

A History Of Manufactures In The Kansas Fuel District

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A HISTORY OF MANUFACTURES
IN THE
KANSAS FUEL DISTRICT

Submitted for Master's Thesis

BY

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MANUFACTURES.

*A History of Manufactures in the Kansas District.*¹

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ESTIMATION OF MATERIALS.

The principal difficulty that the investigator of this district has to contend with is the utter lack of any secondary works upon which to base his investigations. The work has to be practically all gathered from the original sources. So far as the writer has been able to discover, this is the first attempt to outline the development of manufactures of this part of the country, and with but two or three exceptions this is as true of even individual industries as it is of the whole of manufactures. There are a considerable number of local county and town histories in existence which represent the principal counties and towns in the district that this paper has attempted to cover, but without exception they are barren of manufacturing information, with the exception of the histories of Omaha and Kansas City, listed below. Of all the histories of the state of Kansas, and there are a score, but two pay even passing attention to manufactures, and the rest confine their attention to the political side of the history.³

NOTE 1 (Author's note).—This outline of the development of manufacturing in the midcontinent gas belt and adjoining districts was prepared for the Carnegie Institution, of Washington, as a part of their economic history of the United States, and it is printed at this time by their permission. The work was done at the University of Kansas under the direction of the department of economics, as a part of the work required for the degree of Master of Arts in that institution.

Parts of the work are necessarily brief, and the paper can be but little more than an outline for more detailed study of conditions. The need of more attention to this side of the history of the Middle West is painfully apparent to the most superficial observer, and if this outline proves of assistance in the furtherance of such work the author will be satisfied.

NOTE 2.—RICHARD LEROY DOUGLAS was born on a farm near Columbus, Cherokee county, Kansas, February 9, 1884. His father was George W. Douglas, a native of Iowa, who settled in Cherokee county in 1868, and his mother Thula (Ellis) Douglas, a native of Tennessee, who came to Cherokee county, Kansas, with her parents, Mr. and Mrs. Richard Driscoll Ellis, in 1879. His parents were married in 1882 and still live on a farm near Columbus. Mr. Douglas graduated from the Cherokee county high school in 1903, and entered the University of Kansas in September, 1904. He graduated from the School of Law in June, 1909, and was admitted to the bar the same month. He graduated from the University in February, 1910, with the degree of Bachelor of Arts, and received the degree of Master of Arts in the following June. During the last year of his course he held the University fellowship in sociology and economics.

NOTE 3.—

"My theme to-day is History—not the shelf
Whereon she sets her idols, but herself.
If I examine History aright,
I read of one long and unbroken fight—
One thrilling drama; every scene and act
Contains the record of a city sacked.
From time to time the curtain drops amain
On cities blazing, with defenders slain;

"Yet, ere their ashes have had time to cool,
They start again to opulence and rule.
To what strange power, so vitalized and strong,
Do these recurrent energies belong?
Whence come the latent forces that re-rear,
From ash and wave, the palace and the pier?"

The publications of the University Geological Survey of Kansas are the only real compilations of manufacturing statistics by local investigators, and they are on the whole quite satisfactory as suggestive sources of materials. They are careful and accurate, so far as they go, and to that extent are of considerable aid. The other states of the section under consideration do not have any publications that approach them for completeness and value in either this or any other branch of the work. Special editions of a number of newspapers in the better towns of the state have been of considerable service, and, for the most part, the information therein contained has been found reliable.

Where practicable the investigation has been supplemented by personal visits and interviews, but it must be admitted that as a means of collecting information that method is a failure for the purposes of such a work as this. As a means of verifying tentative conclusions, reached from other sources of information, however, interviews and visits have served an important purpose in the preparation of this discussion.

This district is in the beginning of what should be a period of considerable manufacturing importance, and it is to be hoped that a growing appreciation of the importance of manufactures in this prairie region will stimulate an attempt to chronicle the growth of the various lines of industry that the fuel region is eminently fitted to pursue. If this outline proves of assistance in this it will not be in vain.

INTRODUCTORY.

While it is the intention of this discussion to cover generally the group of prairie states which lie between the Mississippi Valley states proper and the Rocky Mountain states, Colorado, Wyoming and Montana, it has been found advisable to limit the work slightly in territorial extent. Such a territory would include the Dakotas, Nebraska, Kansas and Oklahoma, with Texas in the horizon on the south. Such a strip of territory, however, does not present a uniform basis for consideration, either from the point of view of resources, of settlement, population or development. Some parts

"No answer back the old historian brings;
His tale is but of battles and of kings.
His prose and verse were written to proclaim
Some useless battle or some kingly name—
No honor given to the brains or toil
That pluck the wealth from mountain, sea and soil.
They leave that out—but throw distinguished light
Upon the least minutiae of a fight.

.....
"Since Cecrops landed on the Grecian shore,
Brought on a stock—started a country store—
Picked out a site by some prophetic guess,
And boomed old Athens to a grand success.
The human mind has always sought renown
In founding states, or building up a town.

.....
"Yet ancient chroniclers forget to state
What built the cities, and what made them great.

.....
"And History, with proud patrician frown,
Ignores a power that never burned a town.

.....
"Now, when the truth is told, it shows two things:
First, states are rich and great in spite of kings;
And next, that nations opulent are made
By neither kings nor battles, but by trade.

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of that group of states just enumerated have no manufacturing interests that entitle them to consideration except locally, and do not even attempt to be self-supplying. Perhaps the only exception to this rule is the flour industry, which is distributed throughout the group as far south as Texas.

For these reasons the investigations have been confined largely to Kansas and the growing industries of the new state of Oklahoma, whose development is fast becoming important. The further reason exists that these states are representative of the group having all the agricultural characteristics of the others, and having the further advantage of mineral and fuel resources, and the geographical location that enables them to put any manufactures that they produce into the markets further south and west. These advantages, which the other states do not possess to any great extent, make the Kansas-Oklahoma district of real importance as a manufacturing section, and at the same time the discussion of industries and conditions in it includes all the more important phenomena that are common to the other prairie states.

For all practical purposes the manufacturing district proper, if the scattered flour mills and a few minor industries are left out, is confined to a strip of territory not more than 200 miles wide at its greatest extent, and extending from central Oklahoma to Omaha, Neb. Geographical lines cannot be observed entirely in this limitation by bounds nor include all the activities that are related and belong to the prairie section, but it is necessary to include a little of Missouri. Kansas City, for instance, is economically a part of Kansas, and typical of that state. The lead and zinc mining region of the Joplin district, in southwestern Missouri, is also to be included in this territory, on account of the part that it plays in the smelting industry of Kansas and Oklahoma.

It is also to be observed that there is little of interest for the student of manufactures west of the middle of the state of Kansas, or along the line of natural division between the purely agricultural region and the outskirts of the fuel belt on the east. The discussion in reality resolves itself into a

"Old Business is the monarch. He rules both
The opulence of nations and their growth.

"He builds their cities and he paves their streets,
He feeds their armies and equips their fleets.
Kings are his puppets, and his arm alone
Contains the muscle that can prop a throne.

"Old History, stand up. We wish to ask
Why you so meanly have performed your task.
Under your arm you have a showy book,
In which we now insist that we may look.

"We'd like to see what's in that gilt-edged tome;
Say, did Old Business ever reign in Rome?
You say he didn't? Well, may we inquire
If the aforesaid Business reigned at Tyre?
'Don't believe he did?' Well, look the index through.
And see if he is mentioned *once* by you.
'Can't find his name? Well, that is somewhat queer.
Say, of Old Business did you ever hear?"

"You never did? Well, I'm inclined to think
Pens full of pigs, and not pens full of ink,
Should be the object of your future skill,
And that your book should feed the paper mill.
O History! the language may be broad,
But we must here impeach you as a fraud."

Extract from "A Corn Poem," by Eugene F. Ware, July 4, 1876.

consideration of a district that is a part of at least four states, and includes only a part of any of them. As the paper proceeds it will be seen that the presence of the fuel supply in the shape of coal, and later of gas and oil, in conjunction with other mineral wealth, is the distinguishing feature of this district, and is responsible for its economic differentiation from the other portions of the prairie region.

The manufacturing history of parts of even this smaller section dates back but a few years. This is true especially of the Oklahoma district, in which the development has been accomplished principally since 1900. In this respect the recency of the growth of manufactures in that part of the district lacks the formative period that will be observed in the discussion of the industries in the state of Kansas. There is to be observed a very general expansion of all lines of industry in a few years about 1890, accompanied by a considerable centralization in fewer and larger establishments, in which the manufactures of Kansas lost their experimental character. The centralization was not accomplished, however, without interruption, probably owing to the check that the panic of 1893 put on all extensions, and there was a very noticeable break between the beginning of the movement and the centralization that has been going on since 1900. In this latter extension the industries of Oklahoma have taken a part, but not so noticeably as those of Kansas. There they were builded on a par with the partly centralized institution of the Kansas industries, and so can be left out of the early discussion.

The development will be followed chronologically, so far as possible, after a preliminary discussion of the natural resources of the district which enter into the growth of manufactures. Specific industries will then be considered in some detail, for the purpose of bringing out the peculiar phenomena in each.

RESOURCES OF THE COUNTRY.

As the later development of the subject in the following chapters will show, the growth of industry from the first beginnings of manufactures has followed with fair consistency the development of the natural resources of the country. With few exceptions, there has been no attempt to foster manufactures for which there was not a natural basis. This characteristic can only be appreciated in the later discussion in the light of a brief summary of the natural resources of the region. This preliminary section will be brief, for the reason that, in connection with the mineral industries to be discussed later, much of the material will be touched upon again.

At the period of the eighth census, 1860, Kansas was the only part of the section under discussion that had developed any manufactures that deserve mention. The country was but sparsely settled, and the chief occupation was, as it is to the present time, tilling the soil. The settlers were attracted to the new country by its adaptability to agricultural purposes. Corn was the leading crop, as it still is in the regions that were settled at that time—the fertile valleys of the streams of the eastern part of the state. The census of 1860 shows that the corn crop was far in the lead. The reported yield was over five and one-half million bushels,⁴ while the wheat crop was under two hundred thousand bushels, and of oats the state produced less than a hundred thousand bushels.

Outside of the section of the river valleys of the northern and eastern

NOTE 4.—Fifteenth Biennial Rept. Kan. Board of Ag., p. 1196.

parts of the state lack of rainfall was a serious hindrance to agriculture for at least twenty years after this time, and the development of the western section as a wheat-growing country did not begin very early. There were three fairly distinct belts in this area, only one of which had an average rainfall sufficient to make farming a certain thing one year with another. In the eastern portion the precipitation in 1880 was about thirty-three inches annually; in the central portion of the state it was but twenty-five inches, and further west not more than twenty inches.⁵ A contemporary writer says of the conditions: "The experience of the past years has shown the settlers in western Kansas that wheat raising is never a sure thing, and that other crops may be more profitably and surely raised."⁶ It was not until the introduction of hard winter wheat, late in the '70's, that the section began to assume importance as a wheat-growing country.⁷

Stock raising and feeding, however, was profitable and important during the period before the cultivation of the soil and other influences led to an increase of rainfall,⁸ and, as will be seen later, it led to the development of important manufactures in the meat-packing cities along the Missouri river. The prairies were covered with an abundance of grass good for grazing until November each year, and the abundant corn crops that could find no outside market could be used most profitably in feeding through the winter months. Corn which would sell for only fifteen to twenty-five cents a bushel in the markets realized in this way as high as forty and forty-five cents in some instances.⁹ This was especially convenient for the farmers off the lines of railway, which were still few as late as 1880, for they could drive their cattle and hogs to the railway, or even to market, where it would be wholly impracticable, if not impossible, to market the corn necessary to feed the same stock.

Although practically all of the territory included in this region is a part of the great middle western plains, and is in general rolling prairie, the streams, especially of northern and eastern Kansas, were in the early days important locally in a manufacturing way. In the first place the river valleys contained a not inconsiderable quantity of oak, black walnut, cottonwood, hickory and ike timber, that offered a convenient and comparatively cheap substitute for the more popular building lumbers, which at this time were hard to get, and were almost prohibitive in price for the first ten or fifteen years. The walnut timber which was in many places abundant, offered raw material for a considerable number of furniture factories which flourished in the eastern part of the state, at Leavenworth, Atchison, Fort Scott, and in a smaller way in numerous other little towns.¹⁰

The larger streams were, and still are to a lesser extent, of economic importance, in that they offered a cheap and convenient source of power for that class of industry which does not demand the use of heat. The first record of the number of water wheels in use is found in the Ninth Census, and according to that report there were 62 wheels in the state of Kansas.¹¹

NOTE 5.—Kansas Hand Book, 1881, p. 14.

NOTE 6.—Ibid., p. 13.

NOTE 7.—Kan. Hist. Coll., vol. 9, pp. 502-506. T. C. Henry's "A Fenceless Winter Wheat Field."

NOTE 8.—Kansas Hand Book, 1878, p. 6.

NOTE 9.—Ibid. 1881, p. 36.

NOTE 10.—Kansas Monthly, March, 1881, p. 40.

NOTE 11.—Census Rept., 1860, vol. 3, p. 167.

furnishing power for flour and grist mills, and for the sawmills which were scattered over the eastern part of the state. The number of these water wheels multiplied rapidly for a period of twenty years or more, before the opening of the fuel deposits and the extension of the railroads which made the coal available. In 1875 there were 79 wheels alone furnishing power for as many flour mills, and 26 more for combined saw and grist mills in Kansas,¹² and by the following year the number had increased to 105 of the flour mills and 33 of the saw and grist mills, not counting the large number of wheels that were turning sawmills alone.¹³ In 1881 the total number of water powers in the state was given at 150, 110 of which were used for flouring purposes.¹⁴

From this time on for various reasons, among which the opening of the Kansas coal fields and the enlargement of the mills that had been using the water power, the number of water powers fell off rapidly, and the number at the present time is few. A few of the larger dams still remain, and are in constant operation at a profit. The fall of the Kansas river and its tributaries, and of some of the southern Kansas rivers, is great enough to afford abundant power, but as yet there have been few places where the natural power exists at a place where the demand has been great enough to justify the expenditure of enough capital to make it available.

The next natural resources in the order of development are the fuel and mineral deposits that underlie a large portion of eastern Kansas and Oklahoma and western Missouri, the latter demanding some attention in relation to this region on account of the impossibility of separating it as a unit in the history of the remaining portion. The geological formations in this section are peculiar, in that in going from east to west successive overlying formations are encountered, each of a more recent period, until the center of Kansas is passed. This feature is thought to be due to the fact that the area under consideration was the last of the mid-continent basin to emerge from the water in the ages when the elevation of the mid-continent basin was gradually connecting the Rocky Mountain region with the higher lands farther east. The center of this inland sea seems to have been in south-central Kansas, but there seems to have been successive periods of subsiding and emerging that make it difficult to place the limits definitely.¹⁵

In the extreme southeastern portion of the state, and covering probably forty-five square miles in Kansas, is the exposure of the Mississippian limestone, which contains the valuable lead and zinc deposits of the Joplin-Galena district. This area extends over a large part of northeastern Oklahoma, northwestern Arkansas and southwestern Missouri, in which regions it is a continuous surface formation.¹⁶ In Missouri the lead and zinc deposits are found in three counties—Jasper, Newton and Lawrence¹⁷—while there are five counties in northern Arkansas, a little farther east

NOTE 12.—Fourth Ann. Rept., State Board of Ag., Kan., 1875.

NOTE 13.—Fifth Ann. Rept., State Board of Ag., Kan., 1876.

NOTE 14.—*Kansas Magazine*, March, 1881, p. 40.

NOTE 15.—For a detailed discussion of the formations of central Kansas, see vol. III, University Geological Survey of Kansas, chap. 3, and "Geology of Kansas Salt," by Robert Hay, in Seventh Biennial Report, State Board of Agriculture, Kansas, part II, pp. 83-95.

NOTE 16.—Univ. Geol. Survey, Kan., vol. III, pp. 14-15.

NOTE 17.—Mo. Bureau Geol. and Mines, Advance Sheets, vol. X, p. 15.

than the Missouri deposits in Newton county, that are of some importance.¹⁸ Later development has shown that the district extends into Oklahoma, in what was the northeastern part of the Indian Territory, contiguous to Kansas and Missouri. This region furnishes more than half the zinc ore produced in the United States,¹⁹ and about one-third of the lead produced in the United States,²⁰ and since the opening up of the Kansas-Oklahoma gas region by far the largest share of this wealth of mineral is smelted and prepared for the market in the gas belt of those states.

The output of this district has been growing steadily, but with the exception of the development of the Oklahoma and Arkansas districts, which are recent, and at the same time of lesser importance as yet, the territorial extent has not been widened much for several years. There are no available sources of information on which to base an estimate of the probable duration of the life of these deposits, and it is not known whether there are extensive bodies of ore at a greater depth than has been worked. The generally accepted theory as to the origin of the lead, namely, the concentration from percolating waters,²¹ would account for deposits at almost any depth to which the water penetrated and became quiet enough to allow the deposit of the mineral matter in the solution. Many of the mines that were worked as a shallow deposit have, it is true, been reopened and worked at a profit at a deeper level, but how long this will continue no one knows. Be that as it may, the lead and zinc deposits have been and are an important resource as a basis for manufacturing activity, and will continue in importance as long as the ore and the fuel deposits last.

Immediately overlying the Mississippian limestone, in which are found the lead and zinc deposits, and which is supposed to extend in a fairly regular manner beneath the whole Kansas-Oklahoma region,²² are the great coal-bearing beds of shale that cover the surface of nearly half the state of Kansas, a large portion of Missouri and much of eastern Oklahoma. These shales, separated as they are at intervals by heavy beds of limestone, aggregate some 3,000 feet in thickness where they have not been thinned by erosion,²³ and are coal-bearing through their whole extent, though the product of the upper shales is not important in many cases except as supplying a local demand. The base of the Pennsylvanian system, which rests on the Mississippian limestone referred to above, is the heavy bed of shales denominated the Cherokee shales by the Kansas geologists, the heaviest shale bed in the Coal Measures,²⁴ averaging nearly 500 feet in thickness. These shales are exposed on the surface of four of the southeastern counties of Kansas, and are known to extend in a northeasterly direction into Missouri, where they are the coal-bearing strata of that state. They are exposed over a large area in eastern Oklahoma, forming the rich coal fields of that state. In Kansas, these Cherokee shales are the most important by far of the coal-bearing shales,²⁵ and all the coal from the Pittsburg-Cherokee district is found in them, as well as the surface coals in the Fort Scott district,²⁶

NOTE 18.—Professional Paper No. 24, U. S. Geol. Surv., p. 14.

NOTE 19.—Min. Res. U. S., 1906, p. 461.

NOTE 20.—Ibid, p. 444.

NOTE 21.—Mo. Bureau Geol. and Mines, Advance Sheets, vol. 10, pp. 8-15.

NOTE 22.—Univ. Geol. Surv. Kan., vol. III, pp. 16-19.

NOTE 23.—Ibid. p. 21.

NOTE 24.—Ibid, p. 21.

NOTE 25.—Ibid, p. 25.

NOTE 26.—Ibid, p. 140.

and the Leavenworth county deep mines,²⁷ both of which latter are in the upper Cherokee shales. These shale beds are thus the great coal-producing formations that are found in this section, and produce by far the largest share of the coal mined in Kansas.²⁸ The only other coal-bearing shale of any importance in the state, and it does not extend into any except Kansas, so far as known, is the Osage shale, 2000 feet above the Cherokee shale, which has been important in that it has both supplied a local demand, and has furnished a great deal of coal to the Santa Fe railroad.²⁹ The output of the mines in the Osage shale is, however, comparatively small in later years, since the opening of the Cherokee field to its full capacity, and is now not more than six per cent of the output of Kansas, though twenty years ago it was nearly eight per cent of the Kansas total.³⁰

At intervals through these beds of shale, and exposed on the surface of practically all of eastern Kansas and Oklahoma at distances of not more than thirty or forty miles apart, are heavy beds of limestone that are becoming all the time more important in a manufacturing way. These beds of limestone furnish the most excellent material for the manufacture of Portland cement, and, with the shale beds either over or under them, as convenience determines, have been the base of a rapidly growing industry in the past ten years. These materials are the more valuable in that they occur in almost immediate connection with an abundant fuel supply, both of coal and natural gas, and the development of the Portland cement industry based on the fitness of the district, both in Kansas and Oklahoma, has been without precedent. In the neighborhood of Fort Scott, the first bed of limestone that was exposed above the Cherokee shales was of considerable economic importance in that it was naturally suitable for the manufacture of cement without the addition of any shales or other material, and the production of Fort Scott natural cement was one of the early industries in this part of the country.³¹

With the beginning of the development of the Portland cement industry in Kansas and Oklahoma since 1900, the relative importance of the Fort Scott limestone in an industrial way has diminished greatly, though it is still a factor in the cement business. With but two or three exceptions, the development of the limestone beds for the manufacture of cement has been confined to the two heavy beds that lie nearest above the heavy Cherokee shales of the Lower Coal Measures, which are known by the Kansas geologists as the Iola and the Erie limestones, but the reason seems to have been one entirely of the location of the limestone and shales with reference to fuel and railroads, and not of particular fitness of the materials themselves. There is an almost inexhaustible amount of these beds of lime and shale in the states of Kansas and Oklahoma that are perfectly suitable for the manufacture of cement. In a recent interview, Prof. Erasmus Harworth, state geologist of Kansas, said that there is enough limestone and shale in Kansas alone to supply the world with Portland cement for a million years. Further attention will be given to this subject in the later section of this work on the growth of the Portland cement industry.

In casting up the wealth that is hidden in the shales and limestones of the eastern part of Kansas and Oklahoma in the shape of vast deposits of

NOTE 27.—Univ. Geol. Surv., Kan., vol. III, pp. 184, 185.

NOTE 28.—Ibid, p. 183.

NOTE 29.—Ibid, p. 192.

NOTE 30.—Ibid. op. p. 192.

NOTE 31.—Ibid. pp. 34-36.

coal and building materials, it would seem that portion of the earth had yielded up its share of the wealth of the country, but the layers of sandstone scattered through the Cherokee shales hold still another source of fuel wealth in the shape of oil and gas, that has grown to be one of the most important resources of the country in the development of manufacturing interests, and has added millions to the wealth of Kansas and Oklahoma in a decade. Oil has been of minor importance up to the present time as a fuel, only the inferior quality being used for this purpose. The abundance of gas that has been available for the last ten years has been directly responsible for the coming of the Portland cement plants and glass factories, and has revolutionized the brick and tile industry, as well as benefited to a large extent all the manufacturing interests of the eastern half of both Kansas and Oklahoma, and that district practically includes all that is of importance for manufactures up to the present time.

The oil and gas area is included within an irregular strip 40 to 50 miles wide and about 250 miles long, extending in a slightly southwesterly direction from Kansas City on the northeast to about a hundred miles south of the northern boundary of Oklahoma. Its extent is practically coincident with the surface exposure of the Coal Measures, except that it is everywhere somewhat smaller, and is included within that region. The gas and oil "sands" of this region are the layers of porous sandstones that are scattered through the lowest of the Coal Measures, the Cherokee shales already referred to; and with only three or four exceptions the whole flow of both oil and gas comes from those layers of sand,³² or from the sandstones in the shales immediately above the Cherokee shales.

Differing theories as to the origin of the oil and gas in this region have been advanced, and they are of some importance in the discussion of the probability of finding oil and gas at a greater depth when the supply begins to fail. Beneath the Mississippian limestone, which underlies all the Coal Measures of this section so far as is known, it is supposed that there are regular formations of the Devonian age, and immediately beneath that formation the formations of the Silurian age,³³ which bear the Trenton rocks that bear the oil and gas in Indiana and the other parts of the eastern field.³⁴ Reasoning from the fact that the Trenton rocks are the producers in that region, the theory has been advanced that they are the source of the gas in this region, and that it has escaped from its original source through the faults of the Mississippian limestone and worked upward into the porous sandstones of the Cherokee shales, where the heavy fine-grained shales above confined the oil and gas from a further upward movement.³⁵ Writing on this subject in 1905, Professor Haworth said: "To assume that deep drilling in Kansas and the Indian Territory (Oklahoma) will find oil in the Trenton carries with it a double assumption, either of which is liable to be incorrect. First, it assumes that the Trenton rocks extend westward and underlie the oil territory. This is a presumption, with the known facts about evenly divided against it. Any and all stratified rocks have a limit to their extension. In places the Silurian is known to extend over a few miles

NOTE 32.—Haworth, *Independence Reporter Magazine*

NOTE 33.—E. Haworth, *Independence Reporter, Oil and Gas Magazine*, p. 8.

NOTE 34.—*Ibid.* p. 9.

NOTE 35.—S. J. Hatch, *Kansas-Indian Territory Oil and Gas Field*, p. 13.

only, and then to cease to exist simply because they were never formed or created. We have the Silurian in the Ozark region of Missouri and Arkansas, but no one knows to a certainty that they extend as far west as Bartlesville (the heart of the Oklahoma field). The deep well at Neodesha (Kansas) penetrated formations below the Mississippian, which were probably Silurian, but about this there may be some doubt. If these rocks do not reach west to the oil field, then of course oil cannot be found within them at that place. Secondly, if the Silurian can be reached with the drill there is still room for doubt regarding their being productive of oil and gas. As above stated, they are not productive in half the places where known. Why, then, should we expect them to be productive here? In Indiana and Ohio they are particularly porous, remarkably so for limestone, and this gives an opportunity for oil and gas to get into them. To be productive they must first exist, then must be open and porous, and last must have the pores filled with oil."³⁶

At the time Professor Haworth wrote the above there were two deep wells that had found oil and gas below the Cherokee shales of the Carboniferous age, one at Osceola, Mo., and one at Bartlesville, while a score or more of equal depths failed to find any traces.³⁷ Since then a well at Caney, Kan., got a strong flow of gas below the Mississippian limestone.³⁸

This discussion of the probable origin is of importance in this connection only as it embodies the expression of expert opinion as to the future development of the field, and upon which the future of many of the now existing manufacturing establishments depends to a large degree. Development up to the present time has failed to show the existence of a deeper supply, but there is of course room for the finding of such fields later.³⁹ The development of the oil and gas fields will be taken up historically in a later section of the work.

There remain yet to be noticed in the list of resources two things which the Kansas-Oklahoma region owes to the workings of nature—the gypsum beds of the central portion of both states, and the vast salt beds of central Kansas. As we stated above,* the center of the mid-continent basin is supposed to have been in the central or western part of Kansas, and it was during the time when some parts of it at least were cut off from the main body of the ocean and persisted as "dead seas" that both the gypsum and the salt were deposited by the concentration of the sea water. The deposit of gypsum in Kansas is a strip about 230 miles in length, and varies in width from 5 miles in the north to 25 in the central portion, and nearly 140 miles at the southern boundary of the state.⁴⁰ Continuations of this same area are known to produce gypsum in Oklahoma, and have been worked for the last ten years. The geology of Oklahoma has not been worked out sufficiently to determine the extent of the gypsum deposits there, and owing to the fact that it is nowhere regular, like a deposit of sand, limestone or

* *Supra*, p. 6.

NOTE 36.—E. Haworth, *Independence Reporter*, *Oil and Gas Magazine*, p. 9.

NOTE 37.—*Ibid*, p. 9.

NOTE 38.—Hatch, *Kansas-Indian Territory Oil and Gas Field*, p. 15.

NOTE 39.—See, Bulletin 184, *U. S. Geol. Surv.*, by Adams; *Mineral Resources of Kan.*, 1899 and 1903; and *Univ. Geol. Surv.*, Kan., vols. III and IX, for further discussion of this subject.

NOTE 40.—*Univ. Geol. Surv.*, Kan., page 31.

shale, it will be a matter of some conjecture until the geology is carefully worked out. It is, however, known that the same conditions that led to the formation of the Kansas and Oklahoma deposits existed on southward into Texas, where gypsum mills have been in operation for several years.

The following condensed account of the formation of the gypsum deposits by Haworth will meet the needs of the present discussion: "The geologic age of a formation is no indication of the probability of its carrying gypsum. In some parts of America it is of the Silurian age (three ages older than the Kansas-Oklahoma Coal Measures), and elsewhere it occurs in the Coal Measures. The lowest part of the Permian, which immediately overlies the Coal Measures, contains the lowest of the gypsum beds in Kansas. From here upward, through almost every distinct formation of the Permian, gypsum occurs in our state (Kansas), while the Permian of Texas and the Cretaceous of Iowa have large quantities of it. . . . At the close of the Coal Measure time it seems that the greater part of the eastern half of North America existed as dry land, with considerable portions of the western half also under water. This left a great arm of the sea extending north from the Gulf of Mexico, and covering the territory now occupied by the western part of Texas, Oklahoma, Kansas, Nebraska, and the Dakotas, and the eastern parts of New Mexico, Colorado, Wyoming and British Columbia.

"Throughout the time just referred to, sedimentation was a continuous process, forming the heavy Coal Measure shales and limestones which underlie the Permian. Bed after bed was formed in this way, generally reaching eastward to the coast line, and extending westward for unknown distances. Each succeeding bed, therefore, overlies the preceding ones, but its eastern limit is farther west than that of those below it. The same land movements . . . continued throughout the Permian and later times, and finally the whole of the great expanse of water . . . was replaced by dry land. The elevation processes, however, were slow and irregular, with many returns to former conditions, so that the particular area in which gypsum was being deposited might be a site of limestone formation of a later period. The formation of gypsum requires the concentration of ocean water (about half the concentration required for the deposit of salt beds), and this must have been brought about by the segregation, here and there, of bodies of ocean water from the main ocean, so that evaporation could concentrate the liquid. . . . It is highly probable that in each individual case such inland seas or lakes were relatively small, so that the formation of gypsum at any one time and place may not have covered many townships in extent. At this late day it is impossible to determine the exact limits of such gypsum beds. Erosion has worn much of the surface away, and may have destroyed untold quantities of gypsum. . . .

"In detail the Kansas deposits pass from the Lower Permian on the north to the upper Red Beds (overlying the Permian, and supposedly Triassic⁴¹) on the south. This may imply an earlier elevation into dry land conditions in the northern part of the state, and a later one along the southern line. . . . Within Kansas, therefore, the Permian ocean was driven southward, rather than westward, as is proved by the extraordinary thickening of these formations southward. . . . Throughout the period of gypsum

NOTE 41.—Robert Hay, "Geology of Kansas Salt," Seventh Bien. Rept. Kan. Board of Ag., pt. II, p. 84.

formation there was a great lack of stability of oceanic boundaries, which made possible the frequent embayment of ocean water, so that by their surface evaporation gypsum deposits could be produced, and . . . produced them at various times and places throughout the great western area."⁴²

There is another sort of gypsum deposits in some parts of Kansas, called by the Kansas geologists the secondary deposits, usually in low, swampy ground and in connection with springs of gypsum water. It is a granular deposit, somewhat like sand banks, and contains a larger portion of silica and lime than the rock gypsum, but in nearly every place where it is known in Kansas is of good commercial quality. It is supposed that these deposits of earth gypsum were formed by the solution of the rock gypsum underground, and the subsequent deposit on the surface by the gypsum springs just referred to. That these deposits are of recent origin is shown by the fact that there are in nearly all of them modern fresh-water shells that belong to a time long after the formation of any rock gypsum that is known.⁴³

Following the formation of the gypsum deposits just described, there seems to have been a considerable portion of the ocean cut off in an inland sea that included a triangle having its base along the line of the Arkansas river and its apex near the northern boundary of the state. Professor Grimsley says: "The great salt beds just to the southwest (of the gypsum deposits) in the direction of the dip of the rocks may have been deposited later in the stage of gulf evaporation, after the waters had deposited their gypsum and had retreated further to the south."⁴⁴ It is evident, however, that the salt period was less fluctuating than the gypsum period, for the salt is general over the triangle, and near the southern end is about 400 feet in thickness,⁴⁵ with occasionally layers of gray shale interspersed. Above this heavy salt formation are the gray shales to which the salt beds owe their preservation, beds of nonsaline shales from 100 to 200 feet thick.⁴⁶

The salt beds were the last of the geological formations that are of particular importance in a discussion of the manufacturing resources, for they were succeeded by the "Red Beds" and the "Dakota" formation bearing sandstones, neither having any mineral wealth, so far as has been discovered. With this discussion of the resources for a basis, it is possible from this point to trace out the growth of the manufacturing enterprises in a perfectly natural way, and with the beginnings of industry the next section will begin.

THE BEGINNING OF MANUFACTURES.

For the purposes of this paper the investigations will begin with the census of 1860, for previous to that time there were but few manufacturing establishments in the prairie region, and those that were in existence were not of any considerable importance. At that time the territories of Kansas and Nebraska were little else than a wilderness, having had a territorial existence for but five years, and the settlements were confined largely to the region of the Missouri river and its navigable tributaries. According to the census of 1860, the total population of the territory of Kansas was

NOTE 42.—Univ. Geol. Surv., Kan., vol. V, pp. 13-16.

NOTE 43.—Ibid. p. 83.

NOTE 44.—Ibid. p. 80.

NOTE 45.—Min. Res. of Kan., 1897, p. 56.

NOTE 46.—Hay, "Geology Kansas Salt," in Seventh Bien. Rept. Kan. Board of Ag., pt. II, p. 85.

but 107,200 souls, while Nebraska had only 28,841. Oklahoma, then known as the Indian Territory, was wholly unsettled, and does not enter into the discussion for a period of about thirty years longer.

Kansas City, now the metropolis of the district, was unimportant as a town, and was having a hard struggle in competition with Atchison, Leavenworth, and other points in the region then settling up.⁴⁷ Its founders were brought there by the westward-going business, but they could not anticipate the prosperity that was to come in a few years, or fore-

NOTE 47.—

KANSAS CITY, MO., January 29, 1884.

Judge F. G. Adams, Secretary Kansas State Historical Society:

DEAR JUDGE—I hand you herewith two autograph letters written to me by Horace Greeley in 1859. Believing that such relics, no matter how highly prized by the owner, answer a better purpose in public than in private collections, I beg you to accept of them as a contribution from me to the library of the Kansas State Historical Society. Aside from their value as autographs of a distinguished American, they should be dear to all old Kansans as autographs of the man who, above most others, strove earnestly, ably and faithfully for the admission of Kansas into the Union as a free state. Aside from this consideration, again, the subject discussed, the patriotic sentiments of the writer and his prophetic utterances concerning the future of Kansas and Kansas City, render this gift peculiarly appropriate.

If we had an historical society here it would perhaps be more appropriate to retain them in this city. Since we have not, I take pleasure in delivering them into your keeping, knowing how carefully they will be preserved.

The occurrence that led to this correspondence can be briefly described:

Hon. S. C. Pomeroy, who had been at the head of the Emigrant Aid Society of New England (a society formed for the purpose of assisting immigrants from the free states in settling in Kansas), had still some slight interest in the "Free State Hotel," as the building now known as the Gillis House was then usually styled. He had come to Kansas City a short time before the date of the first of these letters, on private business, and while here had been assaulted by Col. H. T. Titus, a former notorious proslavery fire-eater and border ruffian. The assault was an unprovoked and cowardly one, and as such was condemned by the whole community, with the exception of a few of the "bummers" and loafers about his saloon, who naturally backed Titus. An account of this affair was at once sent from Atchison, the home of Pomeroy, all through the Northern states, and of course it lost none of its atrocity for want of local coloring. The New York Tribune took it up and Mr. Greeley wrote a scorching editorial upon it, in which Kansas City came in for a full share of his caustic fire.

Knowing how unjust this particular attack was, and feeling that such an article might do incalculable harm to our struggling city among the Eastern people whom we were then trying to attract, I wrote a letter to Mr. Greeley, stating the exact facts and trying to show him that we were earnestly undertaking to build up a free-state city in proslavery Missouri. How little effect this effort had upon the stern, unforgetful old man the first letter shows (I translated it for the benefit of readers not skilled in deciphering hieroglyphics):

"OFFICE OF THE TRIBUNE, NEW YORK, October 30, 1859.

"DEAR SIR—The history of Kansas City is not unknown to me. It is not unknown to the Northern people. If you are not long enough resident there to know how the big hotel was mobbed, the guests maltreated, and its lessee compelled to give it up, there are plenty who are. Do you know how General Pomeroy was driven from that city? I think I do. In all the struggle for freedom versus slavery in Kansas, Kansas City was a malignant stronghold of persecution and violence. The facts cannot be set aside.

"Of course she is bound to change in time, since her trade must mainly come from free Kansas, not from slave-cursed Missouri. And when she does change—openly, frankly and above-board, I shall be very glad to publish the facts and figures. Until she shall show herself as openly and actively for freedom as she has done for slavery, I think the trade of Kansas should go to her own river ports, rather than to Kansas City.

"You have given me your views on the matter, herewith you have mine.

"DR. T. S. CASE, Kansas City, Mo."

Yours,

HORACE GREELEY.

To this I could only reply by saying that however badly Kansas City people might have acted in the past, during the heat of the strife between the pro- and anti-slavery partisans, her people were now disposed to do all in their power to make amends and to encourage Northern people to come in and help us to build up our city; that the border war was ended, and that the only contentions now existing were among enterprising settlers over rival town sites, etc. But it did not avail anything. He could not realize the change that had already taken place in the character of the people here by reason of immigration, new ideas, business complications, etc., and accordingly replied as follows:

"OFFICE OF THE TRIBUNE, NEW YORK, November 17, 1859.

