

THE ORIGIN AND DEVELOPMENT OF THE DEPARTMENT OF MILLING INDUSTRY Compiled by C. O. Swanson, January 1929.

The testing of wheat varieties was a line of experimental work that was followed by the Kansas State Agricultural College for years even before the establishment of the Experiment Station, but the establishment of this institution greatly stimulated this work. These tests were mainly concerned with those characteristics of most interest to the wheat producer. While these trials led to valuable results it was felt that it was necessary to consider also those characteristics of wheat which concern the miller. Under the leadership of Professor J. T. Willard, head of the Department of Chemistry, an Allis experimental mill was purchased by the Department of Chemistry, in 1905. Baking tests were first made in the Department of Domestic Science in co-operation with the Department of Chemistry. In 1906 the latter department added equipment for making baking tests. An investigation of the chemical factors which determine quality in wheat was conducted in 1905 by W. E. Mathewson, Assistant Professor of Chemistry. At that time there was a currant belief that the baking quality of flour was mostly determined by the ratio to each other of the proteins gliadin to glutenin, or the proportion of alcohol soluble protein in relation to total protein. As a result of Professor Mathewson's work, it was seen that the factors which determine quality were much more complicated.

The year 1905 may then be said to be the time when the Kansas Agricultural Experiment Station began the systematic study to determine as far as possible the milling and baking value of wheat varieties. Mr. Mathewson resigned to spend a year of study in Germany and then later he took a position in the Bureau of Chemistry, United States Department of Agriculture. To take his place Mr. C. O. Swanson, Assistant Chemist at the Indiana Experiment Station, was chosen. He began making milling tests of wheat and baking tests of flour in the fall of 1906. In order to make the milling work more accurate, an aspirator purifier and an experimental scourer were designed and made. A device was also added to the mill which made it easier to set the rolls more accurately and keep them uniform during the milling of a series of wheat varieties. During the first year only those varieties grown in Kansas were used. In 1907 wheats grown in Minnesota, Tennessee, and Washington were also studied in comparison with the Kansas wheats. The results of these investigations were published in Bulletin 177 under the joint authorship of J. T. Willard and C. O. Swanson.

While conducting these baking tests it was early realized that the production of a good loaf depends largely on the physical properties of the gluten. These properties may be determined by the chemical composition of the gluten ingredients but they may also be influenced by the presence of small amounts of substances in the mixture. This is in accord with well known physico-chemical laws. The physical properties of the gluten in the dough may be profoundly affected by small quantities of associated substances in a purely physical way. It is also possible that the small quantities of substances produced by yeast growth may have a profound effect on the quality of the loaf. To test out these theories a series of baking tests were made in which were added to the dough mixture, certain chemical compounds which represented degradation

products of protein, others which were obtained from sound bran and shorts, and also those which may act as a yeast food or simply have a purely physical effect on the gluten. The results of these investigations are embodied in Bulletin 190 by J. T. Willard and C. O. Swanson. In the summer of 1908, Mr. R. C. Thompson was added to the Experiment Station force and he conducted the baking tests recorded in this bulletin.

As often happens in scientific work, an accidental discovery is made which for the time being has apparently more value or at least attracts more attention than the main line of work. It was found that the use of ammonium chloride had a very beneficial effect on the bread produced. It shortened the time of fermentation, increased the loaf volume, and improved the texture. Some four years later, Mr. H. A. Kohman, working for the Ward Baking Company as a Fellow at Mellon Institute, Pittsburgh, Pa., independently made the same discovery. As a result of this he developed Arkady yeast food. In addition to what had been discovered at the Kansas State Agricultural College, he also discovered that the use of ammonium chloride lessened the amount of yeast necessary to use in baking. In applying for a patent the Ward Baking Company found themselves opposed by the yeast interests, who contended that the beneficial effects of the ammonium chloride was a known, having been published by J. T. Willard and C. O. Swanson in the proceedings of the Kansas Academy of Science. The patent was finally granted on the ground of saving yeast, but the other benefits could not be included in the patent. If the Kansas investigators had gone one step further showing the saving of yeast, no patent would have been granted to the Ward Baking Company.

In 1910, a series of experiments were undertaken by the Departments of Chemistry and Entomology for the purpose of settling the vexed question as to whether the common fumigants have any deleterious effect on the bread made from flour treated with them. The results of this work were embodied in Bulletin 178 by George A. Dean of the department of Entomology and C. O. Swanson of the Department of Chemistry. The baking tests were performed by Miss Leila Dunton, graduate assistant in chemistry.

