GROWTH OF THE MILLING INDUSTRY.

EARLY METHOD OF MILLING: In 1787 Oliver Evans invented a way of grinding wheat by means of an upper and a nether mill-stone, set closely upon one another. The lower stone was stationary and the upper one rotated upon it. The resulting friction and heat often changed the color, taste, and quality of the flour due to various chemical changes which took place.

Moreover, "the hard spring wheat, rich in gluten which made it tough, rendered difficult the separation of flour from bran, and thereby yielded a dark-hued flour which brought a low price in the market.---The difficulty in grinding spring wheat by the old process was with the middlings, or that part of the kernel between the bran covering and the starchy central body. The middlings, although known to be rich in the gluten which gives wheat-flour its chief value with the baker and pastry-cook, were associated with bran: and the richer the wheat in gluten, as in the case of hard spring wheat, the more difficult was the process of separation, because the gluten was the cause of the toughness." (Depew, I, 270) Accordingly some means had to be devised, some "middlings purifier" had to be invented, before the milling industry could assume any really large proportions here, and before it would pay to cultivate the thousands of acres of fertile wheat lands in Minnesota and the Dakotas.

EDMUND LA CROIX: The modern method of milling flour is of so recent a date, that the editor of the "Northwestern Miller", in 1903, could write: "It is such a modern industry that the statistical authorities at Washington are still unable to differentiate between flour and grist mills, and it will take at least another decade for British and American statesmen to understand that the business of flour-making has ceased to be a semi-agricultural occupation and has long become a great commercial industry.--The industry as it is to-day is so recent-new that the miller who sold the first spring-wheat flour abroad is still in the prime of life, and other millers who saw the dawn of the new era, as well as milling engineers who installed the fist of the modern machines, are still engaged in active business." (Edgar, W.C., Story of a Grain of Wheat, 149)

In Minneapolis, in 1870, a Frenchman named Edmund N. La Croix, built the first middlings purifier in the United States, modelled after an invention patented in France by Perrigault in 1860. The La Croix machine was crude and he was "slow in perfecting it, and careless in discussing his plans." The result was that a "coarse, unlettered workman,--possessed of a sort of underhanded cunning" who was employed in the same mill as La Croix, "realized the possibilities of the new machine, and lost no time in securing its control for himself."

"While La Croix was experimenting and dreaming, Smith secured patents and thenceforth posed as the creator of the modern purifier, although he never subsequently showed the faintest trace of inventive talent." Smith got some capitalists interested in the invention and in 1878 formed the Smith

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MILLING INDUSTRY (CONT.)

Middlings Purifier Company. This company bought up all the other obtainable purifier patents,for in the meantime the new process had become generally known and many purifiers were in use,and thus secured a practical monopoly of the purifier business. La Croix died poor and broken-hearted while Smith gaily enjoyed the income derived from the sale of the machine. While Smith's business men associates controlled the company and just gave him his income,the business was a tremendous success. Eventually,however,Smith took the administration of affairs into his own incompetent hands,and within ten years the company collapsed,a miserable failure. With the middlings purifier in use,the milling industry made great strides,but further improvements were to come,in the form of roller mills to replace the old-fashioned mill-stone.