"DOCTOR CASE—It would be impossible for us to see things alike—at least for me to see them as you represent them—so we must agree to differ. You may suppose the only quarrel in Kansas was about town sites, etc., but I know better. I know, too, that the position of Kansas City throughout that struggle was one of bitter and lawless hostility to the free-state cause. I know that the abuse of General Pomeroy there did not end with the outrage you so complacently refer to. I know much more, the sum of which is that Kansas City does not deserve patronage or favor from the free-state men of Kansas until her citizens shall openly and manfully undo the wrongs they have done, and place themselves in communion and sympathy with the free-state cause. Such is my view of the matter, and I see nothing like injustice or untruth in what I have said on the subject.

Yours,

HORACE GREELEY.

"DR. T. S. CASE, Kansas City, Mo."

Of course it was useless to continue the correspondence, and I did not reply; but less than a

see that it was destined to become the gate to the whole Southwest.⁴⁸ But when the settlement of the Kansas territory began in earnest, after the organization of the new territory in 1854, Kansas City at once became the gateway through which practically all the settlers sought the new country. Its merchants offered stocks of goods nearest the land of promise, and the steamboat landing was the best on the river.⁴⁹ Then the settlers were naturally glad to be able to follow the Santa Fe or the Oregon trails to the West or Northwest, or the government roads either north or south, and by the combination of these advantages Kansas City, Mo., became in reality a Kansas town, and has remained so largely from an economic standpoint since it has become a city. In the beginning, however, it was not a manufacturing center, as it was a distributing point for the Southwest, and it was not until the manufacturing of the new country had passed the local character and had begun to centralize in important railway centers that it became one of Kansas's factory towns.

At the census of 1860 Kansas was still a territory with an organic existence of five years' duration, and only twenty-one of the forty-one organized counties were included in the census returns on manufactures. Less than one-fourth of the occupied country was settled or improved. Consequently manufacturing was relatively unimportant, as is shown by the fact that

year later, when 250 Republicans in Kansas City formed a Lincoln and Hamlin Club and openly held meetings and made antislavery speeches, I wrote Mr. Greeley again, called his attention to the fact, and he promptly gave us ample credit. Afterwards, in June, 1861, when we raised three companies of volunteers in this city for the defense of the Union, I apprised him of it, and again he gave us due credit.

These facts, in connection with the letters, will, I am sure, make them doubly interesting in your estimation, and not the less welcome in your Society.

Very sincerely yours,

THEO. S. CASE,
Editor *K. C. Review of Science and Industry*.

NOTE 48.—Kansas City Annual, 1907, p. 11.

NOTE 49.—Table showing the amount of merchandise sold in Kansas City for the year 1857:

Dry goods	\$390,007 67	
Boots and shoes.....	146,801 64	
Hats and caps.....	23,480 00	
Clothing.....	96,781 50	
Books and stationery	6,481 90	
		\$663,552 71
Hardware, iron, steel, nails, etc.....	\$147,299 17	
Powder, lead and shot.....	25,088 65	
Glass and glassware.....	20,231 54	
Woodenware, brooms, etc.....	8,980 25	
Stoves, tin and hollow-ware.....	53,281 36	
Plows.....	2,722 00	
Wagons and carriages.....	44,800 00	
		302,402 97
Groceries.....	\$472,005 80	
Flour and meal.....	382,400 00	
Bacon and lard.....	102,545 27	
Foreign and domestic liquors, etc.....	135,915 30	
Cigars and tobacco	47,483 85	
		1,130,350 22
Robes, furs, etc.....	\$267,253 02	
Hides.....	58,580 96	
Salt.....	20,575 00	
Sundries (embracing articles not expressed).....	105,791 86	
		452,201 44
Drugs, medicines and oils.....	\$62,198 20	
Soap, candles, etc.....	37,705 00	
Confectionery	6,090 00	
Crackers and pilot bread.....	18,176 41	
Furniture	34,602 00	
		158,771 61
Saddles, leather and harness.....	\$81,287 90	
Lumber, shingles, sash, etc.....	394,965 49	
		476,253 39
Total		\$3,183,502 34

—Annals of the City of Kansas, Spalding, 1858, p. 79.

although a prairie state, with no extensive timber, 124 of the 209 establishments listed by the eighth census were devoted to the manufacture of lumber and shingles, having an investment of \$395,840 of the total of \$639,870 invested in manufacturing in the territory. Nearly two-thirds of the labor employed was engaged in the lumbering industry, and considerably more than half of the two millions and a little over of manufactured products was lumber and shingles. The sawmills were located on the banks of the streams of the eastern part of the state, cutting up the native timber,* some of which was of fair size, and marketing a great deal of it unplanned, for, being principally hard wood, it was difficult to plane. There were four establish-

Statement showing the amount of warehouse business done in Kansas City for the year ending December 31, 1857, as taken from the books of the commission merchants, and not entering into the calculations of the foregoing table:

No. of packages.....received,	381,628
No. of wagons.....	1,172
No. of plows.....	2,246
No. of sacks of flour.....	49,266
No. of sacks meal.....	4,560
No. of sacks oats.....	2,160
No. of sacks corn.....	2,760
No. of sacks potatoes.....	1,760
No. of bales hay.....	336
Amt. Mexican wool.....	865,000 pounds.
Amt. lumber.....	1,277,200 feet.
Amt. shingles.....	656,090
Amt. lath.....	844,000
No. of kegs powder.....	1,940
No. of dry hides.....	2,280
Bales of buffalo robes.....	7,040 or 70,400 robes.
Bales of furs and skins.....	2,580
Bags of buffalo tongues.....	514
Buffalo meat.....	55,000 pounds.
No. of packages furniture.....	7,768
No. of gallons stoneware.....	5,936
No. of carriages.....	256
No. of pianos.....	32
Amt. of gold and silver in boxes.....	\$1,139,661 50
Amt. silver ore from Gadsden purchase (pounds).....	2,000 00
Amt. of pound freight, exclusive of above (pounds).....	12,985,600 00
No. of wagons loaded with the above goods, 9,884.	
Freight charges, commissions, etc., paid on above goods at warehouse.....	545,020 00

—Annals of the City of Kansas, Spalding, 1858, p. 79.

EXPORTS.

We will in a few brief words give an idea, as intelligent as we can from our limited data, of the export trade of Kansas City. We leave out of this estimate any figures of local exports, as we have elsewhere shown that this country is too new to raise anything as yet, and what it will be when settled and developed, any figures we could give would be so far short of what it will be that we even refrain from prophecy in regard to it.

We take our exports, however, from a region of country lying from 600 to 1500 miles southwest and west.

Exports of New Mexican and mountain products for the year 1857:

Mexican wool, lbs.....	865,000	\$129,600 00
Mexican goat skins.....	50,000	25,000 00
Dressed buckskins.....	50,000	62,500 00
Dry hides.....	105,000	375,000 00
Specie in boxes.....		1,139,661 50
Silver ore, one ton (value not known).....		
Furs, skins and peltries (estimated).....		36,000 00

Total exports..... \$1,767,761 50

—Annals of the City of Kansas, Spalding, 1858, p. 81.

Border Money.—Estimate of what may most appropriately be called "border money"—that is, gold and silver coin that comes directly from the mint, or from New Mexico, and is first put into circulation upon the Missouri border:

Annuity money (paid to various tribes of Indians).....	\$1,100,000
Army money (paid out to privates and officers, U. S. A.).....	2,000,000
Mail money (paid to mail contractors).....	200,000
Emigration money.....	300,000
New Mexico money (brought direct from Mexico).....	1,500,000
Total.....	\$5,100,000

—Annals of the City of Kansas, Spalding, 1858, p. 22.

* Supra, p. 5.

ments, with an aggregate capital of \$10,000, engaged in the manufacture of furniture out of the native walnut, hickory and oak that the sawmills had to use for the making of the coarser grades of lumber.

There were two other lines of manufacturing at the time of the eighth census that deserve mention, and they are the only others that were really established. They are milling and the manufacture of wagons and carriages, with the kindred blacksmithing trade. There were thirty-six grist mills, many of them small water powers, engaged in the making of flour and meal for the settlers. A few of the mills were of fair size and did a considerable business, but by far the majority were custom mills, and did their grinding only as the farmers brought in the grain to get the supply of flour and meal for the family consumption. As there was less than 200,000 bushels of wheat produced in the territory at that time,⁵⁰ or about 1.8 bushels per capita, it is easy to see the comparative insignificance of the milling business at that early day. There were but three wagon and carriage establishments, with a capital of some \$18,000, making in the census year about \$65,000 worth of carriages and wagons,⁵¹ and employing thirty-five hands, while the kindred blacksmithing trade employed twenty-four men.⁵² Among the other industries listed, there were six boot and shoe shops, four brickyards, three harness shops, and about a score of others of one or two establishments to a trade.

The decade between the eighth and the ninth census reports was a most trying one for the progress of industry in Kansas, for it was the scene of a bitter conflict between the *bona fide* settlers and the bushwackers of the border, who did not cease their operations after the election decided that the territory should be a free state. Until after the close of the Civil War the growth of the population was slow, and it was not until about 1867 that the settlement began again in earnest. By the time of the taking of the ninth census the population of the state had trebled, and instead of twenty-one counties, as in 1860, there were forty-one that reported manufacturing interests in 1870. Manufacturing in all its dimensions had practically increased sevenfold, and the state was fast becoming self-sufficing in the lines of manufacturing that its natural resources fitted it to produce. It is an interesting fact that while the number of establishments and the capital increased seven times and the number of men employed nine times in the decade, the value of the product increased only about five times over the figures for 1860.

The number of lumbering establishments increased in the ten years about seventy per cent, and, in point of numbers, lumbering was still in the lead. But by this time the milling business, second in rank in the number of establishments, was easily in the lead in the value of products, with a total output of \$2,938,215 as against a little over a million and a half of lumber sawed. Flour and feed milling from that time until after 1885 was the leading industry, as well as the most widely distributed over the territory. The establishments were comparatively small, the average capital being about \$1000 per mill, and they still were engaged principally, if not entirely, in supplying flour and meal to the immediate neighborhood in which they were located. About one-third of the mills were run by small

NOTE 50.—Ag. Rept., Eighth Census, pp. 54, 55.

NOTE 51.—Vol. III, Eighth Census, p. 167.

NOTE 52.—Ibid,

water wheels, and the rest by steam, with the exception of a half dozen or more wind-driven mills. Another feature of the business, which the census report does not indicate but which is revealed by the state reports four years later,⁵³ is the fact that nearly twenty per cent of the mills engaged in grinding flour and meal were what the reports call "saw-and-grist" mills; that is, they used their power for running their saws during the time they were not needed to grind, and thus were able to run at a profit where the business was too small to make the milling alone profitable.

The endeavor of the new state to become self-sufficing wherever possible is shown as well in the rapid growth of the furniture factories and the wagon and carriage shops up to the census of 1870. The figures show that there were fifty-two furniture factories and sixty-eight wagon and carriage shops, or an average of more than one of each to every organized county. Necessarily these shops were small, and with only a few exceptions supplied only the immediate vicinity, but the number and their activity illustrates the attempt to make the most of the country's resources. The number of the wagon shops soon fell off, for they were not able to compete with the larger makers farther east, who bought in larger quantities and put out better wagons than most of the small shops could produce. The furniture factories persisted, however, and continued to supply the local demands for the cheaper grades of furniture for a number of years. There were sixty-eight wagon and carriage shops in the state in 1870, with a capital on the average of about \$1500 each, and doing in the aggregate nearly a quarter of a million dollars' worth of business annually. It is evident from this that they were little more than blacksmith shops, and were not entitled to rank as factories. A few exceptions existed, such as the wagon factory at Leavenworth, which was in operation about this time and continued to extend its business for twenty-five years or more, and by 1880 was marketing over 6000 wagons a year. Their prosperity was due largely to the possession of a patent spring which they used on the spring wagons that were the principal part of their output, and it was to this fact that the company was so prosperous.

Harness making continued to prosper in a small way, the seventy odd shops doing a little more than \$400,000 of business in the year 1870. The number of brickyards had increased to twenty-seven in the state, supplying the local demands for permanent building materials, and a few limekilns had begun operations where the surface veins of coal had been opened in the eastern part of the state. There were but five ironworks in the state, and only three establishments making agricultural implements in a small way, the settlers depending on getting such supplies from established manufacturers.

It was in 1872 that the state of Kansas began the publication of annual reports of agriculture and industry under the direction of the Board of Agriculture, and some of them contain detailed information of the development between 1870 and 1880 that no other publications touch. The first statistics on manufactures were included in the report for 1874, and were obviously incomplete, but from that time they seem to be fairly comprehensive in the main. There seems to have been an increase in the production of manufactured articles that approached the demands of the population, particularly

NOTE 53.—Fourth Ann. Rept., Kan. Bureau of Agriculture, p. 503.

during the first five or six years of the period. Toward the end of the period the number of sawmills began to fall off rapidly, and from this time sawing ceases to cut much figure in the reports. It is obviously unfair to base any conclusions on the sawing of lumber in a prairie region such as the Kansas-Oklahoma section is, for it could not rank as an important industry except in comparison with the small beginnings of the others under consideration.

The flouring industry in this period becomes the characteristic industry of the country, and being based on the needs of the people and the use of the products of the land was destined to grow. The census reports show an increase for the ten years following the census of 1870 of more than 300 per cent in the output of the flour mills, with an increase of only a little more than 200 per cent in capital, number of mills and number of men employed. According to the first complete report of the state bureau, in 1875, the number of flour and grist mills had increased more than one and a half times since 1870,⁵⁴ and by the following year the number was more than three times that for 1870.⁵⁵ These figures show that much of the increase in numbers for the whole ten years was made during the first six, though no reason has been assigned for that condition, as the growth in numbers was again on the increase soon after, and continued for twenty years longer. The state reports give but passing mention of the other industries at this time, and fail to show a total that approaches that of the census reports, and it would not be strange if the reason was the lack of importance of many of the industries.

There was little to indicate at that time that there was a manufacturing future for the section of the country under consideration, for the mineral resources were practically unknown and almost wholly undeveloped; the extent of the fuel supply was unsuspected; the dryness of the climate made textile industry in any extent out of the question; the exhaustion of the scanty timber supply put lumber trades out of the question as an opening for manufacturing greatness. A contemporary writer says: "The fact must be apparent that Kansas will always have to be an agricultural state, although the importance of combining manufactures with this leading industry is apparent."⁵⁶ The same writer, continuing, says: "At present flour is the principal manufacture, and the industry has grown in the last few years until at present there is a large surplus produced." Wagons and furniture are the only other articles that struck the writer as being of any considerable importance.

By this time, however, the development of the principal towns as centers of what industries were in existence was becoming noticeable. The coming of the railroads must be given the credit for this concentration, and from the time that the transportation lines had established well-defined distributing centers those places began to secure a larger share of the manufacturing. It is characteristic of the manufactures of the whole section that they have followed the railways, and in but few cases have the railways been pushed out to accommodate any manufacturing project. The extent of the growth of a few towns in importance is first indicated in the report of the Kansas Board of Agriculture for 1876.⁵⁷ It indicates the centralizing in eight or

NOTE 54.—Fourth Ann. Rept. Kan. Board Ag., 1875, p. 503.

NOTE 55.—Ibid. 1876, compiled from local reports.

NOTE 56.—Kansas Hand Book, 1878, p. 19.

NOTE 57.—Fifth Ann. Rept.

nine towns in the eastern and northeastern parts of the state, and all of them were the ones that were favored by the railway advantages when the lines were first building. Atchison, Topeka and Emporia on the Santa Fe; Leavenworth and Lawrence on the Union Pacific, and still farther west on the same road, Junction City; and Fort Scott, on the Kansas City, Fort Scott & Memphis, were the towns that were taking the lead.

In that year Fort Scott had a score of enterprises, each with a capital of from \$2000 to \$80,000, and aggregating over \$300,000. Considerably more than half of this amount was invested in the flouring mills, which were the town's principal activity.⁵⁸ Of the towns mentioned above, Fort Scott was the principal one so far as the leading industry, milling, was concerned, and the others showed a greater variety of manufacturing activity. Leavenworth was in the lead in number of establishments, and probably equally in the amount of capital invested, though the figures are not given. Of the 47 factories reported, 3 were ironworking establishments, 4 were brickyards, 4 were engaged in the manufacture of furniture and house furnishings, while there were but 2 flour mills reported.⁵⁹ Topeka was the second town, with 35 manufacturing establishments, 3 of which were flour mills, of only medium size for those times, however, while there were 11 wagon and carriage shops reported.⁶⁰ Atchison, Lawrence, Emporia and Junction City were the only other towns that were mentioned in the report of 1876, and they ranked about in the order named.

In this same year the number of railways in operation in the state of Kansas alone had reached seven, two of them extending entirely across to the west, and a third spanning it from north to south,⁶¹ and Omaha, Neb., had connection west almost to the coast, and with the Kansas systems on the south. Obviously there was nothing in the needs of the new country that accounts for the rapidity of the extension of the railways across the prairies, and in fact it was a matter almost wholly outside the demands of business that was offered that led to the great activity of the transportation lines at this particular time. As the railways became of great importance a little later as the natural resources of the country were discovered, it will be profitable to consider at some length at this point the building of the leading lines of railway across Kansas and Nebraska.

THE COMING OF THE RAILWAYS.

The first railway project that ever materialized in the territories of Kansas and Nebraska was that of the Leavenworth, Pawnee & Western, chartered by the legislature of the territory of Kansas in 1855. The plan was to construct a road from Leavenworth to the western boundary of the territory, then the summit of the Rocky Mountains, in the present state of Colorado. It was one of five charters granted to railway corporations at that session,⁶² and with a single exception⁶³ was the only one that material-

NOTE 58.—Fifth Ann. Rept., Kan. Board Ag., 1875, p. 119.

NOTE 59.—Ibid. 1875, p. 164.

NOTE 60.—Ibid. p. 208.

NOTE 61.—Tuttle, "History of Kansas," p. 554.

NOTE 62.—Territorial Statutes of Kansas, 1855.

NOTE 63.—The Elwood & Marysville Railroad, chartered at the same session. Cutler's History of Kansas is authority for the following statement: "On the 20th of March, 1860, the first iron rail for a railroad on Kansas soil was laid at Elwood, opposite St. Joseph, Mo., on the Elwood & Marysville railroad. On the 28th of April the locomotive 'Albany' was brought over the river from St. Joseph on a ferry boat and placed on the new railroad track. This was the first iron horse that ever touched Kansas soil."

ized to the extent of actual construction. In 1857 the company was organized at Leavenworth, Kan., with a capital of \$156,000 subscribed.

In May, 1857, grading on the line was commenced, and the location of the line was completed to Pawnee, on the site of the present Fort Riley military reservation. Little further was done, however, until after the act of Congress of July 1, 1862,⁶⁴ granting government aid to the construction of a Pacific railroad and telegraph line. One clause of the act authorized the Leavenworth, Pawnee & Western to build a line from Wyandotte, at the mouth of the Kansas river (the terminus of the Pacific Railroad of Missouri) to some point on the one hundredth meridian. In the following year the Union Pacific Railway Company, Eastern Division, was organized, under the act of 1862, and it purchased the franchises and all rights of the Leavenworth, Pawnee & Western.⁶⁵ From this time the history of the road is a part of the general Pacific Railroad project, and was pushed forward as a part of it.

In the meantime, the Kansas territorial legislature had chartered another road, the St. Joseph & Topeka,⁶⁶ projected from the Missouri river, opposite St. Joseph, to Topeka, Kan. The charter lapsed without any actual construction, however, and a new project, in substance the same, resulted in the incorporation of the Atchison & Topeka Railroad Company, February 11, 1859.⁶⁷ The same men were back of the new road, and the only material change was that of the eastern terminus.

Droughts and the Civil War combined to discourage the promoters, however, and nothing was actually done toward constructing the line until the congressional land grant to the state of Kansas for the purpose of encouraging railway construction opened the way to the needed aid. The grant was made available to the Atchison & Topeka company in 1864 to the extent of a grant of 6400 acres of land per mile of road actually built in the state, conditioned on the completion to the western boundary of the state within ten years.⁶⁸ The name of the road had in the meantime been changed to the Atchison, Topeka & Santa Fe Railroad Company,⁶⁹ and the road was projected in the general direction of the old Santa Fe trail toward Santa Fe, N. M.

The promoters of the Atchison, Topeka & Santa Fe had little ready money at their disposal, however, and as it was almost impossible to realize on their land grant at that time, the road was not actually built until after

NOTE 64.—Ch. 120, U. S. Statutes at Large, 37th Cong., 2d Sess.

NOTE 65.—Cutler, *History of Kansas*, p. 245.

NOTE 66.—Laws of 1857. Sixteen railway charters were granted at this session.

NOTE 67.—Laws of 1859. The zeal of the citizens of the town of Atchison to make their town the terminus of the road instead of the Missouri town resulted in their lending aid to bring the Hannibal & St. Joseph from St. Joseph to Atchison. With this secured, the same men backed the Atchison & Topeka project. See Cutler's *History of Kansas*, p. 243.

NOTE 68.—Laws of 1864; see, also, *Moody's Magazine*, September, 1908, p. 145.

NOTE 69.—The treasurer of the Atchison, Topeka & Santa Fe furnishes the following chronology of that road:

1859, Feb. 11. Atchison & Topeka Railroad Company chartered.
 1859, Sep. 15. First officers and directors chosen in Topeka.
 1863, Mar. 3. Congressional land grant to state of Kansas.
 1864, Nov. 24. Directors vote to change the name of the company to the Atchison, Topeka & Santa Fe Railroad Company.
 1864, Feb. 9. Transfer of the congressional land grant to the Santa Fe company.
 1864, Feb. 16. Acceptance of the grant by the directors of the Santa Fe company.

both Kansas and Nebraska had been spanned from east to west by the Union Pacific company, under its charter of July 1, 1862.

From 1855 to 1860 was a period of great railway activity west of the Mississippi, the Granger lines being engaged in pushing out for western traffic just then. It was these projects, between the Mississippi and Missouri rivers, that offered the inducement for the building of the Kansas and Nebraska lines. At this time there were several lines building westward, besides the Hannibal & St. Joseph, already mentioned. The Pacific Railroad Company of Missouri was building westward from St. Louis toward Kansas City, which it reached in 1865.⁷⁰

Two lines, the Chicago, Iowa & Nebraska and the Cedar Rapids & Missouri,⁷¹ were building across Iowa, with Omaha as the objective point. These roads were a part of a single project, to connect the Mississippi and Missouri rivers at Fulton, Ill., and Omaha, Neb. The roads were leased to the Galena & Chicago Union railroad, and were under its control when the Cedar Rapids & Missouri reached Omaha in 1866.⁷² In the same year the Chicago, Rock Island & Pacific purchased the rights of the Mississippi & Missouri River railroad, which was building toward Council Bluffs, Iowa, and in 1869 completed the road into that city.⁷³ The Burlington & Missouri River railroad was headed for the mouth of the Platte river⁷⁴ at the same time, and still another road, the Dubuque & Pacific, now a part of the Illinois Central system, was building toward Sioux City. This line was opened in 1866.⁷⁵

The idea of a Pacific railroad had been before the country for several years, and the secession of the Southern states removed the block on the part of those desiring a southern route, making the location of the route in 1862 a simple matter. With the added necessity of making the most of its western resources, and the original impetus of the Pacific railroad project, the government loaned its credit and offered large land subsidies to assist the transcontinental line. Everything that could be done to hasten the building of the road was offered by the provisions of the charter.

According to the charter provisions, three lines were to be built westward from the Missouri river—one from Omaha, Neb., opposite Council Bluffs, Iowa; one from Atchison, Kan., the terminus of the extended Hannibal & St. Joseph; and one from Kansas City (Wyandotte, as the town was then called on the Kansas side of the line). These lines were to unite at the one hundredth meridian, and from there the line was to be extended to the Pacific coast, a total distance of more than 1700 miles. In order to secure the speedy building of the line, the generous subsidies granted by the government were conditioned upon the completion of the road to the coast by July 1, 1876.⁷⁶ The subsidies, the largest ever granted a railway com-

NOTE 70.—Van Oss, "Amer. Rys.," 590; also, Missouri State Board of Agriculture Rept., 1875, p. 297.

NOTE 71.—Poor's Manual, 1879, p. 810.

NOTE 72.—In 1864 the Galena & Chicago Union was consolidated with the Chicago & Northwestern Railway Company, organized in 1859. (Poor's Manual, 1879, p. 723.)

NOTE 73.—Poor's Manual, 1879, p. 732.

NOTE 74.—Ibid. p. 713.

NOTE 75.—This road became a part of the Illinois Central in 1867. (Poor's Manual, 1879, p. 816.)

NOTE 76.—Ch. 120, U. S. Statutes at Large, 37th Cong., 2d Sess.

pany (with the exception of the Northern Pacific), consisted of loans of government bonds at the rate of \$16,000 per mile on the level plains, with an allowance of twice that amount in the plateau regions, and three times as much for the worst of the Rockies. In addition there was a grant of twenty sections of land per mile for the whole distance.⁷⁷

With the inducements of these conditional grants before them the promoters of the company began construction in 1865. Ready money was scarce, and hard to secure, however. Only about one-tenth of the authorized two millions of capital was paid in, and for a time it looked as if the grants were to be lost for the want of funds to build the road. March 15, 1865, the construction was sublet to the famous Credit Mobilier Company of America, and the work of construction was then pushed forward with unheard of rapidity. The construction of the western end of the road was turned over to the Central Pacific,⁷⁸ with the same subsidies, and with the privilege of building eastward until a junction was made with the westward construction of the Union Pacific. Within two years there were 559 miles of track completed on the eastern end, and a part of the line (Kansas Pacific) was in operation. Both ends of the line strove to get as large a share as possible of the subsidies. The completed line from the Missouri river to the Pacific ocean was finally opened six years ahead of time, when the two construction companies met at Promontory Point, west of Ogden, Utah, in April, 1869.⁷⁹

The junction at the one-hundredth meridian was waived by act of Congress, and the Kansas Pacific, ending at Denver, in 1870 built a connecting line, the Denver & Pacific, to Cheyenne, Wyo.⁸⁰ In the meantime, the Central Branch was built westward 100 miles from Atchison, stopping in the open prairies at Waterville, solely for the purpose of securing the government subsidy. In 1880 the three lines⁸¹ were consolidated in management and united in name, having added enough feeders by that time to make the total mileage a little more than 1800 miles, exclusive of the tracks of the Central Pacific west of Ogden, Utah.⁸² The capitalization of the company had in the meantime (1870) increased to the following amounts: Capital stock, \$36,762,300; first mortgage bonds, \$27,231,000; land grant bonds, \$10,400,000; income bonds, \$9,355,000. The cost of construction averaged about \$60,000 per mile for the whole road,⁸³ aggregating about two-thirds the amount of the capital.

The next railway in point both of time and importance was the Santa Fe, which was the outgrowth of the old Atchison & Topeka railroad already referred to,* and which has been one of the great factors in the development of Kansas, for a long time its principal field as well as its home. When the

NOTE 77.—Moody's Magazine, February, 1908, p. 163.

NOTE 78.—Backed by Leland Stanford, Mark Hopkins and C. P. Huntington; organized under the laws of California, and authorized to build east beyond the state line.

NOTE 79.—Moody's Magazine, February, 1908, p. 163.

NOTE 80.—Poor's Manual (1876-'77), p. 422.

NOTE 81.—In the meantime the Elwood & Marysville road (note 63) had become the St. Joseph & Denver City, and had built to Hastings, Neb. (The extension was under a charter as the Marysville, Palmetto & Roseport railroad, 1857.) It reached Hastings in 1873, and by lease formed a junction with the main line at Kearney, Neb., making in reality a fourth leg to the eastern lines of the Union Pacific.

NOTE 82.—Moody's Magazine, February, 1908, p. 166.

NOTE 83.—Ibid, p. 167.

*Supra, p. 20.

charter was extended, in 1863, the first move was the securing of a government land grant (through the state of Kansas), but the promoters were unable to get any cash or bond subsidies, and the actual construction was delayed until after the Civil War. In 1869 less than 30 miles were built westward from Topeka, and in the following year the line was extended to Emporia, about 60 miles from Topeka, and it was not until 1872 that the line was finished to its eastern outlet at Atchison.⁸⁴ Ten months before the expiration of the ten-year period allowed by the terms of their land grant, only 136 miles of the line was in operation, and there were left 380 miles to be built to the western boundary of the state.⁸⁵ At this time the builders began to emulate the performance of the Union Pacific four years earlier, and the road was pushed forward in the time that was left, and the state line was reached two months ahead of time. The gift of 3,000,000 acres of land in the state of Kansas was secured.⁸⁶ The panic of 1873 came on just at this time, and the work on the new road was suspended entirely for a couple of years, when the western terminus was extended to Pueblo, Colo., in order to secure enough western business to pay operating expenses on that end of the line.⁸⁷

The Santa Fe was soon compelled to build farther west, however, in order to live at all, for there was practically no business whatever on two-thirds of its line. Ten years later it reached the coast, partly by construction and partly by purchase, touching at both Los Angeles and San Francisco. The later development included the opening of a line to Galveston, Tex., in 1887, by lease and construction, and the extension to Chicago in 1888.⁸⁸ The later period of the growth of the road was also marked by the acquisition of the Kansas City, Lawrence & Southern, opened in 1870 as the Leavenworth, Lawrence & Galveston railroad, which was operating nearly 200 miles of line in the eastern part of the state in 1872.⁸⁹ This line was one of those that followed on the heels of the Santa Fe and the Union Pacific, and were obliged to content themselves with what aid they were able to secure from the state, and from the counties that they traversed. The L., L. & G. secured something over a million dollars of municipal bonds, and the grant of 125,000 acres of land from the state,⁹⁰ and with this assistance put the road into operation.

The next road, in point of time, was built by the same group of men that put the L., L. & G. into operation, and was called the Missouri River, Fort Scott & Gulf. The two roads were known to early Kansas history as the "Joy Roads," at least until the sale of the L., L. & G. to the Santa Fe. The Missouri River, Fort Scott & Gulf was organized in 1868 for the purpose of facilitating the development of the southeastern part of the state, and received aid from the state of Kansas in the shape of a grant of 125,000 acres of land,⁹¹ or a little more than 830 acres per mile of track. Baxter Springs, Kan., on the southern line of the state, was the end of the road as originally completed in 1870,⁹² giving it a total length of 161 miles, with Kansas City as its other terminus. The promoters had the intention of ultimately

NOTE 84.—Moody's Magazine, September, 1908, p. 146. NOTE 85.—Ibid. p. 146.

NOTE 86.—Ibid. p. 145. NOTE 87.—Ibid. p. 149. NOTE 88.—Ibid. p. 151.

NOTE 89.—Kansas Magazine, vol. I, p. 23; Poor's Manual, 1879, p. 902.

NOTE 90.—Kansas Magazine, vol. I, p. 24.

NOTE 91.—Poor's Manual, 1879, p. 902.

NOTE 92.—Ibid. p. 900.

building southward to some then indeterminate point, but it was not for some time that it was finally connected with Memphis, on the Mississippi river. In addition to the aid that the state gave in the shape of the grant of land, the cities and towns along the line of the survey donated bonds aggregating \$750,000, or more than \$4600 per mile.⁹³ The road was of considerable importance in relation to the manufacturing interests of the country, in that it was the first to reach the coal belt of the state, and in the first year of operation some 2000 cars of coal were shipped to Kansas City for distribution, from the surface deposits of coal in the vicinity of Fort Scott.⁹⁴ When the coal fields of the Pittsburg district were opened in the later '70's, the road, now known as the Kansas City, Fort Scott & Gulf, was already in the field, and put the coal on the market as fast as the field was developed.

In the same year that the Joy interests began grading for their line to the gulf, work was commenced on still another line, to extend from Junction City, Kan., on the Kansas Pacific, to Fort Smith, in the Indian Territory, a distance of about 180 miles, according to the original project.⁹⁵ The road, though called the "Union Pacific, Southern Branch Railway," was independent of the Pacific system, and got no aid from the government, though it did succeed in getting a grant of 125,000 acres of land from the state, and an aggregate of \$730,000 in bonds from the counties through which it passed.⁹⁶ The line was completed across the state in 1871, but, beginning nowhere, and ending in the same manner, as it did, it was found necessary to make some sort of extension as soon as possible. Accordingly, in the same year that the road was completed, some smaller lines in the eastern part of the state were acquired, the plans perfected for a connection with St. Louis, and with the Gulf on the south, and the name of the road changed to "The Missouri, Kansas & Texas."⁹⁷ In 1872 the "Katy" purchased lines connecting Paola, Kan., its eastern point, with St. Louis, and also with Hannibal, Mo.,⁹⁸ and in the same year extended the southern end of its line through the Indian Territory to the Texas line,⁹⁹ a conditional grant of three and one-half million acres of Indian lands having been secured in the meantime from the government.

In the latter '70's the road had nearly 800 miles of track in operation,¹⁰⁰ and early in 1880 it was acquired by the late J. Gould and his interests. Gould at that time was in control of the Pacific Railroad of Missouri, referred to above,* and he put the two roads loosely under one management and set about extending their lines in Kansas, under the name of the Missouri Pacific, to compete with the Santa Fe lines.¹⁰¹ The union of the roads did not last long, but while it did Gould succeeded in unloading his branch lines at fancy prices, and when the Katy resumed its old name and separate

NOTE 93.—Kansas Magazine, vol. I, p. 24.

NOTE 94.—Ibid, p. 24.

NOTE 95.—Van Oss, "Amer. Rys.," p. 606.

NOTE 96.—Van Oss, "Amer. Rys.," p. 606; also, Poor's Manual, 1879, p. 839.

NOTE 97.—Van Oss, "Amer. Rys.," p. 606; Poor's Manual, 1879, p. 838.

NOTE 98.—Van Oss, "Amer. Rys.," p. 607.

NOTE 99.—Kansas Magazine, vol. I, p. 22.

NOTE 100.—Van Oss, "Amer. Rys.," p. 612; Poor's Manual, 1879, p. 837.

NOTE 101.—Van Oss, "Amer. Rys.," p. 592.

* Supra, p. 21.

existence, eight years later, it had doubled its mileage in the four states that it penetrated.¹⁰²

In the year 1871 still another railway entered this section, this time building into it from the east. It was the St. Louis & San Francisco, which was originally projected as a branch of the Missouri Pacific in 1866. It began a separate existence in 1876, having in the meantime been extended to Vinita, in the northeastern part of the Indian Territory, by the aid of a grant of a little over a million acres of land from the government.¹⁰³ The road became especially important a little later when the lead and zinc mines were developed in the Joplin district, which it traversed, and still later as the development of the coal field was pushed southward into the Indian Territory.

One of the most remarkable features of the growth of American railways is the building of the roads in the Nebraska-Kansas-Oklahoma region that has just been outlined. There were in the three states, according to Poor's Manual,¹⁰⁴ 2306 miles of railway in 1870, and in 1875, 3592 miles. Very little construction was done for four or five years following the panic of 1873, but work was resumed with a will in the two years preceding Poor's report for 1880, and in that year there were 5632 miles in operation.¹⁰⁵ It is hardly profitable in this connection to pursue the development further, for later than this time it becomes a matter of extension for the sake of competing for business rather than for the securing of the subsidies offered, as in the case of the early roads. It is sufficient to say that by 1890 the principal work of railroad building was completed in this section, there being in all more than 15,000 miles in operation at that time.¹⁰⁶ The grants to the five principal companies for the construction of the 3300 miles, approximately, that was built prior to 1875, aggregated more than twenty million dollars in bonds and over seventeen million acres of land, all in the two states of Kansas and Nebraska.¹⁰⁷ Much of the land was sold in an early day to meet the operating expenses of the roads, and it is difficult to estimate the value that it was to them. Much of it sold as high as four and five dollars per acre, and probably little for less than three dollars. Taking three dollars as a conservative estimate, the land granted amounted to \$54,825,000, which, added to the bond subsidies, brings the total of state and municipal aid, and that of the United States, up to \$74,955,000, or more than \$22,000 per mile for all the road built. Of course, the Union Pacific got far the larger share of the land grant, and nearly all the aid bonds, and this average does not represent the actual condition as to the individual roads themselves.

No one, even at the time of the building of the early roads, was deceived as to the difficulties that confronted them when the time came to operate them in the new country, for, as has already been suggested, the roads came before there were any manufactures to transport, or very much in the

NOTE 102.—Van Oss, "Amer. Rys.," p. 612.

NOTE 103.—Poor's Manual, 1880, pp. 850-852.

NOTE 104.—Ibid. p. v.

NOTE 105.—Ibid. 1890, p. vi.

NOTE 106.—Ibid. p. vi.