During the fall of 1909 a campaign for still greater wheat improvement in Kansas was begun by E. H. Webster, director of the Experiment Station. One objective of Director Webster was to secure a man who was well acquainted with the wheat problems from all standpoints and place him in charge of the wheat work. Mr. L. A. Fitz of the Bureau of Plant Industry was secured and placed in charge of the Division of Milling Industry. Mr. Fitz began his work in Kansas March 1, 1910. In 1912 Mr. Fitz was made Professor of Milling Industry and Head of the Department. Miss Leila Dunton, M. S. K. S. A. C. 1912 was appointed as assistant.

During 1910-12, most of the experimental work on wheat and flour was done in the Chemistry Department, Mr. Fitz co-operating. One line of work was to study representative flours produced by Kansas mills, and also mill stream flours. A study was also made on the effect of storage on flour. The results of these investigations are embodied in Bulletin 202 entitled Kansas Flours, Kansas Agricultural Experiment Stations. The manuscript was prepared by C. O. Swanson, J. T. Willard and L. A. Fitz. The slowness of getting bulletins published at that time is shown by the fact that the

experimental work was all done by January 1912, but the date of the bulletin is January 1915. In the case of Bulletin 177 it was still worse. The material was prepared in 1908 but was not published until 1911.

Another line of work was also prosecuted in 1910-12. This related to the effects of different methods of handling and storing, heat and moisture, and germination, and the milling and baking quality and chemical composition of wheat and flour. The results of these investigations were embodied in Technical Bulletin No. 1, Kansas Agricultural Experiment Station. The report was prepared by C. O. Swanson, L. A. Fitz, and Miss Leila Dunton. A large part of this investigation was done by Miss Dunton in partial fulfillment of the requirements for the M. S. Degree.

Sometime after Milling Industry had been definitely established as a department with Mr. L.A. Fitz as Professor and Head, he prepared a report covering the events which led up to the establishment of the department. The report is as follows:

“Since this Department is only a little more than two years old it is deemed advisable to include in this report a brief history of the inauguration of the department and the growth it has made in this brief time.

Inauguration of the Department:- During the fall of 1909 Director Webster began a campaign for still greater improvement in the wheat raising industry of this state. Realizing that the name “Kansas” on a sack of flour should be synonymous with “The Best” steps were taken which will result not only in increasing the yield per acre and total quantity produced but also in improving the quality. A circular letter outlining the proposed work was sent to practically all the millers in the state and to a great many wheat growers. Replies containing a hearty endorsement of the proposal made in the circular letter and urging that the Experiment Station, as soon as possible, begin this line of investigation were received from a large number. On Dec. 27, 1909 a joint meeting of farmers and millers was held at the College for the purpose of discussing the proposed work and outlining the plans for carrying it out.

In order to finance the work the Experiment Station agreed to use \$5000 available from the tax imposed by the Kansas Feed Law provided the millers and grain dealers would raise a like amount. Later the Northern Kansas and the Southern Kansas Millers’ Clubs, the Kansas Grain Dealers, and the Kansas City (Mo.) Board of Trade took up the matter of raising this fund. Committees were appointed from each organization. A joint meeting was held in Kansas City, and the fund apportioned as follows:

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| Kansas Millers | \$2,500 |
| Kansas Grain Dealers | 1,500 |
| Kansas City Board of Trade | 600 |
| Wichita Board of Trade | 200 |
| Kansas City Millers | 150 |

The problem was to be taken up from the following standpoints:-

1. Locate fields of wheat suitable for seed purposes; inspect these fields after they head out and before harvest; encourage proper methods of handling this grain to maintain purity and quality.
2. A thorough study of the handling of the wheat crop after maturity; i.e., the cutting, shocking, stacking, threshing, storing on the farm, and the handling in local elevator as this practice, without doubt, influences the market grade and milling qualities of wheat.
3. A study of the present system of grading as practiced by buyers, state Inspectors, etc., and its influence on the general situation of marketing Kansas wheat.
4. A study of the life history and methods of combating the insect enemies of growing and stored grain and also of the flour and by-products.
5. The eventual establishment of a State testing and baking plant of sufficient size and scope to make results reliable and to have such plant operated for the mutual benefit of miller, farmer, and elevator man.
6. Study of the effect of climate and soil upon the chemical composition of wheat and upon its subsequent milling and baking qualities.

The Department began as a Division and L. A. Fitz, formerly of the Bureau of Plant Industry, United States Department of Agriculture, was placed in charge, March 1, 1910.

