..... Monroe, Wis.
Chambers, C. L. ..... Monroe, Wis.
Clayton, W. D. ..... Monroe, Wis.
Chadwick, Howard W. ..... Monroe, Wis
Clark, Dr. R. B. ..... Monroe, Wis.
Clark & Schindler ..... Monroe, Wis.
Carr, George J. ..... Monroe, Wis.
Caradine, Dr. H. B. ..... Monroe, Wis.
Carroll, Edward ..... Monroe, Wis.
Collentine, Frank, Agt. ..... Monroe, Wis.
Corson, Frank E. ..... Monroe, Wis.
Crouch, Bert ..... Monroe, Wis.
Caradine, H. N. B. ..... Monroe, Wis.
Camenzind, Frank ..... Brodhead, Wis.

D.

Dahler, Mike ..... Darlington, Wis.
Detweiler, Fred, Route 4 ..... Monroe, Wis.
Detweiler, John ..... Monroe, Wis.
Dedrick, H. E. ..... Brodhead, Wis.
Deininger, E. M. Route 2 ..... Juda, Wis.
Duerst, Henry J. ..... Monroe, Wis.
Day Bros. ..... Monroe, Wis.
Discher & Schneider ..... Monroe, Wis.

Dunwiddie, Wm. ..... Monroe, Wis.
Dunwiddie, Brooks ..... Monroe, Wis.
Dunwiddie, John ..... Monroe, Wis.
Dodge, Chas. S. ..... Monroe, Wis.
Dodge Lumber Co. ..... Monroe, Wis.
Deininger, John ..... Monroe, Wis.
Duerst, Math C. ..... Monroe, Wis.
Dallenbach, Gottfried ..... Monroe, Wis.

E.

Erickson, Anton, 1030 Jenfray St. ..... Madison, Wis.
Eaton, Geo. W., Route 9 ..... Monroe, Wis.
Emmenegger, Robt., Route 1 ..... Gratiot, Wis.
Elmer, Alvin A. ..... Monroe, Wis.
Elmer, John H. ..... Monroe, Wis.
Etter, John T. ..... Monroe, Wis.
Einbeck, Bros. ..... Monroe, Wis.
Emmenegger, Fred ..... Monroe, Wis.
Elmer, Henry ..... Monroe, Wis.
Edwards, E. L. ..... Monroe, Wis.
Elmer, Adam ..... Monroe, Wis.
Elmer, Jacob H. ..... Monroe, Wis.

F.

Ford, J. B. Co. ..... Wyandotte, Mich.
Feldt, John, Route 6 ..... Monroe, Wis.
Fritsch, John D. ..... Monroe, Wis.
Fritsch, John F., Route 1 ..... Clarno, Wis.
Faeser, John, Route 8 ..... Monroe, Wis.
French Cheese Co. ..... Browntown, Wis.
Frautschy, Arthur ..... Monroe, Wis.
Fritz, Dave ..... Monroe, Wis.
Fitzgibbons Bros. ..... Monroe, Wis.
Faeser, Fred ..... Monroe, Wis.

G.

Gates, Geo. P., Sharples Sep. Co. ..... Madison, Wis.
Grinnell, W. O. ..... Monroe, Wis.
Green, R. C. ..... Edgerton, Wis.
Gempeler, Jacob Sr. ..... Monroe, Wis.
Goetz, John & Son ..... Monroe, Wis.
Gettings, John ..... Monroe, Wis.
Green County Herold ..... Monroe, Wis.
Gnagi, Dr. W. B. ..... Monroe, Wis.
Gettings, Miles T. ..... Monroe, Wis.
Geigel Hardware Co. ..... Monroe, Wis.
Geigel, Jacob ..... Monroe, Wis.

Grinnell & Messmer ..... Monroe, Wis.
Geiger, W. J. ..... Monroe, Wis.
Gifford, R. B. ..... Monroe, Wis.
Geiger, J. H. ..... Monroe, Wis.
Galle Cheese Co. ..... Monroe, Wis.
Gorham, Ernest ..... Monroe, Wis.
Gorham, R. D. ..... Monroe, Wis.
Geigel, John, Route 6 ..... Monroe, Wis.

H.

Holcomb, Ernest ..... Monroe, Wis.
Hanson, John ..... Monroe, Wis.
Haberman, H. W., Route 7 ..... Monroe, Wis.
Hauser, Thomas ..... Basco, Wis.
Huber, Emil ..... Argyle, Wis.
Hare, L. L., Route 8 ..... Monroe, Wis.
Hefty, Henry T. ..... Monroe, Wis.
Hodges, Dr. F. L. ..... Monroe, Wis.
Heer, Ab. & Son ..... Monroe, Wis.
Heeren, J. B. ..... Monroe, Wis.
Hauser, John T. ..... Monroe, Wis.
Hefty, Henry ..... Monroe, Wis.
Hartnett, J. J. ..... Monroe, Wis.
Huber, Anton ..... Monroe, Wis.
Hawthorn, Wm. ..... Monroe, Wis.
Holmes, R. M. ..... Monroe, Wis.

I.

Ingold, Ferdinand ..... Monroe, Wis.

J.

Jaberg, Roy ..... Monroe, Wis.
Jeffery, F. D. ..... Monroe, Wis.
Janke, L. F., Sherman Hotel ..... Madison, Wis.
Jackson, E. R. ..... Blanchardville, Wis.
Jordan, Charles A. ..... Monticello, Wis.

K.

Klassey, Joshua, Sr. ..... Monroe, Wis.
Koller, Anton ..... Orangeville, Ill.
Klassey, Henry, Route 6 ..... Monroe, Wis.
Keller, Alfred ..... Monroe, Wis.
Koller, O. ..... Brodhead, Wis.
Kittleson, M. ..... Blanchardville, Wis.
Kooreman, Gerrit ..... Monticello, Wis.
Knobel, Albert ..... Monticello, Wis.
Klassy, H. C. ..... Monticello, Wis.
Kubly, Dietrich ..... Monroe, Wis.

Keel, Everett ..... Monroe, Wis.
Knight, M. J. ..... Monroe, Wis.
Karlen, Jacob, Jr. ..... Monroe, Wis.
Karlen, Gottlieb A. ..... Monroe, Wis.
Krueger & Kundert ..... Monroe, Wis.
Kundert, Henry Sr. ..... Monroe, Wis.
Knipschild Bros. ..... Monroe, Wis.
Knipschild, John Jr. ..... Monroe, Wis.
Kohli, Louis H. ..... Monroe, Wis.
Kohli, Chas. R. ..... Monroe, Wis.
Kessler, Earl ..... Monroe, Wis.
Knight, W. J. ..... Monroe, Wis.
Kundert Bros. ..... Monroe, Wis.
Kellenberger, Robert ..... Monroe, Wis.

L.

Luchsinger, John ..... Monroe, Wis.
Lenherr, Jacob ..... Monroe, Wis.
Liechti, Carl ..... Verona, Wis.
Loveland, W. A. ..... Monticello, Wis.
Lengacher, Rudy ..... Monticello, Wis.
Laabs, Jim ..... Monticello, Wis.
Lorch, J. F. ..... Monroe, Wis.
Lynch & Lynch ..... Monroe, Wis.
Lanz Bros. ..... Monroe, Wis.
Ludlow, Henry ..... Monroe, Wis.
Ludlow, Willis ..... Monroe, Wis.
Ludlow, Edwin ..... Monroe, Wis.
Lamboley, F. E. ..... Monroe, Wis.
Lanz, Fred ..... Monroe, Wis.
Luchsinger, F. B. ..... Monroe, Wis.
Lichtenwalner, J. P. ..... Monroe, Wis.

M.

Marty, Fred ..... Monroe, Wis.
Morris, George ..... Monroe, Wis.
Meyers, Austin ..... Monroe, Wis.
Marshall, A. J. ..... Madison, Wis.
Monticello Auto Co. ..... Monticello, Wis.
Martini, Aug. ..... Monticello, Wis.
Marty, Fred C. ..... Monticello, Wis.
Meier, John ..... Monticello, Wis.
Marty, Carl & Co., 216 N. Ohio Street ..... Chicago, Ill.
Morton, Earl ..... Monroe, Wis.
Marty, Gempeler Co. ..... Monroe, Wis.
Monroe Light & Fuel Co. ..... Monroe, Wis.
Musselmann, Fred ..... Monroe, Wis.

Monroe, Dr. Wm. B. ..... Monroe, Wis.
Miller, Walter ..... Monroe, Wis.
Miller, Charles E. ..... Monroe, Wis.
Metropolitan Store, Inc. ..... Monroe, Wis.
Marty, Dave ..... Monroe, Wis.
Miller & Weaver ..... Monroe, Wis.
Monroe Lumber & Fuel Co. ..... Monroe, Wis.
Meythaler Bros. ..... Monroe, Wis.
Mauermann, Dr. J. F. ..... Monroe, Wis.
Monroe Land Co. ..... Monroe, Wis.
Monroe Electric Co. ..... Monroe, Wis.
Meythaler, Chas. T., Sr. ..... Monroe, Wis.
Morton Salt Co. ..... Milwaukee, Wis.

N.

Naef, John, Route 4 ..... Argyle, Wis.
Neuenschwander, Will, Route 8 ..... Monroe, Wis.
Newman, Dr. M. J. ..... Monroe, Wis.
Nicollier, Edward ..... Monroe, Wis.
Noble, J. Earl ..... Monroe, Wis.
Norton, Geo. W. ..... Monroe, Wis.

O.

Ohl, J. S. ..... Monroe, Wis.
Ott, L. C., Route 8 ..... Monroe, Wis
Odell, Emery A. ..... Monroe, Wis.

P.

Preston Bros. ..... Monroe, Wis.
Portmann, Casper ..... Darlington, Wis.
Peoples Supply Co. ..... Monticello, Wis.
Perkins & Burgy ..... Monroe, Wis.
Priewe, Wm. ..... Monroe, Wis.
Pietzsch, George ..... Monroe, Wis.

R.

Rinehart, Wm. ..... Monroe, Wis.
Roderick, J. L. ..... Brodhead, Wis.
Roth, Paulus ..... Monroe, Wis.
Regez, Ernest ..... Blanchardville, Wis.
Rottler, R. G. ..... Monroe, Wis.
Ruf, Paul A. ..... Monroe, Wis.
Regez, Jacob ..... Monroe, Wis.
Roth, Christ ..... Monroe, Wis.
Roub, Dr. J. F. & Son ..... Monroe, Wis.
Regez, Herman ..... Monroe, Wis.
Regez, Rudy ..... Monroe, Wis.
Roth, H. C. ..... Monroe, Wis.

Reck, E. D. ..... Monroe, Wis.
Rote, Alvin F. ..... Monroe, Wis.
Roderick, Claude A. ..... Monroe, Wis.
Rufenacht, Fritz, Route 7 ..... Monroe, Wis.
Ruprecht, O. H. ..... Dubuque, Iowa.
Rinehart, Myron, Route 1 ..... Browntown, Wis.

S.

Sammis, J. R. ..... Madison, Wis.
Stauffacher, Peter ..... Monroe, Wis.
Stauffacher, W. J. ..... Monroe, Wis.
Shepley, Chas. ..... Monroe, Wis.
Stauffacher, Emil, Route 6 ..... Monroe, Wis.
Smith, William ..... Monroe, Wis.
Stuart, Richard ..... Monroe, Wis.
Schmidt, N. C., Route 8 ..... Monroe, Wis.
Sprecher, J. U. ..... Madison, Wis.
Schoepfer, John ..... Darlington, Wis.
Schindler, Thomas ..... Monroe, Wis.
Stauffacher, Jacob, Route 7 ..... Monroe, Wis.
Smith, Roscoe, R. R. ..... Monroe, Wis.
Sharples Separator Co. ..... Chicago, Ill.
Stauffacher, Nic, Route 6 ..... Monroe, Wis.
Schlaeppi, Albert, Route 2 ..... Browntown, Wis.
Smith, Chas. J., Route 4 ..... Monroe, Wis.
Stocker, Carl, Route 2 ..... Juda, Wis.
Stocker, Albert, 5428 Nat. Street ..... Milwaukee, Wis.
Scott, Charles ..... Blanchardville, Wis.
Scott, G. A. ..... Monroe, Wis.
Sherron, J. L. ..... Monroe, Wis.
Schindler, Charles A. ..... Monroe, Wis.
Schmidt, Leon ..... Monroe, Wis.
Streiff & Bauman ..... Monroe, Wis.
Stauffacher, Fred J. ..... Monroe, Wis.
Schaad, Emil ..... Monroe, Wis.
Swartz, Harry C. ..... Monroe, Wis.
Schneider Bros. ..... Monroe, Wis.
Shriner Bros. ..... Monroe, Wis.
Schneider, Max ..... Monroe, Wis.
Scheidegger, Ernest ..... Monroe, Wis.
Service Garage ..... Monroe, Wis.
Soseman, Dr. J. D. ..... Monroe, Wis.
Stearns, G. O. ..... Monroe, Wis.
Stauffacher, Ernest ..... Monroe, Wis.
Strahm, John ..... Monroe, Wis.
Schmid, Carl ..... Monroe, Wis.
Schindler, Dr. A. J. ..... Monroe, Wis.

Saucerman, W. T. ..... Monroe, Wis.
Schober, Rudy ..... Monroe, Wis.
Schneider, Chas. H. ..... Monroe, Wis.
Schiess, Conrad ..... Monroe, Wis.
Siegenthaler, Mrs. Fred ..... Monroe, Wis.
Steffin, Jacob ..... Monroe, Wis.
Schmidt, Nickolaus, Sr. ..... Monroe, Wis.
Stauffacher, I. M. ..... Monroe, Wis.
Solbraa, M. E. ..... Monroe, Wis.
Stettler, Christ, Route 1 ..... Juda, Wis.
Saalsaa, Martin ..... Monroe, Wis.
Schwartzlow, Charles ..... Monroe, Wis.
Stewart, John W. ..... Monroe, Wis.
Stauffacher, M. H. ..... Monroe, Wis.
Stoldt, Albert ..... Monroe, Wis.

T.

Tschudy, Andrew, Route 5 ..... Monroe, Wis.
Thorp, Geo. E. ..... South Wayne, Wis.
Trickle, Joe, Route 8 ..... Monroe, Wis.
Tschudy, Fred, Route 5 ..... Monroe, Wis.
Treat, Ben ..... Monroe, Wis.
Times Printing Co. ..... Monroe, Wis.
Thorp, E. M. ..... Monroe, Wis.
Trukenbrod, W. F. ..... Monroe, Wis.
Trukenbrod, W. E. ..... Monroe, Wis.
Theiler, Robert ..... Monroe, Wis.
Trachsel, Albert C. ..... Monroe, Wis.
Tuttle, H. W. ..... Monroe, Wis.
Thorp, James ..... Monroe, Wis.
Treat, Frank A. ..... Monroe, Wis.
Trumpy, Jos. ..... Monroe, Wis.
Trumpy, Fred ..... Monroe, Wis.
Trumpy, Henry ..... Monroe, Wis.

V.

Voegeli, Albert ..... Monroe, Wis.
Van Wagenen, H. G. ..... Monroe, Wis.
Voss, Gust ..... Monroe, Wis.
Vogt, Carl ..... Monroe, Wis.
Voelkli, Henry ..... Monroe, Wis.
Vogel, Gottfried, Route 6 ..... Monroe, Wis.

W.

Winiger, Victor, R. R. ..... Monroe, Wis.
Walters, Ed., George St. ..... Monroe, Wis.
Woelfli, Theo., Route 9 ..... Monroe, Wis.
Waelti, John ..... Monroe, Wis.

Wellborn, Ernest ..... Blanchardville, Wis.
Wittwer, Edward ..... Monticello, Wis.
Wittwer, Gottlieb ..... Monticello, Wis.
Woodle, L. A. & Son ..... Monroe, Wis.
White, Leland ..... Monroe, Wis.
Whalen, George ..... Monroe, Wis.
Wenger, Sam ..... Monroe, Wis.
Wenger, Rudy ..... Monroe, Wis.
Wagner L. S. ..... Monroe, Wis.
Wettengel, F. W. ..... Monroe, Wis.
Wier, Dr. M. R. ..... Monroe, Wis.
Wescott, John ..... Monroe, Wis.
Wenger, John C. ..... Monroe, Wis.
Wilkinson, G. W. ..... Monroe, Wis.
Weirich, P. J. ..... Monroe, Wis.
Wells, Grant ..... Monroe, Wis.
Wuthrich, Simon ..... Monroe, Wis.
Waelti, Gottfried ..... Monroe, Wis.

Y.

Yaeggi, Fred, Route 3 ..... Shullsburg, Wis.
Young & Co. ..... Monroe, Wis.

Z.

Zimmerman, John ..... Monroe, Wis.
Zweifel, J. P. Jr. ..... Monticello, Wis.
Zilmer, W. F. ..... Monroe, Wis.
Zilmer, A. W. ..... Monroe, Wis.
Zinser & Duebendorfer ..... Monroe, Wis.
Zumbach, Gottfried ..... Monroe, Wis.

OFFICERS FOR 1919

President—Fred Marty, Monroe, Wis.
Vice President—John Deininger, Monroe, Wis.
Secretary—Henry Elmer, Monroe, Wis.
Treasurer—Joseph Trumpy, Monroe, Wis.

Directors.

Charles R. Schepley, Monroe, Wis., for three years.
Fred E. Benkert, Monroe, Wis., for two years.
Gottfried Waelti, Monroe, Wis., for one year.

Judges on Cheese.

Fred Marty, Monroe, Wis.
F. W. Galle, Monroe, Wis.
Anton Huber, Monroe, Wis.

Committee On Resolutions.

Henry G. Van Wagenen, Monroe, Wis.
John P. Lichtenwalner, Monroe, Wis.
Fred Trumpy, Monroe, Wis.

Auditing Committee.

Albert Babler, Monroe, Wis.
Chas. R. Schepley, Monroe, Wis.
Jacob Burgi, Monticello, Wis.

ADDRESS OF WELCOME.

By J. L. Sherron.

Mr. President, Officers and Members of this Association, Ladies and Gentlemen:

To me has been accorded the very pleasant and agreeable task of appearing before this association this morning, not so much in a personal way, but rather in a representative capacity, and on behalf of the people of this city and this community, extending to you a most hearty welcome. In doing this I feel assured that I am not only expressing the sentiments of the business and professional men and women of this city, but the sentiments of all classes of our citizenship.

The city of Monroe is known far and wide for the hospitality of its residents, and they are always pleased to welcome and entertain any men or organization whose purpose is to advance the business or social welfare of the community.

Experience has shown that all business enterprises are more or less interdependent, and that the growth and development of each, if attained in an honest and proper way, necessarily tends to promote the general prosperity of all. Experience has also shown that any business enterprise that hopes to attain legitimate and lasting success must be based upon honesty, integrity and a thorough knowledge of its underlying business principles. Dishonesty and trickery may for a time give to a business undertaking an appearance of success, but eventually the truth will come out and its true nature will be revealed, and then like a house built upon sand it will collapse leaving disappointment and ruin.

As I understand the primary aim and purpose of your Association is to promote the growth and development of the cheese and dairy interests of Southern Wisconsin, and the degree of success already attained is to me the strongest evidence that in the past you have adopted and followed the principles above mentioned—honesty,

integrity together with a knowledge of the underlying business principles of these industries. I am not particularly familiar with conditions in other counties of Southern Wisconsin, but I do know from reliable sources that the cheese and dairy products manufactured in Green county have a wide, and as I believe, a well merited reputation for purity and wholesomeness.

The cheesemaker, the dairy farmer and the dealer in cheese and dairy products have in the fullest sense of the term put Green county on the map.

As a result of this great wealth has come to this section. It would be difficult to find a more prosperous community than is to be found in Green county and other counties in this section of the state where the cheese and dairy business has become permanently established, and this association through its conventions and the enterprise of its members is well worthy of the support and encouragement of all. I believe that this association through the great work in which it is engaged in disseminating useful and practical knowledge pertaining to these industries has a bright and promising outlook. The great world war which for four years has shook the leading nations of the earth to their very foundations, bringing in its train untold woe and suffering, has at last terminated, and we are now in the after-math of that gigantic struggle. The period of reconstruction is now at hand, and just what the future may have in store for us, no one can say with absolute certainty. We know that after the close of the Civil War, after a brief period of restless uncertainty, this country experienced the greatest industrial and business awakening it had ever known.

It is now, I believe, the general concensus of opinion among those best qualified to speak, that this country is about to enter a period of industrial expansion and business enterprise never before witnessed in this or any other country. It is needless to say that the industries which this association is promoting,—the cheese and dairy interests,—will participate in this great business

and industrial boom and reap a rich reward therefrom.