NOTE 107.—The total of subsidies for each of the five roads was as follows:

Road.	Acres land.	Amt. bonds.
Union Pacific.....	13,400,000	\$17,600,000
Santa Fe.....	3,000,000	.....
L. L. & G. (Santa Fe).....	125,000	1,050,000
M. K. & T.....	125,000	730,000
K. C. F. S. & M.....	125,000	750,000

way of agricultural products. A contemporary writer¹⁰⁸ says: "The Kansas roads will have a hard time to keep out of bankruptcy for the next few years, . . . for we have built roads far in advance of the needs of the people. . . . The amount of the bonded debt of some of the counties and municipalities is alarmingly disproportionate to the amount of taxable property of the state." The amount of traffic was indeed small, and in 1870 the Kansas Pacific, with nearly five hundred miles of track in Kansas, reported only a little over three million dollars as their gross receipts for the year,¹⁰⁹ while the Missouri River, Fort Scott & Gulf could muster but a million dollars' worth of business for its 160 miles of track.¹¹⁰ It is no part of this work to discuss the financial problems that these roads had to meet, and no attempt will be made to even enumerate the financial difficulties in which they were involved almost immediately. The fact that, without exception, the early roads whose building was induced by the subsidies of land and bonds had one or more experiences in insolvency illustrates forcibly how far in advance of the development of the country the network of transportation lines was extended in the states of Kansas and Nebraska.

The coming of the railways early, as they did, while unprofitable for the roads and their stockholders for several years, was, on the other hand, a great influence in the development of the country. An early writer says:¹¹¹ "The rapid growth of Kansas is owing mainly to the Kansas railway system," and this is as true of the later manufacturing growth as it was at the time it was made of the settling of the country for agricultural purposes. When the coal fields were opened up there were at least three lines already built into that territory to carry the fuel wherever there was a demand for it for any purpose. The same was true only a few years later when the deposits of lead and zinc were developed in approximately the same region. The older towns, too, that had attracted more or less of capital for the foundation of manufacturing activities, had railway lines ready to carry in the raw material and the fuel where needed, and carry out the products to all the settled parts of the country, at the reasonable rates that the number of competing lines secured them. It is for that reason that a few towns took the lead as indicated above,* early in the game, and it is for the same reason largely that the country has from the very first utilized every resource, as soon as it was discovered, as a basis for whatever manufacturing enterprise it would support.

OPENING OF THE FUEL SUPPLY, AND BEGINNING OF MINERAL INDUSTRY.

Following close on the heels of the extension of the railways in the state of Kansas came the discovery and development of the coal beds that have already been referred to, and as the fuel supply and the railroads practically go together in influencing the development of industry, the coal mining industry will be taken up historically. The lead and zinc district, which was opened soon after the southeastern Kansas coal field, will also be taken up at this time. Though not the first into the outside market, the southeastern field was the first to produce coal, and from the first settlement, immediately after the war, some coal was stripped from the surface veins of the

NOTE 108.—Milton W. Reynolds, in *Kan. Mag.*, vol. I, p. 26.

NOTE 109.—*Kansas Magazine*, vol. I, p. 21. NOTE 110.—*Ibid.* p. 24. NOTE 111.—*Ibid.* p. 27.

**Supra*, p. 18.

Cherokee shales for the consumption of the early settlers. The following account of the opening of the mines is taken from a note by Haworth in his first report on the mineral resources of Kansas:¹¹²

"These early settlers in southeast Cherokee county began mining coal in the fall of 1866. The coal beds they operated upon were some of the thinner and lower veins, now entirely abandoned. . . . The vein was about twelve inches thick. The surface stripping amounted to but little, and with plow and team it was a very little matter to lay bare a considerable area and to dig up the coal. This supplied the local demand and also furnished some for the adjoining territory in Missouri, to which market it was conveyed by wagon. Some years later the heavy beds of coal now so extensively mined in Cherokee and Crawford counties were discovered where they came to the surface, and mining operations began by the stripping method.

"The outcropping of the heaviest coal beds of the area forms an irregular line extending northeast and southwest. Weir City was the first town founded upon the coal fields, followed by the location of Pittsburg, nine miles to the northeast, and this in turn by the numerous coal-mining villages . . . so well known in that part of the state. At the present time more than two-thirds of the coal mined in the state, nearly all of which is taken from the same coal bed, comes from these two counties, from the coal vein commonly called the 'Weir City' or the 'Pittsburg heavy vein.'

"Along with the development of mines operating in these heavy coal beds, lesser beds have been operated, particularly in Cherokee county, by the stripping process, where they are exposed near the surface. The price of coal for the last few years has been so low that it has been unprofitable to work these lesser beds, the individual farmers usually finding it profitable to buy the coal from the market rather than spend time mining it from their land. . . .

"Almost synchronous with the development of the coal mines in Cherokee and Crawford counties came the development of similar mines in the vicinity of Fort Scott, where a bed of coal from fourteen to twenty inches in thickness is found immediately under a heavy limestone. . . . In the early days these mines were operated by individual farmers on whose land the outcroppings of coal were found, or by small companies which worked the mines during the winter, when labor was cheap and fuel in demand. This process was continued until recently, when the price of coal became so low that profitable mining is now carried on in but few places in the vicinity of Fort Scott—only such localities as chance to afford the coal with the minimum amount of stripping.

"Further north, in the vicinity of Pleasanton and Mound City [about twenty-five miles north of Fort Scott], similar beds exist, and were discovered decades ago and operated on a small scale, the market conditions being such that those desiring coal could not well obtain it from outside sources, and therefore the local market was good, and mining to a limited extent was profitable. So it was with the mines in Franklin county, in Osage county, and in Leavenworth county, only in the latter place the mining is conducted by sinking deep shafts, the majority of them reaching about 800 feet below the surface."

It was these beds of coal, that Professor Haworth dismissed with the barest mention as of very minor importance ten years ago, that were the important sources of fuel for the first ten or fifteen years after the building of the railroads, and in those days Fort Scott and Osage City were the important sources of the fuel supply. Shipment of coal began out of the Fort Scott district as soon as the Memphis railway reached it out of Kansas City. Five years later a contemporary writer spoke of the Fort Scott coal as "too well known to call for a detailed description,"¹¹³ and is authority for the

NOTE 112.—Min. Res. Kan., 1897, pp. 36, 37.

NOTE 113.—Prof. B. F. Mudge, in Fourth Ann. Rept., Board Ag., Kan., 1875, p. 126.

statement that considerable quantities were marketed in Kansas City, St. Joseph, Mo., and Council Bluffs, Iowa, along the lines of early railways in that direction. The Osage county coal was perhaps of the most importance at first to the outside world in that it furnished a convenient supply of fuel for the Santa Fe railroad from the time the first few miles were put in operation, as the coal was reached by the railway the first year. By 1874 the output of the Osage county mines was estimated at 73,000 tons, while by the next year it had increased to 123,000 tons,¹¹⁴ or almost its present volume. The same writer mentions the coal in Cherokee county as being at that time used in the smelting of zinc,¹¹⁵ a small smelter having been opened at Weir City, in Cherokee county, a couple of years earlier, using ore that was brought from the Joplin mines, which had been opened about five years earlier to some extent. The Cherokee coal at that time, however, had no outside market at all, as the Fort Scott coal was ample to supply the then existing demand and needed a shorter haul to get it to market.

With the exception of the mines in Osage county, which were usually shallow shafts, the coal in the beginning was mined almost entirely by strip-ping from surface outcroppings. The first deep mining in the state was in Leavenworth county, where a company was organized and sinking begun as early as 1859. The promoters of the company had faith, and kept digging until coal was reached, in 1865, at a depth of 713 feet. It proved to be too thin a vein to make mining profitable, however, and it was not until 1870 that the vein that is now operated was reached. In that year the company was capitalized at \$300,000, the shaft enlarged, and the coal placed on the market.¹¹⁶ The discovery of this deep vein of coal was of comparative importance to the towns of Leavenworth and Atchison, for, being the oldest towns in the state, and having a goodly share of the network of railways, they were in a position to do a fair share of the manufacturing of the state, and the discovery of fuel at their doors was sufficient to give them a considerable impetus at that time.

The later development of the Leavenworth coal field has not been very extensive on account of the greater expense of locating and reaching the coal, and it was not until 1889 that a second company was organized for mining coal at that place. The Kansas Penitentiary, at Lansing, near Leavenworth, is actively engaged in coal mining, and produces something over 15,000 tons per month when running full time. All of this coal is used at the various state institutions, and affects the market only in that it reduces by that much the demand that would otherwise exist at those institutions.

It was in 1876 that the first coal was shipped from the southeastern Kansas district in small quantities, and that was produced entirely by strip-pit mining.¹¹⁷ In the same year the first shaft was sunk, and a year later a second began operations. It is characteristic that the field was opened by local capital entirely, and it was not until the railroad companies began to acquire lands for the purpose of controlling their own fuel supplies that

NOTE 114.—Fourth Ann. Rept., Board Ag., Kan., 1875, p. 125.

NOTE 115.—Fourth Ann. Rept., Board Ag., Kan., 1875, p. 126; Cutler's History of Kansas 1883, p. 1152.

NOTE 116.—Leavenworth Post, October 1, 1906.

NOTE 117.—Pittsburg Headlight, Sept. 10, 1904.

outside capital figured to any great extent. The Pittsburg coal was found to be of superior quality for steaming purposes, and, as later investigations have shown, the southern end of the Kansas field is in the lead in this respect.¹¹⁸ For this reason the demand began to grow for the Pittsburg coal as soon as it became known to the market, and in 1879 two more shafts were put down at Pittsburg. By 1884 the output of the mines at Pittsburg alone was about 25,000 cars annually,¹¹⁹ or about half the output of the state.¹²⁰

As early as 1882 the first Pittsburg company became allied with the Joplin Railway Company, which was operating a short line of road between Joplin, Mo., and Pittsburg. Then, in 1886, the Santa Fe organized a company at Frontenac, a few miles north of Pittsburg, and from that time the railroads have been the heaviest consumers of the Kansas coal. It is estimated that at the present time the Santa Fe alone, through its supplying company, the Mount Carmel Coal Company, produces a million tons a year,¹²¹ more than a sixth of the total output of the state, and it has been estimated that in all the Kansas railways use about four million tons of coal each year.

The census of 1880 shows the relative importance of the various districts to be about as indicated above. Bourbon county (the Fort Scott district) was far in the lead, and produced more than half the coal of the state, while the Osage mines produced more than the combined output of Cherokee and Crawford counties, which made up the Pittsburg district.¹²² But, as has been stated, the Pittsburg coal was only just becoming known at that time, and the rapid growth of the output of that district for the next ten years shows its superiority as a fuel producer. In 1890 the two counties had one-third of the producing shafts in the state, and mined more than half the coal marketed. Osage county, with more shafts than the Pittsburg district, was mining about one-third as much coal, ranking second in the state, while Bourbon county had dropped from the leading place into insignificance, in the ten years, and was producing less than one per cent of the total of the state, and that wholly from local pits. In the meantime the number of mines at Leavenworth had increased to four, and they were mining about twelve per cent of the coal of the state.¹²³

The development of the Kansas coal field since 1890 has been marked by the increase in the size and activity of the companies in the Pittsburg district, and with the attendant growth of importance of that field in reference

NOTE 118.—Univ. Geol. Surv., Kan., vol. III, p. 294.

NOTE 119.—*The (Pittsburg) Smelter*, Mar. 22, 1884.

NOTE 120.—Min. Res. Kan., 1897, p. 42.

NOTE 121.—Pittsburg *Headlight*, October 10, 1904.

NOTE 122.—The following table shows the relative importance of the leading localities:

District.	Output (tons).	Value.	No. employees.
State.....	771,442	\$1,517,444	5,024
Pittsburg district	115,310	261,995	751
Bourbon county.....	405,410	622,098	....
Osage county.....	129,832	355,821	879
Leavenworth.....	60,588	121,170	324

—Tenth Census, Min. Ind., p. 650, *et seq.*

NOTE 123.—The relative importance of the districts in 1890 is shown by the following table:

District.	Output (tons.)	Value.	No. employees.
State.....	2,222,443	\$3,301,788	5,956
Pittsburg district.....	1,376,232	1,634,715	2,825
Osage.....	446,018	903,602	2,032
Leavenworth.....	245,616	415,751	937

to the others in the state. When Haworth issued his report on Kansas coal in 1888 the bulk of the output of the Pittsburg district, then about eighty-five per cent of the total, was mined by only ten companies, each of which built and rented the houses for their employees near their mines, furnished stores of their own for the trade of their miners, and in short built up little communities in the neighborhood of each mine. The mines in other parts of the state have become of lesser importance each year, until at the present time the two counties of the Pittsburg district furnish more than ninety per cent of all coal mined in the state.¹²⁴

The importance of the coal supply, the development of which has just been outlined, cannot be emphasized too much in connection with the growth of manufactures. It is largely the lack of this very advantage which has kept the state of Nebraska from coming to the front in any of the lines of activity that Kansas has pursued. Since the first mines were opened in the state there has been produced an aggregate of eighty-six million tons,¹²⁵ worth in round numbers a hundred million dollars at the mines, and supplying numerous industries with power. "It is difficult to surmise what would have been the result to the citizens of our state had coal mining never been followed within our borders. . . . We have various industries, particularly our zinc-smelting and salt-making industries, which probably never would have been in operation had not our mines yielded such large amounts of good and cheap fuel. This is certainly true of our zinc-smelting industries. There is no place in the state showing greater activity than the coal-mining areas in the southeast. Railroads have been built to

NOTE 124.—The percentages of the districts by four-year periods since 1890 are:

	1890.	1894.	1898.	1902.
Pittsburg district.....	64.67%	78.82%	85.51%	89.268%
Leavenworth.....	12.27	9.349	7.91	5.564
Osage.....	7.11	8.197	4.63	3.439

—Min. Res. Kan., 1902, table op. p. 32.

NOTE 125.—The following table shows the production of the Kansas mines to 1907:

Year.	Production, short tons.	Price per ton.	Value of product.
1880.....	550,000	\$1 30	\$715,000
1881.....	750,000	1 35	1,012,300
1882.....	750,000	1 30	975,000
1883.....	900,000	1 28	1,152,000
1884.....	1,100,000	1 25	1,375,000
1885.....	1,400,057	1 23	1,770,270
1886.....	1,350,000	1 20	1,620,000
1887.....	1,750,000	1 40	2,198,110
1888.....	1,700,000	1 50	2,550,000
1889.....	2,112,166	1 48	3,126,005
1890.....	2,516,054	1 30	3,170,870
1891.....	2,758,722	1 31	3,607,375
1892.....	3,007,276	1 31½	3,954,568
1893.....	2,881,931	1 37½	3,960,331
1894.....	3,611,214	1 35½	4,899,774
1895.....	3,190,843	1 12½	3,590,141
1896.....	3,191,748	1 01½	3,227,357
1897.....	3,391,806	1 07	3,488,380
1898.....	3,860,405	1 08½	4,193,159
1899.....	4,096,895	1 25	5,124,248
1900.....	4,269,716	1 28	5,500,709
1901.....	4,793,374	1 30	6,231,386
1902.....	5,230,267	1 36	7,139,139
1903.....	5,839,976	1 52	8,871,953
1904.....	6,333,307	1 52	9,640,771
1905.....	6,423,979	1 45	9,350,542
1906.....	6,024,775	1 47	8,979,553
Totals.....	83,539,580	....	\$112,448,942
Prior to 1880.....	3,000,000	1 50	4,500,000
Grand totals.....	86,539,580	....	\$116,948,942

a wonderful extent, villages have sprung up, and the population has increased, making great business for the merchant and the mechanic, . . . so that the direct benefits of mining reach out to all classes of people, and in the aggregate produce many millions of dollars of business that otherwise could not exist."¹²⁶

The great advantage that the Kansas coal has offered to industry lies not only in its quality and abundance, nor even its convenience, but in the cheapness with which it could be mined and put on the market. Prior to 1880 the average price was not above \$1.50 per short ton, while the average price since that time is only about \$1.30 per ton, prices in every case being for the coal at the mines. The Pittsburg district has always had a great advantage in this respect, and to the present time can get its coal to the surface twenty-five to thirty per cent cheaper than other parts of the state.¹²⁷ The first direct outgrowth of the coal supply was the cluster of zinc smelters that were built in the neighborhood of Pittsburg, flourishing up to the time of the advent of the gas smelters, about 1900, and adding considerably to the industries of the state even before the building of the gas smelters.¹²⁸ The coal has been found in many cases, where the samples were tested, to be of good coking quality, and some of it was coked for use in the zinc smelters before the day of the gas furnaces. Only one regular establishment¹²⁹ for the burning of coke has been built in the state however, and practically all of the coal has been burned in its natural state.

The output of the Kansas coal mines reached its maximum in 1904, as did that of the Oklahoma mines, to be mentioned presently. The reason for this in both cases is the development of enormous quantities of natural gas in both sections, and this new fuel has almost entirely superseded coal for both domestic and factory consumption in the outlying towns, as well as in the immediate oil and gas district. For this, and for the additional reason that many of the railroads in the district have equipped their locomotives with oil burners, and have been using the inferior oils as fuel,¹³⁰ the export business of the coal mines has shown a greater proportion than ever before, and only that fact can account for the demand holding up as well as it has.

As has already been suggested, the coal-bearing formations of Kansas extend practically continuously into that part of Oklahoma immediately south of the Kansas district, and as early as 1880 there was some coal mining in that region.¹³¹ The total area of workable coal in Oklahoma is estimated to be about 14,000 square miles, and forms the connecting link between the Kansas fields and those in Arkansas. Conditions have been very unfavorable for the development of this part of the field, owing to the fact that it has been difficult to get satisfactory leases of the lands, which until a short time ago were nearly all in the hands of Creek and Choctaw tribes, all the district being in what remained the Indian Territory up to the admission of the new state. The Interior Department watched the rights of their Indian wards rather jealously, and fixed the royalties that the leaseholders had to pay. Up to the time of the report of the Dawes Commission on Indian Affairs, in 1898, this royalty was fixed at seventeen and two-thirds

NOTE 126.—Haworth, *Min. Res. Kan.*, 1897, p. 40.

NOTE 127.—*Min. Res. U. S.*, 1906, p. 676.

NOTE 128.—Haworth, *Min. Res. Kan.*, 1897, p. 34.

NOTE 129.—*Min. Res. Kan.*, 1903, p. 24. NOTE 130.—*Ibid.* 1906, p. 650. NOTE 131.—*Ibid.* p. 671.

cents per short ton of screened coal.¹³² The commission reduced that figure to fifteen cents per ton of screened coal, but even with that concession the operators found themselves confined to the southern market, as they could not compete at all with the Kansas coal. In 1898 the Secretary of the Interior exercised the authority given him to reduce the royalties where necessary, and after a thorough hearing reduced the royalties to ten cents per ton of screened coal.¹³³ With this concession the output of the mines on the Indian lands almost doubled in a little more than a year, and continued to increase until the opening of the Texas oil field, which produced an abundance of inferior oil that could be used only for fuel. In consequence of the cheapness of the new fuel, the territory coal was cut off from a large share of the market that had caused its development, and the production began to fall off after 1903. How long this will continue it is impossible to say, but it seems probable that the output will increase from this time. The production for 1907 shows an increase of over half a million tons,¹³⁴ the first since fuel oil came into competition.

Although the production of the Oklahoma district has been approximately half that of the Kansas district for the past six years, its importance in the development of the manufactures of the section has been practically nothing, for, owing to the condition just mentioned, it was unable to enter at all the region where the industries were building. Its importance in this connection lies chiefly in that it will at some future time, when the supply of oil and gas will inevitably fail, have to furnish the fuel and power for the industries that are now using the cheaper and more convenient fuel. As it is in no sense the province of this discussion to speculate on that contingency, the outline of the growth of the fuel supply will end with this brief treatment of the Oklahoma coal.¹³⁵

Practically contemporaneous with the development of the coal supply in Kansas came the beginnings of the mining of lead and zinc in the coal region, and in a very short time the smelting industry grew up around the coal mines, using the cheap and abundant fuel in reducing the minerals for market. Even ten years or more before coal was known in Cherokee and Crawford counties the first lead mines were opened in Jasper county, Missouri, adjoining the coal fields, and probably a thousand tons of lead had been mined and smelted in Jasper county before 1860,¹³⁶ practically all of it, however, with wood as fuel. The first discovery that is authenticated was two miles east of Joplin in 1849, and the next year lead was discovered

NOTE 132.—U. S. Geol. Surv., Min. Res., 1898, part VI, p. 413.

NOTE 133.—Ibid. p. 415.

NOTE 134.—Eng. & Min. Jour., January 4, 1908, p. 80.

NOTE 135.—The following table shows the output of coal from the Oklahoma district by five-year periods since 1880:

	Amount.	Value.	Av. price.	No. employees.
1880.....	120,947	.....	.....	.....
1885.....	500,000	.....	.....	.....
1890.....	869,229	\$1,579,188	\$1 82	2,571
1895.....	1,211,185	1,737,354	1 43	3,212
1900.....	1,992,298	.....	.....	.....
1901.....	2,421,781	3,915,268	1 62	.....
1903.....	3,517,388	6,386,463	1 82	7,704
1905.....	2,924,427	5,145,358	1 76	7,712
1906.....	2,629,731	5,482,366	1 92	8,251

The above figures are collected from the reports on Mineral Resources of the United States 905, p. 589, for 1906, p. 670, and from the *Engineering and Mining Journal*, January 4, 1908, 0. The figures for 1901 and 1903 are introduced for the sake of completeness in the above table, order to show the falling off of production as the oil and gas field was developed.

NOTE 136.—Mo. Geol. Surv., vol. VI, p. 288.

within the present limits of the town. "About 1851 mining began in earnest at different points in Jasper county [Missouri] along Center creek and Turkey creek [north of Joplin]. . . . These . . . mines were producing so much lead ore at the time of the Civil War that they became objects of no little importance to each of the belligerent parties. . . . It is doubtless true that many people came across the line into Cherokee county and at least suspected that the vicinity of Galena was lead-bearing. . . . In fact, with the settlement of Cherokee county, many rumors were afloat about the Indians having mined lead ore here and there in different places."¹³⁷

Immediately following the Civil War, the mining operations were not of much importance in Jasper county, and it was nearly fifteen years before the rediscovery of lead in Joplin started the mining fever anew. In 1871 the mining operations began in earnest. In 1875 mines were opened at Webb City¹³⁸ (about ten miles north of Joplin). About a year later, early in 1876, a well digger found a large pocket of the richest galena that had been found, while digging a well on Short creek, ten miles west of Joplin, in Cherokee county, Kansas, and as soon as the news of the find became known companies were formed, and prospecting began in earnest on the Kansas side of the line. "In the spring of 1877 the same prospector, while digging in Short creek valley about a mile above Bonanza (the name given the first Kansas mine), came upon a large body of pure lead ore that produced several hundred dollars' worth of metal. Again the excitement was renewed. . . . Almost every shaft that was sunk found large quantities of lead near the surface. . . . It is estimated that within three months from the discovery of lead in this particular locality not less than twelve or fifteen thousand people had encamped on the grounds."¹³⁹

It is a peculiar thing that for the first few years after the opening of the Joplin-Galena district, in the '70's even, but little attention was given to the abundance of zinc ore that was uncovered by the prospectors in their search. One reason was that the ore required a better fuel supply than the first miners possessed to reduce it, and as the first railroad did not reach Joplin until about 1875 it was an expensive matter to get the bulkier and less valuable (at that time) "jack" to market. The Matthieson & Hegeler smelter of La Salle, Ill., had, it is true, a representative in Joplin before 1875, "but in these early days zinc ore was not reckoned of any considerable importance, and, therefore, its discovery attracted little attention."¹⁴⁰ As early as 1870 zinc was discovered in Kansas, near Galena, and one mine produced a considerable quantity of it, marketing at Joplin with the buyers for the La Salle smelter.¹⁴¹ The discovery of lead in the same vicinity about the same time put a quietus on the zinc activity for a time, and all energies were bent toward the production of the more profitable ore. The development of the deposits of zinc ore was inevitable, however, for "the two ores are so intimately associated that they cannot well be separated in a description of their occurrence. Scarcely a shaft that did not produce ores

NOTE 137.—Univ. Geol. Surv., Kan., vol. VIII, p. 20.

NOTE 138.—Ibid. p. 21.

NOTE 139.—Min. Res. Kan., 1897, pp. 17-18.

NOTE 140.—Univ. Geol. Surv., Kan., vol. VIII, p. 21.

NOTE 141.—Ibid. p. 21.

of both metals. Frequently the same shovel of earth will have the two mixed in about equal quantities."¹⁴²

In 1873 a small zinc smelter was started at Weir City, about twenty miles from the zinc deposits at Galena, using the recently discovered coal deposits as fuel, and hauling the ore by wagon to the smelter. As it required about three and a half tons of coal to reduce a ton of zinc ore,¹⁴³ this was for a time the only feasible way. Within two years, however, the St. Louis & San Francisco railway reached Joplin and Galena, giving access to the Illinois smelters, and the gap between the Frisco and the K. C., F. S. & M. railways was bridged, allowing shipment of the ore to the Weir City-Pittsburg district by rail, and the output of zinc ore began to assume the leading position that it has held ever since. At the present time about seven times as much zinc as lead is produced in the Kansas-Missouri district.¹⁴⁴

With the opening of the Kansas smelters and the connection with the Illinois smelters the output of zinc grew rapidly, and the mining processes became of a less experimental character. It was at first feared that the ore deposits would not prove lasting, and the first mines gave every evidence of this fear. The improvements were all of a temporary character, and the operations were confined to the surface deposits. Another reason was that in most cases the miners had not the means to sink their prospect shafts very far, and in nine cases out of ten the hole would be abandoned if it did not encounter a body of ore near the surface, simply for the want of funds to go further. In this respect the early mines were much like the prospect holes that the average gold seeker puts down in the boom days. "It was only a short time, however, until matters assumed a more . . . substantial form. Regular mining companies were organized; each controlled the properties belonging to it, and conducted its operations in a systematic manner."¹⁴⁵

Rather strangely, it was not until the mines had been in successful operation for more than twenty years that much outside capital was attracted into the mining business, probably because the capitalists shared in the fear that the deposits would not last long enough to make mining properties paying investments. The early smelters partook of the same characteristics, and, while the smelter men came into the field from the East, in many cases the first smelters were small affairs, and the volume of business did little more than to net interest on the investment, plus wages to the owner-laborers, who went into the business on a partnership basis, and did much of the labor for themselves. The production of two to three million dollars' worth of wealth every year by the mines brought a considerable aggregate of wealth into a small section of the country in the course of time, however, and the development was fairly thorough and satisfactory before the lead and zinc mines began to figure in the financial world as investments.

Then it was that the high range of prices of zinc in 1899 attracted Eastern capitalists to the advantages of the Missouri-Kansas field. Spelter prices for that year were twenty per cent higher than they had been for several years before, and as the permanent character of the field was well

NOTE 142.—Min. Res. Kan., 1897, p. 19.

NOTE 143.—Ibid p 33.

NOTE 144.—*Zinc-Lead Reporter*, 1907, p. 13.

NOTE 145.—Min. Res. Kan., 1897, p. 18.

established by this time the prospect of large gains brought a great influx of capital that continued for two or three years and resulted in a thorough exploitation of the whole district.¹⁴⁶ It was estimated that in about nine months after the rush opened in the spring of 1899 the number of new mills in the district was almost doubled.¹⁴⁷ Much of this extension was, however, speculative, and a great deal of outside money was poorly invested and lost.¹⁴⁸ Much of the activity for the year was *bona fide* development, and there was a substantial increase in the production of the district, which in that year aggregated more than ten millions of dollars.

The growth of the output of the district has been remarkably consistent, and represents the combined influences of the addition of outside capital, the extension of the territorial extent of the district, and the deeper development of the deposits. The unprecedented rush of capital to the Joplin districts (already referred to), in 1899 was not accompanied by an increase at all proportional in the output, and the following year of 1900 fell off considerably, and the two years from 1898 to 1900 showed a gain little greater than the normal increase for ten years before. Ore prices have been a very important factor in determining the production of the district, and several times within the last fifteen years the prices have been low enough to cause the temporary closing of the mines for higher prices. In the case of lead alone, however, the increase has not been so noticeable, though the statement above is true in the main of lead, as it is for the gross output. The ten years from 1887 to 1897 represented a comparatively steady output, aggregating about three and a half million dollars' worth of the two ores each year. The ten years after 1897, however, saw a remarkable increase, owing to the influences mentioned, and in that time the output nearly quadrupled in value.¹⁴⁹

It is estimated that the value of the ore shipped out of this district since its first opening to the present time is not less than a hundred and eighty millions of dollars,¹⁵⁰ and as this figure represents practically a net addition from the outside, at least until ten years ago, when outside capital began to claim a share, the importance of these mines in an economic way to this

NOTE 146.—Univ. Geol. Surv., Kan., vol. VIII, p. 31.

NOTE 147.—Min. Res. Kan., 1898, p. 20.

NOTE 148.—Haworth, in his report on lead and zinc, says: "The unusually high prices resulted in a great influx of capital and promoters, who would buy property here and sell it to newly formed companies. Mining properties sold for from two to five times their value, and a great deal of outside money was so poorly invested that it was entirely lost. These bad results were partly due to the promoters who paid such large prices, and partly to a lack of proper management by the new companies. . . . Yet with all these hindrances the lead and zinc mining territory of Kansas and Missouri prospered."—Univ. Geol. Surv., *supra cit.*

NOTE 149.—The ore shipments and values for the ten years from 1897 to 1907 are as follows for the district:

	Zinc (short tons.)	Lead.	Value.
1897.....	177,976	30,105	\$4,726,300
1898.....	234,455	26,687	7,119,865
1899.....	255,088	23,888	10,715,305
1900.....	248,446	29,132	7,992,106
1901.....	258,306	35,177	7,971,650
1902.....	262,545	31,625	9,430,890
1903.....	234,873	28,656	9,471,395
1904.....	267,240	34,362	11,487,350
1905.....	252,435	31,679	13,302,800
1906.....	278,929	39,188	15,128,175
1907.....	286,587	42,034	15,419,727

—Joplin *Daily Globe*, January 26, 1908.

NOTE 150.—Joplin *Daily Globe*, January 26, 1908.

section of the country was very great. These figures do not include the addition in value that the smelting industry, which followed close after the mines, put on the raw ores. At first only a small part of the Joplin ores were smelted in this section, to be sure, but as long as twenty years ago the Kansas smelters were claiming probably half the ores from the Joplin district, and for the past ten years, since the opening of the gas supply and its utilization in the smelters, nearly all the output has been reduced in the Kansas and Oklahoma smelters, which are now producing two-thirds of the spelter of the United States. As the smelting industry will be taken up in detail in a separate section, it is sufficient to merely suggest here the importance of the business which has been the principal activity of several of the towns in the fuel belt for years. "The population has been increased many thousands, practically all of whom subsist in one way or another upon the outside money [that the mining and smelting industries bring in]. This money is paid for the raw ore and metals fresh from the smelters, going to the merchants and . . . laborers, a great portion of it reaching the farmers in the surrounding neighborhoods. The great increase in population has been associated with social, intellectual . . . and political activities until the extent of the influence along these lines has become so great, and ramifies all phases of activities, . . . scores and even hundreds of miles in extent, so that no one will ever be able to summarize the influence for the last thirty years, or for the future."¹⁵¹

While the above quotation puts the case strongly, the importance is not much exaggerated, as is shown by the growth of towns, the extension of a network of railways, and the prosperity of a section of the country that would not be even up to the average but for the mines and smelters, with the markets and other activities that follow such an addition to the population as this branch of mineral industry brought in. The coincidence of the lead and zinc mining territory with the fuel belt, utilizing first the coal and later the natural gas a little farther removed from the oil supply, has undoubtedly been the basis of the greater share of the prosperity of that section of the country.

MANUFACTURING SINCE 1880.

As has already been suggested, even before 1880 the older towns in the eastern part of the state of Kansas that had been favored by the first and most convenient lines of railways were taking the lead in the manufactures of the section. There was a considerable rivalry among them for the leading place in trade and industry, and each of them did everything possible to advertise and foster any new industries. This situation continued very noticeably for a period of about fifteen years longer, or until about 1895, which date marks the beginning, to all intents and purposes, of the conditions that now exist. This period marks the rise of a half dozen towns to places of considerable importance by a considerable increase in number and character of manufacturing enterprises, as well as a healthy growth of business, reaching its culmination, however, in the early '90's. Since that time the alteration of trade conditions, the development of other and more advantageous centers, and other influences, have combined to relegate some of these towns that aspired to metropolitan positions to second- and third-rate positions.

NOTE 151.—Haworth, in Univ. Geol. Surv., Kan., vol. VIII, p. 32.

Conditions were in general favorable for the growth of a number of manufacturing interests to supply the wants of the immediate country and of those sections lying farther west. Centralization had not been carried out to any great extent in the industries farther east with which the new establishments had to compete. Freight rates were high—much higher, as a matter of course, on most manufactured articles than on the materials from which the finished articles were made. Hand labor was of greater importance then than a few years later, and the small shops were not at the disadvantage that they are now. Then, too, the western country was new, and the field was not developed commercially as it came to be a dozen years later, and the new manufacturer had all the advantages of local spirit and reputation, knowledge of the needs of his market, and few of the disadvantages that the small factory now has. The factory that entered the field at this time had an even chance to land the business, and almost without exception the new enterprises prospered and encouraged others to come in.

It was natural that the older towns of the richer northeastern part of the state should be the ones to feel the influence of these conditions most, and for this reason, in connection with the reasons mentioned above, Leavenworth, Atchison and Lawrence especially experienced a very flattering growth in a manufacturing way from about 1875 into the early '90's. Topeka, Emporia and Fort Scott had the same experiences, though in hardly as marked a degree. Leavenworth and Lawrence, particularly at one time, had at least double the number of industries that they have at the present time, and each had rosy hopes for industrial futures. Furniture, iron-working establishments and implement factories were among their best paying and most characteristic enterprises. It will be observed that many of these establishments were built up on the basis of conditions that were only temporary, and as the conditions changed and those industries were placed on a footing of competitive relationship with other localities natural unfitness in some cases caused a falling off in business, and finally discontinuance or removal to a better field.

The example of Lawrence, situated as it is without the advantages of fuel supply or specially advantageous transportation facilities, is perhaps the strongest representative of this movement. Much of the activity is due directly to the fact that there were a few men like A. Henley, one-time state senator, and former Congressman J. D. Bowersock, who, with money to invest, put it into manufacturing enterprises in their own town. Conditions were for a time such that they prospered at it, and other enterprises came after, encouraged no doubt by their successes. And further than this, these men were interested to some extent in every important enterprise that came into the community, so their influence for expansion was effective, both as a motive power and as an example.

One of the best examples in Lawrence of the growth and later decadence of industry was perhaps that of the Consolidated Barbed Wire Company, so called, which began in a very small way as early as 1878. It was at first largely a personal enterprise, and the output was but a few hundred pounds of wire a day. But in 1888 the company was organized and incorporated, and the equipment increased. The manufacture of nails and woven fencing was added, and later, as the demand grew, of bale ties. In 1890 the company employed forty men and had an average output of thirty tons per day, which was a considerable matter in those days. The business was extended

rapidly until 1895. The products were marketed in Kansas, Indian Territory (Oklahoma), Colorado, and even New Mexico. A contemporary account states that the Lawrence company "competed successfully with the Eastern manufacturers,"¹⁵² and the growth of the business for a few years certainly bears out the statement.

After 1895, however, conditions rapidly became such that the business became less profitable each year, and in 1898 it was sold out to Eastern competitors, who closed and dismantled the mills. At least three good reasons can be assigned for the decadence of this particular industry. In the first place, it began and prospered on account of the fact that the company had the services of a man who built for them the machines that were then used in the making of the wire, and when larger machines were introduced that required less personal attention they were at a disadvantage. The total lack of material was another factor that condemned the industry to failure as soon as it should be subjected to close competition with more favored localities. The reduction in prices about 1895 was the other factor, and all combined to make it advisable for the owners to dispose of the industry at the first opportunity. "Under local management during high prices, and while the demand exceeded the supply and profits were high, the industry could operate successfully. But close competition was more than the conditions here could stand."¹⁵³

Another enterprise that the same men started in 1893 was the manufacture of the Eclipse hay press, and for a time, two or three years probably, the company prospered. Owing to the fact that they had all the business that they could manage without this new enterprise, however, and for the further reason that their machine had some defective parts, the company sold out all their rights and the business moved to Kansas City. This will be observed in the case of many enterprises about this time, and the movement toward the city on the Kaw will be noticed more particularly with the view of pointing out the reasons for the movement to a larger center with less favorable labor conditions, where the cost of material equipment is proportionally larger.

Another of the large industries of Lawrence that is on record was the canning company, which however is still running, though on a smaller scale than formerly. It was organized in 1881, and increased its business as the demand for canned products grew, until in 1890 it was putting up in the neighborhood of a million cans annually. The pay roll of the company was from \$1200 to \$2500 per week, according to the season of the year, and the products found a market in ten states, extending as far west as the coast. "It is the largest canning factory between Baltimore and San Francisco . . . and the only one in Kansas using all kinds of fruit."¹⁵⁴ For the same reasons, undoubtedly, that the canning business has not been more characteristic of this section of the country, the Lawrence establishment found its territory restricted early after this, and it now supplies only local markets. The competition of the surer fruit states was more than the conditions here could stand, and now the factory has to depend on the advantage in freight rates in the home market.