The first problem was the financing of the work. The Kansas Grain Dealers and the Wichita Board of Trade failed to contribute but the Kansas millers subscribed nearly \$2000 and the total fund secured from all outside sources was \$2382. This money was subscribed for the purpose of:

1. Sending into the growing fields a number of experts to examine the fields; determine the purity and quality of the wheat for seed; instruct the farmer in its care as a seed crop; assist him in selling it as a seed crop; co-operate with the elevator and mill men in giving this seed wheat the widest possible distribution throughout the wheat belt, gaining thereby these things:
 - (a) A very large increase in number of acres seeded to good wheat.
 - (b) An appreciable increase in yield per acre.
 - (c) The organization of a system for perpetuating the best varieties of Turkey type wheat.

(d) The education of the wheat grower in caring for and handling his crop to get greatest returns per acre for his work.

(Note.- Raising the average yield per acre two bushels means an increase of eleven million bushels in our total yearly production and raising the quality one grade means an increase in price of one or two cents per bushel. This all means the adding of practically \$10,000,000 to the value of Kansas' yearly production of wheat.)

2. Checking the damage wrought by insects injurious to stored grain and mill products.

Steps were taken to locate fields of wheat "that would be suitable for seed purposes". Circular letters were sent out to farm and trade journals, daily newspapers, and to farmers who had bought good seed. These met with ready response and over 175 fields sown from introduced or College bred seed were located and 135 of these inspected just before harvest. About 14,000 acres of this wheat would pass inspection for purity and freedom from noxious weeds. Samples of the threshed grain were sent in for final inspection.

A list of farmers having seed wheat for sale was published and copies were sent out all over the state. The wheat farmers all awakened to their opportunities and an unprecedented demand for good seed wheat resulted. The supply of over 6000 bushels at Hays was soon exhausted and most of the farmers having good seed wheat for sale were able to dispose of it at a good premium over the ordinary price of milling wheat. Inquiries and orders for good seed came not only from all over Kansas but also from many other states. Only about one-third of the men on the list reported to the department their sales of seed wheat, but even this number reported the sale of over 35,000 bushels. The total cost of this work as paid from the Millers' Seed Wheat Fund was \$443.08. The expense incurred for mill fumigation as reported by the Entomology Department was \$375.12. This left a balance on hand of \$1563.80. Later the sum of \$37.00 was used in the payment of cash prizes awarded for samples of wheat exhibited at the sixth annual meeting of the Kansas Corn Breeders' Association, leaving an unexpended balance in the millers' fund of \$1526.80.

It had long been known to those working for the improvement of the wheat industry that good seed alone would not solve the problem. Along with this must go proper rotation and proper cultivation methods. The matter was taken up with the State millers' organizations and all agreed to support a bill asking for an annual appropriation of \$15,000, for the purpose of developing good seed, distributing it, and demonstrating methods of good farming. One-half this amount was secured and, as the greater portion of this work was most closely related to the work of the Agronomy Department, the fund was placed in their charge with the inspection of wheat fields for seed purposes still left under the supervision of the Milling Industry Department.

For the crop of 1911 over 150 fields were personally inspected before harvest and a list giving the names of about 200 farmers having seed wheat for sale was supplied to all persons desiring it.

For the crop of 1912 over 165 fields were inspected and a list of nearly 200 farmers offering seed wheat was issued.

A follow-up letter has been sent out each fall to all farmers on the list asking them to report names and addresses of parties to whom they have sold seed wheat. Only about one-third of those listed have ever reported, but even these few report the sale of over 35,000 bushels from the crop of 1910 and about 32,000 from the crop of 1911. Reports for crop of 1912 are not available at this date. Most of this seed wheat has sold at a margin or from ten to sixty cents above market price for commercial wheat.

Many farmers report the inspection and advertising has been a great help to them in disposing of their surplus seed wheat. While a few did not sell all of their seed, many others report that the demand was greater than they could supply. A notable example of co-operation in this is found in the Farmers' Union, at Lost Springs. This organization bought from J. H. Mapes, of Salina, 1800 bushels of seed wheat from the 1910 crop. They secured Mr. Mapes' name from our seed wheat list. They had the 1911 crop grown from this seed inspected and sold from it over 10,200 bushels in carload lots.

Kansas is not only supplying her own demands but is also furnishing seed wheat for her sister states.

Considerable equipment has been obtained for class room and laboratory work. A course dealing with the handling, marketing, and commercial grading of grain, and the manufacture of various food products from grain, has been given during the winter term of each year to seniors in the Agronomy course as well as to special and elective students. This work consists of three lecture periods and one laboratory period per week, or four credit hours. Twenty-seven students took the work in 1911 and twenty one in 1912. In several instances grain men, millers, and flour salesmen have come in for a few days special instruction in grain grading and wheat and flour testing. A set of special lectures on wheat, flour, and flour manufacture has been given each spring term to classes in the Domestic Science course studying bread making.