Man after all is a good deal of an animal; he must eat to live, and any industry that is engaged in the production of a clean, palatable and wholesome food product need have no fear that there will not always be a good demand for it. Primarily owing to the ravages of the great war there is to-day a decided scarcity of foodstuffs in Europe, and if reports are reliable, in some parts of Europe there is actual want and starvation. This deplorable condition of want and suffering is manifesting itself in a revolutionary social and political movement called "Bolshevism," which if not checked, menaces the peace and safety of the world.

A hungry, discontented man is always a dangerous factor in any community; he is pretty apt to listen and be swayed by the plausable, though deceptive argument, of the wily advocate whose primary aim is to create a state of unrest and social disorder.

It is the general opinion of those who are in the best position to know, that food and plenty of it is the most effective weapon with which to fight bolshevism or any other movement of a similar nature.

So, I say to this association and all others who are interested, build up and promote to the fullest extent the cheese and dairy interests; produce all you can, and even then, in my opinion, you will not be able to meet the full demand for many years to come.

At this time I feel that it is meet and proper to pay a slight tribute to the memory of your former president and our esteemed townsman, Mr. S. J. Stauffacher whose untimely death was a great shock to this community and a decided loss to this association. Mr. Stauffacher was a man of the highest probity; he took a great interest in this association and he was deservingly proud of its achievements; every movement having for its aim the welfare of the business and social interests of the community always received his hearty support and cooperation, and in advocating what he believed to be just and right he was fearless and out-spoken.

REMARKS BY ACTING PRESIDENT.

By John Deininger.

Little did I think a year ago when I was elected by this association for vice president that I would have to take the chair as acting president. And should I had known it I don't think I should have accepted it. It is no easy task to take the place of such a highly qualified man as Mr. Stauffacher. He seemed to know just what to say and when to say it. He has done some remarkable work for the cheesemakers and dairymen of this county. In those few years that I was an officer in this association he had been several times to the legislation and also to Washington, D. C., and he was always doing some good, as his voice had some influence with the legislation committees and with the large membership of this association behind him. However I will try and do the best I can. With your co-operation with me, we will try and make this meeting a success.

All kinds of business have organizations and conventions, lumber men, hardware men, rural route mail carriers and even the poor threshermen. The threshermen of Wisconsin have done wonderful work at their conventions. It has been about ten years since they organized and since then they have done more for the good of the threshermen than any other organization that I know of. They have drafted bills and sent committees to the legislature's committee until they have a law that has saved many lives. If you only knew how many threshermen's lives were lost before they were organized, it would surprise you. And I have not heard of a single death of a thresherman at the last convention I attended about three weeks ago. The law used to be they, the threshermen, had to carry some planks 2 inches thicks, 12 inches wide and not less than 10 or 12 feet long, and if they went through a bridge they were in for it and had to pay the damage. And now the law is, any bridge over

a 6-foot span will have to hold a draw load of 15 tons and if anything happens the town in which it happens are in for the damage. That is what they have accomplished in this organization. That is what the cheesemakers and dairymen can accomplish if they will work in harmony and work together. If the cheesemakers and dairymen knew what this association has accomplished for their good this hall would not hold half of them.

REPORT OF SECRETARY

By Henry Elmer.
Monroe, Wis.

Mr. President and Members of the Association:

This is the fifteenth time that I have the honor to report upon the work as secretary of this association.

Early in the year of 1918 we engaged Mr. John Z. Aeschlimann as Factory Instructor. Mr. Aeschlimann did very satisfactory work during the season of 1918. He worked in all 164 days and visited 353 factories. In his paper "My Experiences as Cheese Factory Instructor in the Past Year," he will give a more detailed report of his work.

On March 23, 1918 the Executive Committee voted to add $300.00 to the Sinking Fund and to loan this amount to a responsible party at 5% interest. The committee, also voted, that the Secretary's alary shall be $50.00 per year and that $10.00 extra shall be paid to him for solicing members, also all necessary expenses. The President's salary shall be $50.00 per year. The Vice President, Treasurer and each of the three Directors shall receive One Dollar each for every meeting they attend. The claims of the Monroe Dramatic Club and Mrs. Wegg-Booth each one for five dollars was allowed.

At the meeting held on January 7, 1919 the following Resolution was passed by the Executive Committee:

Whereas, the Father of all has in his infinite wisdom, removed from our midst our President, S. J. Stauffacher, and

Whereas, the intimate relationship held during years of inestimable service with the Southern Wisconsin Cheesemakers' and Dairymen's Association, make it fitting that we, the Directors and Officers record our appreciation of him, therefore be it

"Resolved that the removal of S. J. Stauffacher from the Southern Wisconsin Cheesemakers' and Dairymen's

Association in which he has been a faithful and efficient President for eleven years leaves a vacancy which will be deeply felt by the Directors and Officers as well as all the Members of the Association, therefore be it also

"Resolved, that with deep sympathy with the afflicted family, relatives and friends of the deceased, we express our earnest hope, that even so great a loss may be appeased by the knowledge of an exemplary life spent in the service of his fellow men, and be it further

"Resolved, that a copy of this resolution be sent to Mrs. S. J. Stauffacher and sons and to Mr. Peter Stauffacher and family, as well as to each of the local papers."

The Executive Committee agreed to hold the 1919 convention on March the 13th and 14th at Monroe, Wis., and to give the usual evening entertainment. The Secretary was instructed to procure speakers and get everything ready for a successful convention.

It was also agreed to pay John Z. Aeschlimann the balance of the $1000.00 state money amounting to $16.00.

At the meeting of February 11, 1919, it was agreed to engage Bast's seven piece orchestra to furnish the musical program for Thursday and Friday evening, also the Monroe Dramatic Club to give a three act play Thursday evening, same to be repeated Friday evening. The Secretary was instructed to secure another orchestra to play at the close of every afternoon session. The secretary was ordered to insert a want ad in the Green county Herold to secure a factory instructor for the year 1919.

Our treasury is in a very prosperous condition. We have for the year 1919 a balance of $1776.33 on hand, besides a sinking fund amounting to $1310.47. Mr. Jos. Trumpy will give us a detailed report of the receipts and disbursement during the year 1918 - 1919.

Mr. Fred Marty and your Secretary on February 19, 1919 were in Madison to be present at the hearing regarding the Whey Butter Branding law and did all we could do to help in order that said law be repealed. Your

Secretary spared no work in order to get the different supply houses to donate special prizes also this year to the cheese exhibitors and that he was successful in his work is shown by the premium list on the program.

Each cheesemaker who captures a prize should thankfully acknowledge the receipt of same to the respective firm and use their goods. As I emphasized at previous conventions, we are to have more support from the dairymen and the cheesemakers as this association is really doing their work.

I hope that we all will enjoy this convention, and if we all will take an active part in the discussion of every subject, it will make this the very best convention we ever had.

In conclusion let me thank you one and all for the support you have given during the past year and especially during those last days.

I thank you.

HENRY ELMER, Secretary.

REPORT OF TREASURER.

By Joseph Trumpy.

DISBURSEMENTS

March 15, Prof. Hugh G. Van Pelt	$ 69.00
Order No.	
213-215—Mrs. Nettie B. Wegg, for music furnished during 1918 convention	35.00
214-216—Miss Charline Booth, for 3 act play 2 nights during 1918 convention	75.00
218—L. A. Woodle & Son 2,000 adm. tickets and advertising	8.93
219—Times Printing Company for 500 membership cards, 2000 1918 convention programs and advertising	15.50
220—Fred L. Kohli hall rent for 1918 convention	45.00
221—Young & Co., for material for cooking demonstration during 1918 convention	3.56
222—Badger Cheese Co. cheese display	5.00
223—Prof. J. L. Sammis, Madison, expenses during 1918 convention	9.05
224—H. C. Bobb for photograph 1918 cheese display	2.00
225—Miss Fern Bast for 1918 convention work	4.00
226—S. J. Stauffacher for 1917 salary and expenses	34.85
227—Secretary Henry Elmer for 1917 salary and 1917 and part 1918 expenses	37.60
228—Green County Herold for 1000 O. and D. cheese factory inspection blanks	10.00
229—A. H. Barber Creamery Supply Co. for 2 dozen pint composite test bottles	1.80
Paid John Z. Aeschlimann direct from state during season of 1918, cheese factory in	

structor	938.60
230—Robert Emmenegger first prize Round Swiss cheese 1918 convention	5.00
231—Fred Stoller, second prize on Block Swiss	2.50
232—Carl Liechti, first prize on Limburger	5.00
233—Fred Langacher, second prize on Limburger	2.50
234—Kohli Jewelry Co., two gold and one silver medals	17.00
235—John Z. Aeschliman, balance salary	45.40
236—Robert Kohli Trust Estate, printing 1000 letter heads and 500 envelopes	9.25
237—L. A. Woodle & Son, publishing resolutions in memory of president S. J. Stauffach, deceased.	1.50
238—Times Printing Co., publishing resolutions in memory of President S. J. Stauffacher	2.10
239—John Z. Aeschliman, balance to make his salary for 1918 $1000	16.00
Floral Piece for S. J. Stauffacher	4.00
Total Disbursements	$1405.14

RECEIPTS

March 13, 1918, Balance	$1798.50
March 14, Fern Bast, membership	53.00
March 15, Fern Bast, membership	33.00
Ed Wittwer Bros., Monticello	50.00
Henry Elmer, membership	186.00
Ernest Regez, Blanchardville	1.00
Geo. Ott	1.00
Jacob Gempeler	16.00
Asht Bros. Cheese Co.	4.00
Henry Elmer	6.00
March 14, Tickets sold at hall at 25c per ticket	42.50
March 15, Tickets sold at hall at 25c per ticket	33.87
Sharples Separator Company, donation	10.00

Brodhead Cheese & Cold Storage Co.	8.00
Rec'd from stae during season of 1918	938.60
Total receipts	$3181.47
Total disbursements	1405.14
Balance for 1919	$1776.33
1919 Balance	$1776.33
Sinking fund	1310.47
Total	$3086.80

PRIZES FOR CHEESEMAKERS.

Donated by the Marschall Dairy Laboratory, Manufacturers of Rennet Extract, Madison, Wis:

For highest score of all Cheese Exhibits, one twenty-five dollar Waltham Watch, 16 size, with 25 year guaranteed gold filled engraved Hunting Case and 17 jeweled Waltham movement.

Donated by the A. H. Barber Creamery Supply Co., Chicago, Ill., Machinery and Supplies for Making and Handling Dairy Products:

Second prize on Swiss—One Facile Jr. Babcock Tester.

Donated by the J. B. Ford Company, Wyandotte, Mich., manufacturers of Wyandotte Dairymen's Cleaner and Cleanser:

First prize on Swiss—Six Fruit Knives of the new "Queen Elizabeth" Pattern, one of the most beautiful examples of the silversmith's art. They are heavy plated silver with handsomely finished handles.

First prize on Block—Six Fruit Knives of the "Queen Elizabeth" Pattern, one of the most beautiful examples of the silversmith's art. They are heavy plated silver with handsomely finished handles.

First prize on Brick—Six Fruit Knives of the new "Queen Elizabeth" Pattern, one of the most beautiful examples of the silversmith's art. They are heavy plated silver with handsomely finished handles.

Donated by the Chr. Hansen Laboratory, Inc., Milwaukee, Wis., manufacturers of Rennet Extract, Butter Color, Rennet Tablets, Etc.:

For highest score of all Cheese Exhibits, except Swiss Cheese, One Five Dollar Check.

Donated by the General Laboratories, Madison, Wis., manufacturers of the celebrated Disinfectant, "B K.":

For first, second and third prize on Round Swiss, each one gallon B. K. For first, second and third prizes on Block Swiss, each one gallon B. K. For second and third prize on Brick, each one gallon B. K. For second and

third prize on Limburger, each one gallon B. K.

Donated by Parke, Davis & Company, Chicago, Ill., manufacturers of Curdalac, Spongy Pepsin, Rennet Extracts, etc.

Second prize on Block—One gallon Rennet Extract.

Second prize on Brick—One gallon Rennet Extract.

Third prize on Brick—One gallon Curdalac.

Third prize on Limburger—One gallon Curdalac.

Donated by Lehmaier, Schwartz & Co., Inc., New York, N. Y., manufacturers of Tin Foil, H. G. Van Wagenen, Monroe, Wis., local representative:

First prize on Limburger—One Mirroir Aluminum Tea Kettle.

Second prize on Limburger—One Illinois Aluminum Coffee Pot.

Donated by the Conley Foil Co., New York, N. Y., manufacturers of Tin Foil, C. R. Schepley, Monroe, Wis., local representative:

For highest score of Limburger wrapped in Conley Foil—One beautiful Ansonia Mantel Clock, valued at $12.00.

Donated by the Sharples Separator Co., Chicago, Ill., Marty Gempeler, Monroe, Wis., local representatives for Sharples Separators only:

For highest score of all Cheese Exhibits—$7.00 cash.

For second highest score of all cheese Exhibits—$5.00 cash.

For third highest score of all Cheese Exhibits—$3.00 cash.

Donated by the Association:

Gold Medals or equivalent Cash Prize to the Cheesemakers having highest scores on Swiss, Block Brick or Limburger Cheese.

Silver medals or equivalent Cash prize to the Cheesemakers having second highest scores on Swiss, Block, Brick or Limburger Cheese.

Also $20.00 to be divided pro rata among all cheese exhibits scoring 90 and above except those that received gold or silver medals.

CHEESE SCORES.

Limburger Cheese.

First prize.

John Meyer, Monticello, Wis. .....96. points

Received a gold medal. One Mirroir Aluminum tea kettle and one beautiful $12.00 Ansonia mantel clock.

Second prize.

Victor Winiger, Monroe, Wis. .....93. points

Received silver medal, one Illinois aluminum coffee pot and one gallon B. K.

Third prize.

Rudy B. Langacher, Monticello, Wis. .....91. points

Received $1.93 in cash, one gallon B. K. and one gallon Curdalac.

Badger Cheese Co., Monroe, Wis. .....97. points

Badger Cheese Co., Monroe, Wis. .....96.50 points

Badger Cheese Co., Monroe, Wis. .....95. points

Complimentary Scores.

Emil Huber, Argyle, Wis. .....90. points

Received $1.92 in cash.

Brick Cheese.

First prize.

Joe Lauber, Blanchardville, Wis. .....97.25 points

Received gold medal, six "Queen Elizabeth" pattern fruit knives and $5.00 check.

Second prize.

Albert Schlaeppi, Browntown, Wis. .....97. points

Received cash $2.50, one gallon B. K. and one gallon Rennet Extract.

Third Prize.

Carl Liechti, Verona, Wis. .....95.50 points

Received one gallon B. K., one gallon Curdalac and $2.05 cash.

Badger Cheese Co., Monroe, Wis. .....96. points

Badger Cheese Co., Monroe, Wis.....95. points

Complimentary Scores.

Carl Stocker, Juda, Wis. .....95. points
Received $2.03 in cash.
Christ Stettler, Juda, Wis. .....94.50 points
Received $2.02 and $5.00 in cash.

Block Cheese.

First prize.
Robert Emmenegger, Gratiot, Wis. .....91. points
Received in cash, $5.00 and $3.00, one gallon B. K. and six "Queen Elizabeth" pattern fruit knives.
Second prize.
Victor Winniger, Monroe, Wis. .....89. points
Received in cash $2.50, one gallon B. K., and one gallon Rennet Extract.

Swiss Cheese.

First prize.
Albert Schlaeppi, Browntown, Wis. .....97.50 points
Received in cash, $5.00 and $7.00, one 17 jeweled Waltham watch, one gallon B. K. and six "Queen Elizabeth" pattern fruit knives.
Second prize.
Peter Acherman, Darlington, Wis. .....97. points
Received $2.50 in cash, one gallon B. K., and one Facile Jr. Babcock Tester.
Third prize.
Adolf Abplanalp, Juda, Wis. .....96.50 points
Received in cash $2.06 and one gallon B. K.
Xaver Buholzer, Argyle, Wis. .....94.50 points
Received in cash $2.02.
Robert Emmenegger, Gratiot, Wis. .....94. points
Received $2.01 in cash.
Carl Stocker, Juda, Wis. .....92.83 points
Received in cash $1.98.
Frank Camenzind, Brodhead, Wis. .....92.50 points
Received $1.98 in cash.

ADDRESS

By George J. Weigle

Dairy and Food Commissioner

Mr. Chairman, Gentlemen:

About a year ago—at your last convention—I had the pleasure of addressing your association on the subject of the dairy laws of the state of Wisconsin. I have again been asked to speak to you on this subject, and if in talking today I touch upon matters I spoke of last year, I trust you will pardon me. The Wisconsin legislature, as you all know, is now in session, but they have not as yet enacted any laws that pertain to the dairy industry. There are a number of bills introduced, in which I believe you will be interested, and I shall speak of these a little later.

Before I tell you about the proposed laws, I believe you would be interested in knowing something of the history and work of the Dairy and Food Department. So many people do not know what the Dairy and Food department is doing. Some believe that it has to do only with the dairy industry and know nothing at all about the drug, the food and the weights and measures departments.

You as citizens of the state have a right to know and should know what the state official can do and is doing for you, and what benefits you are deriving from departments which have been established for the good of the people.

The Dairy and Food Commission, in my estimation—and I say it pridefully—is one of the most important branches of our state government. And when I say that I do not mean to belittle the responsibility and activities of the other state departments, but the Dairy and Food Department guards the public health, and public health is the foundation upon which rests the happiness of the people and the welfare of the state. It is not the cre-

ation of a political party—to provide jobs for political friends; it was established for the one purpose of serving the people and is as old as time itself. We have to go back four thousand years, to the time of Joseph and Pharaoh. Joseph was the first food commissioner appointed—appointed by the king, Pharaoh, of Egypt. As time went on we find that the Egyptians, the Greeks and the Romans made laws to regulate the manufacture of food and drugs. Every nation has had food legislation in some form or another, and as our civilization has advanced more and more, so have our laws become more and more complicated, but it is interesting to know in passing that the laws now on our statutes are based upon the simple laws of the Jews as given in the 14th chapter of Deuteronomy.

However, it was not until twenty-five years ago that Wisconsin had its first comprehensive general food law, and since that time laws have been enacted at each successive session of the legislature raising the standard for our dairy foods and drugs and eliminating little by little the unscrupulous manufacturers and dealers.

Few people realize the enormous amount of work carried on by the dairy and food department, its responsibility, and the difficulties that confront the commissioner in enforcing the many and varied laws which the legislature has placed under his jurisdiction, but before I enter into a discussion of the work of the department I wish to take up briefly its personnel. It is comprised of the commissioner, who is the responsible head of the commission and upon whose shoulders rests the burden of seeing to it that the laws are enforced honestly and impartially. Then there are two assistant commissioners, nine dairy inspectors who inspect cheese and butter factories, milk plants, and all places where dairy products are manufactured and sold, a chief chemist who has charge of the inspection and analysis of all food products and drugs made in and shipped into the state, and four assistant chemists who make the analyses of the samples sent to the laboratory. Three food inspectors who

inspect bakeries, confectioneries, ice cream plants, groceries, meat markets, bottling plants and cold storage warehouses, taking care of the sanitary conditions, and gathering samples of suspected food to be sent to the laboratory for analysis. Then there is a weights and measures department with a chief inspector supervising the work of eight inspectors of weights and measures who devote their time to the testing of scales of all kinds from the sensitive drug scales to the huge track scales. The office force consists of a secretary and five stenographers, with additional help during the busiest part of the year.

Established in 1889 with a force of three—the commissioner, a dairy expert and a state chemist,—the department has grown to comprise a personnel of nearly forty members, whose function it is to promote the dairy and food industry and to protect the consuming public against adulterated dairy, food and drug products. Food laws are of rather recent origin; the growing necessity of such laws is to be found in the changing social conditions of our people. As our method has become more and more artificial and has been farther and farther removed from the simplicity of our fathers, the dangers of contamination and the opportunity for adulteration has become greater and greater. Adulteration and misbranding of dairy foods and drugs are of two kinds; the one springs from deliberate purpose; the other is usually the result of carelessness. One is just as dangerous as the other. Our food laws are intended to reach both classes, for there is no agency more important to the welfare of the people than that which guards the food supply of our people.

The expansion of the department has not been accidental, but has been the result of deliberate consideration and determination by Wisconsin men to provide means for eradicating or holding in check and reducing to a minimum the harmful consequences of adulteration and substitution of dairy, food and drug products.