NOTE 152.—Lawrence *Daily Record*, September 12, 1890.

NOTE 153.—Interview, J. D. Bowersock, 1908.

NOTE 154.—Lawrence *Daily Record*, September 12, 1890; Topeka *Daily Capital*, August 8, 1888.

Another Lawrence enterprise that disappeared about 1890 was the old Lawrence Plow Company, that was one of the first to make its appearance. So long as hand labor could compete in the business the factory flourished, and its business was a considerable part of the town's activity for many years, until matters adjusted themselves, as in the case of the wire factory mentioned above, and the factory was discontinued. An iron foundry, established as a small shop almost with the founding of the town,¹⁵⁵ and which rose to some importance in the later '80's, is now little more than an insignificant repair shop.

Also characteristic of the extension of business about 1890 was a large manufacturing chemical company,¹⁵⁶ first established in 1880, and recapitalized in 1890 at \$90,000. At that time it employed about fifty men, and manufactured patent medicines, extracts, toilet sundries and the like. "The business, formerly confined to Kansas, now has a branch at Salt Lake City, and covers Nebraska, Iowa, Missouri, Arkansas, Mississippi, Texas, Louisiana, Indian Territory, Washington and Oregon. Its increase of business in the last year has been 400 per cent."¹⁵⁷ Shortly afterward, however, this enterprise went the way of the others mentioned, and nothing came in to take its place in the town's business. The men who had their money invested began in many cases to seek other investments in the state and elsewhere. The Henleys, for instance, who had been one of the moving influences in the earlier days, went out into the central part of the state and invested their capital in the growing gypsum cement plaster industry.

In a considerable degree the two older towns, Atchison and Leavenworth, the first settled points on the Missouri river in Kansas, show the same extension of manufacturing up to about the early '90's, and a subsequent decline. In the case of Leavenworth particularly the decline was very great. Being one of the points selected for the beginning point of the Union Pacific railway, and favored by the location on the river, the town cherished for a long time the hope of becoming the metropolis of the state. In the first thirty years after its founding in 1854, this ambition seemed in a fair way of realization. But it is an interesting fact that twenty years ago the town had more factories, exclusive of the small establishments, such as bakeries and confectionery shops, and establishments used in the trades, such as carpentering and the like, than it has now. It had then the largest wagon factory in the state and four smaller, but active, factories; its seven flour mills included the largest and best equipped mills in this section; and in 1879 it is recorded that "they are shipping their products all over Kansas, Illinois, Iowa, and Missouri."¹⁵⁸ Its iron foundries employed some 500 men, and were growing rapidly; it had six furniture factories, including the pioneer and largest in the Middle West. Besides these industries the town had the only boot and shoe factory in the state, and one of the first packing houses west of the Missouri river.

Atchison, while never cherishing the same pretensions for first place industrially, was enjoying a period of industrial activity that it has not seen for the last fifteen years. A contemporary account states that the town had

NOTE 155.—Topeka *Daily Capital*, August 8, 1888.

NOTE 156.—The Leis Chemical Company.

NOTE 157.—Lawrence *Daily Record*, September 12, 1890.

NOTE 158.—Leavenworth County Clippings, vol. I (not paged).

sixty factories employing about 1000 men in 1879,¹⁵⁹ while the last census lists but sixty-one factories, employing 940 men.¹⁶⁰ One of its big industries was the Fowler packing plant, established in 1878, with an equipment of \$175,000, and employing about 500 men. The capacity of this first large packing house in this region was about 3000 hogs per day, and the early success of the venture did much to encourage the coming in of the other packing establishments a little later. The census of 1880 reports five carriage factories, seven flour mills, five brickyards and four furniture factories, and not half of these remain at the present time.

The extent of the falling off of the industries in the two Missouri river towns is shown by a comparison of the census figures for the number of leading industries for 1880¹⁶¹ with the last report of the state Bureau of Labor.¹⁶² Leavenworth had in 1880 forty factories in nine of her foremost industries, while in the same industries in 1907 only eighteen were reported. In the same time the number in Atchison dropped more than half—from twenty-seven to eleven—in the enterprises that constitute her leading activities. The only branch of industry that has not suffered a decline in the period is the iron industry, which has lost nothing in the number of establishments, and has continued to grow at a normal rate ever since the beginning. The reason for this exception is undoubtedly twofold to a certain extent. In the first place, every section of the country finds it advantageous to be self-supplying in certain kinds of ironwork. It is cheaper to have the pig iron and the charcoal shipped in and the castings made near the point of consumption than to pay the higher rates on finished articles that are made at a distance, even with the advantage of the coincidence of the supply of fuel and ore. Further, the industry as it was established at Leavenworth and Atchison was not such that it requires the environment of a large city, or even of extensive railway connections, for it has little need of a distributing center.

One of the representative iron plants began operations as a small foundry in 1872, and gradually increased its output as the needs of the country called for more of the product. The increase of the equipment and the standing of this foundry enabled it to branch out into railway work about three years ago, and it is now supplying a considerable share of the castings used in car repairing in the near-by shops. Leavenworth has also two foundries engaged in the manufacture of bridge and structural steel that have never felt any serious diminution in business since the first establishment thirty years ago. To be sure, none of these enterprises rank very high in point of size among manufacturing plants of the world, but they have been for years and are still supplying a good share of the local demand for their line of ironwork, and support a not inconsiderable part of the population of the two towns. In order to live and prosper, it has been necessary for these plants to change as the conditions and the trade they cater to has changed, and intelligent personal management must be given credit for a part of the prosperity.¹⁶³

NOTE 159.—Atchison *Daily Champion*, February 20, 1879.

NOTE 160.—Census Manufactures, Kansas, 1905, page 14.

NOTE 161.—Tenth Census, Manufactures, pp. 241, 242.

NOTE 162.—Kan. Bureau of Labor Rept., 1907, pp. 254, 284, 285.

NOTE 163.—“The conditions of trade and manufacturing caused from time to time the wiping out of much that used to prevail, causing some things to be obsolete, or too expensive to keep.

Contemporaneous with the decline of the towns of northeastern Kansas, and almost commensurate with it, is the development of the trade and manufacturing center at the towns Kansas City, Mo., and Kansas City, Kan. The beginning of this growth and centralization at the junction of the Kansas and Missouri rivers precedes by some years the noticeable decline of the other towns, but it got its principal impetus in the same period of prosperity, in the later '80's and early '90's, that marked the culmination of the activity of the other centers. At the same time another center was developing at Omaha, Neb., started apparently by the activity that the coming of the packing houses gave to that city when the large Eastern packers entered the field about twenty years ago. To this time Omaha, including the packing enterprises in South Omaha, comprises nearly four-fifths of the manufactures of Nebraska,¹⁶⁴ and for this reason the attention that is given to that state in this paper will be centered in the development of its principal city. This will be taken up after the consideration of the growth of Kansas City.

The growth of a manufacturing center at Kansas City, as well as the rise of its commercial activity, can truly be said to be neither the result of accident or design. It was the result of the natural fitness of the location with reference to traditional lines of communication, as has already been suggested in this paper, and its location at the gateway of commerce to the Southwest.¹⁶⁵ In a way, the growth was in the face of a determination that it should not be the leading town, the competing points making strenuous efforts to counteract the progress that it was making as a trading point. The Pacific Railway of Missouri extended its line on to Leavenworth in an early day, and boasted that it would make Kansas City nothing more than a whistling station, and cutoffs were built to Lawrence and St. Joseph from points east of Kansas City, with the same intent. The Leavenworth, Pawnee & Western built from Leavenworth to Lawrence, avoiding Kansas City, and the Santa Fe did not fill up its gap between Lawrence and

up; therefore, conversant with the want of the railroads, I conceived the idea of a more thorough supplying of their wants, and as they needed a heavy tonnage of supplies that otherwise had to come a long distance, I was enabled to find a market at home for such wants, and over 200 men are now engaged in supplying this market."—Interview, John Seaton, Atchison, 1908.

NOTE 164.—Census Manufactures, Nebraska, 1905, p. 15.

NOTE 165.—Live stock "is an item of business which, we think, more than any other connected with our city, is calculated to astonish those who have given no direct attention to Western trade and development. It is, in magnitude, the heaviest item in our money transactions. There are many causes combining to make this result, and which have made Kansas City the stock market of the Western plains.

"In the first place, Kansas City is the depot of the Santa Fe and Mexican trade, and consequently the best market for oxen. It is also the nearest river point to the stock-growing regions of Arkansas, Texas, and the Cherokee country, and the first place they strike the Missouri river on their trips north, to California, Salt Lake, and the United States forts and trading points north of the Platte. It is also the nearest and most accessible river town to southwest Missouri and over two-thirds of the territory of Kansas at which emigrants and others can land and outfit. It is also the best starting point for stock direct to California, Utah and Fort Laramie, as grass is from two to three weeks earlier by the Kansas than by the Platte, water more abundant, and less liability to Indian depredations.

"These facts all conspiring here for the past few years made this the point of exchange and sale with stock drovers and stock raisers, and it is here that stock buyers come to meet the drovers and make their purchases.

"The drover of Texas buys cattle and drives them to this point, where he meets Missouri and California drovers, to whom he sells; thus making it the rendezvous of the cattle trade of the whole country west of the Mississippi. We have also known large lots sold here for Chicago and points east. The same may be said of dealers in mules and horses, for it is the nearest and best market to the country producing them, and is the point to which emigration looks for its supply.

"When these facts are considered, the large amount of our live-stock sales will be readily understood. We have known as high as 15,000 head of stock sold here in one week during the season. This, large as it may seem, is but the beginning of what is to come. We see, by the Texas papers, that the drovers from that state who have returned report in the most favorable

Kansas City for several years after the road was first put into operation.¹⁶⁶ But there were some conditions that no amount of effort could counteract. In the first place, the most of the settlers came by steamboat across Missouri for the first few years, and Kansas City had not only one of the best landings on the river, but one of the best ferries as well; and, as has already been seen, the proximity of the Santa Fe trail to the west and the military road south made the town an objective point for the settlers on that account. Naturally they desired to get their provisions as near their new homes as possible, and as supplies could be brought from St. Louis by boat in about five days,¹⁶⁷ its trade was soon growing rapidly.

Another thing that made for the growth of Kansas City even in the early days of the settlement was the fact that the bulk of the settlement soon after the war was to the southwest rather than in the direction of the towns farther up the river, and the fact that there were no towns in the southern part of the state for a long time that had the benefit of railway connections such as would enable them to fill the place of distributing centers. Then when the emigration began in earnest to Oregon and California, passing through Kansas City as the shortest route by rail or trail, as the case might be, and taking supplies from the country surrounding it, the growth of the town was rapid and permanent. The fitness of the location was soon apparent to the financial world, and the railways were soon either seeking it as a terminus or, as in the case of the older roads, extending their lines to meet the trade that it commanded. So much for the advantages. The effect was for a good many years confined to the extension of the importance of the town as a trading and distributing point, and in the meantime the competing towns, disappointed in that respect, were building up their manufacturing interests in all the lines that the conditions of the new country demanded.

One of the first manufacturing ventures of Kansas City was the building of a flour mill soon after the war, and with the growth of the country the output of the Kansas City flour mills gradually became important.¹⁶⁸ At times in the early history of the mills they had to go into Missouri instead of the country across the line west for the wheat to grind into flour, and

light the advantages of our market, and no doubt many who have heretofore taken other routes will next season drive to this point. Should the Mormon war be commenced in earnest next season, as we have no doubt it will, it will have the effect of sending all the California droves this way, by the more southern route, as well as add immensely to our sales for army supplies, transportation, etc. From these causes we should not be surprised to see our stock sales increase 100 per cent over last year."

"Statement of live stock sold in this market for the year ending December 31, 1857: [We compile the following from our live-stock market reports of the past season, as published by us weekly, from the actual sales made by and through our stock dealers, and from statistics furnished us by city butchers.]

14,700 horses, mules and oxen, averaged at \$86 per head.....	\$1,262,200 00
52,000 stock cattle, from Missouri, the Cherokee country, Texas and Arkansas, sold here for the California, Salt Lake, Forts Kearney and Laramie, and for home markets, averaged at \$18 per head.....	939,000 00
Total.....	\$2,198,200 00

[We have no data from which to judge of the number of hogs and sheep sold, and prefer not to estimate.]"

—C. C. Spalding, *Annals of the City of Kansas*, 1858, pp. 78, 79.

NOTE 166.—The *Kansas City Annual*, 1907, p. 13.

NOTE 167.—*Ibid.* p. 11.

NOTE 168.—"The history of milling here began a little more than forty years ago with the building of the first flour mill near the river bank in what is now the north end of town. Somewhat later mills were built in other parts of the present city, on Delaware and Walnut streets, and in the west bottoms. There were also, from time to time, mills built across the line in Kansas. Of the older mills only the Zenith, at First street and Troost avenue, now remains. It was built in the later '70's, and has been so enlarged and rebuilt that practically nothing of the original mill remains."—*Kansas City Annual*, 1907, p. 119.

the town did not for many years display any unusual activity in the manufacture of flour. With the introduction of hard wheat by the Mennonites from Russia, who settled in Kansas in the '70's,¹⁶⁹ the supply of wheat became dependable, and Kansas City began to prosper in the milling business, as did the other towns of the wheat-raising belt. The hard wheat did not become a practical factor until late in the '80's, so that the growth of the milling business in Kansas City received this stimulus at practically the same time that other industries were enlarging their capacities and the movement toward centralization began to place manufacturing in all lines on the present basis.

The advantages of location and trade that have been outlined made Kansas City an especially favorable location for flour milling as soon as the exportation of Kansas flour began (about 1880, or possibly a little earlier to surrounding states) and to the fact that the city is the objective shipping point for a large share of the product that is not ground in the wheat belt must be given the credit for much of the recent development.¹⁷⁰ Since 1890 the production of wheat began to assume its present proportions, and since that time, and principally in the later '90's, the largest of the Kansas City flour mills have been built. At the present time Kansas City mills have a capacity of approximately 3,000,000 barrels annually, and send their products wherever American flour is consumed. "The recent great additions to the city's milling capacity will greatly advance the name and reputation of Kansas City as a milling center. It will be long before any such an aggregation of mills will be erected in any center as now stands at the head of the Mississippi river. The tendency is towards a wider distribution of mills as near as possible to the wheat fields. In spite of this tendency, however, Kansas City has doubled its capacity within the last few years. It will continue to grow, and within a few years we will see a milling capacity here of 20,000 to 25,000 barrels per day (against 15,000 barrels daily now)."¹⁷¹

The meat packing industry was one of the first manufacturing enterprises now characteristic of Kansas City to make its appearance. "The pioneer¹⁷² in this field was Edward W. Pattison, who in 1867 established a house at Junction City, where he formed a company and packed about 1000 cattle. . . . In 1868, in company with J. W. L. Slavens, he built the first packing house in Kansas City, and that year packed about 4209 cattle, the first beef packing done in the city." In 1869 Mr. Slavens sold his interest to Dr. F. B. Nofsinger. In the summer of 1880 Jacob Dold & Sons, one of the largest packing firms in Buffalo, N. Y., purchased the packing house of Nofsinger & Co., and still remain the representatives of the pioneer packers of Kansas City. In 1868 Thomas J. Bigger, formerly of Belfast, Ireland, began the packing of hogs for the Irish and English markets, the first enterprise of this kind started in Kansas City after the war. In 1869 Mr. Slavens, of the pioneer firm, formed a copartnership with Ferguson, Slavens & Co., which afterwards became Slavens & Oburn, and later the Morrison Packing Company.

"In 1870 Plankinton & Armour rented the packing house of Pattison &

NOTE 169.—Fifteenth Bien. Rept., Kan. Board Ag., p. 945, *et seq.*

NOTE 170.—The Kansas City Annual, 1907, p. 119.

NOTE 171.—Ibid, p. 121.

NOTE 172.—"The History of Kansas City, Mo.," by Theo. S. Case, 1888, is the authority for the statements regarding the early Kansas City packers, while the coming of the present packers is noted as the firm name appears in Hoye's Kansas City Directories.

Nofsinger, but in the following year built their own house. The firm had already two large houses, one in Milwaukee and one in Chicago. From the date of the establishment of their business here the steady and rapid progress of the great interest they represented may be said to have commenced in Kansas City." About 1884 John Plankinton retired from the firm, and the present corporation of Armour Brothers Packing Company was formed.

The Fowler Brothers, with packing houses in Liverpool, New York and Chicago, began beef and pork packing and lard refining in Kansas City in 1881.¹⁷³ Of the other packing houses now here, Swift & Co., of Chicago, began operations in 1888; Schwarzschild & Sulzberger Company, of New York, about 1892; the Cudahy Packing Company in 1900; Morris Nelson & Co. about 1903, John Morrell Packing Company the same year, and the American Dressed Beef and Provision Company about 1904.

There was no lack of cattle for a basis of beef packing. It is estimated that at the close of the Civil War there were in Texas literally millions of cattle for which there was practically no market. The only way to reach Chicago, at that time the principal Northern center, was to drive the herds through Kansas and into Missouri to some railroad terminus.¹⁷⁴

The opening of this great cattle-raising region by the railroads soon made Kansas City¹⁷⁵ an important shipping point. "It is already the second hog and cattle market of the great West, and has already outstripped St. Louis, Cincinnati, New Orleans, and all the rest except Chicago."¹⁷⁶ The reason assigned by this writer for the development of the market so rapidly was the competition of the southwestern railways that entered Kansas City.

This was the situation at the time of the perfection of the refrigerator car system, which has made it possible to ship fresh meats the world over, and as soon as the cars were proven the Chicago, New York and Boston packers began to look about for a western location for packing houses. It was about this time that the citizens of Omaha, Neb., succeeded in interesting some outsiders in the establishment of a cattle market and packing center in Omaha, and in 1884 a stockyards company was organized with a

NOTE 173.—They had established a large pork packing plant at Atchison in 1878.—Atchison *Daily Champion*, February 20, 1879.

NOTE 174.—Joseph G. McCoy tells in his "Historical Sketches of the Cattle Trade in the West and Southwest," Kansas City, 1874, of the efforts of himself and brother to secure railroad shipping points in western Kansas for the Texas drovers of 1867-'73. The Kansas quarantine law of 1867 prevented Texas cattle being driven into Kansas east of the sixth principal meridian and north of township 19, except during December, January and February of each year. The McCoy's induced the Kansas Pacific to put in a switch at Abilene, just east of this meridian, late in 1867, and advertised the town among Texas drovers with such success as to attract 35,000 cattle to that point the first year, together with Eastern and Western buyers. The trade increased yearly at Abilene until, in 1871, 600,000 animals were brought in. That year the drovers met with great loss, for the railroads had agreed upon a high freight tariff on live stock east from Chicago, and there were few buyers from any section, and 1871 was the last in which a cattle business was done in Abilene, for incoming settlers and other interests had begun to discourage the town as a shipping point. Newton, on a branch of the Santa Fe, offered shipping facilities this year, and Wichita, in 1872, drew large herds to her market, the same branch of the Santa Fe having reached that point in May, 1872 (*Topeka Commonwealth*, October, 1872). "In 1873 near 450,000 head of cattle entered western Kansas, besides about 50,000 which turned off the trail to the eastward and went to Coffeyville. There was nearly no demand from any source for stock cattle." As was usual, from three- to four-fifths of the cattle brought from Texas were stock animals, cows and calves, and in former years a large proportion had been sold to cattlemen of western Kansas, Colorado and the more northern territories, and now beeves from these new herds had come in competition. The Eastern financial panic of 1873 reached Kansas in October, and proved disastrous to the cattle trade, which did not fully recover until after the grasshopper years of 1874 and 1875. In August, 1871, the L. L. & G., now the Southern Kansas Railway, had been opened from Lawrence to Coffeyville, and thus gave connections, by way of Kansas City, to the East from the territory.

NOTE 175.—J. G. McCoy's *Historic Sketches of the Cattle Trade*, 1874, pp. 274-276.

NOTE 176.—*Kansas Hand Book*, 1881, p. 36.

million dollars' capital which controlled, so it is reported, an investment of some fifteen millions of dollars in American cattle and grazing lands.¹⁷⁷ Then in 1885 G. H. Hammond & Co., a Michigan company, began the erection of a packing plant in Omaha, followed in the next year by another that the stockyards company was erecting under contract for the Fowlers, who had already built packing houses at Atchison and Kansas City, Kan. Then in 1886 Sir Thomas J. Lipton, the well-known English pork packer, built a packing plant in Omaha, which in the following season he sold to P. D. Armour, of Chicago, and Michael Cudahy, of Milwaukee.¹⁷⁸ In 1890 Armour sold his Omaha interests, devoting his time to larger interests at Kansas City.¹⁷⁹ Although the Eastern packers were hardly established in Kansas City by 1890, the census for that year shows six packing houses, representing nearly nine millions of dollars and handling nearly forty million dollars' worth of finished products.¹⁸⁰ In that year only about one-third of the cattle that came to the Kansas City stockyards were sold to the packers, the rest being reshipped to Chicago and St. Louis. By 1895, however, the Kansas City packing houses were consuming about half the million and a half head of cattle that the stockyards received annually, and by the time of the twelfth census¹⁸¹ nearly two-thirds of the cattle that came to Kansas City were slaughtered there, while very few hogs were shipped out of Kansas City. The following tables are taken from the Thirty-ninth Annual Report of the Kansas City Stockyards, December 31, 1909:

TOTAL YEARLY RECEIPTS.					
Year.	Cattle.	Calves.	Hogs.	Sheep.	Horses and mules.
1871.....	120,827	.....	41,036	4,527	809
1872.....	236,802	.....	104,639	6,071	2,648
1873.....	227,689	.....	221,815	5,975	4,202
1874.....	207,080	.....	212,532	8,855	3,679
1875.....	174,754	.....	63,350	25,327	2,646
1876.....	183,378	.....	153,777	55,045	5,339
1877.....	215,768	.....	192,645	42,190	4,279
1878.....	175,344	.....	427,777	36,700	10,796
1879.....	211,415	.....	588,908	61,684	15,829
1880.....	244,709	.....	676,477	50,611	14,086
1881.....	235,863	.....	1,014,304	79,924	12,592
1882.....	439,671	.....	963,036	80,724	11,716
1883.....	460,780	.....	1,379,401	119,665	19,860
1884.....	533,526	.....	1,723,586	237,964	27,163
1885.....	506,627	.....	2,358,718	221,801	24,506
1886.....	490,971	.....	2,264,484	172,659	33,188
1887.....	669,224	.....	2,423,262	209,956	29,690
1888.....	1,056,086	.....	2,008,984	351,050	27,650
1889.....	1,220,343	.....	2,073,910	370,772	34,563
1890.....	1,472,229	76,568	2,865,171	535,869	37,118
1891.....	1,270,917	76,570	2,599,109	386,760	31,740
1892.....	1,479,078	92,077	2,397,477	438,268	32,505
1893.....	1,660,807	86,021	1,948,373	569,517	35,097
1894.....	1,689,193	83,352	2,547,077	539,555	44,237
1895.....	1,613,454	76,198	2,457,697	864,713	52,607
1896.....	1,714,532	100,166	2,605,575	993,126	57,847
1897.....	1,817,526	104,436	3,350,796	1,134,236	37,006
1898.....	1,757,964	88,269	3,672,909	930,303	17,483
1899.....	1,912,019	105,465	2,959,073	953,241	33,775
1900.....	1,967,719	113,077	3,094,139	860,449	103,308
1901.....	2,000,165	126,410	3,716,404	980,078	96,657
1902.....	2,082,541	196,625	2,279,337	1,154,084	76,844
1903.....	1,953,371	183,741	1,969,381	1,151,730	67,274
1904.....	1,996,610	166,861	2,227,170	1,004,099	67,562
1905.....	2,180,491	242,091	2,507,548	1,318,968	65,582

NOTE 177.—Bell, History of Omaha, pp. 622, 627.

NOTE 178.—Ibid, pp. 624-627.

NOTE 179.—Rept. Comm'r Corp., Beef Ind., p. 37.

NOTE 180.—Census of Manufactures, 1890, part II, pp. 842, 843.

NOTE 181.—Ibid. 1900, part III, p. 415.

TOTAL YEARLY RECEIPTS—concluded.					
Year.	Cattle.	Calves.	Hogs.	Sheep.	Horses and mules.
1906.....	2,295,979	259,815	2,675,601	1,616,788	69,629
1907.....	2,384,294	285,966	2,923,777	1,582,148	62,341
1908.....	2,154,338	303,789	3,715,109	1,640,542	56,335
1909.....	2,350,946	308,982	3,092,835	1,645,325	67,796
Totals.....	45,417,029	3,076,479	74,497,199	22,541,299	1,397,984

TOTAL YEARLY SHIPMENTS AND DRIVEN OUT.					
Year.	Cattle.	Calves.	Hogs.	Sheep.	Horses and mules.
1871.....	120,794	.....	40,102	4,527	809
1872.....	236,799	.....	104,399	6,071	2,648
1873.....	227,666	.....	220,574	5,951	4,204
1874.....	207,069	.....	212,714	8,877	3,685
1875.....	174,511	.....	63,096	25,310	2,635
1876.....	183,256	.....	153,180	54,829	5,321
1877.....	215,771	.....	198,204	42,333	4,296
1878.....	175,549	.....	426,355	37,012	10,794
1879.....	211,361	.....	589,794	61,157	15,826
1880.....	244,281	.....	676,848	51,004	14,090
1881.....	286,134	.....	1,015,447	79,848	12,604
1882.....	439,521	.....	961,906	80,708	11,607
1883.....	460,598	.....	1,379,005	119,180	19,869
1884.....	533,992	.....	1,724,287	237,214	27,092
1885.....	506,577	.....	2,359,027	223,088	24,656
1886.....	490,906	.....	2,264,323	172,397	33,098
1887.....	669,062	.....	2,423,546	209,491	29,618
1888.....	1,055,547	.....	2,009,250	351,796	27,739
1889.....	1,219,395	.....	2,073,314	369,878	34,485
1890.....	1,472,853	76,713	2,863,354	535,207	37,134
1891.....	1,272,249	76,580	2,601,109	387,912	31,783
1892.....	1,477,741	92,156	2,396,737	438,139	32,432
1893.....	1,661,247	85,968	1,948,457	569,277	34,891
1894.....	1,687,274	83,256	2,547,588	589,359	44,153
1895.....	1,613,123	75,923	2,457,167	863,100	52,655
1896.....	1,714,336	100,284	2,604,842	989,420	57,710
1897.....	1,817,033	104,355	3,348,556	1,134,222	36,945
1898.....	1,758,396	88,521	3,674,269	981,668	17,487
1899.....	1,911,356	105,048	2,957,827	953,615	33,357
1900.....	1,968,266	112,830	3,096,091	860,517	102,579
1901.....	1,999,048	127,386	3,712,573	980,071	96,571
1902.....	2,087,357	197,670	2,283,827	1,152,907	76,388
1903.....	1,957,660	186,327	1,967,096	1,158,334	67,272
1904.....	2,001,495	167,625	2,226,304	1,001,434	66,538
1905.....	2,176,297	246,612	2,504,586	1,314,292	63,651
1906.....	2,296,414	259,127	2,674,849	1,611,048	67,117
1907.....	2,384,739	285,788	2,915,459	1,578,059	62,126
1908.....	2,148,625	304,366	3,711,739	1,636,752	56,490
1909.....	2,341,879	308,474	3,090,968	1,645,702	67,811
Totals.....	45,405,877	3,085,009	74,473,769	22,521,706	1,390,164

The amount of capital invested in the packing houses had increased nearly seventy per cent in the decade, and represented about fifteen millions of dollars, while the number of packing houses had increased from six to eight. The value of the packing-house products in 1900 was more than seventy-three millions of dollars,¹⁸³ or more than the combined value of all the manufactured products of both Kansas City, Kan., and Kansas City, Mo., for the year 1890. The five years from 1900 to 1905 showed a continuation of this growth, representing an increase in the amount of capital invested of about fifty per cent, accompanied by an increase in the value of products of about twenty per cent.¹⁸⁴ This discrepancy between the increase of capital and production cannot be taken as permanent, for the reports for 1907 indicate an output of more than a quarter of a billion dollars, representing an increase of more than fifty per cent since 1900, while the net increase in capital remained at about the same percentage.¹⁸⁵

NOTE 183.—Thirty-ninth Annual Report, Kansas City Stockyards, December 31, 1909, p. 408.

NOTE 184.—Census Manufactures, Kansas, 1905, pp. 22, 23.

NOTE 185.—Rept. Kansas Bureau Labor, 1907, pp. 284, 288.

It requires no further elaboration to indicate the actual importance of the packing industry that has grown up in the Kansas side of the town. Its importance in relation to the other enterprises is shown in a few very simple comparisons. Taking the census figures for 1905 as a basis of comparison, the value of the products of the packing industry (eighty-eight millions) was more than double the value of all other manufactured products in both Kansas Citys, and the packing houses employed about two-fifths of the laborers employed in manufacturing in the two cities; two-fifths of the capital invested in manufacturing is in the packing industry, and the value of the cattle, hogs and sheep slaughtered is more than three-fourths that of all the raw materials consumed in the factories of the two towns.¹⁸⁶ The industry pays nearly four and a half million dollars annually in wages to its employees, who with their families would make a city equal in size to any but three or four towns in the state of Kansas. The product of their labor comprises nearly one-tenth of the output of all the packing houses in the United States, and is second only to that of the Chicago plants in volume.¹⁸⁷

This great centralization that has been accomplished in Kansas City has practically been the result of twenty years' work, for before 1890 the industry was comparatively small. It is the consequence of conditions partly peculiar to the industry itself, but in part the result of conditions which led to the growth of other lines of manufactures in Kansas City in the same period. It is not unfair to give to the rapid growth of the packing industry part of the credit for the attraction of other activities, for prosperity in any line, for whatever cause, cannot but attract others. At any event, before the census of 1890 the activity of the two Kansas Citys was beginning to be noticeable in manufacturing, and in the census year they had some 1700 establishments, producing about seventy-six million dollars of finished products. The Kansas town at that time had little else in a manufacturing way than its packing houses, its other industries aggregating only about four million dollars annually. Until 1886, the Kansas side of the town was, however, a group of independent towns, each going its own way, but with no union of strength such as the union into one municipality in 1886 gave to it. Since that time it has quadrupled in population, has added to its list of industries mills and elevators, foundries and machine shops, has multiplied its packing houses, until now it produces more manufactured articles than any other city in the United States according to population, and practically double the amount of the Missouri side of the town.¹⁸⁸

With the abundance of material the packing houses furnished as a basis there has grown up in Kansas City a large and growing soap and tallow business. One plant alone turns out 25,000 tons of laundry soap annually, and two others bring the total output up to 40,000 tons per year,¹⁸⁹ and the product is marketed all over the Missouri valley. Also depending to some extent upon industries that were already established are the factories for the man-

NOTE 186.—Census Manufactures, Kansas, 1905, pp. 22, 23. Ibid, Missouri, pp. 24, 28.

NOTE 187.—Census Manufactures, 1905, Slaughtering, etc., pp. 15, 16.

NOTE 188.—The Kansas City Annual, 1907, p. 37. The towns of Armourdale, Kansas City and Wyandotte were consolidated by proclamation of Gov. John A. Martin, March 6, 1886, and received the name of Kansas City, as provided for by acts of the legislature of that year for the consolidation of cities. —Session Laws 1886, pp. 86, 89; also, history of "Wyandotte County and Kansas City, Kansas," Goodspeed Pub. Co., Chicago, 1890, p. 384.

NOTE 189.—The Kansas City Annual, 1907, p. 191.

ufacture of crackers, biscuits and confections, which consume annually in the neighborhood of 80,000 barrels of Kansas City flour and 800 tons of lard from the Kansas City packing houses. Practically all varieties of crackers and biscuits are made in these factories, which employ 300 men constantly at a yearly wage of \$425,000, while nearly 100 salesmen cover the whole Central West with the product of their labor.¹⁹⁰ All the cracker factories also make large quantities of nearly every grade of candy in connection with their other sweets, one of the largest devoting several acres of floor space to this branch of the business.

Iron and metal working, including machinery, implements and railway shops, has been for the past ten or fifteen years an important branch of the industrial life, and now furnishes employment for nearly 3000 men, and the annual output is more than five millions of dollars. The foundries and machine shops are easily in the lead from every point of view, and their products make up fully half the output of this class of goods. They alone employ a thousand men, and represent nearly three millions of capital. The tinware factories, four in number, represent a capital of a million and a half, and the annual output is about half a million of dollars.¹⁹¹ Agricultural implements, including hay presses, wagons and carriages, are now produced in Kansas City in quantities to cut a considerable figure in the markets of Kansas and Oklahoma. Three thousand farm wagons every year is the output of one factory, the only one in this section of the country that is entitled to rank as a factory, and the value is more than a quarter of a million a year, all developed since 1905. Another enterprise, doing a business of a quarter of a million, manufactures scrapers and road tools, being the only one west of Chicago.¹⁹²

Within the last few years Kansas City has been invading the western field with steam and gasoline engines. The plant that manufactures Corliss engines is said to be the largest west of the Mississippi river, and its output is about half a million annually. "Milwaukee, Wis., and Michigan manufacturing districts formerly held the first place in this line of manufacture, but Kansas City is now supplying all the surrounding territory, and nothing is too large or too small in the line of a Corliss engine for the Kansas City manufactory. This firm sells its product as far east as Pittsburg and as far west as the coast, and in round numbers 500,000 horsepower is represented by the machinery turned out by this company yearly. Three hundred men are employed in this industry, with a weekly pay-roll of \$3500 and an annual product of half a million."¹⁹³

Quite recently Kansas City has been figuring in the middle western market as a manufacturer of practically all grades of furniture, and at the present time there is little furniture made in this section outside of Kansas City. The older factories, which were built before the days of centralized factories, have nearly all gone out of business. Some of the enterprises that were established at Leavenworth and the other Kansas towns have moved to Kansas City, attracted by the market and transportation advantages. "There are not less than twenty-five manufacturers and jobbers engaged in the manufacture and jobbing of furniture or supplies for the

NOTE 190.—The Kansas City Annual, 1907, pp. 102, 103.

NOTE 191.—Census Manufactures, 1905, Kan., pp. 22, 23. Ibid., Missouri, pp. 24, 28.

NOTE 192.—Kansas City Annual, 1907, p. 193.

NOTE 193.—Ibid., p. 193.

retail dealers and funeral directors; eight manufacture mattresses; four are producers of spring beds and cots; four factories manufacturing extensive lines of upholstered furniture; one iron bed factory; three engaged in producing folding beds; . . . all making a strong and desirable market for the retailers in the territory tributary to Kansas City."¹⁹⁴

It is not profitable to continue further the enumeration of the manufacturing enterprises that have been developing and extending their operations in the two Kansas Citys in the last twenty years. The list would include a hundred lines not mentioned above, such as the breweries, with two millions of product; the tobacco factories, with a half million; saddlery and harness factories, with three-quarters of a million; the recently established shoe factories and factory-made clothing establishments, as well as a long list of others producing the things that the wholesalers who job their wares out of Kansas City would otherwise have to buy elsewhere to supply the needs of their customers through Nebraska, Kansas and Oklahoma.

With the growth of the last twenty years which has put Kansas City in the lead as a manufacturing point, it is rather a remarkable fact that there is not as yet a true factory class even in the oldest of the industries. That fact is accountable for the lack of some industries that conditions of trade would make profitable, but which demand a class of labor trained from childhood in the trade. With its 25,000 factory employees, there is not as yet a factory class, and probably will not be in the true acceptance of the term until the country surrounding is more densely settled and the opportunities for changing employment are more restricted. To a limited extent there is a restriction of the children of the laborers of the packing houses and machine shops to similar lines of work, but the independence, or democracy, or freedom, or whatever it is that characterizes the West, has not yet yielded to the factory influence, and there are few children "born to trade" of any sort. This condition is even more true of other places in this region, and in some cases, as in the glass factories that came West since 1900 into the gas towns of southern Kansas, it was necessary to import the workmen from older factory centers to overcome this dearth, and it is a difficulty that such industries have failed to keep the supply of labor up to the needs of the business.

There is no reason why Kansas City should not continue to prosper in manufacturing, for the development seems to be only fairly under way at the present time. The fuel supply is close at hand, practically all industries now having the benefit of the southern gas field, with the coal belt of the same region to draw upon in the event of the failure of the more convenient fuel. She has as yet practically no labor problem to meet, for outside the packing industry, the iron-working and tobacco trades, labor is unorganized and the "closed shop" is unknown. The cost of living is reasonable, standards of wages high enough to enable the family of the workman to live in comfort, and the laboring class is on the whole content. The development of the country to the southwest, tributary to Kansas City, is not ended by any means, and the demand for the product of the industries that are and are to be established is on the increase. With the advantages of geographical location, with more railways than Chicago giving easy access to all parts of the country, and with no disadvantages to run the fixed cost of pro-

NOTE 194.—Kansas City Annual, 1907, p. 98.

duction out of proportion, the future of manufacturing is bright, and present activity bids fair to continue.