JOHN STEVENS: John Stevens was born on December 4,1840,in Wales. While he was still a child the family came over to Canada, moving next to Ohio,and eventually,in 1854,to Neenah,Wisconsin. Stevens had to work to help support the family and accordingly he got a job as sweeper and helper in a Neenah flour mill. At that time the flour industry had not yet shifted so far westward,and Neenah was a relatively large flour center. Then Stevens became a miller in the mill of John Mills. The latter also employed one Tom Oborn,an English miller who used a system entirely different from that generally used by the American millers. Instead of picking the face of the stones like the others did,in order to rip as well as to crush the grain,Oborn left the face smooth. By this method he was able to get a yield of 25% of the so-called "good"flour,while the other millers got only a 20% yield of the "good" flour. This was of course a matter of great consequence because the good flour,being lighter in color,and much tastier,sold for about $2 a barrel a more than did the other. In 1864 Stevens together with one J.L.Clemens,bought this mill,and he at once proceeded to adopt Oborn's method of milling. Not satisfied with just using this better method,he got to figuring as to the cause of the improvement,and he came to the correct conclusion that Oborn's process was better because it did less cutting and powdering of the husk. He kept pondering over some mechanical device whereby the berry could be opened and yet the bran left intact,and finally he decided that the best means of doing this would be by using rollers instead of stones. Now rollers had been used in Hungary for quite some time already,and the Hungarian millers were doing a flourishing export business. This led some of the more far-sighted American millers like Pillsbury to go to Europe and learn all about this "high-milling" process. When they returned some of them adopted the Hungarian system altogether with the result that they had to discard all this machinery in afew years,for in the meanwhile Stevens had perfected his rollers made of chilled iron,12 inches in diameter and two feet long and corrugated. He also invented a device to feed in the wheat and experimented to find out the proper speed at which the rollers should be made to turn,in opposite directions,of course. With this machine he was

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MILLING INDUSTRY (CONT.)

able to get 500 barrels of flour while his competitors could get-only get 200 barrels at best. Moreover he was able to get 90% good flour and only 10% of the cheap flour, instead of 20 and 80% respectively like the others got. Stevens had a lot of trouble trying to keep his mthod secret. Even when he hired a watchman to watch the mill day and night, his rivals found means to break in and steal his plans.

Although Stevens made his invention about 1870, it was not patented until 1880. "The merchant mills of the country generally acknowledged his rights by paying him for the use of his inventions long after they were installed." (Encycl. Americana II, 387)

THE ROLLER PROCESS: Instead of millstones, chilled iron and porcelain rollers were now used, and instead of being ground only once, the grain is broken between six or seven different sets of rollers and it is sifted after each breaking. "The old process aimed to get as much flour as possible at one grinding; the new seeks to get as little as possible at the first two or three breakings. The old millstones were set so close together that the weight of the upper stone rested almost wholly upon the grain. The first rollers in the new process are set so far apart that the kernel is simply split for the liberation of the germ and crease. The old process sought to avoid middlings as far as possible, because they entailed th e loss of flour. The new process seeks to rpoduce as much middlings as possible, because out of the middlings comes the high grade 'patent' flour." (Depew I, 270 Article by Chas. A. Pillsbury.)

MINNEAPOLIS: The reasons why Minneapolis took the lead and became the greatest of the milling centres are: 1. The water-power from the Mississippi River; 2. Its location as "the gate-way between the wheat fields and the markets"; 3. The fact that the spring wheat of Minnesota and the Dakotas is the best in the world; 4. The genius, enterprise, and fore-sight of the millers in Minneapolis, such as Washburne and Pillsbury. The value of the product in Minneapolis rose as follows:

None in 1840	$7,500,000 in 1870
$500 in 1850	$41,500,000 in 1880
$1,300,000 in 1860	$60,000,000 in 1890

The output in barrels of one hundred pounds each increased from 940,786 in the years 1877-1878, to 9,418,225 barrels in 1894-1895, while exports during the same period increased from 109,183 barrels to 2,377,090 barrels.

UNITED STATES: The products, (flour) in barrels, of the twelve largest milling centres of the United States in 1894 were:

Minneapolis	9,400,535	Kansas City	725,390
Superior-Duluth	2,946,292	Indianapolis	690,096
St. Louis	1,656,645	Chicago	444,000
Milwaukee	1,576,064	Baltimore	420,373
Buffalo	1,292,565	Cleveland	402,000
Toledo	869,500	Cincinnati	335,821

(Depew I, 271)

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MILLING INDUSTRY (CONT.)

In 1880 the flour and grist mill industry led all other industries in the United States with a total value of $505,185,712, meat packing and slaughtering coming second with a value of product of $303,562,413. By 1890, although the value of the product of the milling industry increased further to $513,971,474, the industry ranked a close second to meat packing which had advanced in value to $561,611,668. The flour produced in the United States in 1889 amounted to 80,948,977 barrels, and in 1899 this amount rose to 103,524,094 barrels.