When we consider the dairy industry in its pioneer

days and the men who fought its battles under the greatest difficulties, without protection from the law, we often wonder how they were able to do what they have done and how the industry survived and grew to what it is today. Responsible for many of the laws which brought about the greatest improvements in Wisconsin's dairy industry are such men as Governor W. D. Hoard, Professor Henry, Professor Babcock, Wisconsin members of congress, members of the state legislature, my predecessors in office, and members of various organizations. These laws will remain an everlasting monument to these men, through whose initiative, foresight, persistence and untiring efforts they were enacted. They saw the vision of Wisconsin as a wonderful dairy state,—the greatest dairy state in the Union.

In 1889, under the leadership of the late Ex-Governor Hoard and others, the first laws were enacted for the suppression of the fraudulent manufacture and sale of imitation butter and cheese. The annual production of cheese at that time was sixty million pounds, and at no time since has the honest manufacturer met with such dishonest competition. Those men were loyal to the industry, and their fight against the counterfeiters brought about the standardization of butter fat in cheese.

In 1895 Governor Upham stated in his message to the legislature:

"The high reputation which the Wisconsin cheese product earned, and for a long period maintained in the market, has been injured by the manufacture within the state, and by the sale, of what is called "filled cheese," greatly inferior in quality, but not distinguishable from the better product by ordinary inspection. While not favoring paternalistic legislation, I deem it to be the duty of the legislature to protect by adequate measures this great industry against permanent injury by fraud, and to protect the people against imposition. I recommend, therefore, the enactment of some well-considered law which shall under appropriate penalty, compel the manufacturers and vendors of such cheese to so

brand, mark or color it that it shall no longer be sold for what it is not."

Then came the sanitary laws, the laws relating to the under-reading and over-reading of the Babcock test; a law defining the word "food;" and others prescribing standards and definitions for various articles of food. In 1909 standards and definitions were prescribed for butter and cheese, for milk, cream, ice cream, etc., to raise the quality of the products that were produced in the state.

In 1915 the law licensing all the cheese factories and creameries in the state went into effect, and I consider this one of the big pieces of constructive legislation for the benefit of the dairy industry. We now have in the office at Madison a complete record of conditions at each of the factories in the state. That law raised the making of butter and cheese to a profession which required preparation, and as a result of it our factories are better regulated today than they have ever been. There is furnished by our rules and regulations, a standard of cleanliness by which they may be guided and by which they are judged.

Law on Emmenthaler Cheese.

In 1917 the whey butter law was enacted—and I do not need to tell you anything about that. There has been a great deal of discussion regarding it of late. Following this came the law limiting the moisture in American cheese to 40 per cent. Before this law was passed cheese makers were incorporating as much water as they could to increase their yield, and matters had come to such a pass that it was impossible for the honest cheese maker in many districts to remain in the game and remain honest, and we were again in danger of losing our reputation for high grade cheese. The law has now been in force for two years, and results are noticeable. American cheese is not the soggy, moist article it was. There is still room for improvement but a great deal has been done in this short time.

Other dairy laws passed in 1917 were those with reference to the appointment of special dairy and food inspectors and the pasteurization of factory by-products. This last named law was placed under the jurisdiction of the Department of Agriculture with the assistance of the inspectors of the Dairy and Food Department.

The enforcement of some of these laws may seem to have been rather slow to the minds of some people; they may think that not enough has been accomplished, but I want to say that the enforcement of new laws must necessarily be slow in the beginning. The laws must be tested, tried out, to see that they are workable, and that they have true worth, and the machinery for their enforcement must be perfected. But I feel that in the short time that these laws have been in effect a great deal of good has been done.

This brings me to a discussion of the bills that are now before the legislature.

Perhaps the most important of these is the one to limit the amount of moisture in Brick cheese to 42 per cent. The moisture law passed at the 1917 session had only to do with American cheese; the present bill has to do with Brick cheese. What was true of American cheese two years ago is true of Brick cheese today. There is too much moist, soggy Brick cheese being made.

With the passage of this Brick cheese moisture law the cheese industry of Wisconsin will be put back on a firm foundation; the dishonest cheese maker will be compelled to be honest—in the matter of moisture, at least—the honest cheese maker can make cheese without losing money; there will be an increased demand for Wisconsin product, and the industry will grow and prosper. That is the ideal toward which we are striving in trying to enact these moisture laws—to put Wisconsin's cheese industry on a good solid foundation where only honest and wholesome competition can exist.

There is a bill to require all milk at milk depots, cheese factories and creameries to be bought on the milk fat basis and not on the pooling system. This, I believe, is

the solution of the skimming and watering evil. We receive letters almost daily from cheese makers asking us to send an inspector to the factory to test the milk as it comes in. "I believe some of my patrons are skimming and watering their milk"—they say. If it were required that all milk should be paid for on the amount of butter fat it contained, skimming and watering would soon stop. Dairymen would try to increase the amount of fat—they would take much better care of their cows, they would feed them more wisely; they would do everything that a dairyman can do to increase the amount of butter fat in his milk, and as a result we would have better dairy herds on our farms.

There is another bill introduced which requires that all operators of the Babcock test shall be licensed. Many of the men who are operating the Babcock test today do not fully understand it—they read it as best they can, but they have had no instruction. Consequently there is a great deal of suspicion on the part of the farmer whose milk is tested. He is not sure that the tester is right, and when his milk averages a low fat content he grumbles and finally comes to us for help. We are glad to help out in such cases, and to settle the disagreement, but it is costly work. You can see that when I tell you that our inspectors have large territories and they try to work them systematically so as to save as much time and as much traveling as possible, and if a man is asked to make a special trip into another part of the territory he is going to lose time and spend unnecessary money. Babcock test operators should be licensed and before they can be licensed they must show that they are competent to do the work.

There is still another bill relating to the dairy industry before the legislature, and that is the bill to license all cream buying stations in the state. The licensing of these stations will mean that clean and sanitary conditions will and must prevail where cream is handled and stored. It seems only just and proper that the cream buying stations should be under the very same supervis-

ion that the factories are. The passage of this bill will mean closer supervision over the milk and cream supply, and that in turn will mean better quality raw material.

Another evil which is gradually creeping in and for which we have no regulation is the manufacture of vat made block Swiss cheese and its sale as kettle made. We have received several letters of late pertaining to this cheese. This vat-made cheese does not have the fine texture nor the keeping qualities of the kettle-made cheese and should not be sold as such. I believe it should be made in a different size to distinguish it from the genuine article which has won Wisconsin its reputation for a quality product. I would suggest that the Swiss cheese dealers of Wisconsin get together, draft a bill and have it introduced in the legislature, and thus protect the industry. In my opinion this vat-made article should be labeled "Brick Cheese with Swiss flavor."

I have given you all the bills that have ben introduced in the legislature that pertain to the dairy industry. With all these added laws to enforce, the department remains the same in size. The Department has not a sufficient number of men to do the work that is allotted to it; each man has too large a territory to cover. I should like to see about twenty dairy inspectors traveling about the state,—each with a territory of such size that he can remain to help an operator when he sees that he is in trouble. But such a force of inspectors requires a large appropriation, and a large appropriation depends upon the expressed need for more inspectors from those whom those inspectors can help.

We need your help and cooperation in everything that we do—I wish that I might impress that very forcibly upon you. The success of the Dairy and Food Commission depends to a very great extent on the cooperation that we receive from you as cheese makers of the state, and also, of course, from the butter makers. We need your cooperation in the enforcement of the laws, we need your cooperation in maintaining sanitary conditions ev-

erywhere where food is made, we need your cooperation to improve the quality of the raw material so that Wisconsin's dairy products may have first place in the markets of the world.

The Improvement of Whey Cream.

Prof. G. H. Benkendorf

Madison, Wis.

The rather recent increase in the amount of whey cream produced in Wisconsin is a striking illustration of the rapid changes that have taken place in the development of the dairy industry during the past twenty-five years.

During the summer of 1905, only a brief fourteen years ago, Professor Farrington of the Dairy Department of the University of Wisconsin made an extensive study of the manufacture of whey butter at Swiss cheesefactories in southern Wisconsin and found practically all factorymen skimming the whey by either one of two methods commonly termed the "cold process" and the "hot process." This was just about the time the centrifugal separator was being introduced for the purpose of separating the whey.

It may be of interest to discuss these two methods.

In the "cold process" the whey was run into large wooden tanks on the outside of the building. These usually had a shed roof to offer the whey some sort of protection. The whey stood in these tanks for about twenty-four hours and the cream which came to the surface by gravity was skimmed off by means of a tin scoop. Of course this method was not very efficient but the cheesemakers employing it recovered a part of the fat. Tests made by him showed that the whey after the cream was skimmed from it still tested about .3 percent fat, which is just about what the whey at American cheesefactories usually tests before it is separated.

The "hot process" was more satisfactory but still very crude. Soon after the sweet whey was taken from the kettle it was subjected to a temperature of about 170 degrees F to 180 degrees F. About twenty pounds of very sour whey was added to it and this mixture was

then constantly stirred for about thirty minutes. White cream would soon begin to rise to the surface and after a while the kettle would be covered with a whitish layer of cream. The cream was then dipped from the surface by means of a scoop and strained through coarse linen cheese cloth into small tubs. Of course some whey would naturally be scooped off with the cream but this was gotton rid of by means of a hole in the bottom of the tub.

This method is much more efficient than the "cold process" and the whey tested after skimming as low as .05 percent fat, which compared with .30 percent fat by the "cold process" showed up very well for the hot process. The quality of the cream was also very much superior. The "cold process" produced a cream that was decidedly sour, testing as much as .7 percent acidity, while by the "hot process" the cream only tested a .15 percent acidity.

It does not take much imagination to appreciate the quality of the butter made from whey cream standing in a tank out of doors (even though it had a roof over it) for twenty-four hours until it became about as sour as it could get. For that reason the "hot process" was better, even though the objection was raised that it required a lot of extra fuel to heat the whey to such high temperatures. I have made inquiries and have been unable to hear of any cheesefactories that are employing either the hot or cold method at the present time.

The centrifugal separator has completely captured the field. About 1903 Mr. Fred Marty, whom you all know, was instructor at the dairy school and became interested in the installation of a whey separator to instruct the students to the advisability of separating the whey by centrifugal force. Being an instructor in the Dairy and Food Department, he was able to do a lot of good work along that line and Professor Farrington reports in his bulletin which he wrote during the summer of 1905, that there were then about eight or ten centrifugal separators at the Swiss cheese district.

Of course the introduction of the separator was slow

because it meant a radical departure from old methods and because many of the factories were not equipped with power to operate these power machines. However, the losses in the whey at Swiss cheesefactories is so great that they saw the needs of separating the whey and were the first to develop the industry. The American cheesemaker did not fall in line until some few years later.

Under the old "cold process" only about four pounds of fat was recovered from 1,000 pounds of milk. Comparing this with the centrifugal method where we now recover 7 pounds of fat from 1,000 pounds of milk, it is evident that there has been a very striking improvement on this point.

It is not a question at the present time of "Does it pay?" I well remember attending meetings near Hollandale some years ago where we tried to persuade the factorymen that it would pay to separate the whey by centrifugal force. I presume that if these same factorymen would be asked to report their present income from whey cream, they would probably put it at around $2,000 to $2,500 per year for an ordinary sized factory. Of course a good part of this increase is due to the fact that the price of butter fat has very materially increased, but nevertheless the amount of money derived from the whey cream is a very neat tidy sum.

It shows that as an industry develops, the by-products are utilized more and more. In the cotton industry in the South, one of the big problem that the cotton ginner had to contend with was the problem of getting rid of the accumulation of cotton seed. This is not the problem at the present time because the farmers appreciate the value of cotton seed meal. There is a ready and stable market for the same.

There is a saying about the packing industry that "nothing is lost but the squeal" and it is the by-products according to their story that make the packing industry profitable at the present time.

Whey cream has been termed a by-product, but at

Swiss cheesefactories I do not think it advisable to speak of whey cream as a by-product for this reason:—The whey from 1,000 pounds of milk will yield about 7 pounds of fat. On account of the high price of fat, this cream can be sold at the present time for from 50 to 60 cents a pound or about four dollars for the 1,000 pounds of milk delivered. I believe that the whey cream should be considered one of the products of a Swiss cheesefactory.

It is well known that there is no class of dairy products that requires a higher grade of milk than does Swiss cheese. It must be delivered two times a day, and it must be and is perfectly sweet. This milk within a short time is heated up to a temperature of 125 degrees to 140 degrees. The utensils which it comes in contact with must be kept scrupulously clean. Therefore if it is separated soon after the whey is drawn, it is very evident that the quality of the cream can not help but be very superior. Comparing the quality of the cream at the present time with the quality of that old sour, "cold process" cream that was made into butter fifteen years ago, we can see a very marked improvement.

It is now a question of getting this excellent whey cream to the creamerymen or ice cream maker in good shape. To produce a good grade of whey cream requires not only good raw material but carefullness on the part of the cheesemaker. He has the good raw material and it is up to him as a careful maker to keep the quality of the cream up to the high standard as it comes from the separator. This can easily be done if he will follow four simple rules: (1) keep the cream clean, (2) cool immediately to well-water temperature, (3) skim a rich cream, (4) deliver the cream to the factories at frequent intervals. Allow me to speak briefly on these four important points.

Keep the Cream Clean.

Probably no class of dairymen appreciate the value of cleanliness as much as do the cheesemakers, particularly

the Swiss cheesemaker. He has learned that he can not make good cheese if he allows the milk to be contaminated. Therefore the whey as it is drawn from the vat usually represents a very high grade product. This clean whey should then be put into a clean holding vat. This vat according to the regulation of the Dairy and Food Department must not be of wood or of galvanized iron or of cement. It must be a well-tinned properly constructed vat. We believe it to be a very satisfactory regulation and one that is lived up to by all cheesemakers.

From this vat the whey runs through sanitary piping to the separator. This is another satisfactory regulation of the Dairy and Food Department. We believe that all of you appreciate the importance of having a clean separator and that it should be washed whenever it is used. At American factories of course this means once every day, but at Swiss cheesefactories it means that they should be washed each time they are used, or twice a day. We believe that the extra labor to keep the separator clean will pay for itself in better skimming and also in prolonging the life of the machine very materially. It may happen that a cheesemaker is delayed in washing his separator at once. If such is the case he ought to run two or three pails full of clean warm water through the machine to thoroughly wash out the whey. This is best accomplished by allowing the water to run through the machine when it has about half speed.

When the whey cream comes from the separator it should be run into a small well washed can. It positively should not be run into the can that contains some of the cream separated previously. To do so is very bad dairy practice and as a matter of fact every cheesemaker appreciates that because he has no doubt stood at the door of the intake many a time and advised the farmers that they should not mix fresh morning milk with the old milk. He has no doubt told them many times that the proper way to cool the morning milk was to keep the fresh milk separate until it had the same tempera-

ture as the evening milk and then mix the two if it is necessary to do so, but never mix warm milk with cold milk. For a like reason, he should never mix warm cream with cold cream.

He should also avoid keeping cream where there are objectionable odors. At many factories the motor power is a gasoline engine. We have heard of many complaints that the whey cream frequently had a gasoline taint.

About three years ago we made an investigation near Hollandale and found many factories using gasoline engines at that time. We made the following observations; namely, that there were several cheesefactories having gasoline engines that produced a cream that showed not the least taint of gasoline. We found on investigation that they kept their gasoline engines clean and that the stuffing boxes did not leak gasoline, and that the exhaust pipe was high enough to carry the exhaust above the roof of the building. In this way the wind did not have any chance to blow the exhaust gasses back into the building.

We went to some factories where they had considerable trouble with the cream and found at these factories that they had the exhaust pipe running through the side of the cheesefactory. When the wind comes from that side of the building it is very evident that the odors of these burned gassed will blow back into the building. We found gasoline engines where the makers were not very careful to clean the engine itself and it had considerable taint. All of these factories had trouble with their cream, depending of course on how the wind blew and also on how bad the gasoline flavor stayed about the engine.

There is no question whatever but what a gasoline engine can be used about a cheesefactory but it must be used with judgment. It is plainly evident to every cheesemaker that he must have a clean-smelling work room wheer he stores the whey cream if he is going to produce a good whey cream.

Cool at Once.

Immediately after separating the whey, the cream should be set in cold water. Every cheesefactory separating whey ought to be provided with a cooling tank. Such a tank need not cost very much. A tank large enough to hold at least two cans will often do. If a cheesefactory man does not care to purchase one of the many different kinds of excellent cooling tanks on the market, he can take a good sized barrel and saw it in two. This will answer the purpose very well. These tanks can be arranged so that the water from the pump must pass through the tank before it can be used elsewhere about the factory. In that way there will always be cold water in the tank.

As stated before, the newly separated cream should be first cooled down before it is mixed with the cool cream. It certainly will not take long to cool about 60 or 70 pounds of cream if suitable provision is made to do so. Assuming that we have 85 pounds of cream and that the tank will hold three cans of water or about 250 pounds of water, if this water has a temperature of 50 degrees it is very evident that the heat from the cream as it is cooled down will pass into the water so that the cream and water both will have a temperature very close to 60 degrees.

It is very evident that merely putting cream in water is not all that is necessary, but it is very important that the cream be cooled below 60 degrees and this can only be done if the water is changed when the cream has been partially cooled. Since whey cream is usually quite rich it is very important that it be stirred at least once or twice while cooling.

We observed that sometimes the cheesemakers separate the cream in the evening about eleven o'clock and then, being in a hurry to go to bed because they are obliged to get up early in the morning, they would merely allow the cream to stand near the separator until next morning. Such practice is very bad and will bring the

whey cream industry in disrepute. We know that a cheesemaker, particularly a Swiss cheesemaker, must work very hard, keep late hours, and we do not begrudge him one minutes sleep, but it certainly will not take him more than a minute to take this cream can from near the separator and set it in the cold water.

Skim Rich Cream.

One of the objections made years ago to the use of a common milk separator was the fact that the cream from it would only test from 8 to 10 percent and that in order to get a good whey cream it was necesssary to re-separate the cream. In other words it was necessary to run the cream through the separator and separate out a part of the whey.

This objection was overcome by specially constructed machines to separate whey. These machines are now very greatly improved and answer the purpose very well. Whey cream should test at least 45 to 50 percent. By purchasing such cream the buttermaker is able to add considerable quantities of good starter and in this way produce a very high grade piece of butter.

Frequent Delivery.

As we stated previously, the cream as it comes from the whey separator is a very superior article. It is satisfactory for table use, it is satisfactory for ice cream making, and is satisfactory for making the finest grades of butter. It is not the old-fashioned whey cream separated years ago by the old-fashioned "cold process." Under the careful supervision of the Dairy and Food Department, the whey cream is produced as a high grade article of food. The cheesemaker knows how milk ought to be taken care of. He is well trained along that line, he can easily provide himself with facilities for cooling the cream, and if he does not do so, I think it would be well for the Dairy and Food Department to compel him to have a cooling tank just the same way as he is now compelled to use sanitary fittings, to have a

clean holding tank, and a clean whey separator.

This cream should be delivered to the factories frequently. It should not be held a week, or even in the summer time two times a week. It should be delivered frequently and if this is done, I see no reason why the whey cream is not the equal or even superior to the majority of the fancy hand separator cream delivered at the factories.

We feel that this whole problem of producing a sanitary cream is in the hands of the cheesemaker. If he does not produce a clean article from the clean milk that he gets, then he has no business to be called a cheesemaker. I think it does not look well for a cheesemaker to stand at the intake door and rebuke the farmers when they do not keep their milk clean and cool the milk properly if at the same time he does not do his share by cooling the cream properly or by keeping the utensils clean.

Wisconsin produces about 70 per cent of all the Swiss cheese in America. Between two and three million dollars worth of whey cream are produced in Wisconsin annually. The whey cream industry will continue to grow and we believe that it should be encouraged in every way possible. One of the best ways to encourage the demand for the same so that the price that the cream will sell for will be increased, is to produce an article that is absolutely above reproach.

I am confident that you appreciate this and as a class of people you already have done very much to improve the quality and bring it up to the high standard that it now holds. We hope that the good work will continue.

Phosphorus and Permanent Agriculture.

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Phosphorus has been called the "Master Key to Permanent Agriculture!" An inadequate supply of phosphorus in the soil has been the source of great waste in agricultural effort. Phosphorus is the one element that is universally deficient in agricultural soils. Indeed it is entirely possible for the methods of farming followed by one or two generations to so deplete the soil of phosphorus that succeding generations will be face to face with serious problems. The average corn belt soil contains only sufficient phosphorus to produce about 50 one-hundred bushel crops of corn. The subject of phosphorus is indeed one worthy of most sincere consideration in relation to the production of crops.

The Phosphorus Supply of the Soil.