Practically contemporaneous with the rise of Kansas City to leading position is the development of a similar center at Omaha, Neb., dating also in that case since 1885, and most marked during the decade between 1890 and 1900. As has already been remarked in the introduction to this paper, the state of Nebraska has no natural advantages that, so far as can be determined at the present time, will ever make it a manufacturing community. Lack of both fuel and water power have so far, and probably will, prevent the growth of any very considerable factory interests in the state. The only significant exception, if indeed it be an exception, is the growth of the packing industry at Omaha (South Omaha), which, ranking as it does as the third in size in the United States as a packing center, gives it an important position in the manufacturing of the state. The census reports for 1900 and 1905 show a steady condition in the relation of this center to the state, both showing that the two Omahas produce approximately four-fifths of the manufactures of Nebraska. The packing houses alone produce nearly half the products of the state, measured in values, while the total value of all the products of the state is only about one-tenth greater than the value of the output of the factories of the two Kansas Citys.

From these facts it will be seen that, up to the present time, at least, Nebraska offers a fairly barren field for the student of manufacturing. Her flour industry is not, it is true, insignificant, aggregating some twelve millions of dollars annually, but that is only about double the output of the one center at Kansas City. There is no milling center in the state, probably for the double reason of the lack of power and the relative proximity to the great flour mills at the head of the Mississippi, and the markets of the lake port, which invite exportation of wheat rather than milling. At any rate, the industry is distributed among some 240 comparatively small mills, whose field of operation is principally local. Dairying is a leading industry, and the creameries of the state add three and a half millions to her manufactures annually; malt liquors add a million and a quarter; printing and publishing amounts to another five millions; car repairing amounts to four and a half millions; and these, added to packing and milling industries, make up seventy per cent of the total of the state. Outside these activities there is little in the state that can be classed as true factory activity, most of the industries reported to make up the total being as much in the nature of trades, or at most shops with local trade only. This being true, the relative importance of the center of activity at Omaha can be readily appreciated.

The growth of the importance of Omaha in manufactures follows in general the course outlined in the growth of Kansas City. The packing houses were the opening wedge that seemed to give the impetus to other lines of manufacturing, and it was felt at about the same time, from 1885 to 1890. The industries that had been established there earlier than that time had made no remarkable progress, and gave no evidence of the potentiality of development in their condition before the activity of the citizens for stockyards and packing houses, which finally bore fruit in 1885¹⁹⁵ with the erection of the first packing plant. Omaha had a stockyards project that was looked to to bring business and prosperity to the town as early as the '70's, and the pluck of the early promoters was finally rewarded early in the '80's by

NOTE 195.—Bell, *History of Omaha*, p. 623.

the interest that English cattle growers began to take in the scheme to develop a shipping center at Omaha. It is said that as early as 1880 there was an English investment of fifteen millions of dollars in cattle and grazing lands tributary to Omaha,¹⁹⁶ and the citizens set about interesting them in the project of establishing large stockyards there.

The stockyards enterprise soon met with encouragement from outside sources, and it is recorded that "English and American capitalists have put \$1,000,000 in the common stockyards and \$2,000,000 English capital is promised to build packing houses." The first packing house was actually built as the result of this activity in 1884, and leased in the following year to G. H. Hammond & Co., a Michigan corporation, and the stockyards began to turn part of their business into the local packing house. With the business started, and a paid-up capital to work with, the stockyards company went after the packers in earnest, and free building sites with good cash bonuses were offered to attract prospective investors. In 1886 a bonus of \$135,000 brought the Fowlers into Omaha (their Chicago house having already established a business at Atchison, Kan., and had bought the Kansas City plant in 1880),¹⁹⁷ and very shortly afterwards Thomas J. Lipton, the English packer, built in Omaha. But in the following year Lipton transferred his property to the Armour-Cudahy Company, to whom a still larger bonus was given. G. F. Swift & Co., of Chicago, having become interested in the prospects at Omaha, were induced to enter the field by the payment of a bonus of \$135,000 and a free building site in 1887. In all, the stockyards company paid out \$420,000 in cash and donated a large tract of land near the yards to secure the industry that had been the dream of its promoters for nearly twenty years past.¹⁹⁸

Whether or not this expenditure would have been necessary in the end to get the packing houses at Omaha it is of course impossible to say, but there is little doubt that it brought them in sooner than they would otherwise have come. In that way the expenditure is justified, for the subsequent and nearly contemporaneous growth at Kansas City makes it extremely probable that Omaha would not have fared so well in the final adjustment of the business if the points had been left to compete on the basis of attractiveness of the locations alone. Be that as it may, by 1890 Omaha had attained importance in the packing business, having secured four large establishments, and in that year the value of their products reached twenty-four millions of dollars,¹⁹⁹ and by the end of 1892 had almost doubled that amount, the products totaling forty-five millions in round numbers.²⁰⁰ It is probably unfair to give the coming of the packing houses the credit for the expansion of industry that took place in Omaha in the period of five years or so about 1890, but undoubtedly the addition of more than five millions of capital and the additional employment of more than 2000 men in the stockyards and packing houses in such a short time had a great deal to do with it.

Other and older industries in Omaha were on the increase after 1885, and their prosperity, accompanying that of the packing houses, induced a period of rapid growth for the city. The old Omaha & Grant Smelting Company,

NOTE 196.—Bell, *History of Omaha*, p. 622.

NOTE 197.—*Ibid.*, pp. 623-625.

NOTE 198.—*Ibid.*, pp. 623-631.

NOTE 199.—*Census Manufactures*, 1890, part II, p. 508.

NOTE 200.—Bell, *History of Omaha*, p. 633.

established in Omaha in 1870, which smelted ores from Colorado and the Black Hills region of the Dakotas, consolidated with a Denver company in 1882, and its volume of business increased many fold in the next few years. By 1892 it was employing a thousand men, and its products were valued at twenty-one millions annually. Its plant covered twenty-five acres, and was rated the largest in the world, and it was drawing ores even from Canada and Mexico.²⁰¹ A dependent industry, the Carter White Lead Works, the first of its kind west of St. Louis, which used the pig lead of the Omaha smelter, experienced a rapid increase of business at the same time. Its capital was increased 500 per cent from 1880 to 1889, and by 1890 it employed seventy-five men and produced 10,000 tons of lead white annually.²⁰² A linseed oil factory had reached a million and a half of products, and a pioneer soap factory multiplied its capital and productions by ten about the same time.²⁰³

This increase brought population, and money to be spent, and encouraged the growth of other activities. The rapid growth of the town called for a great amount of building material, and at one time there were fifty-two brick-yards about Omaha, producing a hundred and fifty millions of brick annually, where now five yards meet all requirements. Five clothing factories, employing 400 people, began operations at this time, and a bag factory employing another hundred came in in 1887.²⁰⁴ Three shirt factories were added, and after them came a button factory, marketing a large share of its output with the clothing factories. Foodstuffs being in greater demand, the supplying industries grew rapidly. A cracker factory was built in 1883, another in 1885, which was soon bought by the American Biscuit Company, which employed 200 people. Vinegar and pickle factories, breweries and distilleries followed rapidly and added materially to the total. Six furniture factories were built from 1889 to 1891, employing 300 men, making a specialty of beds and mattresses. Wood and paper packing-boxes and tinware factories, employing 200 or more men, were doing a flourishing business supplying the various industries that had grown up in a few years.²⁰⁵

This expansion of industry had nearly reached its maximum in 1890, and the fifteen years following the census of that year saw an increase of only twenty-five per cent in the value of manufactured products in Omaha proper, while in the same time the capital invested nearly doubled. In South Omaha, where all the packing houses are located, the increase for the same period was about 215 per cent in the value of manufactures, the most of it represented by the trebling of the output of the packing houses, which now forms all but a couple of millions of the manufactures of the south side of the town. Outside of Omaha there has not been any development of a center of manufacturing in any line of industry that deserves particular mention. The rural districts come in for the most of the other manufactures, Lincoln and Nebraska City contributing but a comparatively small share of the total. "In 1905, of the factories reported, 73.2 per cent of the establishments were in the rural districts, while in 1900 the percentage of such establishments was 74.4; and the value of their products was 18.3 per cent of the total for the state in 1905, as against 15.3 per cent in 1900. The percentages of increase in number of wage-earners, in wages,

NOTE 201.—Bell, History of Omaha, p. 496.

NOTE 202.—Ibid, p. 497.

NOTE 203.—Ibid, pp. 501, 508.

NOTE 204.—Ibid, p. 503.

NOTE 205.—Ibid, pp. 499, 500.

in capital, and in value of products, are greater for the rural districts than for the urban."²⁰⁶ The value of manufactures in the two Omahas is about 78.3 per cent of the state, and this, added to the 18.3 per cent that the urban manufactures contribute, leaves but 3.4 per cent of the total for the other towns that rank above urban in character.

It has already been noticed that in the case of Omaha there was a great increase in the size of manufacturing establishments and a relative increase in the amount of capital invested during the period from 1885 to 1892 or thereabouts. While there were special reasons partly responsible for the unusual increase in the expansion of the factories there which did not obtain in Kansas, yet the same movement is noticeable in all lines of her manufacturing enterprises. There has been a movement toward the centralization of industry in fewer establishments with relatively more capital ever since the period of prosperity that preceded the panic of 1893. For the greater part of the decade following the census of 1890, however, stringency and even contraction followed the years of panic, and manufacturing did not make much progress, and the most of the centralization has been accomplished since 1900. The past four or five years have shown this movement to the greatest extent, and it is still going on at the present time.

The actual extent of the movement can only be shown by a comparison of the figures of the census reports, which, in 1880, show an average investment of \$3995 for each establishment which in the next ten years had almost trebled, the average capital in 1890 being \$9824. The figures for 1900 are difficult to explain, for they show an increase of nearly seventy per cent in the number of establishments, and a decrease in the average capitalization of fully a thousand dollars, or nearly twelve per cent. The census of 1905, however, shows a remarkable centralization, the average amount of capital having increased to \$37,658, and leaving the packing houses out of the consideration, to \$25,750 for every manufacturing establishment listed. The report of the state bureau of labor two years later, probably slightly incomplete, since it shows an actual increase in number of establishments, nevertheless indicates that the average capitalization had practically doubled since 1905, if the packing houses are left out of the accounting. In this consideration a truer estimate is reached by omitting them, as the capitalization is larger than any other industry and it would swell the average out of proportion to the real conditions in the others. In view of these figures the only satisfactory explanation of the decrease in capitalization shown by the census of 1900 is that in that report a number of hand trades were counted which should not have been listed. It is also probable that it took into account the growth of small establishments in the towns of the western part of the state at this time, which had hardly begun to feel the influence toward centralization that was going on in the larger towns.

The milling industry, the oldest and most widely distributed of the manufactures of the state of Kansas, gives a fair illustration of the extent of the centralizing movement, though those figures also leave something to be explained in the case of the report for 1900, the decrease in the average amount of capital indicated being about thirty per cent. This can be explained in part by the fact that in that year the census report listed under this head a large number of feed mills scattered over the western part of the state,*

NOTE 206.—Census Manufactures, 1905, Nebraska, p. 5.

* Interview, Kansas Labor Commissioner, 1908.

but how much this would affect the result is a matter of conjecture. The ten years from 1880 to 1890, which was the period of introduction of the gradual reduction "patent process" in the Kansas mills, showed a doubling of the average amount of capital per mill. Then come the figures of the census of 1900, showing an increase of fifty per cent in the number of mills and a decrease of one-third in the average capitalization. The later '90's was the period when the last of the old-fashioned burr mills, running on part time, many being small water-power mills and survivals of the early period of milling, were giving way before the disadvantages of competition with the larger and better equipped mills using the new process. With a knowledge of the real movement that was going on, it would be expected that the report would show exactly the contrary to what it does. Either there was a great undervaluation of the mills in that report, or the listing of a large number of little feed mills in the industry put the figures out of proportion, for the next reports indicate a condition inconsistent with them.

The census of 1905 indicates the general movement toward centralization very clearly, the figures showing a trebling of the average capitalization for the fifteen years since the census of 1890, the number of mills being about the same at this time as fifteen years before. On the basis of the 1900 report, the decrease in number of mills for the five years is about one-third, and the increase in capitalization for the same time about 400 per cent. The multiplication of capital and size of the more favorably located mills, is, however, going on much as even these figures indicate, and the state report for 1907 shows that the average capitalization had risen to \$62,932, an increase of about sixty-one per cent in the two years.

Other industries that were established early enough to form a basis of comparison show in about the same degree this movement toward the centralization of manufacturing in larger and better establishments, which for the first time in many cases are now large enough to be ranked as factories. In the case of many industries that are now ranked as of first importance in the manufactures of the state, the conditions about 1900, chief of all the discovery of oil and gas in abundance, have either worked such a radical change in the industry that a comparison would show little or nothing of value in this connection. Others have had their origin practically in that period, and their history is practically all of the present day.²⁰⁷

NOTE 207.—The following table, compiled from the census reports, except that of 1907, which is from the report of the State Bureau of Labor, shows the figures on which the preceding discussion was based:

YEAR.	All industries.			Milling industry.		
	No.	Average capital.	Inc.	No.	Average capital.	Inc.
1880.....	3,395	\$11,192,315	.....	320	\$3,395,928	.....
1890.....	4,471	43,926,002	144%	348	7,844,280	113%
1900.....	7,830	66,827,862	— 10*	533	8,366,966	— 30*
1905.....	2,474	88,180,117	327	354	13,816,887	148.7
1907.....	1,769	119,983,322	80	202	12,712,364	61

* Per cent for 1900 is a decrease.

NATURAL GAS AND OIL.

Following close upon the centralization of industries in Kansas City and Omaha that has just been under discussion, came the important discoveries of natural gas and oil in the early '90's, the influence of which in the period of prosperity after 1895 started the growth of a new manufacturing district in the eastern part of Kansas, which since 1900 has been gradually extended into the northeastern part of Oklahoma. The oil was at first the most important part of the discovery in a commercial way, until the establishment of the new industries using the abundant supply of gas as fuel, but economically the gas has been by far the more important of the two to the development of the district. For this reason the operations in oil will be given only passing mention, though in reality prospecting for the one has as frequently resulted in developing the other branch of the mineral wealth, for the districts are practically coincident. The oil development will be touched upon again in connection with the oil refining industry, and for the present the discussion will be centered on the fuel importance of the gas development.

"The history of the development of oil and gas in Kansas really dates back to 1860, when there was some preliminary prospecting in the neighborhood of Iola, Kan., inspired by stories of oil and gas springs that the early settlers got from the Indians²⁰⁸ as early as the period of the development of the Pennsylvania field in the '50's. The history of the discovery and development of oil and gas in Kansas may be divided into three parts: First, the early period, dealing with the early observations of surface indications, and a little prospecting. Second, the period in which the prospectors began using the drill actively. . . . Third, the period of recent development, which began about 1890, and continues to the present time."²⁰⁹ Little was accomplished in the early prospecting of the first two of these periods, and only passing mention will be given to them. The influence on manufactures has all come since the important developments about 1895, and afterward.²¹⁰

As early as 1860 there was a company organized to drill for gas and oil in Miami county in the neighborhood of Paola,²¹¹ about fifty miles south of Kansas City, and leases were secured on 30,000 acres of land. A little drilling was done before the outbreak of the Civil War, but little was accomplished, and the company scattered in that time of strife and border troubles, and all records of the drilling were lost. A little later some shallow wells drilled at Mound City, in Linn county, produced small quantities of gas and oil, and it was thought worth while to send the state geologist to investigate the geology of that region, and a flattering report from him led to some

NOTE 208.—"Beaver Spring was the first spring in Kansas showing crude oil on its surface. The Indians would camp there to gather oil by placing their blankets on the surface of the spring, and in a few hours wring the blankets and secure much oil. They used it for frozen parts, for cuts, sprains, for sores on their ponies, and externally for internal ailments. The spring was in Miami county."—From a letter of Ely Moore, of Lawrence, May 17, 1909.

NOTE 209.—Univ. Geol. Surv., Kan., vol. IX, p. 21.

NOTE 210.—There are numerous accounts, more or less accurate, dealing with the early discovery of oil and gas, and a number of newspaper accounts dealing with the later period that are quite accurate, but Haworth's report, in volume IX of the University Geological Survey, will be adopted as the basis of the account, supplemented by notes from other accounts where profitable. Statements and quotations not otherwise credited are from that volume.

NOTE 211.—The *Herald of Freedom* of March 31, 1855, mentions the finding of oil in the vicinity of Osawatimie.

further prospecting. "But the money was hard to raise, drilling was expensive, and at best it was but mere child's play compared with the way oil wells are drilled at the present time. Under such circumstances, . . . very indifferent success followed these undertakings." Some drilling in the neighborhood of Kansas City at the same time found a little oil and gas, but not enough to offer much encouragement.

The second part of our history includes the period from 1870 to 1890, during which time a fair amount of drilling was done, on a small scale, however, and by men of limited experience and for local interests. "About seven miles to the northeast of Paola, in 1882, wells were put down, and a fair amount of gas was obtained, and piped into the city. Encouraged by this fair success, drilling was prosecuted to a considerable extent throughout a semicircle reaching from northeast to southwest of town. Occasionally an oil well would be found producing a heavy, dark oil which found a ready market at five dollars a barrel for lubricating purposes. But a far greater value was obtained in the natural gas, which was found in sufficient abundance to supply the city of Paola with lights and heat from those early days up to the present time." Fort Scott, Wyandotte (Kansas City, Kan.), and Iola, later the center of development, found gas in small quantities about the same time.²¹²

The development of the present period began in reality with the operations of a Mr. Mills, who did some prospecting for oil at Neodesha, about thirty miles from the southern line of the state. Meeting with some success he went East, and succeeded in interesting a Pittsburg firm, who began work in the Neodesha field in 1893, and soon met with reasonable success. They brought in a number of producing gas wells and laid pipes to supply the town, and lighted the first gas from the pipes on the Fourth of July, 1894, as a part of the celebration. These men brought in some good oil wells, and in the following year sold their holdings to the Forest Oil Company, afterwards the Prairie Oil and Gas Company, a branch of the Standard Oil. The operations at Neodesha were thus of great importance, in that they opened the field to outside development, and for this reason should rank as the real beginning. Gas was found really before Guffey & Galey, the Pennsylvania drillers, struck gas at Neodesha, by the prospecting of a local merchant at Coffeyville, almost on the southern line of the state. Coffeyville was using the gas from his wells for domestic purposes in 1892, and about the same time Cherryvale,²¹³ about half way between Neodesha and Coffeyville, finally secured a producing gas well, after the local company had all but given up hope, and that town also began to use the new fuel.

NOTE 212.—Prof. Robert Hay, then of the United States Geological Survey, in an article in the fifth biennial report of the Board of Agriculture, gives an account of the early development, the principal item of which follows: "The Kansas Oil and Mining Company was organized in 1882 with a capital of \$425,000, and drilled four wells east of Paola, striking gas in three at a depth of about 300 feet, the pressure varying from 55 to 66 pounds, while a fifth got a small quantity of gas at a depth of 78 feet. Fort Scott began using gas for lighting in the same year, having three productive wells about 200 feet deep, and an oil well yielding four barrels a day. Kansas City, Kan., was using gas from three wells for factory purposes, a flour mill, a planing mill and a brick plant depending on it for fuel. Iola was using gas in the same year from a single well 628 feet deep for light and heat for a hotel. Independence, fifteen miles from the state line on the south, had a well a thousand feet deep that produced a light flow of gas."—Fifth Bien. Rep., pp. 198-207.

NOTE 213.—"The Cherryvale Gas Company has ordered a new drill, and will on its arrival at once commence sinking more wells. The demand for this excellent and cheap fuel is increasing as its advantages over coal and its safety becomes known."—Cherryvale Republican, September 16, 1892.

It was at Iola, in Allen county, however, that the first big well was brought in and the industrial importance of the Kansas field became apparent. There had been more or less local activity in that region ever since the first discovery of the Acres well in 1873, and in January, 1894, a strong flow was struck in the thirteenth well in the field, and the town had enough gas from that time for all domestic purposes. Encouraged by this success a new company was formed, and just as the drillers were becoming disheartened the strongest well ever drilled in the Iola field was brought in on Christmas eve, 1893,²¹⁴ and the town found that it had far more gas at its disposal than it could use. This was the first well to reach the stratum of the best oil and gas "sand," near the base of the Cherokee shales, and it was with this step that the industrial development dependent on the gas supply was inaugurated. Reports of the supply of gas soon attracted various manufacturing enterprises, foremost among them being the brick plants, zinc smelters and the Portland cement mills. Such was the lead that the big gasser of 1895, and others that were soon brought in, gave to Iola, that for a time it was the center of the manufacturing activity that followed.

For a time the demand for the vast stores of natural gas that the drillers tapped here and there all over the oblong area of some half a dozen counties, from Paola southwestward, lagged far behind the supply, and the bulk of the development from 1896 to 1900 was made with the hope of finding oil. The utilization of the gas to an extent commensurate with the possibility of production depended upon the advent of a large amount of capital to make it available for domestic purposes generally, and still more upon manufacturing establishments to turn its pent-up energy into work and wealth. Soon after the development at Iola, brick plants were started at Coffeyville and at Cherryvale, using natural gas as fuel,²¹⁵ but they were not very heavy consumers, and many of the large wells in the period before 1900 were closed in, and no immediate benefit was secured from them.

This in brief was the condition of the Kansas gas field in 1900. The Standard Oil Company had erected a refinery at Neodesha which was completed in 1895, with a capacity of 500 barrels a day,²¹⁶ and in the next two years its operating branch, the Forest Oil Company, had eighty-three producing wells distributed in seven counties of the Kansas field. Stimulated by the activity at Neodesha, and encouraged by the prospects of a market for their oil that the Standard offered, the other towns renewed their operations, and in the two years from 1900 to 1902 the present development was fairly foreshadowed. Chanute began prospecting independently in 1899, encouraged in the hope of finding oil by the showing of oil in the earlier gas wells. The work of the first two years was principally done by a Mr. I. N. Knapp, who, disappointed in getting leases at Neodesha, turned to that field, and made a deal with that city to drill gas wells for them, and to have the privilege of retaining all the oil that he should find. In this way he developed several hundred acres, drilling more than 200 wells, and in 1900 began shipping oil to the gas factories of Kansas City and Omaha. He continued in this business until after the laying of the Standard's pipe line to Kansas

NOTE 214. — "Discovery and Development of Natural Gas in Kansas," by Charles F. Scott, in *Kansas Historical Collections*, vol. 7, p. 128. The *Iola Register* and the *Friend-Herald*, Iola, differ as to the date of bringing in of this well, giving the date as December 19, 20 and 23, 1893.

NOTE 215. — Min. Res. Kan., 1898, p. 46.

NOTE 216. — Ind. Rept., Oil and Gas Mag., p. 9.

City in 1904, when he sold certain products of his refinery to that company, and retired from the field some years later. Both 1902 and 1903 were boom years for Chanute. The Prairie Oil and Gas Company entered the field with two large storage tanks and a pipe line to the Neodesha refinery, and the number of wells multiplied rapidly. Many of them were gas wells, and increased the visible supply of gas far beyond the local demand.

An interesting chapter of the development is written in and about Independence, Kan., in the operations of McBride and Bloom, two young men who had been in business drilling in the Kansas field since the beginning of the development. In 1901 they brought in a monster gas well near Independence, and immediately covered the county with leases, and by 1903 had developed a number of oil producers southwest of Independence, and made themselves wealthy thereby. In 1903 the Standard entered the field, and in that year finished its pipe line to Bolton, the center of the pool. Near Independence, also at Erie, development in 1903 brought in fourteen gas wells and a number of oilers, adding to the supply of available fuel. Other development resulted in a great addition to the oil production of the state in 1903-'04, and to take care of the production the Standard had increased the capacity of its Neodesha refinery first to 1000 barrels a day in 1902, and to 5000 in 1904.²¹⁷ Then in 1903 an independent refinery was built at Humboldt by C. D. Webster, who came out from the Pennsylvania field.²¹⁸ In 1904 the Standard erected a second refinery at Sugar creek, near Kansas City, Mo., with a capacity of 6000 barrels per day, and in the same year a second independent establishment entered the field, this time just south of the Kansas line, in the Indian Territory, where the development had reached by this time.²¹⁹

This was the situation with regard to the gas supply for the first year or two after the great development in 1900. Nearly every one of the Kansas towns in the gas belt had a gas company of its own, and had more gas than it knew what to do with. Many of the oil wells failed of their purpose and brought in gas. The all-absorbing question was what to do with it. It was at this stage that the towns through their commercial clubs went after the manufacturing interests, wherever idle capital was to be had in the United States. Three-cent gas for a long period of years was the offer that they made to prospective manufacturers. Many offered free building sites, and in some instances free gas was offered for two or three years as an extra inducement to locate.²²⁰ These efforts probably did more in the way of advertising the resources that the new gas field had to offer than in any other way, but in that respect success followed closely. The amount of correspondence that followed for a few years from manufacturers from all over the East was voluminous, and many industries came in at least sooner than they would have done otherwise for this reason.

The towns to the south of Iola had the advantage in that once their propositions got the ear of the prospective manufacturer, they had all the force of the example of what had been accomplished there before 1900. Iola had to go after her factories, and had to prove the value of the fuel supply to get them. Then, after a long wait, the Lanyons decided to locate

NOTE 217.—Interview, 1908.

NOTE 218.—Independence Reporter, Oil and Gas Magazine, p. 43.

NOTE 219.—Ibid, p. 34.

NOTE 220.—Independence Daily Reporter, March 6, 1903.

a smelter at Iola, and the exodus from the coal district of Pittsburg began with the plant of the Robert Lanyon's Sons, that was built in Iola in 1896. Other smelters followed closely after this first one, and in a few years brick and Portland cement plants were added to the list of consumers of Iola gas.²²¹ All this was before 1900, before any of the other towns had put their surplus gas to any industrial use, and before they had fully realized the wealth that was going to waste beneath their feet. Local capital had, it is true, organized the Coffeyville Brick and Tile Company in 1896, and built other plants at Independence and Cherryvale in 1898, using gas for fuel,²²² but beyond that the demand for domestic purposes fixed the market for the gas of those towns.

The development of the years 1900 to 1902 extended the gas field to practically its present extent, and the cheap rates offered to manufacturing institutions began to scatter the incoming capital to the southward of the first center at Iola. The larger interests as they came in, almost without exception, availed themselves of the offer of free fuel or of the three-cent rate, as the case might be, but in most instances they set about to acquire holdings of their own, and put down their own gas wells near the site of their plants. In the case of the Portland cement mills, which began to dot the country through the gas belt after 1900 and the successful start of the Iola mill, the production was often larger than the industry called for, and the companies offered their gas to other manufacturers at the regular factory rate.

Then it was that another factor entered the field and put the real gas development of the field on its feet. This was the organization of the Kansas Natural Gas Company, animated by T. N. Barnsdall, of Pittsburg, Pa., backed by other capital from the Pennsylvania field. A charter was secured in 1904, the wells and equipment of the Consolidated Gas, Oil and Manufacturing Company, organized a year earlier by McBride & Bloom, the pioneer developers, were taken over, and the new company, with a capital of \$12,000,000, started out to supply all eastern Kansas with gas from the southern field. In 1905 the Caney Gas Company was acquired, and a few months later the big concern took over the Coffeyville Gas Company, which owned 64,000 acres of gas lands and was valued at nearly a million alone. Several other local companies were taken up, and within two years from its inception the Kansas Natural controlled the output of the Kansas field, save for the production of the wells by the individual manufacturing plants, such as the smelters, brick plants and like industries.

The Kansas Natural centered its development in the field in and about Montgomery county, Altoona, just north of Neodesha, and Deering, south of Independence, being the centers of the two larger pools from which it drew. As soon as the supply was located the company began laying pipe lines into the Joplin mining district, and northward to Topeka, Lawrence, Kansas City, Leavenworth and Atchison, touching intermediate towns outside of the gas district.²²³ These lines were practically all completed by the end of

NOTE 221.—*Iola Register* (daily), May 13, 1907.

NOTE 222.—Interview, 1908.

NOTE 223.—One of the incidents of the activity of the Kansas Natural was the organization of the Kansas Gas Protective Association, which tried to stop the operations of the company, and to forbid the piping of the gas out of the state. Finally, December 17, 1904, the pipe line was blown up in three places in Montgomery county, and the litigation in the courts that followed gave the victory to the Natural, and its operations have not been opposed since that time.—*Independence Reporter, Oil and Gas Magazine*, p. 36.

1905, the piping of Kansas City being completed in 1906, and the company counted nearly a million population in the towns that it served. The larger manufacturing establishments, however, that are situated in the gas belt, are not included in these figures. In 1905 the Kansas Natural had 350 wells, with a tested capacity of two billion cubic feet daily, and had nearly 400 miles of sixteen-inch mains laid to reach its customers. The company has been an important factor in the industrial situation since that time, in spite of the fact that the largest share of manufacturing gas is produced from other wells.²²⁴ It has made a permanent rate of twelve and a half cents per thousand feet for manufacturing purposes, and has hundreds of factories using its gas.

In 1904 the development of the field had passed southward across the state line into Oklahoma and Indian Territory, and some large oil pools were opened south of the line. In Oklahoma but one district produced oil to any extent (all the development being for the sake of oil), while in the Indian Territory the development was confined largely to the Osage lands on account of the fact that leases were difficult to obtain elsewhere.²²⁵ Late in the year the activity increased in the vicinity of Bartlesville and Tulsa, and by the end of the year there were about 500 oil wells producing in the territories. In the following year the development of the oil pools in and about Bartlesville, Ramona and Pawhuska brought in numerous strong gas wells,²²⁶ and those towns began to offer gas to manufacturers, for two cents a thousand.²²⁷ The next year (1906) saw an unprecedented development in the supply of gas in the Indian Territory, the field developed extending from the Kansas line southward almost to the Arkansas river, and being in most places from five to ten miles in width. The larger number of the wells are in the Cherokee Nation, and will average twenty million feet per day.

The same conditions continued in the field south of the Kansas line throughout 1906, the amount of gas developed and left unused being enormous. Practically no manufactures had as yet entered the field, and owing to the uncertainty of the laws and rulings of the Interior Department, the gas was left practically unused save for local domestic purposes. The possible production increased enormously,²²⁸ however, in spite of the fact that

NOTE 224.—"There are twenty-five glass plants, fifteen smelters and perhaps a hundred brick plants drawing on the Kansas gas field and consuming a hundred million cubic feet. . . . In the same district domestic consumers do not use to exceed 25,000,000 cubic feet. The plants enumerated have their own gas lands and do their own drilling for the supply for nearly all of them."—Independence Reporter, Oil and Gas Magazine, p. 37.

NOTE 225.—"Later in the year the Secretary of the Interior began to confirm leases within the Cherokee territory, and drilling began with great activity. . . . A few small areas were leased previously, including nearly all the town site of Bartlesville, which was leased to the Cudahy Oil Company; . . . Since the Cherokee leases have been confirmed drilling has become very active in the little town of Alluwe, about thirty miles south of the town of Coffeyville, and at the villages of Dewey and Lenapah, the former being four miles north of Bartlesville, and the latter ten miles south of Coffeyville."—Univ. Geol. Surv., Kan., vol. IX, p. 207.

NOTE 226.—"A well drilled close to the state line in October tested close to thirty-five million feet. In the Indian Territory some enormous gas wells have been found, a number of which range from fifteen to twenty million cubic feet. The strongest wells are near the line between the Osage and Cherokee land, some on one side and some on the other. . . . In the vicinity of Bartlesville the gas is found in the sand above the oil sand, and frequently the gas is allowed to escape, and the drill sent down to the oil."—Univ. Geol. Surv., Kan., vol. IX, p. 214a.

NOTE 227.—Univ. Geol. Surv., Kan., vol. IX, p. 214.

NOTE 228.—"Gas has been developed in the Indian Territory to such an enormous extent in connection with the oil development that the Cherokee and Osage territories could probably supply two or three times as much gas as is developed in Kansas. A great deal of this territory

the companies in their drilling purposely tried to avoid the known pools of gas, in their search for oil. In 1907 the Kansas Natural laid a small pipe line into the field south of the state line, and drew heavily from it until the Oklahoma legislature passed a law prohibiting the exportation of gas from the above field, and the law since that time has been²²⁹ thoroughly enforced so far as can be learned. The southern end of the field thus presents an anomalous condition. There are millions of dollars' worth of gas on tap that up to the present time have been absolutely of no value, on account of the conditions outlined above. The conditions are analogous to those that prevailed in the Kansas field for the first few years, but the determination of Oklahoma to keep the gas at home will, if persisted in, eventually result in a movement of gas-using industries southward.²³⁰

In the Kansas gas field there was considerable activity during 1907, notably in the northern end, probably stimulated by the impossibility of drawing from the Oklahoma field. The principal development was that of a pool a few miles southwest of Chanute, where a large number of wells were drilled that would run from two to thirty million feet.²³¹ In this respect the new field is almost as good as that in Montgomery²³² county, which was exploited two years earlier. A new field was also opened between Neodesha and Fredonia, in Wilson county, the wells being smaller, however, and the flow used principally by the local manufacturing interests. Other shallow fields, producing wells of three to five million capacity, were also developed at two or three other points. It is known to be a fact that the constant drain on the gas supply of the northern part of the Kansas field, especially at Iola, where the zinc smelters and the Portland cement mills consume millions of feet of gas every day, that there is fear of the failure of the supply at a no very distant day. Deep drilling has been going on at Iola for nearly a year past with a view of increasing the supply before the want is really felt. Nothing definite can be learned as to the results, but no new finds have been made known to the public, and the indications are that that part of the field at least is at present confronted with a gradual diminution of the supply.

It would be very difficult to state either the production of the Kansas-Oklahoma gas fields authoritatively,²³³ or, if the production were ascertained,

gas is shut in awaiting a market, while other portions are piped to various towns and villages and retailed for domestic consumption. Practically no manufacturing concerns are established south of the state line."—Univ. Geol. Surv., Kan., vol. IX, p. 219.

NOTE 229.—

"R. L. Douglas, *University of Kansas, Lawrence, Kan.*:"

"GUTHRIE, OKLA., February 17, 1910.

"DEAR SIR—Your letter of February 14, addressed to the secretary of state, has been referred to this office.

"The law referred to in your letter was not a territorial law, but was passed by the first state legislature, and will be found in chapter 67 of the 1907-'08 Session Laws. This law was declared unconstitutional by the United States circuit court of the eastern district of Oklahoma, by a decision which was filed in July, 1909. The decision has not been officially reported, but no doubt will be contained in the 172d volume of the Federal Reports.

Very respectfully,
W. C. REEVES,
Assistant Attorney-general."

NOTE 230.—"But few factories are as yet established (1907). At Bartlesville there are two zinc smelters, and one is building. At Dewey, four miles north, a Portland cement plant is building."—Haworth, in Eng. and Min. Jour., January 4, 1908.

NOTE 231.—Haworth, in Eng. and Min. Jour., January 9, 1909.

NOTE 232.—"In another column of this booklet will be found the detailed report of Sealy L. Brown, gas inspector, showing the amount of gas developed in Montgomery county, Kansas, January 1, 1909. In spite of the vast amount of gas piped to Kansas City, Topeka, Leavenworth, St. Joe, Joplin and other cities, the wells of the great Montgomery county field show no diminution."—Mid-Continent Oil Fields, 1908, p. 44.

NOTE 233.—Tables were published in the bulletins on Mineral Resources of Kansas for the years 1897 to 1902, inclusive, that are as accurate as any for the Kansas field. No figures were available for the Oklahoma field for the purpose of this article that give satisfactory summaries.

to give an accurate valuation, on account of the fact that the gas is sold at prices varying from three cents to twenty-five cents a thousand in different parts of the district, and manufacturers who own their own wells have no satisfactory records of the amount of gas actually consumed. Probably gas to the value of half a million, or thereabouts, was produced in the experimental period up to 1897,²³⁴ and about twenty-five millions since that time, as nearly as the estimates can be reconciled.²³⁵ No figures are obtainable for Oklahoma, though it is estimated that there were a hundred and forty billion feet of gas produced in that district last year.²³⁶ The estimate is, however, in all probability high.

The importance of the development of natural gas to the manufacturing interests of the state lies, however, in its particular advantages as a fuel in certain kinds of industries, rather than in the amount that is produced. To some of the industries that have been built up in the eastern part of Kansas since 1900 gas is an essential element. This is true of the glass factories, which have to make gas if they cannot secure the natural product. Others, as the Portland cement mills, find it doubly advantageous, the cost and efficiency both entering into the consideration. In others, such as the brick industry, which gas has revolutionized, and the zinc smelters, the convenience and economy is the greatest recommendation. It has often been stated that 20,000 feet of natural gas is equal in efficiency to a ton of ordinary coal,²³⁷ and under the loose conditions that prevail in small factories, where the firing is not of the best, that is probably a fair estimate. It has been stated on good authority that with average conditions about 25,000 feet²³⁸ of gas would equal a ton of coal. As the cost of fuel to the larger plants, located in the gas belt, is not above three cents a thousand, the ratio of gas and coal would make it necessary to get coal at seventy-five cents a ton to equalize the two fuels from the point of cost alone. This advantage, in connection with the superiority of equal firing, convenience and the like, have been the factors that have attracted the industries to the

NOTE 234.—Min. Res., Kan., 1902, p. 39.