In addition to this regular work a special class in elementary agriculture for teachers was taught for half the spring term of 1911. This class had fifty-nine enrolled.

Besides teaching these classes, this department has assigned all the sophomores in Agriculture, amounting to from eighty-five to one hundred seventeen students per term.

Since March 1, 1912, this department has had charge of the enforcement of the state law regarding the manufacture and sale of concentrated feeding stuffs. This matter has been taken up with the feed manufacturers and dealers in the state with a view to secure the passage of the uniform law as recommended by the Association of State Feed Control Officials. Additional registrations have been secured and several cases of apparent law violation taken up. The appointment of an additional inspector has been asked for and everything is favorable for a much better observance of the law than has formerly existed.

Experiment Station Work: Most of the experimental work was carried out in co-operation with the Chemistry Department. It consisted principally of milling and baking tests and chemical analyses of wheat and flours.

In order to have at hand some data regarding the quality of different grades of flour manufactured in Kansas, thirty-five samples of flour were secured from twenty-five representative mills in the state and baking tests made on these flours. Samples of the wheat were also secured and both wheat and flour analyzed.

Samples of the mill streams were secured from two of the best mills in the state and these were baked and analyzed.

A study of the different methods of harvesting and handling wheat with their effect upon milling quality and market grade and value has been carried on through two seasons.

Also the effect that different methods of tempering wheat may have upon the milling and upon the quality of flour obtained there from has been studied. All these data have been written up and part has been ready for publication for over six months.

In connection with the seed work the question has come up among the millers as to the cause of "yellow-berry" in hard wheat. Many millers had believed it to be due to the yellow berry seed planted and had advised as a remedy the importation of new seed. All previous investigations had led to the belief that this deterioration in the hard wheat was due primarily to the effect of climatic conditions and not to character of seed sown. To verify the results of previous experimental work and to demonstrate the preponderating effect of climate rather than character of seed on resulting crop the following experiment was carried out:

Six samples of clear hard seed and six samples of yellow berry seed were selected. These samples, with one exception, were Kharkof wheat and came from seed originally sent out from the college. These samples were planted at both Hays and Manhattan. Conditions with respect to the different lots were uniform

at each place. Owing to the extremely dry season there was very little yellow berry produced in the samples grown at Manhattan and the samples grown at Hays were uniformly of the thin, shriveled, "shoe peg" type of hard wheat. In all cases the samples grown from yellow-berry seed were fully as good in every respect as those produced from the clear hard type of seed.

Plans for the experimental mill have been worked out and designs for special machinery are being made. Equipment for the new milling and baking laboratory has been designed and ordered.

Experiments are being conducted to corroborate data already secured with respect to the study of changes which take place during the sweating of grain. Also experiments are being conducted to determine if possible whether or not this change can be brought about artificially by means of proper tempering of the wheat before milling.

The effect upon milling and baking qualities of different kinds of damage in wheat such as "bin burning" and sprouting is also being determined:

Respectfully submitted

L. A. Fitz
Professor of Milling Industry"

The legislature of the 1913 session appropriated \$7500 for equipment for the mill, and \$2000 was made available from Experiment Station funds for 1912-1913-14-15. This was for conducting experiments on wheat varieties. The contract for the machinery was awarded to Wolf & Co., of Chambersburg, Pa. Mr. E. T. Bauer was present when the contract was let in the late spring or summer of 1913. Part of the machinery was on exhibition at the Operative Millers Convention, Kansas City, summer of 1913.

The machinery was installed during the summer of 1913 and the mill was first started during January 1, 1914. Mr. L. L. Leeper was hired and reported for duty about February 1, 1914.

After the formal establishment of the department of Milling Industry, a considerable investigation on wheat and flour was conducted in the Department of Chemistry by C. O. Swanson and associates. The following list of publications show what was done.

Acidity in wheat flour; its relation to phosphorus and other constituents.
C. O. Swanson
J. Ind. and Eng. Chem. IV, 274-275

A preliminary study of the conditions which affect the activity of amylolytic enzymes in wheat flour.

C. O. Swanson and J. W. Calvin
J. Am. Chem. Soc. XXV, 1635-1643.

A study of certain conditions which affect the activity of proteolytic enzymes in wheat flour.