It has already been pointed out in our previous discussion that our average soils may contain from 35,000 to 50,000 pounds of the element potassium in the plowed soil of an acre of land but these same soils will contain only from 1,000 to 1,500 pounds of the element phosphorus. When grain is sold from the farm about equal amounts of phosphorus and potassium are carried away, while in livestock systems more phosphorus than potassium is carried away. At the time of maturity about three-fourths of the phosphorus appropriated by the plant is stored in the grain and one-fourth left in the stalk straws and leaves. With potassium by far the largest proportion of the element appropriated by the plant remains in the stalk straws and leaves. Thus because of the rather limited supply in the soil and the great proportion that may be carried away in the production of grain crops, the phosphorus supply of the soil may be more or less rapidly exhausted.

The soil has been compared to a bank, in which there may be a certain deposit of money. It it were possible to withdraw say 10 per cent of this money each year, it is readily seen that there would always be some money remaining, but there would come a time, when the 10 per cent withdrawal would only amount to a few cents. The amount would become so small that it would not be worth the effort to collect it. Thus it may be with the soil. The essential elements of plant food are drawn upon year after year without replenishing the supply. The time finally comes when it is not considered worth while to farm such land any longer, and the contribution to abandoned and wornout farms increases. It is not uncommon to hear the older farmers of the corn-belt remark upon the decreasing productiveness of the soil.

Of all the essential elements of plant food, nitrogen and phosphorus are the two elements that are in danger of such exhaustion under general farming conditions. Nitrogen may be taken care of by practicing a good system of farming, but the phosphorus content of the soil cannot be increased in any such manner. We cannot draw upon the air for this important element. The phosphorus of the soil can only be replenished by purchase and application. Thus of all the essential elements phosphorus is the only element that must be purchased solely for plant food purposes.

Phosphorus and Good Farming.

Long continued experiments showing the effect of the addition of phosphorus to the soil upon production are very few. In fact there is only one where we may go for such information and that is the famous Rothamsted experiment station in England, which was founded about the middle of the last century. In 1848 a definite rotation of turnips, barley, clover and wheat was started upon one of the fields where turnips were fed upon the land, and the animal manures allowed to remain upon the soil. For the next 36 years phosphorus was applied upon one part of the field in comparison with another part on which no phosphorus was applied. During this time

$29.52 worth of phosphorus was applied and the total value of the produce from the land at fair market prices was $662.82. On that portion of the field which did not have any phosphorus applied, the total value of the produce at the same prices was $432.43, a total increase from the $29.52 worth of phosphorus applied, of $230.39. In other words, an investment of $3.28 an acre every four years paid back $25.60 in the four crops, or an investment on the principal of 680 per cent.

It is upon another field of this old experiment station that we are indebted for some valuable information upon the effect of phosphorus upon potatoes. For 26 years the average yield of potatoes on an unfertilized field was 51 bushels. On another field which differed only by the application of a phosphorus fertilizer, the average yield for the same period was 102 bushels, exactly a 100 per cent increase.

It is thus quite evident from these the oldest experiments that phosphorus, soil and crops are closely related to the business of farming.

The Importance of Phosphorus.

All of the essential elements of plant food have their important and specific roles to play in plant growth. Each one of them is just as important as any of the others. However, because of the fact that phosphorus is the one element of plant food which in general systems of farming must be purchased solely for plant food, we will pause here just a moment to note what it is that phosphorus does in the plant and what may generally be expected when phosphorus is applied to the soil.

The element phosphorus itself is closely related to the life processes. It is present in the living matter of plant and animal cells and is related in some manner to the division of living cells into new cells and consequently closely related to growth. We would thus expect to find phosphorus especially important to the living parts of seeds and plants. It is important in the germination of seed and the growth of the seedling. It has

often been observed that a plentiful supply of phosphorus induced a good rooth growth, thus increasing the power of the growing plant to 'forage' for its self.

In the field the influence of phosphorus is noticed especially upon the seed or grain portions of the plant. Compared with soils which are more or less deficient in phosphorus, soils which have a better supply are frequently noticed to effect the grain crops by earlier maturity, by increase of the proportion of grain to straw, by better quality of grain, by a less moisture content, by tiding them over unfavorable conditions, by warding off phorus induces a good root growth, thus increasing the yield.

Depletion of the Soil Phosphorus.

There is no general system of farming by which the phosphorus content of the soil can be maintained, without the purchase of phosphorus. As already pointed out, the grain crops remove relatively large proportions of the phosphorus which they appropriate from the soil. In a straight grain system of farming it is possible to more or less rapidly deplete the soil of its phosphorus. If a good four year rotation of crops are grown, say consisting of corn, oats, clover and wheat, producing large crops and all removed from the land, the total amount of phosphorus carried from the soil by the four crops will be 77 pounds. This compared with the amount of phosphorus in the soil shows a very limited number of such crops.

In planning for the return of phosphorus to the soil it is common to plan for the return of such an amount as will be necessary to produce good crops. As will be seen from the figures above, there should be provided sufficient phosphorus in the soil so that from 75 to 100 pounds at least of available phosphorus should be provided each four years. A rather common figure upon which calculations have been based for the application of phosphorus fertilizers, has been 25 pounds of available phosphorus for each year.

In livestock farming about one-fourth of the phosphorus consumed in the feed of animals is retained by the animal. About three-fourths will be returned in the manures. This phosphorus is chiefly found in the bones of animals. As much as 10 to 12 per cent of dry bones are phosphorus. Even milk and butter contain some phosphorus, though the amount is relatively low. Thus even in livestock farming it will be impossible to maintain the phosphorus content of the soil without the purchase of that element. Undoubtedly the amount of phosphorus leaving American farms each year by the sale of animals and animal products is quite large. Generally speaking the depletion of soil phosphorus in livestock systems of farming is very much less than in grain farming, but even here the phosphorus question cannot be overlooked.

Forms of Phosphorus.

Thus far in our discussion of this subject we have talked about phosphorus. This is the name of the single element in which we are now interested. It is not however the form of the material with which we can deal. In its elemental form phosphorus is rather dangerous. It must be kept under water to keep it from catching fire. If exposed to ordinary air, pure phosphorus will soon burst into flame. The name "phosphorus" comes from a Greek word meaning "light bringer." Although we are interested in the light which phosphorus brings to bear on the possibility of a permanent agriculture, we are not directly interested in the pure element.

To be of use agriculturally phosphorus must be combined with other elements. In such combinations they are known as phosphates. There are a large number of compounds which contain phosphorus in such combinations. The phosphates which may be used for the improvement of the soil vary considerably in their characteristics, and adaptability. Since we are interested in permanent agriculture—the making sure that all the essential elements of plant growth are abundantly sup-

plied—we are interested in the best forms of phosphorus to use and as a pure business proposition we will want to use the more economical forms. Thus it will be profitable to mention some of the more important forms.

Forms of Phosphorus in the Soil.

The phosphorus occurring naturally in soils may be of two general forms, organic and inorganic. Wherever vegetation has grown the phosphorus used by the plant will be built into the plant structure. The roots and other portions of the plant left in the soil which become the source of organic matter for the soil will contain such organic phosphorus. In the surface layer of soils containing more or less organic matter a considerable portion of the phosphorus may be in this form.

The inorganic phosphorus of a soil usually is in the form of a phosphate of calcium, one of the ten essential elements of plant food. The common designation for such a form is tri-calcium phosphate. This is an insoluble mineral phosphate. In some soils where the iron and aluminum content may exist in greater or less amounts under certain conditions the phosphorus may be combined to form salts of these elements. Salts of phosphorus in this form are considered to be in an extremely unavailable form. Where such conditions prevail the use of lime will be of value to furnish the element calcium, which will tend to keep the phosphorus in the calcium form. The calcium phosphates, though spoken of as insoluble, are acted upon by the natural processes going on in the soil, and made available for plant growth.

How Phosphates Are Made Available for Plant Growth.

The natural phosphates contained in the soil are relatively insoluble. Crops grown upon these soils get the necessary amount of phosphorus from these forms by natural processes. If the supply of such phosphorus is adequate for good crops and the best conditions prevail for the liberation of the phosphorus, other things being equal, good crops may be reasonably expected.

Of those things under the control of the farmer which will encourage the natural processes making insoluble phosphates available for plant growth, limestone and organic matter may be given especial attention. Limestone corrects the acidity of the soil and thus encourages a great host of bacteria or other organisms in the soil to thrive. These organisms bring about the decomposition of the organic matter, in which such substances as carbonic acid, nitrous acid and other organic acids are produced which bring about the liberation of the insoluble plant foods. The rate of decay of organic matter depends largely upon its age and origin. Old resistance forms that have passed through the process of decay are of less value for the liberation of plant food. Thus in our systems of farming the use of fresh organic matter provided by the rotation becomes one of the most effective ways for the farmer to encourage these natural processes to take place in the soil.

Of course good tillage, cultivation, drainage, encourage the decay of organic matter by allowing a freer circulation of air in the soil. It must be remembered, however, that the effectiveness of these agents is limited to the content of organic matter in the soil, and the whole process is limited to the amount of phosphates in the soil.

The Relation of the Crop to Insoluble Phosphates.

Agricultural crops are not limited entirely to the activity of organisms and the decay of organic matter in the soil for the supply of phosphorus from the insoluble sources. Plants may have considerable power to secure the phosphorus they need from such sources by their own activity. Indeed it has been repeatedly observed, that plants have this power and that it may vary considerably with the kind of crop grown. In general the grain crops have a comparatively low feeding power for such phosphates, while the legume crops in general on the other hand have a rather high power. In the main this power is related to the rooting system of the plant. This does not mean, however, that all plants having a certain kind of rooting system will be good feeders. The

University of Wisconsin has explained this power which agricultural plants may have to directly use such phosphates on the basis of certain growth characteristics. When insoluble phosphates are made soluble by the natural processes already mentioned, two things are formed from the phosphate—the soluble phosphate and a salt of calcium. If the phosphate is removed by a growing plant the calcium salt will remain. If this salt remains in too large an amount it will prevent the formation of more soluble phosphates. Now if there is anything that can remove the calcium salt then more soluble phosphate can be formed. Such salts may be removed by drainage, but this is not feasible during the growing season. They may be used up in the neutralization of acids in the soil; or the plant itself may have especial needs for the calcium. The Wisconsin Station has studied a number of these agricultural crops, and have found that in general the best feeders upon insoluble phosphates are also large users of calcium. The grain crops in general do not use a great deal of calcium. Thus in the entire absence of decaying organic matter in the soil some plants are able to liberate the phosphorus by the secretion of carbonic acid from their roots and to use up both of the products formed, until they secure all the phosphorus they need. It can be readily seen that a rotation planned to include one or more of the crops that can feed more or less directly on the insoluble phosphates will be one means of making use of the insoluble phosphates in the soil. If these crops can then be turned back into the soil directly or indirectly through manure the poor feeders will be greatly benefited. This no doubt is one important reason for using legumes in rotations.

These matters have been mentioned at some length because they will make it possible better to understand why rock phosphate should be given more consideration in general farming. The natural soil phosphates are relatively insoluble, but nature provides for their liberation. Should not nature's plan be allowed to operate with the assistance of man where needed? Surely if

such a method is permanent and profitable it is worthy of consideration.

Forms of Phosphate Fertilizers.

It has already pointed out that phosphorus is universally deficient in agricultural soils. The natural forms of phosphorus in the soil have been mentioned. The question naturally arises now, what about the various forms of phosphorus fertilizers that are used and recommended for soil improvement?

There are three natural sources of phosphorus; the soil, natural beds of calcium phosphate, or rock phosphate and the slag phosphate secured from iron ores Along with these may be mentioned the farm sources of phosphorus, farm manure and the bones of animals.

Farm Manure as a Source of Phosphorus.

There are many farmers who attribute great virtues to farm manure as a fertilizer. It is claimed by many that farm manure is the only fertilizer needed for soil improvement. It is indeed claimed by some that the keeping of livestock is one of the important essentials upon every farm. It is asserted that the soil problems demand livestock on the farm. Obviously if this is true, then our nation has a difficult task ahead. It has been calculated that if all the domestic animals on the farms of the United States are figured to the equivalent of cattle there would be less than one cow for every ten acres of farm land. One cow would certainly have much difficulty in maintaining the fertility of ten acres in general farming. As a matter of general information at this point, you may be interested to know that the fertility of the soil can be easily maintained without the presence of livestock upon the farm, under general farming conditions. Indeed the man who keeps livestock, merely for the purpose of maintaining the fertility of his soil, may be in a poor business. If he is interested in livestock from other motives and his business efficiency is enlarged by the keeping of livestock, then he does well

to develop this branch of his business. Since I am talking to dairymen, we will of course be interested in the relation of this aspect of your business to permanent agriculture.

When grain is sold from the farm about three-fourths of the phosphorus used by the plant is sold. When grain is purchased and fed to livestock this phosphorus comes back to the farm. As a general average about three-fourths of the phosphorus in the feed is returned in the manure. Thus if sufficient grain is bought and fed upon the farm, and the manure saved and applied upon the soil, the farm may become richer and richer in the element phosphorus year by year. Some sections, where the livestock system of farming is well developed clearly show this to be the fact. However, broadly speaking this system of soil enrichment is limited because there would be little demand for livestock and their products, if all farmers engaged in this enterprise. On the other hand livestock farmers who feed only the produce grown upon their farms gradually reduce the phosphorus content of the soil, and must purchase phosphorus in some form to establish permanent agriculture. It is not difficult to find some dairy farms which may be classed as worn out, especially in the eastern states. Even in the middle west some dairy farmers are asking why they are not producing the crops they once were producing. The answer is permanent agriculture.

Acid Phosphate.

Acid phosphate is made by treating one ton of rock phosphate with one ton of sulphuric acid. This results in two tons of acid phosphate, which is a manufactured product. Each ton of acid phosphate, will contain one-half the phosphorus that was contained in the original ton of rock phosphate. If the ton of rock phosphate contains 280 pounds of the element phosphorus, then one ton of the acid will contain 140 pounds. In addition to the soluble phosphate produced by the reaction, the product will contain whatever impurities were present

and the sulphuric acid in the form of a calcium salt, commonly known as gypsum or land plaster. The whole product is known as acid phosphate and the phosphorus contained in it is very soluble in water. This fertilizer has been widely used as a phosphate fertilizer, and is claimed by many to be the most efficient and economical form to use. There is no doubt that this material is an excellent source of phosphorus for soils deficient in that element.

In permanent agriculture one seeks to supply the needs of the soil in the most efficient manner. So it is well to consider acid phosphate a little further in this relation. When this material is applied to the soil it soon reverts back to the form of the insoluble phosphate. But because it is soluble it has been well distributed in the soil before the reversion is complete. Such reverted phosphate is probably more soluble than the original insoluble form. This is one of the important reasons given by the users of acid phosphate for its use. The great virtue of acid phosphate is its thorough distribution in the soil and the ease with which plants can use it. On account of these characteristics rather small amounts may be used effectively. From 100 to 400 pounds per acre may give very decided results.

From its nature it can be seen that acid phosphate contains the full measure of the sulphuric acid used in its manufacture. It is held by some that this may contribute to the acidity of the soil. Again the presence of land plaster is considered by some as objectionable, as this is a powerful soil stimulant. However one of the important features concerning the use of acid phosphate is its expense. Before the war conditions prevailed a ton of rock phosphate containing 280 pounds of phosphorus per ton could be purchased and delivered into Illinois for less than $8.00 a ton, much of it being delivered for about $6.00. This same ton of rock phosphate when made into two tons of acid phosphate sold in Illinois at the same time for from $30 to $40 per ton. In other words a pound of phosphorus in the rock phosphate cost about 3c while

a pound in the acid form cost about 12c. Thus because of its expense farmers could not afford to apply acid phosphate in any quantity, and they have made the practice of applying it at the rate of a few hundred pounds per acre, or in amounts just large enough to furnish sufficient phosphorus for good crops. From year to year there will be little actual soil enrichment from the use of acid phosphate, present needs will be cared for only.

With this view of the use of acid phosphate one might well ask, although such applications are usually effective for the year they are applied, whether or not this sort of hand to mouth existence with respect to the use of acid phosphate, could not be replaced by the more insoluble form in such quantities that the soil would actually be enriched with the element phosphorus and then allow the natural processes to come into play as already described. This would be aiding nature in her own way and there could be nothing wrong with the plan if it gave profitable results.

Many experiments have been conducted with rock phosphate to determine its value as a fertilizer. Many favorable results have been secured with it while on the other hand there are still many who condemn its use. Among the state experiment stations who strongly emphasize the use of rock phosphate for soil improvement under general farming conditions is the Illinois station. Great success has followed the use of this material in that state, and it will be our purpose here to bring out some of the important facts concerning its use.

The Use of Rock Phosphate.

The chief arguments that have been used against the use of rock phosphate are that it is insoluble and consequently unavailable to growing plants. It has been pointed out a few months ago that rock phosphate has the same general chemical composition as the natural phosphates contained in the soil. The phosphates have supplied phosphorus to growing crops by natural processes, why cannot rock phosphate be used in the same

manner. The advantages of rock phosphate are that it is the natural form of phosphate, and that it is cheap. Ordinarily an investment of $8 in rock phosphate will supply an acre of land with 280 pounds of phosphorus. By an investment of $32 the phosphorus content of the average corn belt soils can be doubled and to do this with acid phosphate would cost about $150 or more. Thus the cheapness and nature of rock phosphate permit it to be used in quantities large enough to actually enrich the soil. Furthermore very little of the phosphate will be lost from the soil, practically all of it remaining in the soil for the use of crops. By using rock phosphate in this manner it would not be unreasonable to expect that the land would becoming better year by year. On the other hand it is difficult to conceive of land getting better year by year by the use of the other forms of phosphorus unless large money values are applied per acre, which does not seem to be practical.

For a twelve year period, 1884-1895, the Pennsylvania experiment station applied a $1.05 worth of rock phosphate per acre in connection with a rotation of corn, oats, wheat and hay and as an average of the 12 years the value of the increase due to the phosphorus was $5.85 and $8.41 as an average of the last four years. Here was an increase of 560 per cent to 800 per cent on the investment counting corn at 35c a bushel, oats at 30c, wheat at 70c and hay at $6 per ton.

In 1895 the Maryland Experiment Station began field experiments with different forms of phosphorus fertilizers. As an average of six tests every year for 12 years, increases in corn, wheat and hay from $1.96 invested in rock phosphate amounted to $22.11 with crops valued as given for the Pennsylvania Station. The report from the Maryland Station states that rock phosphate produced a higher total average yield than acid phosphate, and at less than half the cost.

The Rhode Island and Massachusetts Experiment Stations have also carried on field experiment for periods of more than ten years with various forms of phos-

phates. They also report profitable results from the use of rock phosphate.

The Ohio Experiments.

The Ohio phosphate manure experiments have become famous for their contribution to this subject. These experiments have occupied such a prominent place in the discussion of soil improvement questions, that we cannot omit saying a few words here about them. These experiments were begun in 1897. They consist of a three year rotation of corn ,wheat and clover on three separated tracts of land, so that each crop is represented each year. One plot in each series receives 8 tons of manure once during the three years, applied to the clover sod to be plowed under for corn. Other plots on each series, in the same manner receive the 8 tons of manure with the addition of 40 pounds of rock phosphate per ton, or a total of 320 pounds for the rotation. Another set of plots in the same manner receive the manure and 40 pounds of acid phosphate per ton. Thus in these experiments the acid phosphate and the rock phosphate are applied in equal amounts, the acid phosphate containing only one-half the phosphorus contained in the rock phosphate. The Ohio Station has published the results of 18 years work upon these experiments and they constitute some of the best information we have upon the comparative value of these two forms of phosphorus.

Table 1.

Ohio Results. Average of 18 years.

Treatment	Corn Bu.	Wheat Bu.	Hay tons	Value 3 crops	Net gain for Pros. 3 acres
None	34.7	11.6	1.37	$29.85	
Manure	56.4	21.2	1.91	47.95	
M, r. P.	65.2	25.8	2.36	57.40	$7.85
M, a P.	64.0	26.7	2.34	57.47	$7.28

These experiments have been subjected to various forms of interpretations.

The figures presented here give the Illinois view of the Ohio experiments. Here rock phosphate applied at the rate of a little more than 100 pounds per acre per year as an average of 18 years gave an increase of 9.0 bushels of corn, 4.6 bushels of wheat and .45 ton of clover. A similar application of acid phosphate containing only one-half the phosphorus and costing twice as much gave an increase of 7.6 bushels of corn, 5.5 bushels of wheat and .43 ton of clover hay.