NOTE 235.—Min. Res., U. S., 1906, gives the following table of gas production for Kansas (at page 823):

Year.	No. producers.	Value.	No. wells productive.
1897.....	10	\$105,700	90
1898.....	29	174,640	121
1899.....	31	332,592	160
1900.....	32	356,900	209
1901.....	48	659,173	276
1902.....	80	814,431	404
1903.....	120	1,123,849	666
1904.....	190	1,517,643	1,029
1905.....	171	2,261,836	1,142
1906.....	130	4,010,986	1,145

In addition to this table, Professor Haworth, state geologist of Kansas, estimated that in 1907 the gas consumed had a value of from six to seven millions of dollars. (Eng. and Min. Jour., Jan. 4, 1908.) On that basis, the value for 1908 would be in excess of seven millions in all probability.

NOTE 236.—Report state mine inspector, Oklahoma, quoted in *Kansas City Journal* (daily), January 11, 1909.

Valuable material is contained in the following publications: First Biennial Report Kansas Bureau of Labor, 1901-'02, pp. 323-339; Coffeyville *Daily Journal* (supplement), April 6, 1907; Independence Reporter Oil and Gas Magazine, December 1905; Iola *Daily Register* (anniversary edition), May 13, 1907; Annual Reviews, "The Mid-Continent Oil Fields," 1905, 1906, 1907, published by the Independence *Daily Reporter*; various numbers *The Kansas Derrick*, published at Iola, Kan.; "Kansas-Indian Territory Oil and Gas Field," Chanute, June 1, 1904.

NOTE 237.—First Bien. Rept., Kan. Bureau Labor, p. 329.

NOTE 238.—Univ. Geol. Surv., Kan., vol. IX, pp. 201, 202.

southeastern part of the state, and have added a net increase of thirty or forty millions to the manufactures of the state since 1900.

The first of the new industries was, as has been stated,* the Lanyon zinc smelter at Iola; and soon afterward several brickyards began the use of gas. Then, in 1899, the establishment of the cement mill at Iola, followed as it was with remarkable prosperity, led to the organization of others in rapid succession. Other smelters were built all along the line of gas towns from Iola to Deering, near the southern line of the state. The number of gas-burning brick plants multiplied, and the failure of the Indiana gas field attracted the glassmakers to the new field as early as 1902, the first factory being a small twelve-pot window-glass factory at Independence.²³⁹ By 1905 there were four cement mills, nine glass factories, twelve smelters and more than half a hundred brick plants in operation in the state using gas as fuel,²⁴⁰ and the gas belt had become the center of manufacturing and business activity.²⁴¹ Since that time eleven more Portland cement mills have been built in Kansas, and two in the gas district of Oklahoma (Indian Territory); the number of glass factories has doubled, the smelters have builded southward across the state line at Bartlesville, and the population of the district has almost doubled.

One of the incidents of this growth of manufacturing and of the development of the oil and gas fields is the inception of a great demand for machinery of all kinds, and out of this new demand has grown up a wonderful increase in the iron foundry and repair business. In 1903 the largest of the iron-working establishments were consolidated into one company, under the name of the United Iron Works Company, with a capitalization of \$650,000, with a line of eight plants reaching from Iola to Springfield, Mo., where the head offices are located. The purpose of the consolidation was to secure a specialization of industry in the shops best located to do a particular line of work, and thus to prevent wasteful competition between plants. The plan worked so well that in addition to the first five plants included, two more were purchased in 1904, and a third was erected at Independence in 1906.²⁴² The conditions of the gas-belt district are such that it is highly advantageous to have such a string of ironworking plants to attend to the heavy repair business, which demands prompt and convenient service. The fact that the rates on the raw materials, pig iron and charcoal, are much cheaper than rates on the finished machinery that is

NOTE 239.—*South Kansas Tribune* (weekly), December 6, 1905.

NOTE 240.—Census Manufactures, Kansas, 1905, p. 20.

NOTE 241.—“There are twenty-five gas plants, fifteen smelters, four cement plants, and perhaps a hundred brick plants drawing on the Kansas gas field.”—Independence Reporter, Oil and Gas Magazine, p. 37. The estimates in this account are considerably larger than the census figures, and are probably a little too large.

NOTE 242.—The two plants at Springfield, Mo., make a specialty of ice-making machinery, coal-mining machinery, and railroad repairs, and employ 150 men. This is the parent plant, and the head office of the company. The Aurora, Mo., branch, specializes in zinc concentrating plants for the Joplin district, and employs 25 men. The Joplin plant also makes concentrating machinery, and boilers and sheet steel supplies for the mines, and employs 85 men. The Pittsburg plant makes coal-mining machinery, and does railroad repair work, employing 75 men. The Iola plant, established in 1901, makes all kinds of cement-mill supplies, oil tanks and smelting machinery, besides general repair work in all these lines. It employs 165 men. The Independence plant, the last of the line, makes a specialty of brick-making machinery, and supplies most of the yards in that part of the gas belt, giving employment to 50 men. The freight difference gives these plants a twenty per cent advantage over similar plants east of the Mississippi, and accounts for the growth of the industry.—Interview, 1908; also, *Iola Register*, May 13, 1907.

* *Supra*, p. 59.

produced where the materials are at hand, gives the specialized shops a trade advantage that has made the iron trades a most prosperous industry.

An interesting feature of the development of the gas-belt manufacturing towns is the fact that almost without exception the industry has added a settlement to the town in which it is situated, and this factory section seems, in most cases, to be a thing in itself and apart from the rest. The thing that strikes the casual observer is the apparent absence of any effect whatever in the way of addition to the town since the coming of the factories, and this impression persists until the immediate neighborhood of the factory is reached. There, usually, he will find a settlement almost equal in size to the population that depends upon the industry. Of the cement mills, the glass factories, the smelters, and, in some instances, of the brickyards, this is almost universally the case. The oil refineries and the machine shops do not follow this rule. One potent reason is doubtless the consideration of convenience, which makes it advisable for the laborer in these establishments to live near his employment. As in most cases these establishments are necessarily at some distance from the residence part of the towns, and as the labor employed represents an addition by so much to the previous population, it is a rule that there is a settlement for each large industry. Thus, for the first time in the manufacturing life of the state, there is a class different from the general population, and one that does not mingle freely with it. In this respect there is a similarity to the situation in the coal-mining towns, where the settlement for each large mine has been the rule for years, even in the case of American labor.

It is also worthy of notice that the new manufacturing population is not to any extent organized, and that the labor union is not a very important factor, especially in the industries that have followed the development of the gas belt. The cement workers are wholly unorganized, as are the brick workers,²⁴³ the smelter men,²⁴⁴ the employees of the oil refineries, and a large proportion of the ironworkers. The glassmakers are organized to an extent, but not at all closely. Of the fifteen glass factories reported by the state in 1907 only two had local unions, but as the glassworkers represent a population that comes from an older field, a much larger number than this have in all probability had union connections at some time or other. The ironworkers have by far the larger share of the unions in all these towns, and have had a substantial growth, continuing up to the present time. The boilermakers and the iron molders have accomplished the larger share of their organization since 1900, while the machinists have added very little to the number of their locals in ten years. On the whole, however, the labor union is a comparatively unimportant factor in the manufacturing classes, while on the other hand the miners, railroad workers, carpenters, stonemasons, bricklayers and cigar makers are well organized in all but the small establishments.²⁴⁵

NOTE 243.—The first biennial report of the State Bureau of Labor reports: "On April 7 (1902) the union (in the Coffeyville Brick and Tile Company's plant) resisted a system of dockage for lost time during working hours, incident to the operation of the plant. The company refused the demand, and 150 men went on a strike. On April 10 a conference was held and a contract agreed upon covering the differences, the company conceding the point the men demanded" (p. 266). This is the only showing of an organization in the reports, and the statement above may be taken as approximately true.

NOTE 244.—There were four smelter men's unions listed in the report of the State Bureau (p. 132, *et seq.*) for the year 1902—two at Iola, one at Kansas City and one at Wichita—but no further information is given about them, and they are not listed in 1903.

NOTE 245.—Report Bureau Labor, 1907, p. 104, *et seq.*

Most of the factory unions have been organized within the last ten years, the greatest activity being from 1899 to 1904, about the time that the labor unions were receiving so much advertising, and the "closed" or "open" shop controversy was so prominent. Another factor may have been the recognition that was given to labor organizations by the establishment of the State Society of Labor, the enactment of the factory laws on child labor and factory inspection and the enforcement of the new labor laws²⁴⁶ by the labor commissioner. All these provisions, aimed at the recognition and assistance of the labor unions incidentally, as they were operative on labor in general, became effective in 1899, and it is certain that after that time the number of unions increased very materially. One thing that the unions may have been instrumental in securing was the enactment of the child-labor law in 1905,²⁴⁷ for that had been urged by all the unions since 1900 in every report. In some instances the unions have been very beneficial to the laborers, but on the whole the steady increase in wages has not been attributed by the unions themselves to the effect of the organization any more than to the general activity of business.²⁴⁸

The situation of manufacturing with reference to all the recent establishments that depend on the gas belt is so much a matter of the present time that it would be largely a matter of speculation to attempt to give them a permanent rating in the manufacturing of the country. It is highly probable that the northern end of the district has reached its maximum, while there is nothing as yet to indicate a similar condition in the southern end of the Kansas field. The Oklahoma gas region is still comparatively unused in an industrial way, only the Portland cement mills and the smelters having ventured into it as yet. Statehood and the settled conditions that go with it will doubtless encourage factories to locate there where they have been discouraged. The continued enforcement of the law against piping gas out of the state will, if adhered to, inevitably draw some of the establishments southward from the Kansas field, which being older and drained heavily all the time will fail first.²⁴⁹

It must, however, seem improbable that there will ever be a complete exodus of industry from this section, whatever the fate of the gas supply, unless of course there should be a similar discovery elsewhere coincident with a failure here. It is stated on good authority²⁵⁰ that even in the case of the Kansas zinc smelters for the last two years the advantage is not very great, and the old Kansas coal smelters, as well as the Illinois coal smelters that are building substantially and equipping for a complete

NOTE 246.—Chapter 34, Session Laws, 1898.

NOTE 247.—Chapter 278, Session Laws, 1905.

NOTE 248.—"Average wages, as compared with 1900, are increased in fifty-two instances, decreased in seven, the same in forty-four. . . . Causes for increase: Forty-one organizations assign reasons for increase in wages, the prevailing being on account of the organization and the prevailing activity in all lines of business."—First Bien. Rept., Bureau Labor (1901-'02), p. 142. "Opportunity for employment, as compared with 1901, increased in eighty-eight instances, decreased in six, the same in fifteen. Causes for increase: thirty-eight, 'general prosperity.' Ten, 'organization.' Four, 'strikes in the East.' Wages, as compared with 1901, increased in forty-five instances. . . . The prevailing reasons for such increase are 'Organized labor, and general activity in business and prosperity.'"—Ibid. p. 292.

NOTE 249.—At this time (1910) the Kansas Natural Gas Company has been using Oklahoma gas for the supply of its Kansas trade for months. The failure of the gas supply in the Iola district and the weakening of the wells south almost to the Montgomery county district have made it of importance that this Oklahoma gas should be made available. There is little doubt that the duration of the Iola supply is to be short, and parts of that district not supplied by the Kansas Natural are now using coal for domestic purposes.

NOTE 250.—Walter R. Ingalls, in Eng. and Min. Jour., January 4, 1908.

utilization of by-products, are on an equal footing. The Kansas smelters recover no by-products, with the exception of part of the Iola works, and are built rather temporarily. When the gas fails, there is no reason why the Kansas industry should not reorganize on a basis of greater economy, using the undiminished coal supply, and operate at little if any disadvantage.

The district will inevitably extend southward to some extent on account of the fact that the conditions are practically uniform over southeastern Kansas and northeastern Oklahoma. That, it seems, is destined to be the factory district, if present conditions should prove to be more than temporary; and there is no visible cause for a termination of the conditions that have been making so strongly for industrial growth in the past few years. If the line of commerce shifts to a north-south line and exports seek an outlet by way of the Gulf of Mexico, as railway traffic men assert, and as seems probable, the present growth will receive an additional impetus that should be even greater than that given by the discovery of the new fuel supply ten years ago. The transportation lines are here, the capital is here and on the increase, and there is a substantial foundation in economic resources to sustain such a growth.

The tendency at the present time, and it is but little more than a tendency as yet, is for the building up of more important manufacturing centers through the central parts of Kansas and Oklahoma, which supply in a measure the things that have heretofore been imported from Kansas City and elsewhere. Topeka, Wichita and Oklahoma City are the largest and most important of the cities that have been participating in this later growth. Their importance began in a commercial way owing to their favored locations as distributing centers, and at the present time they are doing heavy business in distributing to the trade of the smaller towns of their district. This is especially true of Wichita and Oklahoma City, which being farther removed from the prairie center of commerce at Kansas City have a larger field to supply. Oklahoma City, as the metropolis of the new state of Oklahoma, has been almost from its beginning one of the best and most active commercial cities of the prairie region, but up to 1900 it had no beginnings in an industrial way that amounted to anything. Wichita and Topeka, on the other hand, have had industrial aspirations, and some actual importance, for years.

The actual importance of the two cities (Topeka and Wichita) at the present time is shown by a comparison with the total manufactures of the state. For comparison the figures for Kansas City, Kan., will be subtracted from the state total, for they represent a much larger value of products than any other centers in proportion to the capital and wage-earners, on account of the peculiarities of the packing industry, which makes up the bulk of its industries. Subtracting the totals of Kansas City from the state reports, there were in Topeka and Wichita in 1907²⁵¹ manufacturing establishments with one-ninth of the capitalization of the rest of the state, employing more than one-sixth of the wage-earners, paying one-seventh of the wages, and producing more than one-fourth of the products of the state after Kansas City was subtracted. The growth of the industrial life of both the cities has been very rapid, and is proportionately greater in Wichita than in Topeka, on account of the fact that the former is but beginning industrial life of importance. In five years since 1900 Wichita in-

NOTE 251.—Twenty-third Ann. Rept., Bureau Labor, tables, p. 280, *et seq.*

creased the capital invested in all industries 148 per cent, with an increase of 6.7 per cent of the number of establishments; wages increased 59.9 per cent, while the value of the products increased 122 per cent. In Topeka capital increased 99.7 per cent, with an increase of 6.8 per cent in the number of establishments; the number of wage-earners increased 37.5 per cent, and wages 25.9 per cent, while the value of products increased 72.9 per cent.²⁵² The four years since the figures above were collected have seen a continuation of the increase of the importance of Wichita at a greater rate than Topeka, and the indications are that it will continue for a considerable time as yet.

The importance of the industries of Topeka is added to materially by the railway shops of the Santa Fe, they being the main shops for the system. Though there is not much actual construction carried on there, the amount of the repair work is enormous, and adds a considerable amount to the total for the city. In consequence of the railroad work there is a considerable activity in the iron foundries, whose product is nearly a million dollars annually. Flour mills add two and a half million; one of the largest creameries in the United States added over four millions last year,²⁵³ out of the product from 400 collecting stations through the state, which were distributed again in the shape of butter to dealers all over the country. The product of the Topeka packing house adds a large amount of pork products to the total. Among the comparatively new industries should be mentioned a structural steel company, a new automobile factory which has a rapidly increasing output, a vegetable canning factory, a pickling and preserving factory, all of which are growing rapidly. At Wichita, the largest single item of industrial importance is the output of two pork-packing plants, while the flour mills are second, with an output of a million and a half of product annually. The growth of the business of the manufacture of drugs and toilet preparations is one of the important features of the latest growth, and a new paint factory, making paints for the Southwestern climate, is rapidly extending its market.

Oklahoma City showed the greatest increase in the five years after 1900, increasing from almost nothing to some actual importance, and revealing the potential importance of that city as a future manufacturing center. In the five years the capital invested increased 729.5 per cent, the number of wage-earners 227.3 per cent, and the wages 317.3 per cent; the value of the products increased 334.4 per cent,²⁵⁴ by far the most rapid increase of any part of the prairie section in the same time. Favored by location in the center of the new state, with railway connections of the best, on the north-south line of traffic, this city will inevitably increase in importance, both as a distributing center and as a manufacturing point in many lines of products. There is abundant wealth in the city, and it will be strange if the potential importance does not place the city on an equality with Kansas City as a manufacturing and commercial point at no very distant time.

In the following sections the history of the more important of the individual industries will be taken up in the order of importance and development. There are, however, many lines of manufacturing that are becoming

NOTE 252.—Bull. No. 28, Census Manufactures, 1905, p. 16.

NOTE 253.—Topeka *Daily Capital*, March 7, 1909.

NOTE 254.—Bull. No. 30, Census Manufactures, 1905, p. 32.

important in this section that will not be touched upon in this paper on account of the length that it would give to the discussion. They should not, however, be entirely overlooked. Dairying²⁵⁵ is one of the industries that is constantly becoming more important and is destined to become characteristic of the whole section. There are in Kansas and Nebraska at the present time more than a hundred creameries, whose capital aggregates nearly four million dollars, and whose output in 1905 was more than seven million dollars' worth of butter, to say nothing of the value of the frozen products in the shape of ice creams that they put out in large quantities every year. Car construction and repairs by railroads is of considerable importance, there being some fifty-three shops in the two states, representing about nine millions of capital, and nearly sixteen million dollars' worth of products every year. Bakery products make over three millions in the two states. Malt liquors are a million and a half in Nebraska, and tobacco industries amount to two millions in the three states in this section.

With this suggestion of the importance of some of the lines of industry that are not treated in detail, the discussion of the more important individual industries will be taken up.

FLOUR MILLING.

The milling industry is one of the oldest manufacturing enterprises in this section of the country, and at the same time one of the most thoroughly characteristic and widely distributed over the whole section. One of the first needs of the settlers of the new country was for the means of grinding their wheat, one of the first products, into flour for their family consumption. This necessity caused the building of small gristmills in the early days in every community. The eastern part of the section, including principally southeastern Nebraska and northeastern Kansas, built many of these mills, the small streams furnishing power for a majority. Wheat raising was of less comparative importance in the first twenty years of the history of the new states than it is at the present time, and before 1870 there was almost no flour sent out of the district. Home consumption furnished practically the whole of the demand, and it was hardly looked upon as a manufacturing enterprise as a source of wealth and profit, but as a necessity to society. Most of the early millers followed the business as a sort of side issue to their regular employment or business.

There are almost no accounts at all of the early period of the milling industry in this part of the country, partly on account of the very fact that it was looked upon as so much a matter of course that it attracted little attention.²⁵⁶ In the later years, the industry has attracted some literary attention, and there are a few accounts that are serviceable as a source of material for a statement of the development of the industry. For this reason it has been necessary to draw the conclusions as well as many of the details from scattered accounts in local reports for the most of the whole period. It has therefore been the purpose of this article to study particularly the industry in Kansas, which, being the center of the group of states under consideration, and the most quickly settled part of the district, is

NOTE 255.—Sixteenth Bien. Rept., Kan. St. Bd. Ag., pp. 1038-1040.

NOTE 256.—Cutler's History of Kansas gives local mention of the establishment of flouring mills, but no tabulated statistics.

characteristic enough to make the study sufficient for the whole section. This is further justified by the fact that it is in Kansas alone that there has been any considerable centralization of the industry in the later period.

The census reports are the only sources of information as to the number of mills and extent of operations until the beginning of the publication of a few statistics on manufactures by the secretary of agriculture in his annual reports, beginning with 1874. The first census of Kansas territory was in 1860, and showed only thirty-six flour and grist mills in the state. The average capital invested was given as a little over \$3000, and the value of the products was almost \$300,000. Small as this amount seems to be, considering that it was the sum of all the flour industry in forty-one counties, it shows a larger total than any other single industry, and this leading position in manufactures it held until the rise of the meat-packing interests at Kansas City about 1890. It was not until nearly 1870, however, that the production of flour in the state assumed its normal relationship to the demands of the population for flour. Previous to that time the needs of the people for bread were supplied from the corn crops, where the supply of wheat in the state did not meet the requirements.

In the ten years from 1860 to 1870 the number of flour and grist mills had practically trebled, and the industry was assuming stable proportions. The amount of capital had increased nearly nine times, and the product had grown in like proportions, reaching in the year of the census \$2,938,215. In the same time the population of the state had trebled, the acreage farmed had practically quadrupled, and the wheat acreage had increased from less than 200,000 acres to two and a third million acres. Soft winter wheat was the sole product at this time, and as the weather conditions at that time were such as to make wheat growing uncertain in a considerable portion of the section,²⁵⁷ the milling industry still represents the needs of the settlers for bread.

The early census reports do not show the distribution of the mills,²⁵⁸ nor the relative numbers of water powers, but those facts are partially supplied by the report of the agricultural department of Kansas in 1874.²⁵⁹ These figures are not very satisfactory, on account of the fact that the returns are incomplete as to numbers, and still further deficient in giving the values of the mills reported. The next year, however, the report²⁶⁰ shows practically complete enumeration of mills, though other details are deficient, as before. There were 158 flour and grist mills reported in the state of Kansas in 1875, with an average capital investment of \$11,000 each, or almost four times that of fourteen years previous. Only a little more than half the mills were valued, but at that average capitalization the whole number brought the total capital investment up to nearly two million dollars, while in the following year it passed three millions by the same method of computation. In 1875 there were nearly 300 mills reported, or more than are in operation in the state at the present time.

NOTE 257.—The Cutler's History of Kansas, 1883, gives under each town a list of its manufactures, a history of individual enterprises. Flour and corn mills are included in the number; money invested, power and output are usually shown, as well as date of establishment.

NOTE 258.—Kansas Hand Book, 1881, p. 13.

NOTE 259.—Third Ann. Rept. State Board of Agriculture; the accounts are scattered through the body of the report, covering over a hundred pages, so that it is impossible to give page references.

NOTE 260.—Fourth Ann. Rept.

The relative importance of the water powers of the streams of the eastern part of the state is suggested by these same reports. In 1874, 86 of the total of 158 reported were run by water power, and how large the proportion may have been earlier can only be conjectured. It was just at this time that the number of water powers was on the increase, as is shown by the report for 1875, which lists exactly half of the 290 flour and grist mills as steam-driven. From this time on, however, there has been a gradual decline in the number of water powers, until at the present time there are but a few in the state, and only at the most favorable locations. There are a considerable number of points where it would be possible to locate water powers that are not utilized at all now, on account largely of the convenience and cheapness of fuel as compared to the initial cost of installing water powers. Another feature of the flour milling industry through the '70's is the considerable mills that were run only a part of the time, and in connection with small sawmills. These combination mills were not confined to the water powers along the streams, but persisted for some time after the use of steam power in the flour mills became the rule. Over two-thirds of the combination mills reported in 1875 were driven by steam. Wind was a source of power to a small extent, and there were at one time ten wind flour mills in the state. The reports for the year 1876,²⁶¹ show practically the same results that have been stated, save that there was an increase in the number of mills reported, the number averaging ten to each county reporting flour mills—330 in all.

The decade following the conditions that have just been suggested saw a practical revolution of the milling industry of the state. At the beginning of that time only about the amount of wheat was made into flour that the population of the state demanded. The mills were small, none of them being above 150 barrels capacity, and the average much less. Exportation of flour was unheard of, and almost unthought of.²⁶² But there were several influences working quietly in the later '70's that were making for the reorganization of the milling industry on an industrial basis that would make the products important in the commerce of the outside. The first if not the most important of these was the introduction of hard wheat in Kansas by the Russian Mennonites who emigrated to the south central part of Kansas in the '70's, and settled in a group of counties along the Santa Fe railroad. Prior to that time it had been found impossible to build flour mills of any consequence on account of the uncertainty of the wheat crop in that section of the state, and one of the early mills in Harvey county had to ship wheat from Atchison at times to supply its burrs.²⁶³

The first party of the Mennonite colonists brought only a small quantity of the Russian or "Turkey" hard wheat with them, and for several years only such as they needed for themselves was grown from it.²⁶⁴ About 1885,

NOTE 261.—Fifth Ann. Rept., State Board of Agriculture.

NOTE 262.—An article in the *Kansas Monthly* for July, 1878 (vol. I, No. 1), calls attention to the relative insignificance of the milling industry to its possibilities, in the eastern part of the state where crop conditions were fairly satisfactory. "Probably there is not a mill in the state that has a capacity that will average 150 barrels a day, and there is not enough to manufacture one per cent of the present crop. . . . Every well conducted mill is paying large profits. . . . and I doubt if there is any other business in Kansas that pays so well."

NOTE 263.—Fifteenth Bien. Rept. State Board of Ag. (Kan.), p. 945.

NOTE 264.—Ibid, p. 948.

however, Mr. Bernard Warkentin,²⁶⁵ who had been influential in getting the Mennonites to settle in Kansas, being convinced of the great superiority of the new wheat as a sure crop producer, imported a considerable quantity of it from Crimea, and sold it to the farmers for seed. Mr. C. B. Hoffman,²⁶⁶ a pioneer miller of the state, who had been running one of the largest mills on the Smoky Hill river at Enterprise, was one of the early promoters and one of the first to offer the hard wheat flour for export.²⁶⁷ The wheat did not have to be acclimated, but was naturally adapted to the region west of the eastern quarter of the state that was too dry for the soft wheat that had been the whole crop up to this time. By many of the oldest millers of the state, who have watched the development of the milling industry from the early days, the introduction of hard wheat is given the credit for the growth of the exportation of flour from the state.²⁶⁸

Beginning about the same time was the improvement of natural conditions which made the production of soft wheat more certain and profitable. The increase in rainfall that has been going on almost since the first settlement of the state has made the eastern two-thirds better adapted to the raising of soft wheat than the eastern edge was at the time the milling industry started. The impetus given to the raising of wheat by the introduction of hard wheat was communicated to the growing of soft wheat as well, and as soon as the increased rainfall became a thing certain, the production of both kinds of wheat increased enormously. In 1870 there were less than two and a half million bushels of wheat raised in the state; in 1880 there were seventeen and a third million bushels; and by 1890 this had

NOTE 265.—BERNARD WARKENTIN was born in southern Russia in 1847, where his father, a Mennonite, was a large landowner. Young Warkentin came to America, locating first in Sumnerfield, Ohio, and from there coming to Kansas in 1872. He settled at Halstead, where he built the first mill in Harvey county. In 1886 he purchased mill property in Newton and removed there, retaining business interests, however, in Halstead. He was the first man to introduce the Turkey hard wheat into Kansas, as his father had been first to interest the Mennonites of southern Russia in that variety of the grain. Mr. Warkentin was one of the "solid men" of Kansas, public-spirited, and alive to the best interests of the community and the state. His death was tragic and occurred while he and his wife were on a trip abroad. They were en route from Damascus to Beirut, when a young man in the next compartment of the railway train, in handling his revolver, accidentally discharged it, the ball penetrating Mr. Warkentin's body. He died in the Prussian hospital at Beirut, about midnight, April 1, 1908. The young man accountable for this accident was a Turkish prince, Mehemed Said, a grandson of the famous Abd-el-Kader, emir of the Arab tribes in Algeria.

NOTE 266.—CHRISTIAN B. HOFFMAN was born in Azmooz, Switzerland, in 1851, and the family emigrated to Wisconsin, settling in Washington county in 1854. In the year 1857 the father, C. Hoffman, born in Switzerland August 1, 1826, came to Kansas, locating first at Leavenworth. He remained there until 1860, when he went into Dickinson county and engaged in farming. In 1868 he left his farm and built a grist mill on the Smoky Hill river near where the town of Enterprise now stands. Mr. Hoffman was treasurer of the town company of Enterprise, organized in January, 1873, and has always been closely identified with its interests. His son, Christian B., was educated at the Central Wesleyan College, Warrenton, Mo., and in 1873 was married to Catherine A. Hopkins, a native of Virginia. He entered into partnership with his father in the milling business, and together their ventures have been very successful, embracing many lines of industry, some of which are now carried on by the third generation of American Hoffmans. C. B. Hoffman represented his district in the legislature of 1883 and has been more or less active in politics.

NOTE 267.—"It was the introduction of hard wheat that made the exportation of flour from Kansas possible. . . . I found that it was a better yielder, and that it stood the drought and other vicissitudes better than the soft wheat. This caused me to chemically analyze its qualities, which showed that it was rich in gluten, and produced a very nutritious and palatable bread. Baking tests confirmed this. Exportation of hard wheat flour began in the early '80's, and was in full swing by 1885."—Letter, C. B. Hoffman, Enterprise, Kan., 1908.

NOTE 268.—"The first flour exported direct by the mills from Kansas was sometime between 1884 and 1887, and was made from hard wheat; it was really the hard wheat of Kansas that made it a wheat raising and flour manufacturing state of any importance."—Chas. V. Brinkman, Great Bend, Kan., 1908.

"The introduction of hard wheat gave an impetus to the raising of wheat in Kansas which furnished a surplus, a market for which was found in foreign countries."—John Kelley (Kelley Milling Company, Kansas City, Mo.)

increased to thirty and a third million bushels. In the decade from 1880 to 1890 there had been but a slight increase in the average acreage of wheat, thus showing the importance of the combined influence of the introduction of hard wheat and the improved crop conditions on the production.

The other important influence was the introduction of the gradual reduction process in the Kansas mills in the early '80's. This process was introduced into the United States from France only about 1870, and the burr process, in general use over the whole United States, persisted in a great many of the Kansas mills almost until 1890. The first mills in the state were equipped for the new process in 1881 and 1882,²⁶⁹ and were ready for business at about the time that the other advantages in wheat growing that have been suggested were well under way.

The successful milling of the hard wheat was dependent on the introduction of the new process, in so far as the export market for flour was concerned, for the old burr process made very inferior flour out of the hard wheat. With the introduction of the new process, and the reorganization of the milling business that followed it, many of the old-time water power mills disappeared altogether from the state. These influences culminated about 1890, just about the time when, as has already been seen, practically every line of industry was experiencing a period of expansion and centralization. The milling industry was no exception, though the centralization was not accomplished until nearly fifteen years later to its full extent. The decade from 1880 to 1890 showed an increase in the number of mills of only 8 per cent, while the amount of capital invested increased 130 per cent,²⁷⁰ the value of the products increased one-half in the same time, and the number of employees about the same.

The exportation of flour to neighboring states, and particularly to Texas and Iowa, had begun as early as 1878,²⁷¹ from some of the older and larger mills in the eastern part of the state. The production of a surplus of wheat, which had been on the increase from 1875, made possible the development of larger mills and the growth of a few rather well-defined milling centers. Those towns that have already been mentioned as taking the lead in manufactures, were the ones to take the lead in the new milling movement. Topeka, Emporia, Lawrence, Leavenworth, Atchison and Fort Scott were the principal towns, and each of them had from two to four or five of the larger mills of the state. In the case of the milling industry, however, there was a wider distribution of mills in the middle western counties of the state, owing to the effort of some of them to operate as close to the supply as possible. There were mills built along the water powers of that section of the country at this time that are still among the largest in the business to-day in this region. Notable among these are the mills of C. B. Hoffman at Enterprise, of C. V. Brinkman at Great Bend, and Bernard Warkentin at Newton. It is largely to the efforts of these pioneer millers in that section of the country that the advertising of Kansas flour, and especially hard wheat flour, was due.

By 1890 the products of the Kansas flour mills were reaching practically all the neighboring states that were not self-supplying. Missouri, Nebraska

NOTE 269.—Letters, C. B. Hoffman and C. V. Brinkman.

NOTE 270.—Tables from census reports for 1880 and 1890.

NOTE 271.—Interview, J. D. Bowersock, Lawrence, 1908.

and Iowa took considerable quantities of Kansas flour, while the products of the Kansas mills found an outlet to the south and southwest, in Georgia, Tennessee, Texas, Colorado and New Mexico. One of the largest of the mills at this time was at Lawrence, having a capacity of 250 barrels a day. Of it a contemporary account says: "Its products are known from the Atlantic to the Pacific, and car lots are sent to the surrounding states. It took the first premium at the World's Fair Cotton Centennial at New Orleans in 1884."²⁷² The annual production of wheat by the state of Kansas reached thirty-four million bushels in 1889, and in 1891 it increased to fifty-six million bushels, affording abundant material for the mills. The quality of the flour was becoming well known, and the mills were in a fair way to prosper.

The financial difficulties of 1888 and the depression in all lines of industry for several years afterward were felt as well by the flour mills as any other lines of manufacturing, and there was little change in milling conditions from 1890 until nearly 1900, when there was a considerable increase in the number of mills, accompanied, however, by only a slight addition to the investment of capital. This was partly due, no doubt, to the fact that there were a number of small mills built in the western half of the state about this time that did only local custom business, and they swelled the numerical count without adding materially to the milling capacity of the state. From 1898 to 1902 or 1903, however, was a period of considerable addition to the milling capacity, and, though there were not many mills of consequence built in that time, there were enlargements going on that have increased the capacity of the mills to far more than the demand for Kansas flour at the present time will keep busy. It has been estimated that about 1902 the milling capacity of the state reached approximately eleven and a half million barrels of flour annually,²⁷³ or practically double the amount actually produced. This estimate shows a condition that actually exists at the present time; that is, that a large portion of the mills of the state can and do run but a part of the time, and only the better located and better managed are able to run continuously.

One of the incidents of the increase of milling capacity about 1900 was the rise of the milling center at Kansas City, which within only a few years past has risen to second place as a milling center in the United States. The annual exportation of a large share of the wheat produced in this section of the country had years ago made Kansas City the market for millions of bushels of the Kansas wheat crop every year, while the growing production of Oklahoma since the '90's added greatly to the wheat that sought the markets through Kansas City. Realizing the important advantage of locating mills in conjunction with such a market, there was a considerable increase in the milling capacity of the Kansas City mills, beginning about 1895. A notable incident of this increase was the erection of one of the largest hard-wheat mills in the world in Kansas City, Kan., by the Santa Fe railroad. These mills, known as the Rex Mills, have a capacity of 5000 barrels daily, but for some reason have not been in operation for three or four years. Recently, however, they have been leased by one of the active milling companies of Kansas City,²⁷⁴ and will be in full operation in a few

NOTE 272.—Lawrence *Journal* (weekly), April 15, 1887.

NOTE 273.—C. B. Hoffman, in Thirteenth Bien. Rept. Bd. of Ag., Kan., p. 539

NOTE 274.—The Southwestern Milling Company.

months. This will make this company the largest operator in the Southwest, with a total mill capacity of 8000 barrels a day. The operations of this one company will require forty cars of wheat daily, worth from \$35,000 to \$50,000, according to the market. The other mills at Kansas City, six in number, have a capacity of 1000 and 2000 barrels each, and bring the total capacity of the mills at this place up to fourteen and a half thousand barrels a day.²⁷⁵

There are twelve towns in the state of Kansas that have a milling capacity of from 1500 to nearly 4000 barrels of flour daily. Topeka heads the list with six mills producing 3750 barrels; and a number of towns through the center of the state in the heart of the wheat belt complete the list. They were all located, in the first instance, with a view of operating on the wheat produced in the vicinity, but when it was found necessary to increase the size and scope of the operations in order to command a standing in the market, it was found impossible to secure enough wheat to run the mills without the aid of the railroads. At the present time many of these mills ship nearly all of their wheat from various distances. This would not have been possible if the railroads had charged the regular local freight rates on the shipment and reshipment, and would have forced the milling industry to centralize completely at Kansas City or some other market center, save for the small mills that were so situated that they could operate on the wheat produced within a radius reached by the wagons of the farmers. By means of the milling in transit rate, similar to the rate made to all manufacturing concerns of any importance, the millers were allowed to stop wheat at their mills and grind it and ship out an equal tonnage of flour and other products on the through rate. By this means the millers in the center of the state have exactly the same footing that the Kansas City millers have, save that they have a little additional trouble of keeping buyers out to supply them, while the Kansas City mills find their wheat coming in constantly of its own accord.

Under these influences the more aggressive mills through the wheat belt adapted themselves to the new conditions after the centralization tendency manifested itself, and the products of a dozen towns find foreign markets on an equal footing with the Kansas City center.²⁷⁶ The only difficulty that they experience is the finding of a sufficient supply of wheat tributary to their mills to keep them running the year round. There is a constant tendency for the farmers to turn their wheat on the market considerably in advance of the marketing of the new crop, and the millers sometimes have trouble in finding enough wheat available without sending to Kansas City for it, and thus doubling their ordinary freight rates. Only the great losses ordinarily incidental to idleness or running on part capacity would justify paying freight twice, but they are compelled to do it at times. The building of elevators all through the western part of the state in the wheat country has helped a great deal in this respect in keeping the wheat in the country longer, and the growing prosperity of the farmers, which enables them to hold their crops longer, has aided in the same result.

NOTE 275.—The *Kansas City Star*, October 26, 1908.

NOTE 276.—The towns that are in the lead are: Topeka, with a daily capacity of 3750 barrels; Wichita, 3460 barrels; Wellington, 3050 barrels; Coffeyville, 1950; Salina, 1925; Leavenworth, 1750; Arkansas City, 1550; Atchison, 1450; Hutchinson, 1150; Newton, 1070; McPherson, 1070; Enterprise, 1050. The total capacity of these mills is 23,225 barrels, or about one and a half times that of Kansas City at the present time.