C. O. Swanson and E. L. Tague
Journal Am. Chem. XXXVIII, 1098-1109.

Nitrogen in amino form as determined by the formal titration in relation to some factors measuring the quality of wheat flour.

C. O. Swanson and E. L. Tague
J. Am. Chem. Soc. XXIX. 482-491

Determination of acidity and titrable nitrogen in wheat with the hydrogen electrode.

C. O. Swanson and E. L. Tague
J. Agr. Res. XVI, 1-13.

Between 1912 and 1923 the work of C. O. Swanson was mostly with soil fertility problems; feeds and animal nutrition. E. L. Tague continued and is still engaged on research problems related to wheat flour.

INFORMATION FROM K.S.A.C. CATALOGS.

Catalog for 1909-10 announces that L. A. Fitz came to K.S.A.C. from the United States Department of Agriculture and was placed in charge of Milling Industry March 1, 1910. The following statement is made: The Department of Milling Industry was established by the Board of Regents primarily to take up investigations in the handling and the milling of wheat.

1st course offered: Grain products, 3 lectures and one laboratory period per week. Course dealing with the commercial methods of grading, storing, and marketing all kinds of grain and hay including loss and deterioration in transit. It will also include a brief study of the manufacture of the various food products from the grains. Laboratory: actual practice in grading samples, determination of dockage, and studying damage in commercial grains with relation to their effect on market value.

Catalogs 1910-11 and 1911-12 announce L. A. Fitz in charge and a course in Grain Products.

Announcement is made that L. A. Fitz was made Professor of Milling Industry and Miss Leila Dunton assistant in 1912.

Catalog 1912-13 contains announcement of 7 courses.

1. Commercial grain and grain inspection.
2. Grain Products.
3. Experimental milling.
4. Advanced Experimental Milling.
5. Wheat and Flour Testing.
6. Experimental Baking Tests.
7. Milling Practice, continuation of course 4.

These were announced as electives for students in agriculture.

The department has a well equipped plant consisting of six double stand rolls with necessary cleaning machinery and dust collectors, sifters and purifiers. Also a complete baking laboratory.

On May 14, 1914, Professor Fitz wrote in his report "with respect to equipment this department is pleased to report that we have the best model mill for carrying on experimental work and for teaching the theory and practice of milling that can be found in this country. In connection with this is also operated a very small experimental mill for milling small samples from test plots and for illustrating the principles of milling. There has also been established well equipped chemical and baking laboratories. Co-operative work with the Agronomy Department enables the wheat investigations to extend from the kernel of seed wheat to the finished loaf of bread."

Mr. A. E. Langworthy was made state feeding stuffs inspector in 1912.

CATALOG 1913-14.

The same seven courses as before are announced as elective for students in the course of Agriculture. At this time a beginning was made towards the course in Flour Milling Engineering. Curriculum in Agricultural Engineering contained 3 options, one of which was flour milling. The student who elected this option took all the 7 courses offered by the department and in addition Flour Mill Design, Milling Entomology and other foundation courses in engineering. All these courses were later incorporated into the curriculum of Flour Mill Engineering.

O. C. Miller was made deputy feed inspector in 1913.

CATALOG 1914-1915

Mr. L. L. Leeper, a practical miller was appointed as miller in the Department of Milling Industry February 1914. The name of L. G. Hepworth appears as deputy feeding stuffs inspector. The same 7 courses in milling were offered under the same status as before.

CATALOG 1915 – 1916

No change in faculty appears. One new course is added, Experimental Baking I, elective for students in Home Economics.

CATALOG 1916-1917

The name of Hogan Phlegar appears as that of miller, Mr. Leeper having resigned. The name of Mr. Hepworth also does not appear. The courses offered by the department were the same as before, elective for students in the course of Agriculture. This catalog contains the first outline for the Curriculum in Flour Mill Engineering. Up to this time graduates in milling were given the degree of Bachelor of Science in Agricultural Engineering. (Mr. Leeper died in 1933.)

CATALOG 1917-1918

No announcement of change in courses. Mr. C. W. Oakes was appointed miller January 1, 1918.

CATALOG 1918-1919.

The College Faculty

Fitz
Dunton
Oakes

Experiment Station Force

L. A. Fitz
Leila Dunton
C. W. Oakes
A. E. Langworthy
F. M. Aiman
C. E. Buchanan

The courses given were:

Principles of Milling
Grain Marketing
Grain Products
Milling Practice I
Milling Practice II
Wheat and Flour Testing
Experimental Baking A.
Experimental Baking B.

Catalogs 19-20, 20-21 contain no changes in personnel or courses.