Perhaps one of the striking things noticed concerning these Ohio experiments is the small amount of phosphate used. From the nature of the materials one could readily expect that the amount of acid phosphate would be more or less effective. It seems truly remarkable that such a small amount of rock phosphate used in connection with the manure has given such striking results. One wonders what might have been the effect had rock phosphate been applied in equal money values, or in amounts large enough to actually increase the total amount of phosphorus in the soil.

The Illinois Experiments.

The Illinois experiments upon the value of rock phosphate do not extend over such a long period of time as some of work already mentioned. The use of rock phosphate in the Illinois experiments dates from 1902, in which it was used on some experiments in preference to bone meal, a standard source of phosphorus. A few years later it was used almost entirely, especially on the new experiments started by the station. In its study of the soil improvement question in relation to permanent agriculture, the Illinois station became firmly convinced that the use of rock phosphate was the solution of the phosphate problem. Here was a product that was comparatively cheap, the farmer could afford to apply large amounts to his land which would bring about an actual enrichment of the soil, and the soil should become better as the years go by. So firm is this conviction in Illinois that rock phosphate is used entirely as a source of

phosphorus in the fertilizer experiments, except in some of the older experiments where bone meal is used. The results secured by the station and by many farmers over the state show that the use of rock phosphate is exceedingly profitable under the general farming conditions.

In the investigation of Illinois soils, the Illinois Experiment Station makes wide use of field cultures. There are about 40 such fields located upon representative soils in all parts of the state. These fields have been extremely valuable in furnishing information in regard to better systems of farming. We will mention only a few of them here in connection with the phosphate problem.

One of the oldest experiments with rock phosphate at the Illinois station was begun in 1902, at Urbana. The phosphate is applied at the rate of 500 pounds per acre per year in connection with a four year rotation of corn, oats, clover and wheat. Manure or residues are also applied in amounts at which the soil is capable of producing them. As an average of the first three rotations the increases in crop yields, with corn at 50c a bushel, oats at 40c, wheat at $1.00 and hay at $10.00 per ton, due to the rock phosphate was sufficient to make every ton applied worth $18.41. The averages for the three rotations are as follows:

First rotation	$11.80
Second rotation	16.19
Third rotation	26.98

Here the return per ton of phosphate was greatly increased each rotation. The one ton of phosphate that was applied each rotation supplied 5 to 6 times more phosphorus than was needed for large crops. After the crops were remvoed from the land, from two thirds to three-fourths of the phosphorus applied was still in the soil. Each succeeding application increased the original stock in the soil. This accumulated phosphorus constituting a reserve becomes more effective each year as is shown by the figures.

The field located at Galesburg growing the same crops,

though in a longer rotation, and receiving the same sort of soil treatment, shows the following increases for a ton of rock phosphate by rotations using the same prices for produce:

First rotation	$ 5.04
Second rotation	11.04
Third rotation	12.29
Fourth rotation	18.49

Here again the residual effect of the rock phosphate is plainly evident.

The influence of rock phosphate upon the yields of wheat has been more or less marked. The past season wheat was grown upon 14 experiment fields in the corn belt of Illinois. These fields have been in operation for from 3 to 16 years and all of them have been treated with rock phosphate at the rate of 500 pounds per acre per year in connection with organic manures and limestone. The average of the yields for the fourteen fields the past season is as follows:

None	29.2
Manure	32.3
M. Lime	35.5
M. L. Phos.	39.2
Residues	34.8
R. Lime	36.7
R. L. Phos.	42.2

These average yields of wheat show an average increase for phosphorus of 5.1 bushels per acre. The average yield on untreated land is raised from 29.2 bushels to an average of 40.7 bushels for the permanent system of soil improvement—organic manures, limestone and phosphate. Surely such results as these are full of thought for the farmer.

At Bloomington, another field is located on the predominating corn belt of middle Illinois. Since 1902 a five year rotation of corn, oats, clover and wheat under various soil treatments has been grown. When these

experiments were begun bone meal was used as the source of phosphorus and is yet used. The results obtained are so striking that it will be worth while to call attention to them here. With corn at 50c per bushel, oats 40c, wheat $1.00 and hay at $10.00 per ton, the increase per acre as an average of the 16 years is $1.29 for residues each year, $11.03 for phosphorus, and 19c for potassium. These figures clearly show the needs of the typical corn belt soil. An annual investment of $3.50 in bone meal returned $3.16 for each dollar invested. On a soil making such a response to phosphorus, one wonders what might have been the result had rock phosphate been used upon the field at the rate of 500 pounds per acre per annum as is done upon most of the other newer fields.

We might go on and quote results from a number of other fields which tell much the same story, but since we have seen that rock phosphate can be successfully used for the improvement of the soil, it may be more worth our while to point out a few other things in connection with the use of rock phosphate.

In passing this subject, we may also say that not only have the experiment stations been able to bring out the value of rock phosphate, but also a large number of farmers have used it with very satisfactory results. At this time we will call attention to only one Illinois farmer who is very enthusiastic over the use of rock phosphate, with clover. Fourteen years ago Mr. F. I. Mann of Gilman, Illinois, upon his 500 acre corn belt farm, began to practice the organic matter, rock phosphate, and limestone combination of farming. His main rotation is corn, oats, wheat and clover. One ton of rock phosphate is applied during each rotation in connection with the clover which is plowed down for the corn. This system of farming has given Mr. Mann some truly remarkable results. For a number of years he has secured an average yield of 70 bushels of corn per acre; for some years his wheat has averaged more than 50 bushels per acre, this last season reaching the 63 bushel mark; his

oats has averaged around the 70 bushel mark, several crops being in the neighborhood of 100 bushels per acre. In recent years his crops in general are larger and better than in earlier years, thus bearing out the contention that any system of rational soil improvement becomes accumulate. Along with Mr. Mann there are many other farmers in Illinois following the same general plan of soil improvement, who are getting most satisfactory results.

Some Effects of Phosphorus.

One of the chief effects of phosphorus upon the average soils under general farming conditions is to increase yields as already pointed out. There are also some other effects which we ought not to pass over.

When a rational system of soil treatment is put into practice as outlined in this discussion, one may wonder what may be the effect on crops during years which are especially unfavorable crop years. After all, seasonal variations or climate is the biggest factor in crop production. This is too well known to warrant discussion. The question arises whether the farmer can afford to invest in the materials needed for the rational improvement of the soil, and take the chances of a possible poor season or a series of poor seasons. There are some who would say that the average farmer cannot afford to take any such risks and that his greatest profits will result when he farms safely. Such may be true when the farmer considers the use of the high priced commercial fertilizers, but it seems to me that when the system which is the burden of this discussion is practiced, that is, the use of natural materials in a natural manner, that there is mush less room for such an argument.

As one illustration out of a number that might be taken, we may consider the results on wheat for the year 1912, which was a notoriously poor wheat year. In the spring of that year the farmers of Illinois plowed up more than 50 per cent of the wheat fields. On the fields that were left there was only a 40 per cent prospect. So compared with normal years there was only a 20 per

cent prospect for the state. The results of soil treatment on the yields of wheat that year are worthy of attention. At Urbana the wheat on untreated land made only 5.3 bushels. Where all was applied except phosphorus, the yield was 6.3 bushels. Where the phosphorus was applied in addition the yield was 23.4. At Galesburg, the corresponding yields were, 15.6 bushels, 20.8 bushels, and 27.4 bushels respectively. As an average of both fields the untreated land averaged 10.4 bushels and on the land receiving the rational soil treatment, the yield was 25.4 bushels, an increase of 15.0 bushels. At normal prices such an increase will net a nice little sum. I have figured the seasonal variations over a period of 10 years for corn, oats and wheat, in relation to a rational system of soil improvement in the corn belt and have not found that the risk is too great.

Another point in connection with the use of phosphorus in the plan under discussion is the effect upon maturity and quality. It is very common to note that land well supplied with phosphates induce earlier maturity of grain crops. There may be as much as from one to two weeks. With corn this may mean the avoidance of an early frost in the fall. With maturity goes quality. The riper grain will be heavier and plumper. It may contain less moisture at harvesting time. I remember reading some government reports a few years ago, in which it was pointed out that enormous quantities of water was shipped by farmers in the form of corn. It was figured at that time that this excess water was equivalent to more than 15,500,000 bushels of corn. Since that time more or less has been said about dryer corn in the markets. No doubt a more liberal use of phosphorus, on our phosphorus deficient soils would be of considerable importance in this connection.

In connection with this general problem it will be interesting to note what some of the Illinois farmers have to say about the use of rock phosphate. As you all remember the season of 1917 was characterized by very early killing frosts and a great deal of soft corn resulted.

This soft corn could not be well stored and much of it sold at 35c per bushel, while the dry corn the next summer brought as much as $1.50 and more per bushel.

One farmer reports that for the past 8 years he has been applying rock phosphate to his land at the rate of one ton per acre every four years, and that his corn matures 10 days earlier on phosphated land . His 1917 crop was of excellent quality and could be stored for summer sale. He makes the practice of plowing under the phosphate with pastured clover sod, insuring a liberal supply of organic matter with it. He states that the effect of phosphate treatment is to be measured over the scales rather than by appearance in the field.

Another farmer upon a sandy type of soil in Indiana, reports that with only two years results he is convinced of the effectiveness of rock phosphate. In 1916 he applied manure with and without rock phosphate. A killing frost came early. The phosphated field made 10 bushels more per acre than the unphosphated and was fully matured. The next season he disked in rock phosphate on clover sod in comparison with no phosphate. In the phosphated field there was practically no soft corn, while in the other there was 20 per cent.

Another farmer reports that where he had used rock phosphate with clover or manure that he was able to pick plenty of good seed corn from his fields, whereas most farmers that season were not able to pick any.

Such reports as these have been given by many farmers. There is strong evidence in favor of that system of soil improvement which makes use of rock phosphate in connection with organic manures.

How Rock Phosphate Should be Used.

Since rock phosphate is rather insoluble some attention must be given to the best manner of using it in systems of soil improvement. Because it is an insoluble product, some states, especially in the south, where the commercal fertilizer interests dominate, laws have been passed making it illegal to sell it for fertilizing pur-

poses. The commercial fertilizer interests are more concerned with selling their high priced goods to the farmer, than they are in seeing the farmer establish permanent systems of soil improvement. In this region of the country we are not bound by any such laws and are privileged to practice any systems we please, which in our estimation will give us the best results. However, because the proper method of using rock phosphate has not been well understood some of the farmers in our own region claim disappointment in the use of this material. I remember of a farmer telling me a few years ago, that he had bought a car load of rock phosphate and applied it to his fields without any reference to the use of organic matter. The next two years corn was produced on this land and as far as he could see there was no benefit at all from the use of the phosphate. Of course he did not make any effort to weigh the corn on this land and compare it with untreated fields. He had expected that he would notice large differences in the growth of corn, which he did not see. The third season this field was in oats and by this time he had apparently forgotten about the phosphate application. At threshing time to his great surprise this field of oats turned out much better than any other in the community. In trying to assign a reason for it, he remembered the phosphate, and became convinced that that was the reason. Since that time he has used much more rock phosphate. This only goes to confirm what was said a while ago, that phosphorus is chiefly concerned with the production of grain, and that the scales are the best measure of the effect of phosphorus.

There are two important things to be kept in mind when buying rock phosphate. In the first place it is phosphorus that we want and therefore the highest percentage guarantee will be the best buy. In the second place, since rock phosphate is more or less insoluble, it should be ground to a fine powder at least not less than 90 per cent should pass through a screen having 10,000 holes per square inch. Some companies are now produc-

ing 95 per cent material. The finer the phosphate is reduced, the more easily it is distributed in the soil and the more easily acted upon.

Rock phosphate should always be used in intimate contact with decaying organic matter. There have been many instances where farmers have applied the phosphate on corn stalks and even on bare ground. Such methods are likely to lead to disappointment, because the effect of the phosphorus will be more or less slowly realized. However, phosphate applied in this manner is not lost and adds to the total stock of phosphate in the soil.

Livestock and Grain Farming.

Rock phosphate may be supplied with organic matter in either livestock or grain farming. When both kinds of farmng are done in a rational manner, there is little difference in the ultimate effect of the soil treatment. Since those before me are probably all livestock farmers it will be with manure that you will be interested in connection with the use of rock phosphate. For the sake of interest, however, for there may be some present who are not extensively engaged in livestock farming we will briefly discuss both systems.

The general plan of the Illinois soil culture experiments is to plan the soil treatment for both livestock and grain farming. In livestock farming it is assumed that all of the produce grown upon the farm is fed to livestock and that the resulting manure is applied to the land. If care is not taken there may be considerable losses of fertility from the manure before it reaches the field. Under good management it has been determined that in a general way, that one ton of average fresh manure may be returned to the land for every ton of produce grown upon the land. Thus in the Illinois experiments in livestock farming manure is applied to the land on this basis; the land receives no more manure than it is capable of producing. This is in fact the method the farmer would have to follow for he could not prob-

ably depend on the purchase of more manure from his neighbors. In the grain system all of the residues are turned back to the soil. This includes the corn stalks, the straws and the hullings from the legumes grown, in other words all but the seed. Here again the land receives in the form of organic matter just what it is capable of producing. In both systems it may be possible to seed some catch crops in the rotation that may also go to increase the organic matter content of the soil. The main difference between these two systems as they have been practiced by the average farmers, is that the livestock farmer has had manure produced upon his farm and he has applied it to his soil, and it being a good fertilizer has given increases in yield. The grain farmer on the other hand has continually sold his grain from the farm and has let the residue go to waste, thus contributing to a more or less rapid exhaustion of his soil.

For the sake of comparison we may look for a moment at the average 10 year results for both systems of farming as secured at the Urbana field. As an average of 10 years the rational system of livestock farming, manure, limestone and phosphate, produced an increase of 21.1 bushels of corn, 17.5 bushels of oats, 1.1 tons clover hay, and 18.2 bushels of wheat. The corresponding system of grain farming produced an increase of 19.4 bushels of corn, 17.9 bushels of oats, .32 bushels clover seed, and 20.7 bushels of wheat. The total annual value per acre of the crops figured at prices already used in this discussion, for the livestock system is $33.43 and for the grain system $32.09.

In this livestock system the use of phosphate increased the yield of corn 6.4 bushels as an average of ten years, oats 6.5 bushels, clover hay .68 tons and wheat 9.5 bushels. It is thus plainly evident that although manure is capable of producing good crop increases, the combination with phosphate gives much better results. Manure itself is somewhat unbalanced with respect to phosphorus, and even in livestock systems of farming without the use of additional phosphorus poorer results

are likely to be eventually attained because of the lack of this element. We may recall the Ohio results mentioned a few moments ago where both rock phosphate and acid phosphate gave considerable increases when applied in addition to manure. In a system of livestock farming where much grain and concentrates are purchased and brought to the farm for feeding purposes it will be possible to increase the phosphorus content of the soil by returning the manure. It is quite likely, however, that the more profitable systems of livestock farming will be those on which most of the feed is raised on the farm.

How Much Rock Phosphate is Used.

Because of its cheapness in comparison with other forms of phosphorus, and because of the importance of soil enrichment in permanent agriculture, the nature of rock phosphate lends itself readily to liberal applications. Such a system does not contemplate the living from one year to the next, but building for a larger and brighter future. I hope that this is the vision you have caught during this discussion. When rock phosphate has been used upon soils that are deficient in phosphorus, in a rational manner, in amounts large enough to enrich the soil, the results from year to year show an accumulative nature. In other words the soil is continually getting better instead of just holding its own, or gradually wearing out. For this reason it is recommended that rock phosphate be applied at the rate of about 1 ton every four or five years until such a time that the soil is fully supplied with the phosphorus it needs for large crops. When such a time arrives then smaller amounts may be applied in order to maintain the needs of the soil. This is the system that is being followed by a great number of corn belt farmers. From all the evidence at hand at the present time this appears to be the wise plan.

The use of rock phosphate cannot well be separated from the plan of permanent agriculture. Soluble forms of phosphorus may be used for soil improvement with

more or less profit, but their use does not necessarily insure a permanent agriculture. In fact the reverse may be true; it is easy to apply such phosphates for the immediate benefits they give, without giving any thought to the other needs of the soil. Success with rock phosphate may not be so marked until it is properly fitted in with the other important factors of permanent fertility. When good farming gives attention to the best physical condition of the soil, by drainage and otherwise, to the establishment of a good rotation of crops, to the return of suitable organic matter to the soil, and to the use of limestone where needed, rock phosphate will lend itself exceedingly well to use in large amounts and hasten the day of permanent, profitable agriculture. The only safe and sound agricultural practice is that which will give the greatest average net returns over long periods of time. There may be individual years when other practices will be more profitable, but in the end that farmer wins who practices a rational system of soil improvement. For normal soils under normal conditions, the plan just enunciated, fills all requirements, and has the tests of years behind it.

In closing I want to give you 14 reasons for the use of rock phosphate as outlined in this discussion. In these days we hear a great deal of discussion about 'the fourteen points' in the settlement of world affairs. I trust that the 14 'points' about to be given you may have a proportionate influence in esablishing permanent systems of agriculture. These 14 'points' have been drawn up by an Illinois farmer and presented to the farmers of Illinois at the recent annual meeting of the Illinois Farmers' Institute. They are as follows:

1. Increases grain yields. My wheat averages 40 bushels to the acre.

2. Produces better quality of grain. My wheat tested 64 pounds per bushel and has nearly always graded No. 1 from phosphated ground.

3. Matures grain earlier. Small grain ripens a day

or so earlier and corn a week or more. This is very important with reference to seed troubles.

4. Protects against insect attacks. Plants grow stronger and better able to resist such attacks. This is especially true with the hessian fly in wheat.

5. Prevents winter killing of wheat. Wheat on phosphated land seldom winterkills, and frequently does on unphosphated land.

6. Improves the soil on permanent basis. One ton of rock phosphate will produce 1000 bushels of corn before the land is as poor as it was before.

7. Pays for itself as it goes. When applied properly rock phosphate gives returns in a year and pays for itself in 3 or four years, and after that it is profit.

8. Gets the same results on the farm as on the experiment fields.

9. Crops increase after a year or two and remain permanently larger.

10. Clover yields are larger.

11. Clover stands are easier to get.

12. Blue grass yields are increased.

13. Crop yields are nearly as large in proportion after the second application as from the first.

14. Gives one the satisfaction of doing a good job of farming, of growing an extra bushel of grain where none grew before.

The Importance of Better Crops for More Dairy Products.

R. A. Moore.

Introduction:

For many years Wisconsin has been forging to the front on dairy lines until our state has become known far and near as the leading dairy state, our income from dairy products mounts higher and higher until now it is estimated that the annual dairy products of Wisconsin bring to the farmers over $200,000,000. We have a class of people who take kindly to the dairy work, and the conditions of soil, climate and pure water excels any state in America.

Breeds of Dairy Cattle.

Our farmers have been thoughtful, and have clustered around them breeds of very fine dairy cattle noted for their excellence. Everywhere throughout the state can be seen the fine Holstein, Guernsey, Ayrshire, Jersey and other breeds of dairy cattle working day and night for the farmer. No single line of effort has been more profitable for the farmer in the past than dairying.

High Price of Feeds.

While this great dairy work has been going on the dairy herds have greatly increased. We now have two million dairy cows in the state. We have reached a point where the question of feed for the dairy cow is one of the most important factors. If our farmers today were forced to purchase the feeds from outside sources, dairying would be carried on everywhere in our state at a loss. Already where farmers have been forced to purchase a part of their feed from outside sources a claim is made, even with the high price paid for cream and milk, that no profit is in sight. Oil meal, cotton seed meal, oil

cake, bran, middlings and all cencentrates have reached a figure that is almost prohibitive from the dairyman's standpoint.

How Will We Solve the Problem.

Realizing the great importance of having more and better feed for our live stock, your Experiment Station in 1898 started a work that has been of untold value to the state and nation. The farmers of Wisconsin are now being benefitted by the beautiful dairy animals which have come down to us with over a thousand years of patient breeding work placed upon them. The fact that we have now dairy animals giving 500, 1000, or even 1500 pounds of butter in a year has not been brought about by accident but has come down to us through the science of breeding which has been carried on from father to son until the present time. The plant breeder has an opportunity for in excess of that of the animal breeder. We find that breeding to perfection is hastened by the number of individuals that the breeder can deal with. The animal breeder is forced to confine himself to 30 or 40 individuals, while the plant breeder can go out before a 160 acre field of oats, barley, wheat or some other crop, and deal with a hundred million individuals in a single season. This has enabled the plant breeder to make rapid strides. I regret to say, however, that the plant breeders were not alive to the great accomplishment that could be secured from the improvement of the farm crops. Over 100 years ago Vilmorin of France showed the world what could be accomplished in the way of plant breeding. The world at that time cried out for sugar. There was great dearth of sugar and with the Napoleonic wars on hand sugar from the cane districts could not be brought readily to the continent. This brought about a state of affairs where matters were becoming desperate. This man in France took the beet, which was quite compared with our Mangel Wurtzel at the present time—a beet with less than two per cent of sugar in it. He showed that it was possible to breed this

beet in such a way that within ten years from the time of starting he had a sugar content of over 20 per cent, which revolutionized the whole sugar interest of the entire world, started hundreds of factories at work, and million of people into the growing of beets. The great industry swept to the western continent, passed through it to the Pacific coast, and the large industry in sugar now in the United States was dependent upon the work of Vilmorin.