A few years ago one of the largest milling companies²⁷⁷ of the state conceived the idea of going into the elevator business for itself, in order to secure a constant supply of high-grade wheat for its mills. Accordingly a subsidiary grain company was organized, sixteen elevators were bought, thirty-five or more buying stations were established in southern Kansas and northern Oklahoma. It is worthy of notice that this is the largest one of three milling centers of large proportions in the state operating wholly on soft wheat,²⁷⁸ the products of which are marketed almost wholly in the Southern states and in the West Indies. One small mill owned by this company, and operated in connection with their other mills, manufactures hard-wheat flour for the demand among local customers of the company, but the large majority of their products are made of soft wheat. The building of elevators over the wheat belt has of late years become the rule, and has aided in general in holding back enough of the wheat crop each year to keep the mills running to supply all the trade they have been able to secure. Occasionally, however, it is necessary to go to the eastern markets and buy wheat rather than to allow the mills to be idle and disorganize the trade that they have been able to build up.

Under present conditions there are two distinct types of flour mills in this section of the country. One is the mill of 500 barrels or more capacity running on full time, twenty-four hours in the day, and exporting its products by the carload. A mill of this character, well managed and favorably located, is under no disadvantage in competition with a mill of 5000 barrels, except in the magnitude of the trade it is able to handle. After a certain limit the construction of a flour mill is a matter of duplication, and the medium-size mill has no unsurmountable difficulties in its way. The smaller mills, of which there are a great number, not only in Kansas but all over Nebraska and Oklahoma, of 200 or 300 barrels capacity, are at a decided disadvantage, and are not able to compete in the same class with the larger mills,²⁷⁹ and their operations are of a necessity confined to local business.

Most of the mills of Nebraska and a share of those of Oklahoma are of this character; they are widely distributed through the wheat-producing belt, and do not figure in the markets of the world to any greater extent than the smaller Kansas mills. In the case of Nebraska this is almost universally true. The milling industry was late in starting, and as late as 1880 Kansas flour supplied a large share of the local demand in that state. The 230 odd mills in 1905 had an output but little over double that of the eight mills operating at Kansas City alone, and the production of the state is only a little more than a fourth that of Kansas.*

In the case of Oklahoma, however, there is a situation similar to what exists in Kansas. In the part of the state that was the Indian Territory

NOTE 277.—The Rea-Patterson Milling Company, of Coffeyville, organized in 1893, with a capital of \$50,000, which has since been increased to \$200,000. It consumes on an average over two million bushels of wheat annually. It is composed wholly of southeastern Kansas men.—*Coffeyville Journal* (daily), April 6, 1907.

NOTE 278.—The others are Atchison and Leavenworth; the Cain Milling Company of Atchison, and the Kelley & Lisle Company of Leavenworth, are the largest, and market their products with the southeastern trade, as does the Coffeyville company.

NOTE 279.—“A mill of 500 barrels capacity, other things being equal, is fully as profitable as a larger mill. A mill of 200 barrels capacity and less must depend upon a local market on its better grades of flour, and is not large enough to command a market on its lower grades, as it does not produce enough. Hence it is at a decided disadvantage.”—Letter, C. B. Hoffman, 1908.

**Supra*, p. 71.

the mills are small and not numerous, and strictly local in character. In Oklahoma territory, however, the building of the mills took on a larger and more important character early in their history. There the larger mills are the rule rather than the exception, and some of them have been in operation practically since the time the wheat raising in that section assumed its present proportions. The centralization has been largely accomplished contemporaneously with the same movement in the Kansas industry. In 1900 there were fifty-five mills in Oklahoma proper, with a capital investment of just about a million dollars.²⁸⁰ That is, there were one-sixth the number of mills as in Kansas, with about one-eighth the capitalization. The products of the Oklahoma mills at the same time were about one-eleventh that of the Kansas mills. In the five years following, however, there was a great centralization of the industry in Oklahoma, and while the number of mills increased only one-half, the capitalization had trebled, and the value of the products had increased in almost the same proportion.²⁸¹

In 1905 only seventeen of the seventy-five Oklahoma mills represented less than \$20,000 capitalization, while thirty, or two-fifths of the number, were in excess of \$100,000 each. The average capitalization for the Oklahoma mills in 1905 was a little more than \$43,000, while the average of the Kansas mills (not including the mills of Kansas City, Mo.) was barely \$39,000. One reason is no doubt that Oklahoma missed entirely the local stages of the industry that Kansas went through, and, with the building of the mills to take care of the wheat production of the new state, it began at the place the Kansas mills had reached after thirty or forty years of experiment and growth. As there were few small mills in the field, such as still persist in Kansas despite their disadvantages, there were but few to eliminate, and the majority of the mills are of the character of the better mills of the older state.

A few years ago there was an organization perfected in Kansas City, aimed to place the smaller mills of the eastern part of Kansas as nearly as possible on an equal footing with the larger mills in a commercial way. An association was formed of the smaller soft-wheat mills, about twenty-five in number, and all the surplus is exported by the Kansas City office of the association. In this way, as the quality of the flour is usually about the same, the association is able, by the amount of flour that it has at its disposal, to command a much more advantageous market than the individual mills could ever hope to reach. The surplus of these mills is probably not much more than the output of a single large mill, and the association is not of actual importance in relation to the industry as a whole. It does illustrate, however, another way of accomplishing the end that the large mills have attained in the commerce of their products. Whether the small mills will be able to live and prosper by means of such an association is doubtful, and it is likely to prove merely a device to enable them to prolong their life to a certain extent in spite of the disadvantages, to which they will eventually yield.

With millions of bushels of wheat going out of this section of the country every year, while there are idle mills only too willing to grind it into flour, the permanence of present conditions may well be called into question.

NOTE 280.—Twelfth Census, Manufactures, part II, pp. 730, 731.

NOTE 281.—Census Manufactures, 1905, Bull. 30, pp. 31, 34.

In many ways it would be advantageous to grind a larger per cent of the Kansas and Oklahoma wheat into flour. It would relieve to a considerable extent the periodical strain on the transportation facilities of the country, by spreading the tonnage more evenly over the year, and would give an additional tonnage eventually in the shape of bags, barrels, machinery and the like incidental to steady operation. On the other hand, there has to be created a market for more Kansas-made flour, by means of systematic advertising. The freight rates would have to be revised so as not to encourage the shipment of unground grain as at present, and for this the railroads would have to be enlisted. There is the further consideration that, with the larger and more substantial building of European mills, accompanied by the tariff on the importation of flour in some of the countries, American flour is likely to be at a permanent disadvantage, and conditions are at present favorable for an actual decline in the proportion of wheat that is exported as flour from this section.

It should be said in conclusion, however, that Kansas hard-wheat flour is at present on a better footing in the foreign market than it has ever been before, and is esteemed second to none in the world, if not indeed as the best. The advantages that the Northwestern flour has had in this respect is a thing of the past in many of the European markets. "It is, however, only in the last year or so that it commands a price equal to the Northwestern hard-wheat flours, and in some cases a higher price. This is due to the fact that, on account of the magnificent mills at Minneapolis, and the enormous amount of advertising, the public got the idea that the Northwestern flours were superior to any others. The facts, however, did not bear out this contention, and the trade is learning that the Kansas hard-wheat flour is the better of the two. Just recently Mr. Robys, of Antwerp, Belgium, a heavy importer of flours, paid us a visit. He said that Kansas flours are commanding a higher price in the Belgium and Netherlands markets than the Northwestern flours of equal grade."²⁸²

SLAUGHTERING AND MEAT PACKING.

To even the casual observer the slaughtering and meat-packing industry is obviously of great relative importance in the list of manufactures of the Middle West. For the last twenty-five years it has held the first place among the manufactures of both Kansas and Nebraska, both in the amount of capital invested and in the value of products. Just now, so far as the state of Kansas is concerned, first place in capitalization, though possibly not in the actual amount of capital, must be given to the Portland cement industry, but that industry has not yet approached in any degree the meat-packing industry in the value of the output. The actual importance of this industry is shown by the fact that the packing houses at Kansas City, Kan., manufacture nearly a hundred million dollars' worth of products every year, or nearly half the value of all the manufactures of the state.²⁸³ In the same degree the industry leads in Nebraska, the value of the products of the packing houses at South Omaha contributing about sixty-nine of the one hundred and fifty-five millions of manufactures of that state in 1905.²⁸⁴

The industry is also remarkable in that it is by far the most highly cen-

NOTE 282.—Letter, C. B. Hoffman, 1908.

NOTE 283.—Bull. 28, Census Manufactures, 1905, pp. 20, 21.

NOTE 284.—Bull. 29, Census Manufactures, 1905, pp. 16, 17.

traized of all the manufactures of the West. This is, of course, as true of the industry in the whole country, so far as the production for anything but local purposes is concerned, six leading companies producing nearly half of all such products in the United States, without counting the products of two or three others who produce together nearly a hundred millions annually.²⁸⁵ The localization of the packing industry is none the less remarkable, though perfectly natural. Practically all the packing of any consequence in the prairie states is done in the four towns, Kansas City, Kan., South St. Joseph, Mo., South Omaha, Neb., and Sioux City, Iowa. Kansas City and Omaha are far in the lead, ranking second and third, respectively, among the packing centers of the United States at the census of 1905,²⁸⁶ though St. Joseph, with forty-two million dollars of products—half that of Kansas City and two-thirds that of Omaha—is fifth among the packing centers, and Sioux City ranks seventeenth. Demanding as it does the existence of a well-established market to give a continual supply of animals for slaughter, it is natural that there should be but a few packing centers, for the reason that there are as few important live-stock markets in this part of the country.

The conditions leading to the establishment of live-stock markets at Kansas City and Omaha have already been discussed sufficiently for the purposes of this paper, in a previous section. An extensive market had grown up from natural suitability of location at Kansas City years before there were any packing houses of any consequence there; and the enterprise of the citizens of Omaha, by their efforts in favoring the establishment of a stock market and packing town accomplished the same result for Omaha. Kansas City had become of some importance by 1880, while five years later saw the beginning of an important industry at Omaha. Sioux City, of considerably less importance to the present time, came into prominence later, and St. Joseph did not attain any importance until Swift & Co. built a two-million-dollar plant there in 1897.²⁸⁷ The building at these towns was almost wholly by Eastern packers, who had been getting their cattle and hogs through these Western markets, and were now seeking to get near to the supply, for the sake of economies in handling. The Cudahy & Armour packing plant at Omaha, which later passed into the complete control of the Cudahy family, is the only important instance where these packers have their offices in the West.

The westward building into these towns was only the logical result of the westward movement of the live-stock industry itself that has been going on for forty years.²⁸⁸ As the center of the supply moved westward, the packers found themselves constantly suffering great losses in shrinkage of the animals in transportation for the long distances they went to reach the packing houses in Chicago and farther east. It needed, however, the invention and perfection of a system of preserving and transporting the dressed products from the time of slaughtering until it reached the Eastern

NOTE 285.—Rept. Commr. Corporations, Beef Ind., p. 58.

NOTE 286.—Bull. 286, Census Manufactures, 1905, p. 14.

NOTE 287.—Rept. Comm. Corporations, Beef Ind., p. 5. This plant had a capacity of 1400 cattle, 7000 hogs, and 3000 sheep per day.

NOTE 288.—There were but 47.2 per cent of the cattle of the country west of the Mississippi in 1880; in 1900, 62.4 per cent were west of the river; in 1905, 72.4 per cent of the yearlings and 84.7 of the dairy cattle were west of the Mississippi, showing a great shifting of the cattle-raising industry to the West in the twenty-five year period. Tables, *ibid.*, p. 3.

markets to make it feasible to build packing houses in the West. In the meantime, the losses to the producers and the packers, incident to the shrinkage of the long haul, spurred on the perfection of the refrigeration system of transportation, and made possible the building in the West of the large packing establishments. The natural economies of a few centers accounts for the fact that there are comparatively few large packing centers in the country, and the location of the most important in the favored cities in this section.²⁸⁹

The decade from 1880 to 1890 was the period of the establishment of the Eastern packers in Kansas City, Omaha, and Sioux City, if it is permissible to class the Cudahy company among the Eastern packers.²⁹⁰ In 1880 Kansas City had two packing houses, with a million and a half of capital, employing 900 men, and making about five millions of products. The first packing house there of importance was only ten years old at that time.²⁹¹ In 1881 Fowler Brothers, who had a pork packing plant at Atchison, Kan., began operations in Kansas City. In 1883 local capitalists built and opened the plant of the Kansas City Packing Company, which nine years later was sold to the Schwarzschild & Sulzberger company, of New York, who were said to be the first Western exporters of dressed beef.²⁹² In 1887 Swift & Co., of Chicago, built their first Western packing house at Kansas City as an experiment,²⁹³ and the next year opened a \$300,000 plant in Omaha.²⁹⁴ There were in all seven packing houses in Kansas City by 1891, with a capitalization of nearly nine million dollars, and products of forty and a half millions.²⁹⁵

The building of the packing houses at Omaha, induced at first by the grant of cash bonuses by the stockyards association of that place, has already been touched upon,²⁹⁶ and by 1890 there were four large packers there, doing about twenty-four million dollars' worth of business.²⁹⁷

NOTE 289.—This discussion will of necessity be much shorter than the importance of the companies engaged and the magnitude of their operations seems to warrant. But there is no way of obtaining anything but the most superficial information, which it is unprofitable to amplify. The Commissioner of Corporations prefaced his report with the statement that only Swift & Co., of all the packers of the country, made public reports, and those were so condensed as to be useless.

NOTE 290.—Michael Cudahy and P. D. Armour, in 1887, bought the plant built in Omaha a year earlier by Thomas J. (since Lord) Lipton. In 1890 Armour sold his interest to Cudahy, who about that time opened his Sioux City branch, and ran it without competition until the Armours built there in 1903; in 1892 they built a western plant at Los Angeles.

NOTE 291.—Case's History of Kansas City, 1888, p. 217.

NOTE 292.—Kansas City Star, June 12, 1898.

NOTE 293.—Case's History of Kansas City, p. 219.

NOTE 294.—Bell, "History of Omaha," p. 631. Swift & Co. were induced to locate this Omaha house by the gift of a bonus of \$130,000 by the stockyards association of Omaha.

NOTE 295.—Packing industry in Kansas City June 1, 1891:

Number of houses.....	7
Value of real estate occupied.....	\$1,500,000
Value of plant.....	5,701,894
Capital employed.....	12,380,000
Value of raw material used.....	34,412,852
Value of product.....	40,656,134
Number of hands employed.....	4,433
Wages paid.....	2,483,915
Floor space occupied, square feet.....	6,230,850
Percentage of increase.....	16.36

—Commercial Club of Kansas City, Twelfth Annual Report, p. 58.

NOTE 296.—Kansas City Comm. Club, Twelfth Ann. Rept., 1891.

NOTE 297.—Census Manufactures, 1890, part II, p. 508.

The Eastern packers were not all represented in these figures for 1890, however, as Nelson Morris did not enter this field until 1904,²⁹⁸ with a plant at St. Joseph, Mo., and one at Kansas City in the following year.²⁹⁹ The business for the first ten or fifteen years was much more of pork packing and less of beef packing.³⁰⁰

Pork packing was a comparatively important industry in Omaha for ten years before there were any attempts to build plants for the slaughtering of beef. The Fowler plant which was built at Atchison in 1878 packed hogs only, and had a capacity of 3000 daily, employing 500 men.³⁰¹ The three plants in Kansas City in 1880 killed seventeen times as many hogs in that year as they did of cattle.³⁰² Much of the beef that was killed at that time was either sold locally or salted and cured, and the refrigeration or ship-

NOTE 298.—Kansas City Times, October 22, 1904.

NOTE 299.—Kansas City Star, January 7, 1905.

NOTE 300.—Statement showing entire packing done in Kansas City since the beginning of the industry, 1868 to 1890-'91, copied from Twelfth Annual Report of Commercial Club of Kansas City, p. 59; 1892 to 1900 found in "Imperial Kansas City, 1900," by Mercantile Illustrating Company, p. 18; 1901 to 1909 taken from "Compliments of The Kansas City Stock Yards Company, 1910."

Calendar year.	Cattle.	Calves.	Sheep.	Year.	Hogs.
1868.....	4,200	.....	.....	1868-'69 (season).....	13,000
1869.....	4,420	.....	.....	1869-'70	23,000
1870.....	21,000	.....	.....	1870-'71	36,000
1871.....	45,543	.....	.....	1871-'72	83,000
1872.....	20,500	.....	.....	1872-'73	180,000
1873.....	26,549	.....	.....	1873-'74	175,000
1874.....	42,226	.....	.....	1874-'75	70,300
1875.....	26,372	.....	.....	1875-'76	74,474
1876.....	26,765	.....	.....	1876-'77	114,869
1877.....	38,617	.....	.....	1877.....	180,357
1878.....	18,756	.....	.....	1878.....	349,097
1879.....	29,141	.....	.....	1879.....	366,830
1880.....	30,922	.....	.....	1880.....	539,097
1881.....	46,350	.....	.....	1881.....	857,823
1882.....	65,116	.....	14,455	1882.....	749,083
1883.....	74,314	.....	56,358	1883.....	1,056,116
1884.....	66,250	.....	88,336	1884.....	1,114,451
1885.....	78,963	.....	32,905	1885.....	1,529,415
1886.....	116,481	.....	89,100	1886.....	1,759,753
1886-'87 (fiscal).....	139,763	.....	98,063	1886-'87 (fiscal).....	1,849,473
1887-'88	240,295	.....	99,589	1887-'88	1,813,444
1888-'89	413,842	.....	197,220	1888-'89	1,703,343
1889-'90	511,305	6,523	201,106	1889-'90	1,777,596
1890-'91	444,519	7,149	159,219	1890-'91	2,223,769
1892.....	598,569	37,736	200,622	1892.....	1,994,395
1893.....	891,495	57,092	366,317	1893.....	1,426,304
1894.....	900,090	45,572	366,743	1894.....	2,098,512
1895.....	855,723	39,461	534,159	1895.....	2,123,966
1896.....	923,374	51,747	672,991	1896.....	2,362,110
1897.....	920,610	36,269	770,569	1897.....	8,040,386
1898.....	890,394	.....	614,752	1898.....	3,263,664
1899.....	991,783	40,150	645,212	1899.....	2,700,109
1900.....	1,092,804	48,623	636,018	1900.....	2,872,128
1901.....	1,175,531	68,228	777,891	1901.....	3,547,313
1902.....	1,089,516	116,083	724,773	1902.....	2,246,303
1903.....	1,025,446	101,022	775,989	1903.....	1,891,708
1904.....	1,012,665	98,619	781,259	1904.....	2,083,020
1905.....	1,244,775	140,489	942,752	1905.....	2,451,901
1906.....	1,340,415	159,550	1,127,533	1906.....	2,582,668
1907.....	1,257,854	166,837	1,082,532	1907.....	2,739,628
1908.....	1,164,904	155,132	1,094,455	1908.....	3,425,907
1909.....	1,334,906	192,824	1,172,669	1909.....	2,745,380

*"In addition to these figures I give below the number of head of hogs received by the Fowler Packing Company through their yards, which are not reported in this company's annual (letter, February 14, 1910):

1904.....	744,824	1907.....	567,804
1905.....	681,865	1908.....	635,447
1906.....	604,969	1909.....	447,279

NOTE 301.—Atchison Daily Champion, February 20, 1879.

NOTE 302.—Commercial Club of Kansas City, Twelfth Ann. Rept., p. 59.

ment of fresh beef was not of great importance in the Kansas City and Omaha plants until the building just preceding the census of 1890.³⁰³ It is also worthy of notice that the bulk of the northern packing, that is, at Omaha and also at St. Joseph, still maintains this character, largely on account of the market conditions in the first place, and on account of the further fact that it is not possible to ship hogs as far profitably as cattle on account of the greater shrinkage.

The business of pork packing is one that lends itself to a wider distribution and a less centralization than the beef-packing industry. In the first place, it is one of the essentials of the pork-packing business that the meat be cured, and the use of refrigeration and rapid transportation cuts less figure than in beef packing. Then, also, cured pork serves an entirely different market. Little of the Western pork goes East, while all the fresh beef seeks an outlet in that direction. The pork is marketed in the northwest and all over the central prairie states, while many of the packers send large quantities to the southeast to the cotton fields. It is this latter trade that the more southerly located houses supply mostly.³⁰⁴ In this connection it is well to note the rise of packing houses of considerable importance at other places than those named, and in some cases independent wholly of the other centers. One of the earliest of these is a model little packing house at Topeka, which has grown gradually from an insignificant butchering house twenty-five years ago to a capitalization of a third of a million, killing nearly one-seventh as many hogs as the Kansas City packing houses, and sending its products all over the South and Southeast.³⁰⁵ Pork and pork products are the specialty of the company, beef being an issue only to supply local demand. Of the same character, but of larger size and greater volume of business, are two packing houses at Wichita, one owned and operated by the Jacob Dold Packing Company, of Buffalo, N. Y., representing an investment of a half a million, and having a capacity of over 5000 animals daily. The other is operated by the Cudahy Packing Company, of Omaha, and is of about the same size, though in the last year or two it does the larger business of the two.³⁰⁶ These plants represent the different oppor-

NOTE 303.—The following table from the report on the beef industry shows the slaughter of hogs and cattle at Kansas City, Omaha and St. Joseph since 1880:

YEAR.	Cattle.			Hogs.		
	Kansas City.	St. Joseph.	Omaha.	Kansas City.	Omaha.	St. Joseph.
1880.....	50,288	.....	.....	523,551	.....	.....
1885.....	104,246	.....	30,930	1,557,556	58,948	.....
1890.....	548,677	.....	322,819	2,306,944	1,397,676	.....
1895.....	893,750	.....	314,312	2,171,357	1,007,716	.....
1900.....	1,092,804	288,977	576,669	2,827,128	2,162,612	1,537,582
1908.....	1,025,446	404,737	735,158	1,891,708	2,177,981	1,577,960

NOTE 304.—Interview, manager Cudahy's Wichita house, 1908.

NOTE 305.—Interview, 1908.

NOTE 306.—This plant was established as a butcher shop in 1874, and gradually increased its operations as conditions justified. It was bought several years ago by John Cudahy, and operated independently by him for several years. It was taken over by the Cudahy Company in 1906. The plant has made it possible to establish a regular market for hogs at this point, and by its connection with the other Cudahy branches, of which there are a score, it is able to buy all the hogs that are offered, and where necessary they are then reshipped to the nearest branch. It was found necessary to do this in order to insure a regular supply, such as is now assured.—Interview, manager.

tunities in the two classes of meat packing, and both are healthy developments due to normal conditions.

There are smaller establishments of the same character along the southern line of the state of Kansas, at Pittsburg,³⁰⁷ Coffeyville,³⁰⁸ and Arkansas City.³⁰⁹ The essential difference in these and other plants of the same size through the district is in the scope of their operations, which are for the most part confined to the locality from which they draw their hogs. Their importance is not actually great as yet, but their development is recent, and there is a probability that there will be an opportunity for medium-sized pork-packing establishments to prosper.

The decade from 1890 to 1900 was one of great development of the packing industry in the Western packing centers, and it saw a multiplication of capital and production. Omaha almost doubled its production in two years after 1890, and the other towns prospered in a degree only slightly less. It is not possible to say how far the panic years affected the industry, but by 1900 a great increase in the operations had been accomplished. The latter part of the decade saw the rise of St. Joseph, Mo., as a western packing center, there being five packing houses of all sorts in 1900.³¹⁰ Swift & Co. were the pioneers, and their two-million-dollar plant was put into operation at that place in 1897. Then in the following year Schwarzschild & Sulzberger, of New York, built at St. Joseph to compete with the Swifts. The Hammond Packing Company came in about the same time, and later, about 1905, Nelson Morris built at St. Joseph. There were five millions of capital invested in 1900, and the products were twenty-nine millions, more than two-thirds of which was pork products. St. Joseph had about a third as much capital and output as Kansas City in that year.

Kansas City and Omaha were not far apart in their importance at the end of the decade, each having approximately fifteen millions invested in the industry. Kansas City was in the lead, with seventy-three millions of products, to sixty-seven for Omaha. Nearly two-thirds of the products of the Omaha packers was pork and pork products, while the pork products of the Kansas City houses was very little over half, if any.³¹¹ This statement shows the relative importance of the centers in the different lines of meat packing, as has already been suggested. The business at Sioux City, Iowa, at this time was practically in the hands of the Cudahy company, which had been established there since 1890 or thereabouts. There were three companies reported, but two of them were unimportant. Beef products make up less than a fourth of the volume of the output of eight millions of this city in 1900. The production of the four cities in this year aggregated about a hundred and eighty millions of dollars, only, however, about seventy per cent of that of the city of Chicago in the same year. They ranked as follows among the cities of the United States as packing centers: Kansas City, second; Omaha, third; St. Joseph, fifth; Sioux City, about seventeenth.³¹²

NOTE 307.—A local plant that has gradually grown to considerable local importance, with a capacity of 300 animals per day.

NOTE 308.—Capitalized at \$50,000, and having a daily capacity of about a hundred animals.

NOTE 309.—Has a daily capacity of about 200 animals.

NOTE 310.—Figures for 1900 are from vol. IX of the Twelfth Census, p. 407, *et seq.*

NOTE 311.—Twelfth Census, vol. IX, p. 408.

NOTE 312.—Ibid, p. 410.

It is impossible to give any exact statement of the increase of the individual cities since 1900, on account of the combining of the only figures available in the census report for 1905.³¹³ The most remarkable feature of the development is the increase of the operations at St. Joseph, which practically doubled its production and more than doubled its capitalization. The increase of capital at Kansas City was also considerable, and out of proportion with the increase in production. Practically every plant at Kansas City has been making important extensions in the last few years, and there are now nearly twenty millions invested there in the packing industry. The capital invested at Omaha increased also in the five years after 1900 almost one-third, while the products increased but one-tenth that much.³¹⁴ The reasons for these showings of the lagging of production behind capitalization cannot be found from the information that is allowed to become public.

An interesting feature of the development since 1900 is a movement in the direction of the combination or consolidation, as indicated by the formation of the National Packing Company in this district in 1903.³¹⁵ The Armours, Swifts, and the Nelson Morris interests were said to be back of it, and at the time there was a great deal of belief current to the effect that there was an actual and tangible combine in existence. However that may be, or whether these companies desired simply to eliminate some of their smaller competitors, in 1903 the new company was organized with a capital of fifteen millions, and bought up the Hammond plants at Omaha and St. Joseph, the Fowler and Ruddy plants at Kansas City, and the St. Louis Dressed Beef and Provision Company of St. Louis, the aggregation having about nine millions of capital before the combination.³¹⁶ If there is an actual combination in existence between the large packers they have kept it hidden successfully, but there is no doubt that prices paid for animals are practically the same for all the packers in any one of the western markets,³¹⁷ and there seems to be a remarkable likeness in the prices charged by all the leading packers for their products. It is a common assertion on the part of the independent butchers that the packers are actively working together, and that there is never anything to be gained by visiting different packers after one of them has made a price.³¹⁸ It seems to be the universal rule that uniform quality brings uniform prices in the packing towns of this district. It has also been alleged, with what truth it is impossible to say, that the larger packers, notably Armour, Morris and Swift, work together in cutting prices and overbidding on cattle for the sake of making it hard for the small competitors. It is true that there is but little if any active competition that shows on the surface among the larger packers,³¹⁹ though they consistently deny the existence of any agreements or combinations.³²⁰

NOTE 313.—Bull. No. 83, Census 1905.

NOTE 314.—Bull. 83, Census Manufactures, 1905, pp. 23-26.

NOTE 315.—A combination of other of the smaller operators was effected at Kansas City in 1905, by which a capital of a million was united in one concern, operating independently of the large packers in that field.—*Kansas City Star*, October 7, 1905.

NOTE 316.—Rept. Comm'r Corp., Beef Ind., pp. 293-295.

NOTE 317.—"It will be observed that the prices of all the packers are very close together, with a greater variance at St. Joseph or Kansas City, though the records are too meager at the latter place. The general result warrants the statement that the prices paid by the packers are substantially the same at a given time on the given market."—Rept. Comm'r Corp., Beef Ind., p. 125.

NOTE 318.—*Kansas City Star*, July 30, 1906.

NOTE 319.—*Ibid*, December 1, 1905.

NOTE 320.—*Ibid*, September 9, 1905.

Conditions in the packing industry, not only locally but nationally, are such that it would be a comparatively simple matter for the larger companies to do anything that they cared to do with the market, for the industry is practically centralized in not to exceed six or seven large companies in the country, and these companies get fully half the beef cattle that are slaughtered in the United States.³²¹ Of course, it is true that in the selling department there is no possibility of the packers controlling the prices of fresh beef in the West on account of the importance of the independent butchers under present conditions, for the small establishments kill nearly three-fourths of the beef that is consumed in this section.³²² So far as the possibility of the public getting any benefit of the greater economies of the larger establishments, there is little chance, for the six large companies control practically all the slaughter in the Western centers, and their charges to the retailers are limited only by the prices that the local butchers with their waste and looseness can make. In this respect the packers are practically free from the competition of the small butchers, and it needs but the demand in this section to put the fresh-beef industry in the same condition that the packed products are at the present time.

In every one of the four cities under consideration the industry is not only dominated by the larger packers, but it is literally swallowed up by them. In Sioux City, Cudahy and Armour have the industry to themselves, and Cudahy had it all until about five years ago. In Omaha there are four companies, the Cudahys, the Armours, Swifts, and the National Packing Company, which may be regarded as an Armour-Swift institution. Cudahy has about one-fourth of the business in the city, and the other three have over seventy per cent, making a total of over ninety-five per cent of the slaughtering in their hands.³²³ St. Joseph may be said to be controlled by Swift and Morris, for the only other concern of importance is that of the National Packing Company, which they helped to organize, and the three companies consume over ninety-nine per cent of the animals that are slaughtered there.³²⁴ All of the six are interested in Kansas City, and there they consume practically all of the slaughter, being a fraction of a per cent higher than the figures for St. Joseph.³²⁵

The following table of the capitalization of the companies that are thus monopolizing the meat-packing industry in the prairie states is interesting. Of course only a part of the capital represented is actually invested or used in these packing houses. These companies had as gross receipts in 1903 seven hundred million dollars, and slaughtered five and a half million animals. The table (Rept. Comm'r Corp., Beef Ind., p. 25) follows:

<i>Name of company.</i>	<i>Where incorporated.</i>	<i>Capital.</i>
Armour & Co.....	Illinois.....	\$20,000,000
Swift & Co.....	Illinois.....	35,000,000
Nelson Morris & Co.....	Illinois (partnership).....	6,000,000
National Packing Co.....	New Jersey.....	15,000,000
Schwarzschild & Sulzberger Co.....	New York.....	5,000,000
Cudahy Packing Co.....	Illinois.....	7,000,000
Total capitalization.....		\$88,000,000

NOTE 321.—Rept. Comm'r Corp., Beef Ind., p. 57.

NOTE 322.—The following table of sources of beef consumed in the different parts of the country shows the conditions of the fresh-beef industry in this section. Six large packers sell:

New England states.....	75 to 80%	Central states.....	25%
New York, New Jersey, Pennsylvania, 50 to 55		Western states.....	20 to 25%
South.....	20 to 25	Mountain states.....	15 to 20

—Rept. Comm'r Corp., Beef Ind., p. 74.

NOTE 323.—Rept. Comm'r Corp., Beef Ind., p. 62.

NOTE 324.—Ibid. NOTE 325.—Ibid, p. 58.

It is to be regretted that it is not possible in this connection to give a better account of the commercial conditions of the industry, or to give more of the labor conditions, but owing to the lack of information that has already been mentioned, it is not possible to give such an account as would be of any value. Therefore with this outline the discussion will close.

MINERAL INDUSTRIES, SMELTING.

The smelting industry, at the same time one of the first and one of the most important of the manufactures of the section, has been carried on in the fuel district of Kansas since the early '70's to some extent. In its beginning it was not of great importance, and in its present aspects the smelting industry, particularly of zinc, is one of those that belong to the period following the development of the gas and oil field since 1895. At present it is one of the most important of the mineral industries, and the section has the distinction of producing nearly two-thirds of the zinc spelter produced in the United States,³²⁶ and is one of the foremost districts, if not indeed the first, in the world.³²⁷ The lead smelting has always been of minor importance in this section, although there has not been a time since the opening of the Joplin mines when there has not been some lead smelting carried on.

The history of the development of the spelter production in the United States is a very interesting one, dating back only to the establishment of a small plant by the federal arsenal in Washington, for the manufacture of brass for the making of the standard weights and measures.³²⁸ The process was very expensive at that time, and the methods the government used were impracticable commercially on account of the cost. The first attempt to use the Belgian retorts failed about 1850 on account of the lack of the proper knowledge of the means of overcoming the tension of the iron and manganese in the ore. Then in the next year the Wetherill process was invented, by which the ore was mixed with anthracite coal on an open hearth, and the ore was vaporized and collected and condensed in muslin bags.³²⁹ In 1856 another attempt was made at Bethlehem, Pa., to use the Silesian model of the retort furnace, but on account of improper handling of the fire clay used in making the retorts the experiment was a failure. The next year two old Saxon smeltermen, Matthieson and Hegeler, demonstrated that the Bethlehem furnace would work with proper handling, but as they

NOTE 326.—"The position in the zinc industry occupied by this state (Kansas), depends on its smelting rather than its mining activities. Thus the presence of usable supplies of natural gas and the geographic position of the state combine to make it the leading zinc-smelting state. In 1906 nearly fifty-eight per cent of all the spelter made in this country was produced by smelters located in Kansas, and of the 20,921 tons increase in production of spelter in this country over 1905, 15,277 tons, or seventy-three per cent of the increase of zinc, was produced by Kansas smelters, while zinc ores produced by Kansas mines, as reported by smelters, amounted to 14,424 tons of concentrates, which yielded 3902 tons of spelter. . . . Of the total increase in production contributed by the Missouri-Kansas district, a large part was contributed by Kansas, and the greater part of this was from the Galena district."—Min. Res., U. S., 1906, p. 471.

NOTE 327.—Productions of zinc in 1900 by principal districts was as follows:

Rank.	District.	Metric tons spelter.
1.....	Belgium.....	119,317
2.....	Kansas-Missouri.....	104,303
3.....	Upper Silesia.....	102,093
4.....	Rhineland and Westphalia.....	53,000
5.....	New Jersey and West Virginia.....	7,491

—W. R. Ingalls: Production and Properties of Zinc, p. 16.

NOTE 328.—Ingalls, "Production and Properties of Zinc," p. 14.

NOTE 329.—Ibid, pp. 13, 14.

went to the western field in Wisconsin in the same year they accomplished little there.³³⁰

It is said that the first zinc works in the West were built in Wisconsin in the early '50's by an old Silesian smelterman named Georgi, who demonstrated that the continental methods could be applied to the American ores. Then in 1858 Mathieson & Hegeler erected their smelter at La Salle, Ill., where the first ores produced in the Kansas-Missouri district were marketed about ten years later.

There were small smelters built in the zinc fields of southeastern Missouri in the latter '60's, one at Potosi, in Washington county, in 1867, and a second at Carondelet two years later, both of them smelting the calamine from the southeastern corner of the state.³³¹ About ten years later the prospecting in the Joplin-Galena district for the development of the lead deposits uncovered the vast zinc ores of that section, and the first shipment of zinc east, about 1870, started the production in that district. Shortly after, as early as 1873, there was a small coal smelter built at Weir City, Kan., the place of the newly discovered coal fields, and ores were hauled by wagon until railway connections were established. The development of the coal field in the next few years moved northward into Crawford County, and when Robert Lanyon came west from the smelters at La Salle he selected Pittsburg as the location for his smelter.³³² This was in 1878, and marked the beginning of the activity of Pittsburg as a smelter town.

The firm of Robert Lanyon & Co. built two furnaces in 1878, and added to this number two more in the following year, as the prosperity of the business and the increased activity of the mines in the Joplin-Galena district made the smelters plenty of business. In 1882 two more furnaces were added, making six in all. In the meantime, however, part of the Lanyon family of smeltermen withdrew from the company, organized the firm of S. H. Lanyon & Bro., and built a second smelter in Pittsburg.³³³ In 1882 two more smelters were built at Pittsburg, the first by two more of the numerous Lanyon family, W. and J. Lanyon, employing about fifty men, with two furnaces. The other was built by the Granby Mining and Smelting Company, who put up a 400-retort furnace and employed about seventy-five men.³³⁴ This made a total of eight furnaces in that year, with a daily capacity of about ten tons of spelter. In 1884 the total capital invested in the four smelters was \$650,000, and they gave employment to 350 men, with an average outlay for wages of \$7500 each month.³³⁴

The growth of the smelter industry at Pittsburg was very rapid all through the '80's, for the convenience of the coal supply so close to the mines gave the Kansas smelters an advantage in that respect, since they got the long haul on the spelter, which reduced the tonnage greatly over the shipments of the raw ores. Where in the early '80's the larger part of the ores went to the La Salle smelters, which had in connection a sheet zinc factory,³³⁵ by the end of the decade the larger share of the ores of the district was being reduced in the Pittsburg smelters. In 1887 there were

NOTE 330.—Ingalls, "Production and Properties of Zinc," p. 14.

NOTE 331.—Ibid, p. 15.