CATALOG 1921-1922

Faculty:

L. A. Fitz
P. L. Mann
C. W. Oakes

Mr. Mann was Acting Head 1922-23. No change in courses. Professor Fitz resigned in the summer of 1922 to take a position with the Fleischmann Yeast Company. The feed control was placed under the Director F. D. Farrell. The course in Grain Marketing was transferred to the Department of Agricultural Economics and the course in Experimental Baking I was dropped.

CATALOG 1922-1923

Faculty:

C. O. Swanson
P. L. Mann
C. N. Oakes.

C. O. Swanson assumed the duties of Professor Milling Industry July 1, 1923. Acting Head of Department June 10 to June 30. Previous to that he was Professor Agricultural Chemistry. P. L. Mann resigned to take effect July 1, and Earl B. Working was appointed in his place. He came September 1, 1923.

The completion of the West wing of Waters Hall in 1923 gave more room to the Milling Department. Rooms 118, 119, 120, formerly used as offices by the Department of Poultry Husbandry were transferred to the Milling Department in the fall of 1923. Room 192, formerly a lecture room, was changed to a laboratory for wheat and flour testing. Room 193 the office of the department since its formal beginning, was made available for a research laboratory. Room 8 was much enlarged so as to give additional flour storage space. Raising the main line shaft from the floor of the basement room of the mill also made more room available.

CATALOG 1923-1924

Faculty:

C. O. Swanson
E. B. Working
C. W. Oakes

The following courses were announced:

Principles of Milling
Grain Products
Milling Practice I.
Milling Practice II
Thesis
Wheat and Flour Testing

Advanced Wheat and Flour Testing.
Experimental Baking A.
Milling Industry Research.

CATALOG 1924-1925

No changes in faculty. Course in Grain Products was dropped and Milling Qualities of Wheat and other Cereals given instead.

CATALOG 1925-1926

No changes in faculty or courses.

CATALOG 1926-1927.

No announced changes in faculty. Mr. Royce Owen Pence was appointed as instructor in milling July 1, 1927.

CATALOG 1927-1928.

Faculty

Swanson
Working
Pence
Oakes.

Several new courses were added.

Principles of Milling II.
Milling Technology I
Milling Technology II.

Wheat and Flour Testing was changed from 4 to 3 credit course.

Milling Qualities of Wheat was changed from a 2 to a 3 credit course.

Several changes were made in the curriculum of Flour Mill Engineering.

The equivalent of six hours of engineering courses were omitted from the curriculum to give place to 4 hours of Milling Technology, and two hours of flow sheet design.

RESEARCH WORK 1912-1923.

The research work was mostly concerned with testing wheats grown under different conditions of soil management on the Agronomy Farm. Also testing wheat varieties for milling and baking qualities. This work was done under Project 60. An enormous amount of accurate and valuable information was obtained relative to the effect of different soil treatments on the quality of wheat. Unfortunately this data was never assembled and made available in published articles while Professor Fitz and Miss Dunton were in charge. Some of the data in relation to effect of tillage on wheat quality

was used by M. C. Sewell and C. O. Swanson in Technical Bulletin 19. Other data have been used in various ways in connection with papers and addresses.

IMPROVEMENTS IN THE MILLING EQUIPMENT.

Very little was done to the milling equipment, excepting some minor changes between the time of its building in 1912-13 until 1924. It was realized that if the college mill should fulfill its function as a place for conducting experiments in milling, it was necessary to add considerable to the equipment and make a large number of alterations. Possibilities of the college mill as a place for research were discussed at Millers' meetings. At a meeting of District Organization No.2, Kansas City in August 1924, Mr. Henry Vilm suggested that several mill superintendents come to Manhattan and look over the situation. Acting on this suggestion a number of men were invited to meet at Manhattan, Friday, October 17, 1924. The following out of town men were in attendance:

Henry Vilm, Supt. Southwestern Milling Co.
Edgar S. Miller, Carrier Engineering Corp.
B. C. Williams, Supt. Red Star Milling Co.
W. H. Davidson, Supt. Snell Milling Co.
John R. Johnston, Supt. Page Milling Co.
David Page, Manager Page Milling Co.
H. M. Bainer, Southwest Wheat Improvement Assoc.
M. Scheuler, United States Department of Agri.
C. V. Topping, Southwest Millers League.
Paul Fisher, Supt. Kansas Milling Company.

The forenoon was spent first in going over the mill. Then all met at Dean Farrell's office and each one was asked to express an opinion on the matter of improving the college mill. Besides the out of town men the following local men attended this meeting:

Dean F. D. Farrell
President W. M. Jardine
C. O. Swanson who acted as chairman of the meeting.