With this great example of what can be accomplished the plant breeders remained practically dormant for over one hundred years, and it remained quite largely to your own Experiment Station to take up this work and show what could be accomplished in the breeding of farm crops. In 1898 Wisconsin was trying to grow over 200 different strains of corn. Practically every variety grown in the state was scrub corn, and Wisconsin had no real Wisconsin variety but was dependent upon outside sources for her seed. This brought about a conglomeration of seed, and led to what was known as the scoop shovel method of handling seed corn. We grew all kinds of corn—early, late, and medium—and very little ripened. Wisconsin was almost the laughing stock of the country from the corn standpoint. Within six years time, by throwing definite lines of breeding upon our corn, we bred standard varieties for our state and reduced the number to about five varieties. We then made a dissemination of the pure bred varieties, and within six years from the time that these varieties were widely disseminated Wisconsin was growing twenty million bushels more corn than she did before, on practically the same area of ground. Counting corn at $1.00 per bushel this was twenty million dollars added to the value of this one farm crop in a single year.

The farm crop problem is one of the most important that we have to contend with. It is the big problem of the state, amounting annually to over 500 million dollars—the foundation rock upon which all good live stock interests are based. Our cheese, butter, milk and cream

are merely farm crops converted into this product. The same is true of beef, pork, lard, etc., so consequently we are dependent upon the grains and forage crops for our success in other lines of effort.

Twenty years ago Wisconsin fully realized just what would happen to our state in a few more years if we continued growing barley and putting it upon the malting market, so consequently in our efforts to improve the barley of the state Wisconsin bred for quality as well as yield. We bred a barley that has a protein content of from 13 to 15. This is considerable higher than corn as the protein content of corn runs from 9 to 10. We felt that by breeding into the barley this high protein content that our farmers would soon fully realize the importance of this great crop as a feed and would discontinue the practice of putting it on the general market. We felt very keenly that it was much better to use this great crop for the production of meat, cheese, butter, cream and milk rather than the beverage that made Milwaukee famous. Wisconsin gave to the world the Pedigreed barleys which are now not only grown throughout this country but throughout European countries as well. These high protein barleys have become noted far and near, and more and more are being used for feed. The sudden rise in price of concentrates have forced many farmers to use barley as a feed, and they know practically for the first time of the great value of this crop as a feed. Experiments by Professors Humphrey and Morrison at the Station show conclusively that there is no grain grown upon the farm that is of such high feeding value as barley. Pork has been produced at the relatively low value of $9.50 per hundred. Milk and butter also have been produced at a very low figure. I herewith give you some of the rations which are recommended by our Professor Humphrey, and also a ration for the feeding of young lambs recommended by Professor Kleinheinz.

Try one of the following mixtures on your cows:

1.	Lbs.
Ground Barley	200
Ground oats	200
Wheat bran	200
Oil Meal	100

2	Lbs.
Ground barley	100
Ground oats	100
Ground corn	100
Oil meal	100

3.	
Ground barley	400
Gluten feed	300
Wheat bran	300

4.	
Ground barley	400
Wheat bran	200
Gluten feed	100
Oil meal	100

5.	
Ground barley	200
Ground oats	400
Gluten feed	200
Oil meal	100

6.	
Ground barley	400
Ground oats	400
Oil meal	100
Cotton seed meal	100

7.	
Ground barley	200
Ground oats	200
Gluten feed	200
Wheat bran	300
Oil meal	100

8.	
Ground barley	600
Wheat bran	150
Dr. Brewers' Grains	100
Oil meal	75
Cotton seed meal	75

Mixture No. 8 includes an unusually large amount of barley for a dairy ration. It has been fed, however, in combination with alfalfa hay and corn silage with good results to cows at the Wisconsin Experiment Station.

Barley contains 9 per cent digestible crude protein and 79.4 per cent total digestible nutrients and falls in a class with corn meal for dairy cows. It should be finely ground and fed with other concentrates like some one of the foregoing mixtures. The more timothy or mixed hay there is in the ration the more necessary it will be to choose a mixture containing a large proportion of oil meal and other high protein feeds.

Barley at 85c per bushel costs $1.77 per cwt., while corn at $1.35 per bushel costs 2.41 per cwt. At these prices barley is the more economical feed.

Put the corn crop into the silo and the barley crop into

the feed bin. This practice will materially increase the profits from milk production at present prices of feeds.

Barley Is an Excellent Feed for Sheep.

Barley is extensively used for fattening sheep in districts where but little corn is grown. Good varieties of barley have been found nearly equal to corn for fattening lambs or older sheep when alfalfa or other legume hay is available. Where other hay or roughage must be fed, barley plus 10 per cent of oil meal or cotton seed meal will produce very satisfactory gains.

Barley for Breeding Ewes.

Equal parts of barley and wheat bran, by weight, will make an excellent grain mixture for breeding ewes during the winter, if their condition or the quality of the rest of the ration requires grain feeding. One-half pound or more of this grain mixture per head daily will answer all requirements nicely. Ewes require a larger amount of grain in their ration after lambing. Ten per cent of oil meal added to the mixture of barley and bran will stimulate milk flow. The amount of grain should be increased to three-fourths of a pound or more per head daily, depending upon the judgment of the feeder.

Barley for Young Lambs.

The following grain mixture is recommended for little lambs:

10 lbs. ground barley
10 lbs. ground oats
20 lbs. bran
1 lb. oil meal.

This mixture is excellent for little lambs that have access to a separate trough by means of a lamb creep. It is recommended, when it is desirable, to grow the lambs rapidly for early market.

Sheep fitted on rations containing barley and shown in dressed carcass competitions have won numerous prizes, which indicates that barley produces mutton of

excellent quality.

The Wisconsin Pedigreed barley was bred from a single plant. One plant out of many millions was the progenitor of the Pedigreed barley. Wisconsin grows one-eighth of all the barley in the United States, and practically 95% of this is now Pedigreed barley which was developed from a single seed twenty years ago. We grow sufficient of this Pedigreed barley annually to plant the entire barley acreage of the world. We sincerely hope that the barley acreage will be increased this year, although so much has been said in regard to the market relating to barley that many of the farmers may feel discouraged, but they certainly should not. They are going to receive a much higher price for their barley by marketing through the farm animals than ever before. If every bushel of barley that has been placed upon the market during the past fifty years had been marketed through the farm animals instead the farmers would have had a much better return for their produce than they have received by the prevailing method of marketing. We are here today to help solve this great problem which is now attracting attention over the dairy district of the United States, and we feel that it is going to be solved by the growing of forage upon our own farms for our dairy herds and buying as little as possible of feed from the outside. We feel by using the Pedigreed seeds we can raise the yield from 25 to 50%. Yes, in some instances we can double the yield of grain and forage per acre. We feel that no farmer ought to be guilty of using the scrub grains. We have used them altogether too long and we should be united in the one common idea of kicking the scrub grains from our farms just as quickly as it is possible to do so. We now are growing nearly all of the Pedigreed seed grains in million bushel lots. These can be secured at a small price over and above the cost of common seed grains. Then why should the farmer suffer the great loss of growing scrub grains when he has at his very door the grains that have been bred for high yield and the power to win the race

in general production? We have also bred for our state the beautiful soy bean which will from this on play an important part in our crop production. The late varieties of these beans can be planted with corn and can be harvested with the corn binder and run into our silos, while the early varieties can be grown for hay and for seed production. The Wisconsin Early Blacks and the Ito San make a beautiful, fine hay, higher in feeding value than clover and next to alfalfa in quality. On fields where clover has failed there is no reason why the farmer cannot go on and grow his crop of high protein feed from the soy bean even after he has found out that his clover was not going to be a paying crop. By the free use of this new leguminous crop, together with the high yielding varieties of corn and with the wonderful yielding varieties of Pedigreed oats and our beautiful barley, there is no reason why Wisconsin cannot lead the world in dairying at a profit.

Values and Uses of Dairy Products.

By Mrs. Vaughan.

University of Wisconsin.

Not long ago Dr. Harvey W. Wiley presented the milk situation as related to war conditions and infant mortality in one of our current magazines. In summing up this article it might be stated that in the majority of cases in this country as well as the European countries, the high death rate among infants and small children is not due so largely to lack of food as it is to lack of milk. This situation became so appalling in Russia that the children of a western state banded together and with their pennies were able to buy and send over a transport packed with condensed milk to the children of Russia.

During the past five years we have heard much said regarding milk as an essential of child feeding, now through the efforts of such men as our own E. V. McCollum we are coming to see it in the light of an absolute necessity to the normal growth and development of children and he speaks of it as "Our greatest protective food." Why? Because milk gives us certain elements of food found nowhere else in such abundance, which are absolutely necessary to growth and mainten ance of good health and even to life itself.

What do we call these new elements? As yet these newly found principles are so young they are not yet named, except in chemical terms and are generally spoken of as vitamines. Many people when questioned why they do not give their children more milk reply that it is too high, yet many of these same people insist on having meat even though the price may soar from 45 to 60 cents per pound. By examination of the following figures (which is a comparison of foods in terms of heat units of energy and cost)

38¼ heat units of milk at 17 cents per quart
12 heat units of eggs at 85 cents per dozen.
28 heat units of meat at 35 cents per pound.
48 heat units of cheese at 42 cents per pound.

Much is said about the balanced ration which is in other words "Undisputed good health" and in terms of foods for the principle meal of the day includes a dish of protein food (meat, beans, peas, cheese, nuts, eggs) two or three starchy foods (vegetables) fat (generally in the form of butter) and some sugar.

How many of us realized that during the period of the war we lost only 8 of every 1000 soldiers sent to the front and think it terrible, while we pass coolly over the fact that out of every 1000 children born more than 150 of them die before they reach the age of one year.

In terms of what is worth the cost, we must conclude that milk at any price under 25c per quart is worthwhile when it means a weakened or a sturdy future generation.

Cheese.

Cheese is a milk product from which a high percentage of water has been extracted and is therefore very highly concentrated as to food value. It is estimated that one pound of American cheese contains the casein and fat of one gallon of milk. While it is much higher comparatively in food value than milk, many people cannot eat it because the fat in cheese surrounds the casein and this class of people must use their own judgment and use cheese only sparingly and generously mixed with starchy food.

1. Kinds:
    1. Hard Permesan, Edam, Roquefort, etc.
    2. Neuftchatel, Limburger, Cream, etc.

11. Manufacture:

Process:

1. Coagulation of casein by rennet or acids.
2. Cutting or breaking of curd into small pieces.

3. Separation from whey.
4. Put into press.
   a. High pressure produces hard cheese.
   b. Low pressure produces soft cheese.
5. Ripened.
   a. Process may continue for months and years.
   b. Action caused by bacteria.
   c. Difference in flavor due to species of bacterial in milk or in place of ripening.

III. General Composition:
1. Protein, one-third of full food value.
2. Fat, one-third, increased depending upon kind of milk used.
3. Water, one-third, lessened as fat increases.
4. Mineral matter, a very small amount.

CO-OPERATIVE HOME ECONOMICS EXTENSION WORK, COLLEGE OF AGRICULTURE—UNIVERSITY OF WISCONSIN.

Scalloped Tomatoes with Cheese.

2 cups drained cooked tomato
4 large sweet green peppers
4 medium onions
½lb. grated American cheese
⅛ teaspoon pepper
1 tablespoon corn oil or melted butter
1 teaspoon salt
1½ cups dry bread crumbs.

Cook tomato, pepper and onion together till tender. Butter casserole and arrange ingredients in layers, leaving a layer of crumbs on top. Bake for half an hour in a moderate oven.

Pittsburg Potatoes.

1 quart diced raw potatoes
1 small onion
½lb. grated American cheese
¾ teaspoon salt.

⅛ teaspoon red pepper
½ can pimentors
4 tablespoons butter
4 tablespoons flour
2 cups milk.

Wash, pare and cut potatoes in half-inch cubes. Put into a stewpan, add finely chopped onion, salt and boiling water enough to cover it all. Bring to boiling point and boil five minutes. Drain and cut pimentos into strips and add to potatoes and cook for another five minutes. Put into buttered baking dish. Make white sauce of butter, flour and milk, add cheese and stir till melted. Pour over potatoes and bake in oven till brown.

Old Fashioned Rarebit.

½ lb. American cheese sliced very thin—12 slices bacon.

Fry bacon on one side, turn and place strip of cheese on each strip of bacon. Sprinkle with red pepper. Cover frying pan and cook till other side of bacon is done. The cheese will melt and be crisp at the edges. Serve at once on hot buttered toast with a crisp salad.

Piquant Cheese Sandwiches.

3 eggs
1 cup sweet or sour cream
1 tablespoon butter
1 tablespoon sugar
a pinch of red pepper
1 teaspoon mustard
4 tablespoons chopped green pepper
1 teaspoon salt
3 tablespoons vinegar
1½ lb. American cheese.

Beat eggs, add cream, pepper, butter, sugar, mustard, and salt. Cook over boiling water till thick. Heat vinegar and add to the cream mixture. Remove from fire and add peppers and spread on bread when it is cool.

Italian Delight.

½ lb. spaghetti
½ lb. Hamburg steak
½ can corn
½ cup olive oil
½ cup grated cheese
1 cup tomato puree
1 small onion
1 clove garlic
1½ teaspoon salt
⅛ teaspoon pepper
2 tablespoons Worcestershire sauce
1 green pepper

Cook spaghetti in boiling salted water. Chop onion, garlic, green pepper very fine and fry in olive oil until onions are a golden brown. Add the tomato puree, salt, red pepper and Worcestershire sauce. When thoroughly heated, stir in cheese until melted. Add spaghetti, corn and lastly Hamburg. Cook over fire for five minutes. Then turn into a baking dish and bake for at least half an hour.

Cheese and Celery Salad.

Wash and crisp 12 stalks of celery and fill with the following mixture.

1 - 10c pkg. cream cheese
3 tablespoons chopped nuts
2 tablespoons chopped green pepper
½ teaspoon chopped onion
½ teaspoon salt.

Serve on lettuce leaves with French Dressing.

English Monkey.

1 cup stale bread crumbs
1 cup milk
1 tablespoon butter
½ cup grated cheese
1 egg
a pinch of pepper

½ teaspoon salt

Soak bread crumbs 15 minutes in milk. Melt the butter and add the cheese. Beat egg slightly. When cheese has melted add soaked crumbs, egg and seasoning. Cook in moderate oven in buttered pan. Cut into squares and serve on toasted wafers which have been buttered.

Why Prices of Materials Have Been So High.

By Miss Hazel Manning.

University of Wisconsin.

1. Wool.
   a. Plenty of wool, but no ships to move it.
   b. Clothing and bedding for the army.
   c. Fewer sheep raised on account of lack of men to care for them.
11. Silk.
   a. Plenty of it in China, but no chance of shipment.
   b. None from Italy or France.
   c. Used in Aeroplane wings.
III. Linen.
   a. Flax fields of Belgium destroyed.
   b. Holland flax confiscated by Germany.
   c. No chance to ship Russian Flax.
   d. Ireland crop poor.
   e. England taken all available linen for aeroplane wings.
IV. Cotton.
   a. Plenty of the short fiber cotton in United States.
   b. Long fiber (Sea Islands) no ships available.
   c. Cheap materials in great demand to replace more expensive, therefore not so much available and higher priced.

How Clothes May Be Made Over This Spring.

Combinations of Materials.

Foulards and taffeta.
Foulards and satin.
Foulards and French serge.
Foulards and georgette.

Touches that Brighten Last Year's Suit.

New vest—Color combinations (red with navy blue or black)

Collar and Cuffs—Color combinations (tan and bright blues with tan or brown. Blue and green with grey or dark green; also white is good with any plain colored suit.)

Color Combinations.

Popular Colors:

Navy Blue—
Light blue, peacock blue, alice blue.
Mikado Red, scarlet, Cherry and victory red.
Tan.
Green.

Black—
Mikado Red.
Alice or peacock blue.
White.

Brown—
Darker or lighter shades.

Taupe—
Red.
Alice or peacock blue.

New Materials (Spring).

Suits and dresses.
Serge.
tricotine.
tricolette (looks very much like sweaters).
jersey.
light weight broad cloth
Scotch tweed.
gabardine.

Silk—
Georgette.
Crepe de Chine.
Foulards (plain and figured)

Coats—
Cravenette cloth.
Serge.
Velour.

Dresses—Summer—

Voile—plain and figured.

Organdy.

Net—chance to use old materials and organdy combinations.

Wash silks and satins.

Taffetas—for suits.

Gingham.

Fancy Stitches.

Wool or silk embroidery in wool or silk in mercerized cotton is very popular. Large designs the best loosely embroidered, no padding.

Arrow head for pocket finishes or at the end of pleat, very popular this year.

All kinds of outline or plain long running stitches is popular. Beading is not so popular as it has been, but large beads in the bright colors are very popular, to be worn with dark dresses.

Seam Finish.

Piecing with seams. Slot seam to cover piecing. Back, front, or side of skirt. Back, front or sleeve in waist. Outside stitching on welt or lapped seams for finish.

References.

1. Cleaning and Renovating at Home. E. G. Osman—A. G. McClurg, Chicago. $ .75
2. Housekeepers Handbook of Cleaning. S. J. McLeod—Harper & Bros. New York City. $1.25
3. Laundry Manual, L. R. Balderston 1224 Cherry St. Philadelphia. $1.25
4. The Dyeing and Cleaning of Textile Fabrics. F. A. Owen—Wiley & Son. New York City. $2.00
5. Clothing for Women. L. I. Baldt J. B. Lippincott, Chicago. $2.00
6. The Dressmaker Butterick Publishing Co. New York. $1.00
7. The Dressmaking. Jane Fales $1.50

Charles Scribner & Sons. Chicago.

8. Industrial Drawing for Girls, Edith Carey Hammond.
9. Textile and Costume Design. Evelyn Peters Ellsworth—Paul Elder & Co., San Francisco. $1.25
10. Textiles—Wollman and McGowan MacMillan, New York City. $2.00
11. The Business of the Household—Taber J. B. Lippincott Co. Chicago. $2.00
12. Practical Home Millinery. Amy J. Reeves Longman's Green & Co. New York City. $1.00

Magazines.

Le Costume Royal—19 W. 44th St. New York. $3.50 yr.
Elite Styles—9 E. 37th St. New York. $2.50 per year.
Vogue—19 W. 44th St. New York. $5.00 per year.

All have styles and patterns that may be altered to suit one's taste. It pays to change ones ideas by using such magazines.

For Commercial Patterns—

Standard, Butterick, Ladies Home Journal, McCall patterns may be used, but care must be taken to buy patterns to one's own measurements.

The Need of Theoretical Knowledge in the Manufacture of Swiss Cheese.

Fred Marty,
Ex-Dairy and Food Inspector.
Monroe, Wisconsin.

Mr. Chairman and Fellow-members:

My experience as a field worker among Cheese Factories for fifteen years, has impressed me of the needed education along theoretical knowledge of Milk and its Products, among our cheese-makers.

Green County should long ago have been in the possession of a model Swiss Cheese factory, where ample accommodations were available to a certain number of students each year.

This institution should, in its construction represent the average Swiss Cheese factory in this district, only perhaps that it would differ in the size of the average cheese factory. But it should act as a guide in construction, and equipment of utensils, and it should be strictly in compliance with the Rules and Regulations of the State Cheese Factory License Law.

This factory therefore, would act as a guidance to the future construction of cheese factories, in construction and equipments.

This saving alone, in the future misconstructed and equipped factories, with its important financial results in the constant change of construction and equipment, would alone reimburse hundred fold the cost of such an institution.

It is an acknowledged fact that the cheesemaker is becoming a more and more important factor to a community of milk producers whose financial success depends entirely upon his knowledge and skill as a cheesemaker.

The high price of land of today makes this fact all the more important. Every year that has elapsed has

sacrificed the cost of construction and maintainance of such an institution a hundred fold, and I am safe to say that in many cases a single factory has paid the price, due to the unskilled knowledge of the cheesemaker.