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GLUCOSE.

The glucose industry which began in the 'seventies developed rapidly, until in 1881 there were nineteen factories making glucose in the States of New York, Ohio, Illinois, Michigan, Iowa and Missouri. Together they consumed about 35,000 bushels of corn per day and between eleven and twelve million per year. Their estimated capital was $2,000,000 and they employed 2100 persons. By 1884 it was estimated that the yearly manufacture and sale of glucose amounted to about ten pounds per capita, its chief uses being in the manufacture of table syrups, strained honey, confectionery, and the cheaper grades of sugar, as well as food for bees, and in the manufacture of condensed milk and mucilage.** (Annual Cyclopedia 1884)

The industry kept growing and in July or August of 1897 the Glucose Trust in the form of the Glucose Sugar Refining Company was formed, including all plants in the country but one, and with a capital of over $40,000,000. Later it became the subject of a report by the United States Industrial Commission. According to the testimony of H.O.Havemeyer of the Sugar Trust before the Industrial Commission," the syrup made from glucose has virtually knocked out the consumption of refined molasses in this country."* (Hearings, I, P, 114)

MANUFACTURE: In the United States glucose is made from corn starch while in Europe it is made from potato starch. The process involves eighteen steps and takes approximately eighty hours. A bushel of corn yields about forty pounds of glucose or corn syrup as it is sometimes called.

"After the corn is steeped it is ground in water, and the wet starch separated and converted in copper converters by the action of hydrochloric acid, which is later neutralized by chalk or some other alkali; (it is then) subjected to filtration, then concentrated in a vacuum-pan until it tests 41 to 45 degrees Baume, the difference being in the amount of water eliminated.--If the conversion of starch with acid is carried to a point where a dilute iodine solution will just give a distinct color-reaction, we have glucose."

(Encycl. Amer. XII, 727)

The extensive use of glucose as a food, some table syrups actually being 85% glucose, led to inquiries and tests. Prof.H.W.Wiley settled the question however by declaring that it was not at all deleterious.

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THE WATER-GAS INDUSTRY.

INVENTION: By 1870 the use of gas as an illuminating agent was pretty general. Compared to thelight given by the old whale-oil lamps and the tallow dips,this fifteen to seventeen candle-power coal-gas was a great improvement. However,when the new and improved kerosene lamps were put on the market,the future of the gas industry became a serious question. In order to get a cheaper and better gas,engineers then began experimenting,with the result that two of them,independently of one another,discovered means of making water-gas by the dissociation of steam in contact with incandescent carbon.

MANUFACTURE: These men were Tessie du Motay and Prof.T.S.C.Lowe. The Lowe process,which is the one more generally in use, is as follows: By the action of steam upon carbon at a high temperature,a mixture of hydrogen and carbon oxides is produced. This mixture is then combined with carbureted gases obtained from oil,petroleum,or naptha. The purpose of the carbon is to make the hydrogen gas luminous,for in itself it gives only a bluish,non-luminous flame.

DEVELOPMENT: The first plant using the Lowe process was installed in Phoenixville,Penn.,in 1873. In 1876 the Manayunk works were opened (near Phila.) and produced about 150,000 feet of water-gas,of twenty candle-power,per day, though its capacity was about 300,000 feet. A contemporary report declares: "The works occupy only a tenth of the space that is required in coal-gas manufacture.-----The cost of the gas is,considering its superior quality,something like one-half that of the gas manufactured by the old process. About three gallons of petroleum are consumed in the production of 1000 cubic feet. The process is very much quicker than the old one." (Appleton's Cyclopoedia 1876 P.517)

Although this invention eventually revolutionized the whole gas industry,it was at first vigorously and bitterly opposed by the coal-gas manufacturers. It was not till 1880 that the latter ceased their opposition and began to adopt the new process in place of the old. Thus in 1880 there were in operation twelve plants of the Motay type and 75 of the Lowe type. In 1890 the numbers had jumped to thirty Motay plants and 260 of Lowe's type. Five years later the numbers were forty and 350 respectively. By 1898 it was estimated that 75% of the gas manufactured in the United States was water-gas. The gas had an average power of from 25 to 27 candles. In 1900 there 892 gas establishments which manufactured 67,093,553,471 cubic feet worth $69,432,582.