After lunch at the College Cafeteria, the discussion was continued. It was decided to ask for a definite appropriation and appoint a committee to help perfect the plans. Mr. C. O. Swanson, who acted as chairman, appointed the following:

John R. Johnson
B. C. Williams
Henry Vilm.

As a result of the work of this committee the following list of items were made out and the cost estimated:

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| 10 - 100 bu. tempering tanks | \$700.00 |
| 1 - No. 0 Monitor wheat scourer | 134.00 |
| 1 - No. 57 B. Monitor wheat separator | 249.00 |
| 1 - No. 0 Monitor brush machine | 160.00 |
| 1 - No. 935 Wolf wheat washer | 1300.00 |
| 1 - Combination Carter Disc separator | 468.00 |
| 2 - 4" x 40" conveyors | 112.00 |
| 2 - 4" x 40" conveyors boxes, steel | 112.00 |
| 10 - Draver No. 1 Model J. Feeders | 350.00 |
| 1 - Feed packer | 241.00 |
| 1 - Small tube and sugar | 10.00 |
| 1 - No. 360 Cyclone dust collector for scourer | 63.00 |
| 2 - No. 366 Cyclone dust; collector for separators | 336.00 |
| 1 - No. 360 Cyclone dust collector for brush machines | 63.00 |
| 2 - No. 367 Cyclone dust collector for rolls | 420.00 |
| 5 - No. 360 Cyclone dust collectors for purifiers | 315.00 |
| 5 - Fans for purifiers | 250.00 |
| 1 - No. 744 (20" x 8) centrifugal | 352.00 |
| 2 - No. 1608 -60 bu. hopper scales | 230.00 |
| 2 - No. 60 bu. hoppers for scales | 100.00 |
| 1 - Platform scale for weighing flour | 135.00 |
| 2 - Double 7" x 14" roller mills..... | 1732.00 |
| 4 - Pairs of 7" x 14" extra rolls | 575.00 |
| 1 - Experimental purifier | 281.00 |
| 30 - Extra sieves for bolters | 252.00 |
| 4 - Recording meter D. C. 220 volt | 300.00 |
| 1 - 25 H. P. motor | 740.00 |
| 2 - Single stand for Allis Rolls with sifter, freight estimated | <u>240.00</u> |
| | |
| Total cost of machinery, delivered | \$10,845.00 |
| Lumber, hardware, belts, pulleys, installations and alterations ... | <u>4,400.00</u> |
| | |
| Grand Total | \$15,245.00 |

Most of the sums were actual catalog prices. Dean F. D. Farrell sent a special request to President W. M. Jardine that the sum of \$15,246 be included in the amounts to be asked from the legislature. This to be included under the general item for new equipment.

The 1925 legislature so curtailed the amount asked for new equipment that there was not enough to start any improvements in the mill. It was seen that no money could be had for this purpose until the 1927 legislature met.

This delay was not altogether a disadvantage. The meeting which had been held and the agitation for new equipment stimulated the interest of several commercial

concerns. The first to make a donation was the Carrier Engineering Corporation. This was due to the interest of Mr. Edgar S. Millar, their western representative. Under date of September 28, 1925 Mr. Miller wrote "I have just returned from a visit to our home office. While there I discussed the desirability of having an air conditioning installed in your mill at Manhattan."

"Appreciating the difficulties you encountered in carrying out your plans for improvements in the mill, I suggested to Mr. Lyle that we offer to make an installation for you at our own expense, and ask in return the privilege of securing data on its performance and of showing the equipment in operation to prospective customers. This suggestion was well received, and I was instructed to get in touch with you and other officials at the college, if the proposition met with your approval." Needless to say this proposition was delightfully received and the air conditioning equipment was installed in the early part of 1926. Mr. W. H. Andrews directing the installation. This equipment is of fundamental importance. It makes it possible to conduct experiments in milling under uniform conditions of temperature and humidity. Without this equipment we would be greatly handicapped.

At the Convention of Cereal Chemists which met in St. Louis June 1925, Dr. F. L. Dunlap of the Industrial Appliance Company, Chicago, made an offer to C. O. Swanson to present the department a Chlorine experimental bleaching outfit. This was installed in the fall of 1925, by Mr. F. C. Van Allen, traveling technician for this company. This equipment has proved itself of immense value as it makes it possible to bleach experimental flour samples with precision and accuracy. We are enabled by means of this apparatus to test flour samples after they are bleached. This is of great importance since practically no flour from the southwest is used without it first being treated with some bleaching agent.