In order that the best results were obtained from this institution, entire different methods than that which is now practiced by the different dairy schools should be installed.

For instance, the eligible student to this institution for the manufacture of Swiss Cheese, should have at least 3 full years of practical experience as a helper, in order to be eligible as a student, as my past experience as an instructor of foreign cheese at the dairy school of the University of Wisconsin for four years, showed me that the student without sufficient knowledge of making cheese, was slow and in many cases unable to properly understand the meaning and appliance of theoretical knowledge in the manufacture of cheese; because this student of limited practical experience had not met with the different mechanical faults and various other troubles that are experienced in daily practice, and therefore did not understand the meaning of theoretical appliances to remedy the trouble. He is therefore in the same position as is the cheesemaker without the theoretical knowledge of milk and its product. He only knows that he has trouble, but does not know the reason why, or how to remedy the trouble.

An opportunity is at hand; that is to take advantage of the Imported Swiss Cheese Market that is established here, and which cannot be supplied by foreign countries for some time to come.

It may be of importance for you to know that East Pennsylvania and Ohio, as well as California are making strenuous preparation, and are to a considerable extent manufacturing Swiss Cheese today.

For example, Ohio is again operating a hundred Swiss Cheese factories, and through the aid of their respective state agricultural colleges, as well as the U. S. Agricul-

tural Department, they are assisting those factories materially in producing a high grade of Swiss Cheese.

The writer had the opportunity to act as cheese judge at the National Dairy Show held at Columbus, Ohio in October 1918, and judged 17 Ohio Swiss Cheeses, of which some of them scored as high as 95 points out of a possible 100 points.

They are introducing a culture in Ohio, whereby they produce the required Eyes or Holes in the Swiss Cheese and the high score placed on some of the cheese there speaks for itself as to the results they are having.

So it behooves Old Wisconsin to do something in the line of improvement, as we will experience keen competition in the future.

I dare say, had Ohio at the present the quality of milk that we have here in Wisconsin they would have the best of us to begin with, as they are closer to the consuming markets than we are here in Wisconsin.

In order to manufacture a domestic Swiss Cheese that will favorably compare with a fancy imported Swiss Cheese, an entire evolution will be necessary in the construction of our cheese factories and also of the handling of the Domestic Swiss Cheese.

Our success of imitating an Imported Swiss Cheese has only been successful in so far as our climatic temperature of a certain time of the year has been favorable to that extent. Whereas, there occurs a loss of hundreds of thousands of dollars annually to the Swiss Cheese Industry of this state, due to the very fact that the construction of the Cheese Curing Rooms for the fermantation process to develop the Eyes or Holes in the cheese, is inadequate, as well as the cheese curing rooms, which should hold the cheese after they are opened up; to prevent the annual enormous loss alone in cracked cheese.

I appeal to you public spirited men, who have the Swiss Cheese Iudustry at heart, to use your utmost effort to bring about an Educational Institution for the manufacture of Swiss Cheese: without it, you will never

reap in full measure the fruit of your labor. But you will each year retract the mistakes of the past, and instead of progression, you will gradually decline in efficiency.

A school of technical teaching in the manufacture of Swiss Cheese would continuously introduce new life and up-to-date methods to the beginner, as well as the older cheesemaker.

Since there is no branch of manufacture where theory is so closely related to practice as in the manufacture of cheese, it would teach them the composition of milk, its different ingredients and their intended purpose.

They would learn why milk coagulates (curdles) when Rennet is added. They would learn the kind and per cent of acidity the Rennet should contain for the milk on hand. They would learn how to prevent the manufacture of 'Cracked Cheese.' They would learn how to prevent the manufacture of 'Glaess Swiss Cheese', as well as cheese that set too many Eyes or Holes. They would learn the reason of a cheese containing 'Stink Spots' as well as many other mechanical faults in the manufacture of Swiss Cheese.

An Educational Institution would soon turn out enough students to cover our entire district, which would soon introduce a more skillful and uniform method of manufacture.

Besides, it would acquaint them in the proper handling of the various milk tests, which so far they have entirely ignored, because they are unknown to them, and we would therefore produce a more uniform quality of cheese.

Can we afford to be without one?

That question I shall leave to you.

Permanent Agriculture.

Prof. C. H. Bauer
University of Illinois, Urbana, Ill.

Upon your request it will be my purpose, while with you upon these two days of your annual convention, to present to you the teachings and methods urged by the Illinois Experiment Station relative to the improvement of soils. You have indicated your interest in the subject of the use of rock phosphate for soil improvement. It will be therefore, my purpose to especially emphasize this subject during my presence with you. However, before going into a detailed discussion of rock phosphate in its relation to soil improvement, I believe that it would be wise to spend a little time upon some general considerations, in order that we may have in mind some of the basic principles underlying soil improvement. Indeed an understanding of these principles is important to a clear understanding of the use of rock phosphate. I will therefore discuss with you at the present time the general problem of Permanent Agriculture.

The problem of Permanent Agriculture, or the term permanent fertility which is often used, in its application is simple. In short it means the making sure that all the essential elements of plant food are so provided that the needs of maximum crops may be fully met. Such elements that are not provided by nature must be provided by man.

The incentive for the establishment of permanent systems of fertility is boldly evident from the records of production and the present agricultural conditions, wherever illy advised systems of farming have been practiced. Too few people realize, that in a great measure, the earning capital of crop production is not 'broad acres,' but the fertility of the soil. The tremendous draft upon the fertility of the soil by ordinary cropping systems is too little appreciated. If a man owns

a 160 acre farm, and grew 80 acres of corn each year, and if it were possible to produce 50 bushels each year, and the commercial price is placed on the elements of plant food removed, that three of the elements often applied in crop production, nitrogen, phosphorus and potassium after 50 years would have a value sufficient to buy another 160 acre farm at $200 per acre. With ordinary systems of farming the fertility is gradually diminished from the soil and often the farmer fails to realize that he is doing business upon a diminishing capital,—the fertility of the soil. Surely the basic principles of soil improvement are matters of considerable importance.

Generally speaking, many of the agricultural practices of the past have been guided to too great an extent by unsound notions. Many people would have us think that emphasis upon the subject of soil improvement and soil enrichment, is entirely out of place. They seem to think that nature in some way will provide all the essentials for the production of crops. This is not, however, the way in which nature works, as is evidenced by the conditions of many agricultural regions. Nature may enrich bottom lands by over flow; she may renew some lands through a low grade system of permanent fertility, by erosion; she may produce legume plants and other forms of vegetation that may enrich the soil with nitrogen and organic matter, but on our common agricultural lands she has been removing year by year important elements of fertility, which make it ever and ever more increasingly difficult for vegetation to grow. If these lands are to continue to produce good crops, it is the farmer himself who must enrich and take care of them. To him must be entrusted the possibility of a permanent agriculture.

Perhaps we might at this point ask ourselves a few questions. Is it a fact that the older agricultural lands are less productive than they once were? If so some very important lessons may be learned from a study of the conditions prevailing. If such is always the gen-

eral rule then future poverty can be predicted. Again we might ask whether land varies in productive power? If there is variation in the productive power of land, what is the cause for it? Then again we might ask do all farmers get similar results when farming similar lands? If not we might ask why they do not? Positive answers to these questions would indicate that land is exhausted by the growing of crops, that there is a great deal of variation in land and also in the ability of the men living upon the land, as farmers. All of these are factors which must be considered in the establishment of permanent systems of agriculture.

It may perhaps be interesting to point out a few broad facts concerning agricultural production and the agricultural lands of this country in connection with our problem. A study of the census reports show that almost 10,000,000 acres of agricultural land was abandoned in the New England states, New York, New Jersey and Pennsylvania between the years 1880 and 1910. Here large areas of agricultural land have been abandoned at the very doors of the eastern markets, where instead of being worth a few dollars per acre they should be worth hundreds of dollars. Undoubtedly rational systems of soil improvement would have done much to prevent this condition. A further study of the census reports shows that the population of this country increases about 21% every ten years. Up to the year 1900 the increase of agricultural land more than kept pace with this increase of population. Since 1900 however the increase of agricultural land has fallen to less than 5%. Furthermore the increase in the production of crops during this latter period has been very slight. Of the five important cereals, corn, wheat, oats, barley and rye, there was only 1.7% increase. The question then as to how the increase in our population has been fed may be found in the records of our exports and imports. The exports in both grain and meat foods were very greatly decreased during this period, and the

imports were increased. We are all aware of the fact that this, the greatest corn country in the world, has already imported corn from Argentine. It may be further noted that during these changes, the price of agricultural land has more than doubled, because of its increasing scarcity in the humid regions of the country. Certainly these facts point to the great need of more economically increasing production from now on.

Before the ideals of permanent agriculture, the economical enrichment of the soil, can be attained, sound principles of soil improvement must be established, through definite knowledge of the needs of the soil. The farmer or those directing his efforts must have definite information in regard to (1) the requirements of the crops to be grown and especially with reference to the requirements for plant food,—those things out of which plants are made; (2) the total stock of plant food contained in the soil, or soil composition; (3) the availability of the plant food elements in relation to practical methods of farming; (4) practical economical methods of supplementing or increasing the plant food content of the soil; and (5) the systems of farming or soil management that will most profitably and permanently maintain the productive power of the soil.

Before entering into a more detailed discussion of these points, it may be profitable to consider the stories of a few farmers with whom some of you may be familiar. Perhaps the history of their success as farmers will help us to a better understanding of the points we wish to discuss here.

We will call our first farmer friend, farmer A to separate him from some of the others we will talk about. He is one of the older group of farmers many of his type which we can find in the corn belt. He came to this wonderful corn belt region years ago, and found a soil so fertile and a climate so constituted that he could grow good crops of corn year after year with out much trouble. Surely this was one of the garden spots of the world. This was the sort of a place he was looking for.

It did not take a great deal of effort to grow a good crop of corn. This is a very rich country. 'I can stay here for ever and grow corn.' Our friend was not trained to look into the future and perceive its problems, and further the future did not bother him. He was satisfied to take things just as they were and as far as he was concerned he would always grow corn. That is the crop that should be grown in this region anyway. Why bother with other crops anyway. So he settled down on his farm which he had picked out in the corn belt and grew corn year after year. He is still growing corn. He has never grown any other crop. When he first began growing corn in this wonderful region he was able to grow as much as 60 bushels or more per acre without much trouble. All through these 40 years that he has been on this farm he has never paid any attention to the soil. No manure has he plowed under, no not even has he plowed under the corn stalks. It was easier to burn them. The soil was rich and it didn't need any care. But now you ask, how much corn is he growing today? Surely he is not growing 60 bushels per acre with that sort of a system? No indeed, he is not. I will tell you. As a recent ten year average his yield of corn has been only 28.3 bushels per acre. In spite of this rather large decrease in yield, our friend does not seem to worry very much about it. He takes it as a matter of course, and when any one says anything to him about improving his system of farming, he merely states that it is better to be producing about 30 bushels of corn per acre per year than it is to be producing 60 bushels per acre once every three years in a three year rotation which is recommended by some. He states that the other crops such as oats and clover that might be grown with the corn, do not pay and thus it is better to have 90 bushels of corn in three years instead of 30. And so our friend Mr. A continues to farm, and he is by no means the only farmer in the corn belt who thinks in the same way. We might say for Mr. A that outside of his ideas concerning the care of the soil, that

he is a very good farmer. He wants his land tiled, he uses the best machinery, cultivates his crop exceedingly well and will use only the best of seed.

In this same region Mr. B also settled a number of years ago. In his thinking he was a good deal like Mr. A except that he was of the belief, that no matter how good the soil was a farmer ought to practice a rotation for the benefit of the soil. So when he began his farming operations near his neighbor, he began alternating each crop with a crop of oats, which system he has followed also for about 40 years. Outside the growing of corn and oats together he did not believe the soil needed any special treatment, not even returning any of the corn stalks or the oats straw. Like Farmer A. he was a good farmer in other respects and was apparently contented to let things go as they were. And now you may ask what sort of yields he has been getting of late. I will tell you. As an average of the same ten years which we have given for Farmer A. his corn crops have averaged 37.6 bushels per acre and his oats 38.6 bushels. Now there are many farmers like our friend Farmer B. in the corn belt. In fact the most common cropping scheme in the corn belt is corn and oats, and I may say that the average yields of corn and oats in the best corn belt counties of Illinois average about the same as indicated above. So Farmer B may be said to represent the average farmer in the corn belt.

Now our two farmer friends had another neighbor whom we will call Farmer C. who settled in this community at about the same time. He did not quite agree with his neighbors in regard to their management of crops. He had come originally from a region where it was believed that good farming could not be done unless clover was grown in the rotation. There were some peculiar properties about clover, which made the crops following yield more than those which did not follow clover. So in his system, even though he was in a wonderful country, was to include a crop of clover. He was even willing to make it a three year rotation, corn, oats

and clover. Outside the virtues of merely growing clover on the land he did not believe that the soil needed any other attention, except that it be well farmed according to the ideas of his neighbors. And so he followed this system along side of his neighbors, for the same length of time and I am sure you will be interested to know how his system compares with theirs. It is a little unfortunate that Farmer C. did not divide his farm up into three equal fields. He did not so he could only produce one crop each year. Thus it is a little more difficult to make a strict comparison, because his corn crop may have come on a year that was not so good as the average year or on the other hand it might be above the average if good years prevailed. However taking the same ten years as those for the farmers mentioned above, his corn yields average 40.7 bushels. Evidently the last corn year must have been a poor one, for placing the ten year period ahead just a year the average was 57.6. Anyway there has been some advantage in growing clover with the corn and oats in such a three year system.

Fortunately we do have another farmer whose results can throw a little light on the clover farming proposition. Instead of practicing the three year rotation all this time he began at a later time taking some land that had lain in pasture for some years previous, and which before this had probably grown some grain crops. He grew the three year rotation for 10 years, then he introduced wheat and now has grown the four year rotation for 7 years. His farm was divided into four fields so that he has produced every crop each year. Outside of his rotation schemes, he also did not believe in any special treatment of the soil, not even putting back any manures or stalks or straws. Although his farm has not been operated as long as his three neighbors' his results probably represent what might be expected under such conditions. Taking the same ten years as for the others his corn averaged 52.6 bushels. Now this you

may say represents pretty good corn farming. And so it does. This farmer has ¼ of his land in corn each year and three other crops must be grown on the same land before corn is grown again, and one of these is clover. We might ask the question however, whether this is the best system of farming in the corn belt in order to insure a permanent agriculture. In order to answer this question we must intelligently introduce Farmer E.

Farmer E. is another type of man entirely. He is a somewhat younger man, and perhaps if we looked into his record a little more closely we might find that he is an agricultural graduate. I am not sure about this, but at any rate when you talk with him you are impressed with the fact he has studied the matter of soil improvement quite thoroughly and that he is pretty thoroughly saturated with the best facts which the world affords upon such matters. For instance he tells his neighbors of the great importance of permanent agriculture, and that rotation alone can not maintain the productive power of the soil. Mere rotation will not return to the soil the plant food removed by the crops. He can prove his assertion by data from long continued experiments. He can for instance tell them of the long continued experiments at Rothamsted, England, which show that a good rotation does not maintain the productive power of the soil. There a four year rotation of wheat, turnips, barley and clover, in which the turnips may occupy the place of corn in similar rotations in this country, was carried on for 60 years or more. On one field no special treatment was given, and the money value of the first four crops of the rotation decreased from $74.84 to $27.50 as the value of the last four crops during the 60 year periods. Compared with the results of this field may be compared the results of another field under exactly the same condition, except plant food materials which are likely to become deficient in the soil were replenished from time to time. On this second field the value of the first four crops was $74.57 and the value of the last four $77.57. Here instead of the total

money value greatly decreasing as was the case with the untreated field, there was an actual increase. Even though the treatment did not greatly increase the original productive power of the soil it has maintained that power through out all these years. Data of this sort from such long continued experiments are extremely valuable in planning the best systems of farming.

Then again Farmer E. was able to point out some important facts in connection with the results of his neighbors. For instance the results of his neighbor D are quite interesting. As he pointed out the average of the first three crops of corn after the introduction of the clover into the rotation scheme jumped up to 75.4 bush els. Of course this would appear as a good argument for clover. The second rotation , the average yield went down to 71.5 bushels, and the third rotation the corn averaged only 49.4 bushels. At this stage Farmer D. introduced wheat into his rotation and as an average of the next four years the corn yield remained about the same, namely 50.8 bushels. Thus even here the use of clover in the rotation has not been able to hold up the original productive power of the soil. Our friend could quote from the results of many other experiments upon these subjects He also had been a close student of the different treatments which might be given the soil in order to make its fertility permanent. He had carefully gone through the results of many experiments upon this subject. He at last hit upon what he thought would be the right idea with respect to the solution of the problem of permanent agriculture. The soil must be enriched. The essential materials should be secured from economical sources. This was his plan. He started out at first as his neighbor D, namely with a three year rotation, of corn, oats and clover. After ten years he introduced wheat making it in the order of corn, oats, clover and wheat. This would enable him to start the clover in the oats, which after producing a hay or seed crop would be plowed down for wheat, to be seeded in the fall. Early the next spring he would seed clover or

a mixture of clovers in the wheat and allow it to grow until the next spring when it would be plowed down for corn. In this mnaner he would have a chance to make two seedings of legumes on each field during the rotation. By feeding and pasturing these legumes and the other products consumed on the farm would be returned to the oil in the form of manure. Or if he preferred not to feed livestock, he would just plow under all of the residues which included everything except the grain and seed which he would sell. Such a system would keep the soil replenished with organic matter which was gradually used up on cultivated soils, and also would provide him with a good supply of the commercially very expensive element nitrogen which the legumes could appropriate from the inexhaustible supply in the atmosphere. Then also his soil would need some minerals. He learned that phosphorus was an elemen that was more or less deficient in most agricultural soils and that if agriculture was to be permanent this element must be supplied in some way. There were a number of forms of phosphorus which he might use, but it was not quite clear to him which would make the best source. He decided on bone meal which he applied at the rate of 200 pounds per acre per year. After applying the bone meal for six years he came to the conclusion that perhaps finely ground raw rock phosphate might be the most economical and profitable form to use. He decided that he ought to apply equal money values as compared with the bone meal, which supplied just enough of the phosphorus to fulfill the demands of a maximum crop. He figured that at this rate he could afford to apply about ½ ton each year. This looked like a very large amount and so he settled on an application at the rate of 600 pounds per year to one-half of his farm, using bone meal on the other half. Thus the use of rock phosphate would give him much more of the element phosphorus for less money than he had invested in bonemeal. This is the system he still follows. When he began his soil treatment scheme not

a great deal was known about the proper methods of liming the soil. It was evident however, that lime in a soil was a very good thing. He was alert and after a few years he decided that he ought to use limestone on his soil at the rate of about two tons per acre once during the rotation. He had learned that his soil was supplied with potash, and he believed that if he farmed well that his crops could get all the potash they needed from the soil. This was the method in which the soil should be treated in order to get the best permanent and profitable results as he arrived at it from a rather exhaustive study of soils and crop production.

Now I am sure you are interested in learning what results he secured from the system which he put into operation. Speaking of the same ten years for which we have already given results from his neighbors systems of farming, Farmer E. averaged 72.8 bushels of corn. For a six year period his corn average 88.5 bushels. During the last several years however conditions were not so favorable for corn and this high average has been cut down. But 72.8 bushels as an average of 10 consecutive crops is certainly something well worth while. In this connection I am sure that you will be interested in the yields of the other crops he has secured. The ten year average yield of oats was 67.0 bushels, wheat 41.3 and clover 2.68 tons of hay or bushels of seed. * Farmer D's. results with these same crops were oats, 49.3 bushels, wheat 21.9 bushels and clover 1.97 tons of hay or bushels of seed. * There is probably no doubt in any one's mind as to which farmer was practicing the most profitable system. It will be at once recognized that Farmer E. is making use of natural materials for the improvement of the soil and that he is using them in such a way as to actually enrich the soil in those things which must be present to make crops grow well. Here with the same rainfall, the same sunshine, the same well practiced art of farming, and the use of good seed, the only differences being that of the treatment of the soil very marked differences in production are se-

cured by these various farmers on the same kind of soil.

* Ill. Sta. Soil Rport No. 18.

Perhaps by this time I need not confess to you, that these farmers about whom we have been talking, are not real farmers, but just characters which we have taken to represent some of the soil experiment work being carried on at the Illinois Agricultural Experiment Station. I can assure you however, that it will not be very difficult to find real farmers in the corn belt whose methods of farming would fit these descriptions very well.