COOKING AND HEATING: The advent of the new electric arc and incandescent lamps also seemed to threaten the gas industry and accordingly the producers looked about for other uses

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WATER-GAS (CONT.)

for gas besides lighting. This resulted in the development of gas stoves for cooking and heating purposes. The first gas stove for heating purposes that was worth anything, al appeared in 1890, the handiwork of Q.S.Backus of Philadelphia. This stove had a hard time winning recognition from the public, but from 1894 on the demand began to exceed the supply. The invention of the incandescent gas mantle by Dr.Auer von Welsbach of Vienna also was a great help to the gas industry.

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Establishment of new industries:

THE TYPEWRITER.

Its introduction: The first real typewriter appeared in the autumn of 1867, the product of the labors and genius of Christopher Latham Sholes, who also coined the word typewriter. From 1867 tp 1874, with the financial aid and moral encouragement of James Densmore of Pennsylvania, Sholes put out a number of machines, each one an improvement over its predecessors. However the mechanical defects were such that the machine was not at all a success. Finally, in 1874, the Remington Arms Company at Ilion, N.Y., became interested and bought the rights to the machine. Sholes wanted cash and got only $12,000 while Densmore was wise enough to take a royalty which eventually netted him much more.

"In 1874 the first Np. 1 Model Remington was placed on the market, of which type about 400 were sold. Many of these machines were returned, not only on account of imperfections they developed, but because the business world had not yet given the typewriter serious consideration.

"The Western Electric Company became the first sales agent for the Remington, but their efforts were not successful and the agency was transferred to the Fairbanks Scale Company in 1878. The Scale Company met with no greater success than the Western Electric Company, for the reason as stated before, the public were not educated to the value of a typewriter, and the efforts of the agencies were otherwise more profitably directed.

"It may be of interest to know that about this time a legal sham battle between typewriter inventors was instigated for the purpose of directing public attention to the importance the typewriter had gained in the commercial world, in which suits and countersuits were brought, all of which were settled out of court 'by agreement of counsel.' The suits were only intended to agitate an interest in the typewriter, which had not thus far been very successful.

"In 1882, the firm of Wyckoff, Seamans & Benedict was organized for the purpose of devoting its entire time and energy to the sale of the machine. The firm consisted of W.O.Wyckoff, a court reporter of Ithaca, New York; C.W. Seamans, who had been sales manager of the machine for Fairbanks and Remington since the machine was placed on the market, and H.H.Benedict, who had long been associated with the Remington Arms Company.

"The next step necessary in the evolution of the typewriter was the education of the public to its commercial value. This was no small undertaking because of custom and prejudice. A typewritten letter often ~~it~~ offended the recipient who seemed to feel that it was a reflection upon his intelligence and ability to read pen writing. For a

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Establishment of new industries:

THE TYPEWRITER (CONT.)

number of years the typewriter was looked upon as a luxury used only by those who had sufficient money to satisfy a whim; later it became a convenience, and finally a necessity." (From Evolution of the Typewriter by C.V.Oden , the man who "sold the first model of the first practicable typewriter." Pp.22-23)

Mark Twain bought a Remington in 1875 and his Tom Sawyer is probably the first typewritten manuscript ever handed to the printers. Incidentally he asked the Remington people not to let anyone know that he had a typewriter for whenever he wrote anyone a typewritten letter he was sure to receive another letter by return mail asking him what the typewriter was like and how he was making out wth it.

From 1882 on the typewriter industry increased tremendously. In 1886 the typewriter department of the Remington Company was separated from the other branches and established as a separate enterprise.

An interesting sidelight, is the following story about the "Father of the Typewriter," Sholes: Believing that the typewriter would help women earn a living, Sholes did his best to perfect it. He was never much interested in money, but he wanted to abolish drudgery.