In the spring of 1926 this same company gave in addition a large agitator which made it possible to use the Chlorine bleach on the flour streams in the college mill.

In the fall of 1925 the Wallace and Tiernan Company of Newark, New Jersey, made an offer through J. A. Strang, Kansas City representative, to install an Agene bleaching system. This was shipped early in the year 1926, and installed in April by Mr. Lyons, their technician.

Before the installation of these two bleaching systems, the college flour was bleached by Novadel. A feeder for the use of this powder was made in the summer of 1923 by Mr. C. W. Oakes. In the fall of 1926 Mr. C. T. Stork, president of the Novadel Process Corporation offered a Novadel Feeder for use in the college mill. This was received in December 1926 and installed in the early part of 1927.

This makes it possible in the college mill to bleach by three different systems.

The Alsop Process Company of St. Louis, Missouri has offered to donate an electric bleaching system. It has not been possible to take advantage of this offer since

we have D. C. current. As soon as the current is changed to A. C. this outfit will be received.

On February 23, 1926, a letter was received from Mr. C. W. Doolittle, general sales manager of the Carter-Mayhew Manufacturing Company stating that Carter-Mayhew is going to present the Department with a Carter Disc machine with their compliments. This machine came and was duly installed during the summer of 1926.

Other donations received later include: A wheat scourer of the most up to date pattern from S. Howes Company", Silver Creek, New York; a one stand experimental mill with four extra pair of rolls, from J. B. Ehram Company, Enterprise, Kansas; a Kjeldahl suction digestion rack, Laboratory Construction Company, Kansas City. The scourer was installed along side the upright Iron Prinz in the mill. The wheat may be sent to either scourer, and so make direct comparisons. The new S. Howes scourer is horizontal and adjustable, and may be used with several types of scouring plates. The Ehram mill is coupled with a Reeves Differential pulley. This together with the extra rolls enables us to make experiments with different kinds of roll cuts and differential. The Kjeldahl digestion rack does away with the need of the customary laboratory hood.

During the summer of 1926 a complimentary installation of a wheat conditioner was made by the Carrier Engineering Corporation under the supervision of Mr. Edgar S. Miller. This machine is a very valuable addition in the duty of wheat conditioning problems.

Three meetings of the Operative Millers have been held under the auspices of the department, May 9, 1925, October 23, 1926, and April 28, 1928. Each was attended by from 150 to 175 millers. They were just meetings of district organizations No. 1 and 2. At the May meeting of 1925 and again at the October meeting 1926, the interest for an appropriation for remodeling the mill was greatly stimulated.

In Dean Call's budget for 1927, an item of \$14,723 was included for remodeling the mill. It seemed best not to make this a special item, but a part of item entitled Laboratory Equipment and Improvements. For this was asked \$56,000 for the biennium, half to be given each year. This item had difficulties in the legislature. It was actually omitted from the recommendations of the Ways and Means Committee. Through the energetic action of a number of millers it was restored, but the amount finally allowed was \$40,000 for two years. Of this sum \$12,000 was allotted for the improvements in the college mill.

It was therefore necessary to trim the \$14,723 estimated in the budget down to \$12,000. This has been done by altering some of the plans, but mostly by getting generous reductions in the prices from manufacturers. The installations have proved more expensive than anticipated, but the cost of machines less.

R. O. Pence appointed Instructor in Milling July 1, 1927.
C. W. Oakes, Miller, resigned February 14, 1933.

J. L Anderson appointed as Assistant on the 9 months basis September 1, 1933.

GRADUATES IN FLOUR MILL ENGINEERING

1916 to Date

Class of 1916
(43 graduates)

Welsh, John Hanna ----- 19

Class of 1917
(26 graduates)

Flora, Jefferson H. ----- 2

Novak, Joe Anthony ----- 11

Class of 1918
(31 graduates)

Helmkamp, Herbert John ----- 13

Mann, Paul ----- 26

Mickle, Ralph ----- 19

Class of 1921
(41 graduates)

Fletcher, Torby G. ----- 33

Class of 1922
(63 graduates)

Rogers, Walter John ----- 47

Degree Granted August 2, 1922

Johnson, Ernest Boisie ----- 51

Class of 1924
(84 graduates)

Hogan, Theodore Thomas ----- 22

Pence, Royce Owen ----- 46

Spencer, Clarence Martin ----- 52

Class of 1925

(71 graduates)

Garvie, Hugh Alexander ----- 48
Rumold, Perie ----- 33

Class of 1927
(93 graduates)

Enoch, Durad Winfield ----- 45
Stoffer, Glen Harold ----- 53