It would be interesting to go on and tell you about some other real farmers who have accomplished results on a large scale just as striking as those already presented you. It would not probably be worth while to take up too much time with such things, but I want to tell you the story of at least one such farmer.

This farmer is very similar to our friend Farmer E. He had made a very thorough study of soil matters and had arrived at conclusions very similar to E's. with respect to the proper method of permanently establishing agriculture. In order to try out his ideas of soil improvement by soil enrichment by the use of natural materials, he went to a section of Illinois where the land is not considered as being worth very much for agricultural purposes. He bought a tract of land that was agriculturally abandoned for a number of years previous because it was not considered worth while to try to grow any crops upon it. This land was purchased for a few dollars per acre, and I presume that owner thought he was getting a fine price for it. The purchaser started his system of soil improvement. Since the land was in a rather poor condition a six year rotation was planned, namely corn, oats wheat and three years of clover and timothy meadow and pasture. In addition to the rotation all the manure that could be made upon the farm was applied to the soil and all the farm residues, stalks, straws, etc., not converted into manure

were plowed directly under. In addition two tons of pulverized limestone and one ton of finely ground raw rock phosphate were applied once during the rotation. The total cost of the minrals per acre per year amounted to about $1.75. With such a system one cannot expect that it will produce big results the first or second year, or perhaps even in the first rotation. With the present farm it is in the second rotation that some striking results appear. In 1913 one of the fields was seeded to the second crop of wheat. At harvest time 35.5 bushels were threshed from each acre of the field, except some checks which had been left for the sake of comparison. On the check which differed from the main part of the field by the absence of the limestone and phosphate, the yield was only 11.5 bushels, a difference due to the minerals of 24 bushels of wheat. Here the use of minerals had caused the production of more than twice as much wheat at an investment of $1.75 per acre, than the land itself was capable of producing. Here was a case of bread from stones. Since this time the results on wheat though varying from year to year have been about as striking. These results are from the farm purchased in southern Illinois by Dr. C. G. Hopkins of the Illinois Station.*

* See Illinois Sta. Cir. 168, Bread From Stones.

It will now be worth while to make a few comparisons from the economic standpoint from the information furnished by these various farmers. Farmers are interested in the largest amount of profit they can secure from an acre of land. From the above discussion it is quite evident that the methods practiced by the farmers of the corn belt bring quite different results. Some of them produce poor crops and others produce good crops. The farmers first discussed are all located on average corn belt land. Such land is worth at least $200 per acre. Surely if the land is worth that much to the farmer he should try to make it earn a proper sort of revenue. For purposes of getting at the problem in general let us assume that there are some

farmers on such corn belt land whose efficiency in corn production is 20 bushels per acre, some whose efficiency is 40 bushels, some of 60, some of 80 and perhaps the 100 bushel efficiency farmer may appear at some future time. It is possible however to find all of these types of farmers in some one year or another. I have known a farmer whose corn crop actually turned out 20 bushels per acre. Just across the road under exactly the same conditions this man's neighbor produces 70 bushels per acre during the same year. The one said it did not rain enough; but the other had the same rainfall.

Now if corn is worth 50 cents per bushel, and it costs $6 an acre for labor, with interest at 5%, taxes at $1 and harvesting is figured at 5 cents per bushel, the farmer who only grows 20 bushels of corn per acre stands to lose $8 on each acre. He pays dearly for the privilege of farming such land. The man who produces 40 bushels makes $1 per acre. The 60 bushel farmer makes $10, the 80 bushel farmer $19 and if the 100 bushel farmer appears he will make $28 above all expenses. It is essential to grow a certain number of bushels to cover the fixed expenses of production. Whatever yield is secured after that will begin to count profits. The farmer is interested in larger yields as a general proposition because it means greater returns to him. If he can keep the costs essential to the increase down to the minimum, he may greatly increase his net profits.

Now this proposition can be turned around the other way. You may say that land that produces only 20 bushels per acre is not worth $200 per acre. No it is certainly not worth that much to the man who so farms but it might easily be worth that to some other farmer. It is of course recognized that it is possible under certain conditions and in certain communities that land values may be entirely too high from all economic considerations. In general however, we are concerned with the actual values of the land. To this may be con-

trasted the real value of the land which rests on its earning efficiency. The earning efficiency of land is dependent upon the productive power of the land. On this basis we may figure what the value of the land should be in the case of the various farms mentioned before. In getting at the real values of land we will need to consider the depreciation of the soil which may be reckoned at 9c per bushel, labor which we have set at $6 per acre, harvesting placed at 5c per bushel and taxes and interest on the investment, which we may place at .5 per cent and 5 per cent respectfully. On this basis with corn at 50c per bushel the earning capacity of land that produces only 20 bushels per acre is such that it would only pay interest on a land valuation of $21.81. Land producing 40 bushels per acre would not have a value of twice this amount but $152.72, and 80 bushel land would have a value of $414.54. It can thus be readily seen of what great importance it is to economically increase the productive power of the land.

At this point I believe we can return to a discussion of the five fundamental propositions proposed a few moments ago. We are now interested in the factors which will enable the farmer to do some of the things about which we have been talking. Perhaps the important starting point for the improvement of the soil would be the farmer himself. As it is not our province to discuss the improvement of the farmer himself at this time we must concern ourselves with some of those things about which he must be informed if he is to intelligently carry out rational systems of soil improvement.

Permanent agriculture is impossible without some knowledge of the habits of plant growth and of the materials of plant growth. The supply of food to the plant, whether it be from the air, or the soil, the amount needed for the production of good crops and the behavior of the plants with an excess or deficiency of food materials, are questions of some importance. It has been said that an acquaintance with the charactersitics, cy-

cles and sources of the essential elements of plant food is of more importance than the usual acquaintance with neighbors when it comes to matters of crop production. It is certainly good agriculture to know enough about these elements, to know which ones may cause some trouble in production and whether it is possible to exercise any control over them. The farmer should know that food for plants is just as essential as food for animals. When this is fully realized then agriculture will mean more than working the land for all that is in it.

There are ten elementary substances out of which plants are made. If any one of them are absent it will be impossible for any plant to grow. Some of these elements are abundantly supplied by nature and others are not. Such must be provided by the farmer or his land will become unproductive.

Two elements are taken directly from the air in the form of a gas known as carbon dioxide, through small openings in the leaf. The amount of this gas in the air is very small, and if the supply could not be easily renewed, three or four big crops of corn would exhaust all of it above an acre. We have never heard however of any one supplying carbon dioxide to the air in order to fertilize his crops. The fact of the matter is that this gas is very readily supplied to the air. When ever any plant substance, coal and other similar things are burned these two elements, carbon and oxygen by which they are scientifically known, unite forming the gas carbon dioxide, which disappears into the air. This same gas is produced by the use of food in the bodies of all animals and is returned to the atmosphere by excretion from the lungs. This same gas may also be produced from other sources, and thus though the amount may be very small, the supply is constant. Nature takes care of these two elements. Water is taken into the plant through the roots. A third element is supplied by water, and known as hydrogen. Thus these three elements, carbon, hydrogen and oxygen, constituting by far the

largest proportions of building materials needed by the plant, are supplied by nature in sufficient quantities for crop production. Sometimes agriculture is attempted in regions where water may be scarce, under which conditions it is necessary to apply it by means of irrigation.

There are two other elements which are usually supplied by nature in such abundance that the farmer need give little attention to them. These are sulphur and iron. They are furnished by the soil.

From the standpoint of crop production it is the other five elements with which the farmer needs to be thoroughly acquainted. These elements are known by the names, potassium, magnesium, calcium, phosphorus and nitrogen. All of them are taken by the plant from the soil. In order to thoroughly understand the relation of these elements to crop production it is essential to study them in connection with the requirements of the crops grown and the supply in the soil. The first is determined by the chemical analysis of the crops and the latter by the analysis of the soil. By studying these elements in this manner it will be possible to determine in a relative manner the fertilizer needs of the soil. Here we will briefly consider some of the more important facts.

Potassium is one of the abundant elements of nature. Usually all normal soils contain a large amount of this element. In the corn belt the total potassium supply may range from 30,000 to 50,000 or more pounds per acre. Even the sandy soils may contain as much as 25,000 pounds. Such amounts are amply sufficient to produce good crops, providing the plants can get it. A good system of farming should maintain conditions so that plants can get all the potassium they need from such soils. There are however some soils that are not well supplied with potassium. Such soils are usually found in the swampy regions, where the amount of organic matter present may be relatively high. A typical peat soil will contain about 3,000 pounds of the element,

which is far too little to supply the potash needs of the plant. Here some form of potash fertilizer is essential. There are some other conditions in which the use of potash fertilizers may prove profitable. They may be of value on the so-called alkali spots found in humid climates, and may be of value on those soils more or less deficient in organic matter. When the organic matter can be replaced, such fertilizers are of little value. Thus generally speaking the use of potash fertilizers on the normal soils is not essential. There are some, however, who would have the farmers purchase this element, in so-called balanced fertilizers for practically all soils.

Magnesium and calcium are the elements that are usually associated with limestone. They exist however in other forms in the soil and as such may supply the plant with what it needs. On a strict chemical analysis however there are some soils which actually have a deficiency of these elements from the standpoint of meeting plant food requirements. Usually however, these elements are not so important from the standpoint of deficient plant food elements, as they are from the standpoint of being deficient in certain combinations, namely in the form of lime or limestones. This in itself is an extremely important matter with respect to most of our agricultural soils and we do not have the time to enter into a detailed discussion of this problem at this time, suffice it to say, that the limestone problem is becoming more and more an important problem for all farmers to consider. Thus in our discussion of permanent agriculture we cannot omit the importance of the limestone question.

As we saw a few moments ago agricultural soils may have as much as 50,000 pounds of potassium in the surface soil. When we consider phosphorus in the same manner we find that some soils may have as much as 2,000 pounds in the surface soil, but it is more usual to find cultivated soils ranging from 800 to 1500 pounds per acre. When grain is sold from the farm about equal

amounts of potassium and phosphorus are carried away, while in livestock systems of farming much more phosphorus than potassium may leave the farm. It is thus quite evident that the question of the phosphorus supply in our agricultural soils may be an extremely important one. This problem will be the basis for our discussion at the meeting tomorrow.

Nitrogen is the most abundant agricultural element and yet commercially the most expensive element. This apparently contradictory fact can readily be understood by careful study. The soil is the source of this element to plants but the original supply exists as a gas in the atmosphere. In the elemental gas form, nitrogen is a very stable element. Of course in this form it is of little use to growing plants for they cannot use it in this form. It must first be converted into some soluble salt in the soil where it is taken up through the roots. On account of its stability, nitrogen does not readily combine into other forms which the plant can use. A few chemical processes have been discovered, but these are rather unsatisfactory, and are very expensive. The really only practical method of getting the necessary nitrogen from the air is to grow legumes which in connection with bacteria that inhabit the nodule growths found on the roots, are able to appropriate such nitrogen and build it into their structure. The growing of legumes and the consequent use of them for the improvement of the soil either in grain systems or live stock systems of farming bring up a whole multitude of questions and problems which it is not our province to discuss here.

In humid climates the nitrogen in the soil is contained only in the form of organic matter, which consists of the partially decomposed remains of vegetable and animal substances. Thus the nitrogen content of the soil can be measured by the organic matter content of the soil. Large quantities of nitrogen are used in crop production, and a good deal of nitrogen may be lost through

leaching and by other means. It thus behooves the good farmer to see that his soil is properly supplied with this important element. It has been said that the nitrogen problem is the most important problem in practical agriculture. A day of labor and a few dollars will provide enough phosphate to last a long time; but the nitrogen problem is not so easy.

There is also the problem of organic matter in our agricultural soils. The decay of organic matter in the soil is extremely important from many standpoints. It can be readily seen that after organic matter has spent itself in decay, that it will have no further virtues in this respect. In order that these beneficial processes may continue it is important that the organic matter supply of the soil be renewed from time to time. Thus these two important problems may be solved together, namely by using organic matter that contains relatively large amounts of nitrogen, and the practical solution lies in the use of the materials which the farmer has at hand or which he can grow for the purpose.

This brings us to the third point of our discussion relative to the availability of plant foods. We are not so much concerned as to the amount of soluble plant food there may be in the soil as we are with the questions as to how the raw food materials are changed to forms which the plant can use. Most of the food which will make the 1919 crop is not now in a condition which plants can use, but by harvest time it will have passed through various changes from raw materials to plant products. It is also possible to conceive of a soil being fairly well supplied with plant food materials, but making a poor crop because these elements were not changed to forms which the plant could use. Our problem is not on the question of the purchase of soluble plant foods, but upon those things which the farmer can do to influence the production of available plant food.

Bio-chemical processes are chiefly concerned with the liberation of the elements of plant food. The operation

of these forces are influenced by a large number of factors, among which may be mentioned, the soil, moisture, air, organic matter, limestone and others. The ease with which available plant food is produced in the soil varies greatly with soil conditions.

The plant itself possesses considerable power to secure soluble plant food from the soil. Some plants seem to have more powers in this respect than others. The effectiveness of the plant as a food gatherer in a large measure is dependent upon the rooting system. Anything that retards the development of the roots will interfere with the feeding power of the plant. Here the physical condition of the soil is of considerable importance. An effort to make the soil a better home for the plant will greatly increase the power of the plant to feed itself. The use of organic matter, the application of limestone, tile drainage, and good preparation of the seed bed are all effective. Under special conditions other practices may prevail.

It is not possible however for agricultural plants to get all the plant food they need by their own activities. Nitrogen is made available through the decomposition of organic matter. The by-products of the decomposition of organic matter are more or less effective in changing insoluble minerals to forms which the plant can use. Limestone has a more or less direct influence upon the availability of plant food elements. Chemical and biological processes may be encouraged to go on more readily by judicious farm practice. These and many other things are more or less under the control of the farmer, all of which will be assistance in the production of better crops.

The most important factor in permanent agriculture is that of soil enrichment. It is not uncommon to hear that the productive power of the soil may be maintained by allowing nature to take her course; that the keeping of livestock is absolutely essential; that good rotation or clover farming are sufficient in themselves. We have

however already seen that plants must be fed just like animals. We know that some of the essential plant foods may be deficient in the soil, and that the good farmer will concern himself in seeing that his soil is supplied with the essential materials. The big question with him is in regard to the manner of soil enrichment. He desires to do the best thing. This in itself is perhaps more difficult than one might think when there are prevalent so many different ideas about fertilizing the soil and the kinds of fertilizers to use. It is often quite easy to listen to the commercial fertilizer interests who advise the use of small amounts of high priced so called complete fertilizers. If one will only stop and figure out what the use of such fertilizers mean he will readily see that such applications add only a very small amount of the plant food actually used by the crop and that such a practice long continued will ultimately impoverish the soil.

In order to get upon a firm foundation with respect to the establishment of permanent systems of agriculture, the Illinois Experiment has thoroughly studied the best facts which the world affords upon the subject of soils and crop production and with the information collected by the soil investigations carried on in that state, has arrived at the conclusion that such cannot be attained except by means of soil enrichment. Further to make permanent agriculture profitable, the most economical sources of the essentials should be used. The best information at hand appears to lead to the conclusion that natural materials used in a naturl way form the bsis for the best farming under general farming conditions. In general this means the use of home-grown nitrogeneous organic matter, finely ground natural raw rock phosphate and pulverized limestone. Abnormal soils in which some one essential element may be almost or entirely lacking as potassium in peat soils, or where there is an abundance of some injurious substance as in alkali soils will need some special attention.

The question of systems of farming is one of a more or less personal nature. There may be as many systems of farming as there are farmers, for each farm will have its own problems. Some of these systems may not be so wisely planned as others, and it is therefore essential that the farmer be guided by the best information available. In general there are two important systems of farming as far as general agriculture is concerned, namely, grain farming and livestock farming. Which system a man shall follow depends upon his desires and inclinations. Both kinds of farmers can maintain the fertility of his soil equally well if he heeds the essential principles.

In conclusion we may say that the aim of permanent agriculture is to produce just as large crops as is economically profitable, and to do it without impoverishing the soil. This means actual soil enrichment. The incentive for permanent agriculture is badly evident from the agricultural and economic conditions existing about us. Our population is making more rapid demands for food each year; there are no large areas of good new lands available for agricultural purposes; the history of many agricultural regious is one of soil devastation and rapid decline agriculturally; the time has come when we must look to the improvements of the lands now in our possession; permanent agriculture is a national problem.

The best information afforded, gathered from all over the world indicates that soil enrichment is profitable; that it makes agriculture permanent. In its final analysis permanent agriculture may be accomplished by applying the simplest fundamental rules. Agricultural land must be well drained; a good rotation must be practiced which includes at least one year in four seeded to a legume crop; all the residues grown upon the farm should be returned back to the soil in full measure, either directly or in the form of manure;limestone must not be allowed to get too low; upon almost all soils phosphorus is deficient, it must be amply supplied. In Illinois it is believed, and there is much evidence to support this be-

lief, that such natural materials as home grown nitrogeneous organic matter, pulverized limestone and finely ground rock phosphate, wisely used in a well balanced system of farming will cheaply and efficiently make permanent fertility possible.

Kurzer Bericht des Käſerei-Inſtruktors.

von John Aeſchlimann.

Ich habe das Amt als Inſtructor am 15. April angetreten und am 31. Oktober die Arbeit vollendet. Ich habe 358 Käſereien beſucht. Im Durchſchnitt fand ich die Käſereien in nettem ſauberem Zuſtande und im großen Ganzen iſt darin viel Fortſchritt zu verzeichnen. Ich wurde 28 mal von Käſer- ſowie Farmer-Companies wegen Trubel beim Käſemachen, gerufen. Die Urſachen, die ich fand, waren in den meiſten Fällen unſaubere Milchgefäße, unſaubere Milchmaſchinen und ungenügend oder ſchlechtes Trinkwaſſer für die Kühe bei heißem Wetter. Der höchſte Erfolg war ſtets da zu verzeichnen, wo Farmer und Käſer zum allgemeinen Intereſſe zuſammen arbeiteten.

RESOLUTIONS.

The following Resolutions were passed at the Nineteenth Annual Convention of the Southern Wisconsin Cheesemakers' and Dairymen's Association:

Whereas, The Southern Wisconsin Cheesemakers' and Dairymen's Association at its annual convention in 1918 passed a resolution asking for the repeal of the present whey butter branding law, and

Whereas, This law is a detriment to every branch of the dairy industry, and especially to the farmers and cheesemakers at Swiss, Block, Brick and Limburger cheese factories, therefore be it

Resolved, That we again at our annuel convention of March 13 and 14, 1919, express our strong opposition to the law, and request that it be repealed by the present legislature now in session.

Be it further resolved, That a committee of two be selected by the board or directors to attend the joint public hearing on March the 19th, before the legislature.

Whereas, The College of Agriculture has been a leader for many years in the establishment of farmers' institutes, lecture courses, traveling schools and technical schools in many branches of agriculture industry, and

Whereas, The principal dairy industry of Southern Wisconsin is the manufacture of Swiss, Block, Brick and Limburger cheese, therefore be it

Resolved, That this Association ask that the College of Agriculture consider the establishment of a branch Dairy School in Southern Wisconsin for the technical

training of cheesemakers and farmers in this region engaged in the production of Swiss, Block, Brick and Limburger cheese. Be it further

Resolved, That this branch of dairy school be established in the city of Monroe as there is sufficient milk at all seasons and a model plant already established which can be utilized at once.

Whereas, The custom heretofore has been to acknowledge the efforts of those who have been instrumental in making our meetings a success.

Resolved, That this Association desires to extend thanks to Mr. J. L. Sherron, the various speakers, the orchestra, the entertainers, to the exhibitors, to the firms who have donated prizes, to the officers and committees, to the cheese instructor, to the members who have so liberally contributed, and to the public for their attendance and patronage, and to the Directors and Officers for their resolution passed in memory of S. J. Stauffacher, our lamented President.

Whereas, One year of so-called daylight saving has demonstrated that such a change is detrimental to farm work; that what little time farmers have for pleasure is by this method taken from them,

Resolved, That this Association protest against a continuance of this practice and favor the defeat of any law changing time to the favoring of the few to the great detriment of a class of citizens who are the actual producers of the resources of life.

Whereas, There are in certain sections of this state Block cheese manufactured that only resembles genuine Block cheese in style and shape, but not in quality, Be it therefore

Resolved, That this Association is in favor of legislation to prevent Brick cheese of high moisture content from being made up in the form of Block Swiss cheese in imitation of genuine Block Swiss cheese.

Respectfully submitted,

H. G. VAN WAGENEN,
JOHN P. LICHTENWALNER,
FRED TRUMPY.

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