"Father Sholes, what a wonderful thing you have done for the world," said a daughter-in-law shortly before he died. "I don't know about the world," was the reply, "but I feel that I hve done something for the women who have always had to work so hard. This will help them earn a living more easily."

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Establishment of new industries:

OLEOMARGARINE.

Origin: Napoleon III offered a prize for the discovery of a substitute for butter, stipulating that the substitute be cheaper and keep from getting rancid longer than butter. This substitute was to be for use in the navy and among the poor people. In 1867 then, M. Mege-Mouries, or Hippolyte Mege, worked out the formula for oleomargarine using beef fat as the source for the butter fat. *
The Mege process was patented in various countries, in the United States in 1873. In 1878 he patented a process in the United States whereby the fat of animals other than cows could be utilized.

Statistics: Thereupon oleomargarine factories began to appear in various parts of the United States, to wit, in New York, Philadelphia, Baltimore, Pittsburgh, Louisville, Chicago, St. Louis, Boston, Cincinnati, New Haven and Providence.
"Reliable statistics of the production and distribution of oleomargarine previous to 1886 are not available; but in the latter part of the year named Congress enacted a law imposing taxes on the product and placing its manufacture and sale under the supervision of the Bureau of Internal Revenue of the Treasury Department; and the reports of that office contain authentic information as to the production and distribution of the article in the United States." **

Production of Oleomargarine 1887-1899

1887	- - - - -	21,813,537 lbs.
1888	- - - - -	34,325,527
1889	- - - - -	35,664,026
1890	- - - - -	32,324,032
1891	- - - - -	44,392,409
1892	- - - - -	48,364,155
1893	- - - - -	67,224,298
1894	- - - - -	69,622,246
1895	- - - - -	56,958,105
1896	- - - - -	50,853,234
1897	- - - - -	45,531,293
1898	- - - - -	57,516,136
1899	- - - - -	83,139,901

In 1898 the rank of states according to production was Illinois, Kansas, Ohio with Rhode Island in fourth place. Since then Ohio and Kansas have changed places. Naturally the meat packers produce most of the oleomargarine.
In 1900 the United States ranked third in the world's production, coming after Germany and the Netherlands.

* Report of U.S. Commissioner of Internal Revenue for 1887 P. cli
** Statistics of Oleomargarine etc P. 287
Table, Ibid P. 292

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OLEOMARGARINE (CONT.)

Manufacture: First "oleo oil is obtained from beef fat through the successive steps of heating, settling, crystallization, and pressure by which it is separated from the stearin and the fiber. In the packing houses immediately after the slaughter of the animals the fat is removed and thoroughly washed in warm water, after which it is chilled and hardened with ice water. It is then minced finely with cutting machines, heated to a temperature of 160 degrees Fahrenheit, agitated until the whole mass is melted and then allowed to settle. Settling is accelerated by spreading salt over the surface. After all the fiber and scrap have settled to the bottom the clear oil is siphoned into another vessel, where salt is again added and the temperature controlled to allow further settling. After sufficient settling has taken place it is siphoned into a vat where it stands from three to five days. During this time the stearin in the oil crystallizes. Part of it forms a crust over the surface and part falls to the bottom. The whole mass is then agitated until it is mushy, after which it is wrapped in canvas cloths and gradually subjected to hydraulic pressure. The oil is forced out and the stearin, which is the hard substance in fats and is most prominent in mutton tallow, remains in the canvas cloths. The oleo oil is then ready for use."

It is then piped to the oleomargarine room where it is mixed with neutral lard (deodorized hog fat) or cottonseed oil (for cheaper grades) while still in the liquid state. "If butter enters the combination tanks must be provided to melt butter. All the constituents are weighed according to a formula of the manufacturer's own or as called for by dealers. The mixture is rapidly cooled to prevent crystallization. After it is cooled, it is tempered, churned with milk or cream, salted, and worked." *

* The Butter Industry P.220-222

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