NOTE 332.—Mo. Geol. Surv., vol. VI, p. 295. Ingalls, Zinc, p. 15.

NOTE 333.—The Pittsburg Smelter, March 22, 1884. NOTE 334.—Ibid.

NOTE 335.—Kansas Monthly, vol. IV, No. 8, p. 103.

21,900,000 pounds of spelter produced at Pittsburg, valued at \$825,000, and there was an investment of a million dollars in capital. Six hundred men were employed in the industry.³³⁶ Two years later the production amounted to 26,716,000 pounds, valued at a million and a third,³³⁷ and the Pittsburg district was spoken of as "the second largest zinc-producing city in the United States,"³³⁸ as it in all probability was.

The existence of an abundance of cheap fuel so near to the zinc mines is, in a word, the situation that made possible this rapid growth of the zinc-smelting industry at Pittsburg. In no case was it necessary to haul the ores more than twenty-six miles by railroad to reach the smelters, so that the freight rates were comparatively inconsiderable. The price of coal has always been low in the Pittsburg district on account of the shallowness of the coal beds at that place and the ease of mining. Pittsburg coal is the cheapest and at the same time the best coal in the district, the average price for twenty years being about \$1.45 per ton for the coal at the mines. The smelters, however, use the inferior "slack" coal, which costs on the average less than half and usually about one-third as much as the screened coal.³³⁹ This grade of coal, so long as it is free from dirt and impurities, as the most of the slack from that district is, is perfectly suited for the smelters, for they require the coal to be rather finely crushed in the latter part of the smelting process, to facilitate the rapid combustion necessary to generate the heat required.

Favored by these conditions, the operations of the zinc smelters in the Pittsburg district increased in volume steadily up to 1898. In 1891 there were six smelters, with a total of forty-two furnaces, in Pittsburg, with a daily capacity of fifty tons of spelter. At the prevailing prices,³⁴⁰ this product was worth about \$9000 daily, and nearly a thousand men were employed about the works.³⁴¹ In the following year the list of smelters shows a slight scattering of the establishments into the near-by towns of the coal district. Galena had a small establishment, shipping in the coal instead of sending the ore away. The disadvantage in this was that the freight would be about three and a half times as much as by the other means, since about three and a half tons of coal were ordinarily required to reduce a ton of ore.³⁴² The other smelters were in the coal towns, however. Scammon and Weir City, both south of Pittsburg, and in the shallower coal, each had one, while Girard, ten miles to the northwest, had one plant. As the production of the zinc mines increased during the '90's, the output of the Kansas

NOTE 336.—Topeka *Capital*, June 4, 1889.

NOTE 337.—Min. Res. Kan., 1897, p. 34.

NOTE 338.—Topeka *Capital*, June 4, 1889.

NOTE 339.—The relative cost of the different grades of coal is shown by the following figures from Mr. Ingalls's book, "Production and Properties of Zinc," pp. 42, 43:

Year.	Cost, slack, per ton.	Cost, mine run, per ton.
1899.....	\$0 35 to \$0 60	\$1 00 to \$1 10
1900.....	75 to 85	1 50 to 1 75

NOTE 340.—\$108.82 per ton in New York for the year.

NOTE 341.—Topeka *State Journal*, November 7, 1891.

NOTE 342.—Min. Res. Kan., 1897, p. 33.

smelters increased accordingly.³⁴³ "Our Kansas smelters have long been so extensive that they have consumed much more ore than our Kansas mines have produced. The Kansas and Missouri mines are so close together that no difference could be made between them by the ore buyers. It is not proper to say that all the Kansas ore is smelted in Kansas territory. It is proper to say, however, that a much larger amount of ore is smelted in Kansas territory than is produced from the Kansas mines, as much more than half of the Missouri ore is shipped to the Kansas smelters."³⁴⁴

While the reduction of the raw ore to the spelter form in which it reaches the market is rather an elaborate one, the outline is comparatively simple, and the equipment is not at all extensive or elaborate. The ores reach the smelters from the crushers and concentrators, which are without exception located at the mines, as a finely crushed concentrate varying from perhaps forty to eighty per cent of ore, the rest being flint and the like that is not perfectly separated. The smelter itself consists of the old-fashioned Belgian furnace that has been in use for decades, the only modification being confined to improvements in the methods of handling the ores. The following paragraph³⁴⁵ gives the process in outline:

"The process consists first, after the ore is crushed, in passing it through a calcining furnace in which it is thoroughly roasted until all the sulphur is removed and the metal is left behind in the form of an oxide. It is then intimately mixed with the proper amount of carbon, generally in the form of coke, which has been produced on the grounds, and placed inside a clay retort which is heated externally until by the reducing action of the carbon the whole of the zinc oxide is reduced to a metallic state. The heat of the furnace volatilizes the zinc as fast as it is deprived of oxygen, and drives it into a conical clay receptacle attached to the retort, but which projects outside the furnace. Here it is cooled to the liquid state, and is drawn out and molded, when it is ready for the market."

From this description of the process that obtained in all the zinc smelters, it will be readily divined that the establishments were not necessarily elaborate. The following description, written in 1891, of the smelting practices of the district, shows that there was a certain looseness and carelessness about the operations that would not be tolerated now. These conditions are characteristic of the smelters all through the period up to the introduction of the gas furnaces after 1898, and to some extent since that time, but in a different aspect, as will be seen later. "The furnaces are in most cases built with the ash pits above the ground with a sloping bank of earth or cinders leading up to the furnace floor. The buildings are scarcely more than sheds, . . . and the first cost is inconsiderable. In the smelting proc-

NOTE 343.—The production of the Kansas mines and the output of the Kansas smelters for the ten years prior to the introduction of the gas smelters is as follows:

Year.	Mine product.	Tons spelter.	Value.
1888.....	33,391	10,432	\$1,025,902 88
1889.....	32,950	13,658	1,368,531 60
1890.....	21,675	15,199	1,652,891 25
1891.....	20,641	22,747	2,475,336 96
1892.....	23,811	24,715	2,218,912 70
1893.....	25,028	22,815	1,733,755 63
1894.....	28,670	25,588	1,902,162 84
1895.....	41,232	25,775	1,831,056 00
1896.....	62,232	20,759	1,653,593 30
1897.....	59,451	33,443	2,755,703 20
1898.....	74,852	38,543	3,508,524 27

NOTE 344.—Min. Res. Kan., 1897, p. 33.

NOTE 345.—Ibid, pp. 33, 34.

ess the cheapness of fuel makes economy in this direction unimportant, and cheapness of living makes labor obtainable at wages as low as anywhere in the country.

"The works are owned by partners, who do the work of salaried employees, and consider as profit what would be only the interest on their money and wages at any other occupation. The furnaces are roughly constructed of inferior material, and will not long sustain the heat required to exhaust the zinc from the cinder. It is the accepted opinion that there is no economy in butchering the furnace for the small additional per cent of the metal; it is preferred to increase the production of the furnace and to reduce the cost of labor and fuel by increasing the charge of ore; . . . in other words, to butcher the ore to save the furnace."³⁴⁶ The only criticism with this description is perhaps that it applies more particularly to the early part of the '90's. Soon after 1890 there was a movement in the direction of the organization of joint-stock companies, the laborers sharing in the profits. Also the personal element of the original shareholders became more or less submerged in the extension of the smelters in the '90's. As to the methods pursued, however, there was little change, the increase in size of the smelters being accomplished by the addition of a larger number of furnaces answering to the above description.

The year 1896, which was marked by the beginning of the work on the first gas smelter at Iola by Robert Lanyon's Sons, successors to the first Pittsburg firm of Robert Lanyon & Co., is the beginning of the present period in the zinc-smelting industry. The development of the gas field in the five or six years following completely revolutionized the smelting industry in Kansas, and moved the smelting district first to a center at Iola, the home of the first important gas development, and a little later to a number of towns southward toward the state line, and finally into the Oklahoma field, with the building of the three large smelters at Bartlesville since 1905. The gas was turned on in the first Lanyon smelter at Iola late in the year of 1896, and in the following year the smelter began operations in earnest. Shortly afterward W. & J. Lanyon, cousins of the first comers, left the Pittsburg district, and built a second smelter at Iola with 1800 retorts. In 1899 George E. Nicholson built the third smelter at Iola, with 1200 retorts; the Robert Lanyon's Sons built a second smelter of 3000 retorts at La Harpe, about four miles from Iola, and the Cherokee Lanyons began operations at Gas City, midway between La Harpe and Iola. Two other small furnaces were started in the same year, and at the same time the Edgar Zinc Company started their 1800-retort smelter at Cherryvale.³⁴⁷

This building, started in 1898, practically comprised the smelter extension of the '90's, and the others came after the gas development of 1900-1902. The smelter capacity at this time was about 12,000 retorts heated by gas, as against 9000 retorts in the various coal furnaces of the state.³⁴⁸ By 1900 the coal smelters of the Pittsburg district had practically suspended operations on account of the disadvantage they had in competing with the gas furnaces, which saved a great fuel expense, as well as labor expense in the use of the gas in the furnaces.³⁴⁹ On account of this disadvantage; accom-

NOTE 346.—F. L. Clerc, "Kansas-Missouri Smelting Practices," in Min. Res. U. S., 1882.

NOTE 347.—Min. Res. Kan., 1898, pp. 38, 39. *Iola Register*, May 13, 1907.

NOTE 348.—Min. Res. Kan., 1898, p. 39.

NOTE 349.—Ingalls, Zinc, p. 38-40.

panied as it was by a rise in the price of coal which was going on at this time for various reasons, the coal smelters found it impracticable to continue operations. Most of the companies went to the gas field as soon as the advantages were demonstrated, deserting the cheaply constructed furnaces without taking the trouble to dismantle them in most cases.

At this same time another important change was being accomplished in the consolidation of the small companies into a few larger companies, with the result that administrative expenses were cut down and competition was sharpened between the stronger and more aggressive companies thus formed. This movement began as early as 1896, before the movement to the gas belt was well under way, in the organization of the Cherokee-Lanyon company. This was a consolidation of five different companies, operating seven coal smelters at Scammon, Pittsburg, Weir City, Cherokee, Kan., and Nevada, Mo. It was this company that built the second gas smelter at Iola. Then in 1899 a second consolidation was effected by which the Robert Lanyon's Sons and W. and J. Lanyon companies, with two smelters each, were united in the Lanyon Zinc Company, making it the strongest in the field at this time.³⁵⁰ A third consolidation was effected in 1902, by which the plants of the Prime Western Spelter Company, the A. B. Cockerill Company, and the George E. Nicholson Company, in the Iola field, were taken over by the New Jersey Zinc Company, one of the large operators of the United States.³⁵¹

The year 1902 was also marked by the erection of the first zinc rolling mill west of the Mississippi, and by the building of a smelter equipped for the recovery of sulphuric acid from the roasting furnaces. The Lanyon Zinc Company built its rolling mill at La Harpe, equipped for an output of twenty tons of sheet zinc every twenty-four hours, the product including strip, rod, and sheet zinc of all grades.³⁵² The sulphuric acid works were built at Iola by the United Zinc and Chemical Company, which had for several years been operating a plant at Argentine, Kan., manufacturing large quantities of sulphuric acid. The rise of the importance of the oil-refining business in this section, demanding as it does large quantities of sulphuric acid in the finishing processes, made it advisable to build this new plant to supply the increasing demand. The daily capacity of the new smelter, for that is what in effect it is, is about forty-five tons of ore per day. There are three blocks of furnaces, containing in all 1728 retorts; on the whole, a good-sized smelter. The sulphur gas from which the acid is made is recovered in the preliminary roasting process, and takes nothing from the amount of the metallic zinc that results. As there is a constantly growing demand for sulphuric acid,³⁵³ it is highly profitable to recover this by-product of the smelters, but strangely enough no other smelt-

NOTE 350.—This consolidation was but a part of the centralization of the smelting industry of the entire country into a few large companies. Practically the whole of the smelting activity of the country, after these Kansas consolidations, was in the hands of seven large companies. The consumption of the spelter is no less centralized, there being but about seven companies using considerable quantities of it. Half the demand for zinc is for galvanizing purposes, and the United States Steel Corporation, which owns the Edgar Zinc Company at Cherryvale and the Girard Spelter Company at Girard, is the chief consumer. There are but four sheet zinc mills in the country, one brass compound company, and one concern that uses zinc in desilverization of lead. It is estimated that four-fifths of the zinc produced in the United States is used by these seven companies.—Ingalls, "Production and Properties of Zinc," p. 47.

NOTE 351.—Ingalls, "Production and Properties of Zinc," p. 22.

NOTE 352.—Iola Register, May 13, 1907.

NOTE 353.—It is used in the manufacture of fertilizer, in refining petroleum, manufacture of nitro-glycerine, alum, soda-ash, ammonium sulphate and blue vitriol principally.

ers in the Kansas-Oklahoma gas belt are equipped for it. The reason is not easy to determine, for it is to the recovery of this product that the new and expensively equipped coal smelters in the Illinois field, that have been built in the last two or three years, owe the advantage that enables them to compete successfully against the low freight rates the Kansas smelters get on account of their nearness to the ore supply.³⁵⁴

It is more than possible that the initial cost of equipping the roasting furnaces for the recovery of sulphuric acid is the deterrent influence. There is to the present time a certain temporary character about all the smelters of the gas belt, caused perhaps by the uncertainty of the duration of the gas supply. Certain it is that there are no smelters so well built and perfectly equipped for permanent activity in this district as the new smelters that are being built in the Illinois field, where there is an expectation of depending wholly upon coal for fuel.* The southward movement of the center of the zinc-smelting activity since 1900 is an indication of the present instability of the gas smelters in the district. There has been a gradual southward movement going on all the time,³⁵⁵ until now there is a smelting center at Bartlesville, Okla., second only to the Iola smelters in the number of plants and the number of retorts.³⁵⁶

In 1905 the Lanyon-Starr Company began the erection of the first zinc smelter south of the Kansas line, at Bartlesville, Okla.,³⁵⁷ in the heart of the new gas field, where the fuel supply is more abundant and less expensive. As early as this there had been felt a growing difficulty of obtaining natural gas in the northern end of the field cheaply enough to have any advantage over the coal smelters, and the prospect of a further failure in the supply of the gas wells led to this move, which was soon followed by the erection of two more large smelters, which were in full blast through 1907.³⁵⁸ The smelters of the American Zinc, Lead and Smelting Company at Caney and Deering, near the state line in Montgomery county, and those at Bartlesville, are probably the only ones that are able to get their supply of gas as advantageously as could be had when the movement began to the gas belt.³⁵⁸ As the gas development of Oklahoma is as yet but well begun, it may be expected that this movement will continue, and in time, if the gas holds out in abundance, there will be an exodus from the Iola district to Oklahoma. The only thing that will prevent will be the event that all the desirable gas lands may be leased before the disadvantages of the other locations force the attention of the smelter companies to the desirability of moving. The situation now is that there is no advantage in getting gas from a supplying company for an industry dependent as largely as is the smelting business on the fuel supply.

NOTE 354.—Ingalls, Zinc, p. 39.

NOTE 355.—In 1902 the Girard Smelting Company left Girard and built a smelter at Chanute; in 1903 the Lanyons were about to build at Neodesha, but sold their contracts to the Granby Mining and Smelting Company of St. Louis, who were operating extensive mining properties in the Joplin district. They put two furnaces into operation the first year, and gradually increased to six, with 3840 retorts in 1907. Then the Cockerill Zinc Company put in a smelter at Altoona, north of Neodesha, followed soon after by the building of the Lanyon smelters at Caney and Deering, southward.

NOTE 356.—Eng. & Min. Jour., January 4, 1908.

NOTE 357.—Min. Res. U. S., 1906, p. 472.

NOTE 358.—Eng. & Min. Jour., January 4, 1908.

* Ingalls, Eng. & Min. Jour., January 4, 1908

Even before the building of the large smelters at Bartlesville there was another movement toward the reopening of the old Pittsburg coal smelters, indicative of the same condition, namely, the passing of the great fuel advantage that the gas smelters had at first enjoyed. That this is the reason of the move is shown by the fact that the first move was made by one of the Lanyons, who fitted up and started one of the old smelters in May, 1904. Even earlier than that, the Cockerill Zinc Company had reopened its old coal smelter at Rich Hill, Mo., and late in 1904 local capitalists bought up another of the old Pittsburg plants and put it into commission. Doubts as to the advantage of the gas smelters at that time was given as the reason for the move.³⁵⁹ Another thing that must, however, be considered in this connection, is that these coal smelters are much smaller propositions, and the personal attention that the proprietors can give to the metallurgy and general management is a decided advantage in some respects. The operation of these coal smelters has continued at Pittsburg, Kan., and at Rich Hill and Nevada, Mo., where they were in operation before the discovery of gas.³⁶⁰ Slack coal at seventy-five cents a ton, the usual price in the Pittsburg district for several years, makes it almost a stand-off with five-cent gas.

Just what will be the outcome of the situation with the smelting industry it is impossible to say. When the gas ultimately fails, if the ore supply is still in existence in the Joplin district, it is more than probable that there will be a return to the coal district. The tendency in the Illinois field at the present time to build larger and improved coal smelters, depending on economies of metallurgy rather than of fuel, has been mentioned. That will doubtless be the final solution of the difficulties here. "With modern gas producers and coal costing eighty and eighty-five cents per ton (a little above the average for good slack at Pittsburg), gas can be artificially made for two and a half cents a thousand; the ratio is as one to two to natural gas in calorific power, which would make natural gas at five cents equal to the artificial gas."³⁶¹ The artificial gas plants could be producing coke, which is required in small amounts, and this would be an added advantage. There may never be an attempt to use artificial gas in the smelters, but the above statement shows possibilities in that direction.

The development that has been going on in the smelter industry in the Kansas-Oklahoma field comprises what has been denominated the most important change in the industry since its introduction in the United States:³⁶² growth of production and the use of natural gas as fuel. The growth of the industry in the ten years following the introduction of the first gas furnaces has indeed been remarkable. The smelters in Kansas alone have quadrupled their output in that time, and in 1906 were producing one and a half times as much spelter as the whole United States produced ten years before. The growth and the new fuel have been largely confined to the district included by Kansas and the new Oklahoma field.³⁶³

NOTE 359.—Pittsburg *Headlight*, September 10, 1904.

NOTE 360.—Eng. & Min. Jour., January 4, 1908.

NOTE 361.—Ingalls, "Production and Properties of Zinc," p. 44.

NOTE 362.—Ibid, p. 25.

NOTE 363.—See tables in Mineral Resources of the United States for 1906, and in Mineral Resources of Kansas, 1903, for figures in detail.

It is singular that there should have been so little real change in the methods as the zinc-smelting industry has experienced. In many cases the methods employed are practically those of thirty or forty years ago, especially in the case of the smaller coal furnaces. "Up to a few years ago the same type of distillation furnace was used that was in use at the time of the inception of the industry in this country. The introduction of the Wetherill process, the mechanical roasting furnaces and the use of natural gas in Kansas are the principal changes. So gradual has been the evolution that many methods and types of furnaces have remained unchanged through long periods of years. . . . For successful distillation of zinc ore, we seem to be limited to comparatively small retorts; all attempts . . . in blast furnaces and otherwise on a large scale, save for the production of zinc oxide, have been failures."³⁶⁴ The progress in the industry has been confined chiefly to mechanical devices in the handling of ores, extending little further than the roasting furnace, and not even generally so far as the application of the devices for the recovery of sulphuric acid.

The following directory of zinc smelters in this district in 1908 is given by Mr. Ingalls³⁶⁵ as follows:

Company.	Location of works.	Furnaces.	Retorts.
Edgar Zinc Co.....	Cherryvale.....	24.....	4,800
Lanyon Zinc Co.....	Iola.....	5.....	3,000
Lanyon Zinc Co.....	".....	5.....	3,000
Lanyon Zinc Co.....	".....	5.....	3,000
United Zinc and Chemical Co.....	".....	4.....	2,304
United Zinc and Chemical Co.....	".....	2.....	480
Cockerill Zinc Co.....	".....	5.....	3,000
Cockerill Zinc Co.....	".....	3.....	1,800
Cockerill Zinc Co.....	Altoona.....	5.....	3,000
Cockerill Zinc Co.....	Pittsburg.....	3.....	672
Granby M. and S. Co.....	Neodesha.....	6.....	3,840
American Zinc, L. and S. Co.....	Caney.....	6.....	3,720
American Zinc, L. and S. Co.....	Deering.....	6.....	3,720
Prime Western Spelter Co.....	Iola.....	9.....	5,344
Prime Western Spelter Co.....	".....	5.....	3,220
Bartlesville Zinc Co.....	Bartlesville.....	6.....	3,456
Pittsburg Zinc Co.....	Pittsburg.....	3.....	672
Lanyon-Starr S. Co.....	".....	6.....	3,720
National Zinc Co.....	".....	4.....	2,432
Chanute Zinc Co.....	Chanute.....	8.....	1,600

There are outside of this district thirteen smelters, having a total of seventy-eight furnaces and 31,276 retorts, being considerably less than half the equipment in the gas belt. The relation of the number and size of the smelters to the production of spelter is very close, the share of the district being about fifty-eight per cent of all the spelter produced in the United States.

NOTE 364.—According to W. R. Ingalls, the noteworthy improvements of the past forty years in the metallurgy of zinc are: (a) Growing importance of the zinc blends as a source of the supply; (b) introduction of mechanically raked furnaces; (c) recovery of sulphuric acid from the gas; (d) gas firing, accompanied by the use of larger furnaces; (e) improved retorts; (f) control of fumes (only in European smelters); (g) labor-saving devices in handling material; (h) natural gas fuel in the United States.—Prod. and Met., Zinc, p. 24.

NOTE 365.—Eng. & Min. Jour., January 4, 1908.

The smelting of lead has always attracted less attention than the zinc-smelting industry, and there is little information accessible on the subject. Lead was the first product of the Joplin district, and on account of the ease of smelting it was the first ore that was smelted in the vicinity of the mining camps. As early as 1853 there was a furnace for the reduction of lead ore about five miles north of Joplin, and nearly a thousand tons of lead were smelted in Jasper county in the five years after 1850. At the outbreak of the Civil War there were two furnaces in the county, reducing the ore with charcoal as fuel.³⁶⁶ Small lead smelters were scattered about the smelter district from time to time, the activity varying somewhat in the different parts of it for various reasons. In 1889 there were furnaces at Joplin, Mo., Pittsburg and Weir City, Kan., and Rich Hill, Mo. An earlier furnace at Galena was closed at this time. The process of lead smelting is comparatively simple and easy,³⁶⁷ and the early furnaces were not very elaborate.

Early in the history of Galena there were some small "Scotch Eyes" in operation reducing a part of the lead produced in that immediate vicinity. They were running for about eight years, when they closed on account of temporary fuel conditions. "Nothing more was done in the line of lead smelting at Galena until 1897. During that year two different companies established smelters at Galena, and began operations on a tolerably large scale. . . . From the closing of the first Galena smelters to the establishing of the latest ones, the Galena ore was principally shipped to the Joplin smelters. A small portion of it went west to supply the demand for lead in the gold and silver smelting furnaces of the Rocky Mountain district. Occasionally, during the last few years, a part of the ore was shipped to the refining works at Argentine. This latter company is doing a large business in refining gold and silver bullion. As a result, it is sending vast quantities of metallic lead ore onto the market, and has established such a reputation as a producer of pure soft lead that it is enabled to make unusually advantageous sales. During the latter part of 1897, particularly, this company entered the markets of Galena and Joplin and bought large quantities of lead ore which were shipped to the smelter at Argentine."³⁶⁸

This Argentine plant, for many years the largest in the country, is worth special mention. It was built about 1880 for the purpose of refining gold and silver bullion shipped in from the other smelters, and for such other kindred work as they could profitably follow. In the latter '90's the company had a paid-up capital of three million dollars, operating smelters at Leadville and El Paso, and shipped the gross bullion, containing large quan-

NOTE 366.—Missouri Geol. Surv., vol. VI, pp. 288, 289.

NOTE 367.—"The smelting furnace most commonly used in the southwestern district is the Scotch Eye." As usually built, a considerable amount of the metallic lead is volatilized, and escapes through the smokestack. Years ago the Lewis patent process for saving these metallic fumes was used in the Moffet smelter at Joplin. This consists essentially in suspending a large number of woolen bags from the ceiling of a large chamber, the lower ends of which are fastened over registers through which the whole of the material escaping through the smokestack must pass. The gaseous products pass slowly through the bags, while the solid products are strained out. The lead vapor escaping from the furnace is soon changed into lead oxide, which in turn is changed into lead sulphate by the sulphur fumes likewise escaping through the smokestack. The product is therefore got in the shape of lead sulphate, and when properly separated from the fumes is used as pigment for white paint. Since the shutting down of the Moffet smelter the same process is used by the Pitcher Smelting Company of Joplin. The new smelters at Galena have attachments for accomplishing the same end, although very different in construction. It is claimed by the operators of this process that the savings are enough to make a handsome margin of profit, so that the old-fashioned 'Scotch Eye,' with no attachments for saving the fumes, has gone out of use."—Min. Res. Kan., 1897, pp. 32, 33.

NOTE 368.—Min. Res. Kan., 1897, p. 32.

tities of lead, to the Argentine plant for final refining. Commercial conditions were such that they could ship the gross bullion to Kansas City as cheaply as they could send the refined metals, and thus the freight on the lead contained in the bullion was saved entirely. The plant carried on lead smelting and the manufacture of various commercial products from the other metals that are recovered in the refining process, chief of which were blue vitriol and white vitriol. The copper was all made into blue vitriol, and in 1897 a million and a half pounds were put on the market from the Argentine plant. Part of the lead was sold in the metallic state, and part of it changed into litharge and put on the market at an advanced price. The operations of the company in the Argentine plant in 1896 amounted to over sixteen and a half million dollars, of which over two millions were the lead products.³⁶⁹ For some reason the refinery and its smelter departments were closed about 1900, and have not been opened since that time. The consolidation of the lead producers probably had much to do with it however.³⁷⁰

Owing to the fact that fuel is of less relative importance in the reduction of lead ores, there has been no such movement of the smelters that reduce the Kansas-Missouri lead from the Joplin district into the gas belt. The only lead smelter in the gas belt is that of the Ozark Mining and Smelting Company, which also operates one of the Joplin smelters. The principal operations of this company are centered in the production of white lead and zinc oxide. The other Joplin smelter, as well as the Galena establishment, is equipped for the production of white lead from the fumes. Practically all of the ore from the Joplin district, about 35,000 to 40,000 tons annually, is reduced in these smelters mentioned.³⁷¹ The lead smelters are apparently prosperous, and are in operation practically all the time, their capacity being approximately commensurate with the production of the Joplin field. No definite information about the present operations is, however, obtainable.³⁷²

SALT.

Although there has been salt produced in Kansas by artificial methods almost from the time of its admission as a state, curiously enough the extent and importance of the vast salt beds in the central part of the state were discovered almost by accident. It was at the time of the oil and gas excitement that was permeating the eastern part of the state in the latter '80's that the settlement of the central part of the state was accomplished, and without any reliable data upon which to base their hopes, nearly every town through that section was actively engaged in prospecting for oil and gas or coal, or anything else that they could find. It was a time of prosperity,

NOTE 369.—Min. Res. Kan., 1897, pp. 15, 16.

NOTE 370.—"In the operating field the lead industry is widely different from the zinc industry. In the latter the production is by nearly twenty different companies, the bulk of it by six large competing companies, while in the lead industry a single corporation, the American Smelting and Refining Company, dominates the entire field, with interests exceeding the combined interests of all the others."—Min. Res. U. S., 1906, p. 440.

NOTE 371.—Min. Res. U. S., 1906, p. 448.

NOTE 372.—Either owing to the fact that each of these companies has developed processes of its own, or that it desires for some reason or other to keep its operations secret, it is practically impossible to get into the works or to get any figures about the business of the different works. For this reason it is impossible to state whether there is any connection between the smelters in this district and the monopoly spoken of above (note, p. 370) or not. For the same reason it is impossible to indulge in any satisfactory discussion of the methods or classes of production other than the bare outline that has been suggested above.

and ready cash was to be had for any such enterprises. Settlers were literally swarming into that section of the state from Missouri, Iowa and Eastern states. It was a boom time for the towns of that section, and factories were projected without number that never materialized as a matter of fact. It was this very situation, however, that brought to light the salt beds. From 1887 to 1888, Ellsworth, Lyons, Hutchinson, Great Bend, Kanopolis, Pratt, Nickerson, Sterling, Anthony, and Wellington organized companies for the prospecting for oil and gas, and by the end of 1888 every one of them had given up the project, with nothing but rock salt to show for their operations.³⁷³

Hutchinson, destined to be the town to profit most from this prospecting, was one of the towns that felt the boom the most, and a drilling project was under way in 1887. The well was put down by Ben Blanchard, of that place, who had the promise of aid from the citizens. As the work progressed, however, without finding anything of importance, the promised assistance faded away, and Mr. Blanchard finished the well alone. The well struck salt at a depth of 500 feet, and left the last layer at 847 feet.³⁷⁴ Mr. Blanchard fenced in the well and continued the prospecting on his own account in secret, and finally found a little oil below the salt. Nothing came of the oil, however, and the excitement that it started subsided, as no one at the time realized the importance of the salt bed that had been uncovered. Kingman, twenty-five miles south of Hutchinson, penetrated a heavy salt bed 250 feet in thickness in July, 1887,³⁷⁵ and in the following December Lyons, about the same distance northwest of Hutchinson, got a heavy salt bed at a depth of about 800 feet that was nearly 300 feet thick.³⁷⁶ Kanopolis, Sterling and Anthony were other towns that found the salt beds in the same year, and practically fixed its northern and southern limits.³⁷⁷

Rather strangely at first the discovery of the salt attracted practically no attention other than curiosity; that in spite of the fact that there had been a small solar salt plant in operation at Solomon City, in Dickinson county, about thirty miles west of Fort Riley, since 1867, and salt had been an object of considerable attention and activity since the first settlement of the territory and the adoption of the constitution.³⁷⁸ The salt marshes that were found along the eastern horizon of what is now known to be the extent of the rock salt area were of considerable importance to the early settlers, and limited quantities of salt were manufactured from them and

NOTE 373.—Min. Res. Kan., 1898, p. 78.

NOTE 374.—Log of Well in Min. Res. Kan., 1898, p. 92.

NOTE 375.—Min. Res. Kan., 1898, p. 91.

NOTE 376.—Ibid, p. 80.

NOTE 377.—"In an east-and-west line the thickness of the salt . . . varies, but how far westward it extends is entirely unknown. The eastern limit of the lake or sea from the waters of which this salt was precipitated is moderately well known, while we are yet in total ignorance of its western extent. In the north-and-south direction our knowledge covers a little wider area, reaching from Anthony on the south to Kanopolis on the north. . . . The salt beds at Anthony are 404 feet thick; at Kingman they are 415 feet thick; at Hutchinson they have thinned to 380 feet, while at Lyons they have decreased to a thickness of 275 feet, and at Kanopolis to one of 250 feet. At this rate of decrease . . . they would entirely disappear before the north line of the state is reached."—Min. Res. Kan., 1898, pp. 87, 88.

NOTE 378.—The constitution of the territory of Kansas, adopted at Wyandotte July 29, 1859, and approved by Congress when it was admitted into the Union, contained the following provision: "Sec. 5. That all salt springs, not exceeding twelve in number, with six sections of land adjacent to each, together with all mines, with the land necessary for their full use, shall be granted to the state for works of public improvement." See, also, Kan. Hist. Coll., vol. X, p. 231, table showing "grants to public land states upon admission to the Union." Ten other states besides Kansas have received twelve salt springs with six sections of land adjacent.

sold in the state from the '60's on.³⁷⁹ The salt factory at Solomon City was the first of any considerable size in the state, and though it has had a rather checkered career it has produced several thousand barrels of salt annually until only a few years ago, and gave Kansas a place as a salt-producing state long before the development about 1890.³⁸⁰

It was a New York salt company that was the first to realize the importance of the salt discovery, and soon after Mr. Blanchard's prospect well went through the salt they had the ground looked over, and put down two wells in Hutchinson, and began the erection of a salt factory. This was the first of the factories that followed the discoveries of the salt beds, and put Kansas in the list of important salt producers. It was opened early in 1888, and the first salt was made March 15. It had a daily capacity of 600 barrels, and made about 70,000 barrels in the first year of its operation. The same spirit of boom development that had inspired the first prospecting for oil and gas seized upon the new project as soon as the Guinlock & Humphrey plant was started, and within a year from the opening of the first factory there were twelve salt plants in operation or just ready to begin operations in the city of Hutchinson alone. The daily capacity of these factories within a year was nearly 5000 barrels, or more than a million and a half barrels annually—almost as much as is actually produced to-day by the Hutchinson salt plants. There is no information to show what share the Eastern salt companies had in this development, but there were at least three Eastern companies concerned in this first activity.³⁸¹

The building of salt plants was by no means confined to Hutchinson, however, and in the same year seven other plants were built at Anthony, Nickerson, Sterling, Wellington and Great Bend.³⁸² Conditions were at first unfavorable for these plants, and half or more of them made no attempt to live when the disadvantages became apparent. The two factories

NOTE 379.—The first salt was made by Mr. J. G. Tuthill, one of the early settlers of Republic county, from a marsh near his farm, about fifty miles northwest of Fort Riley. "In the manufacture of salt, Mr. Tuthill would collect the scales from over the marsh and dissolve them in water, allow the earthy impurities to subside, and siphon off the clear brine and evaporate it to dryness to recover the salt. . . . When the weather was not favorable for the formation of salt scales over the marsh, he would dip or pump the brine from the small wells and haul it to his little salt factory. The brine was evaporated from large kettles, in much the same way that our fathers evaporated sugar water in Indiana, Ohio and the Eastern states. At the present time this sounds like a very primitive method, but at that time it was in accordance with the most approved process. Portions of the arch of Mr. Tuthill's kettle salt plant still stand to mark the spot of his primitive factory. In the early '60's Mr. Tuthill made salt and hauled it to Manhattan, where he received as high as ten cents a pound for it. Mr. Hazen says he sold over a hundred barrels of salt made by Mr. Tuthill and other farmers from 1873 to 1876 while he kept a store in Seapo, Republic county (now extinct)."—Min. Res. Kan., 1898, pp. 72, 73.

NOTE 380.—The salt springs at Solomon City were made known to Eastern salt makers by accident in 1866, and in 1867 a representative of the Continental Salt Company, of New Bedford, Mass., drilled a well to a depth of a hundred feet, striking a good supply of brine at eighty-four feet. The company sold out in a short time, but the factory was operated until 1877. In 1874 a second well was drilled and operated until 1876 under the name of the Wimsatt Salt Works. "Brooks and Brown, of the West Virginia Salt Works, operated it during the years 1876 and 1877. In 1880 the National Solar Salt Company began operations, and in 1881 the two plants were merged into one, and this company operated them until 1885. It was practically closed until 1888, when Mr. Wimsatt operated it first for R. J. Weemys and later for R. W. Wirt. In 1890 it became the property of its present owner, The Solomon Solar Salt Company. As can be seen from the above this plant has gone through numerous changes, and the work has been irregular. . . . The present superintendent says they have a capacity of about 7000 barrels a year."—Min. Res. Kan., 1898, p. 76.

NOTE 381.—Min. Res. U. S., 1888, p. 609.

NOTE 382.—Anthony had two plants with a total capacity of 950 barrels daily. One of them operated three months only, and the other struggled along for three years. The plant of the Nickerson Salt Company had a capacity of 350 barrels. It was sold to a Hutchinson company in 1891, and closed. Sterling had two plants, one of which was in operation but a few months. [In 1890 four plants were built, two of which lived but a year or two, while the others continued in business until about 1900.]—Min. Res. Kan., 1898, pp. 80-84.

at Anthony were closed in a short time, and the one at Wellington lived about a year. All over the salt bed, however, there were plants of various sizes erected, and in 1890 there were no less than twenty-eight factories in the state.³⁸³ At this time there was a great disadvantage that the Kansas salt makers had to contend with in competition with the Michigan salt factories in the fuel problem. In that district the practice of using lumber waste for fuel at a cost of nothing or even less than nothing, since it saved the expense of destroying the waste, gave a wonderful advantage to the factories of that section. For this reason it was impossible for Kansas salt to go East at all, as the Michigan makers were also favored by freight rates that had been made to encourage the industry in its infancy.

With conditions in such a state, it is no wonder that so many of the early Kansas salt plants gave up the struggle. In self-defense the larger operators about Hutchinson, who had the advantage over many of the others in an abundant water supply that some of the others did not have, bought up many of the larger plants and closed them to prevent the total demoralization of the trade. Even in 1890 one of the larger Hutchinson plants had gotten control of seven other plants, and as early as that the consolidations had benefited trade conditions to a certain extent.³⁸⁴ The financial difficulties soon after this and the hard times following them made matters still more critical for the smaller plants, and resulted in a great reduction of the number. About this time one of the sons of J. Sterling Morton bought an interest in one of the largest plants, and soon thereafter the freight rates were adjusted more favorably for the Kansas factories. It is generally understood that the concessions were secured by Mr. Morton through his brother, Paul Morton, then traffic manager of the Santa Fe railway, but this cannot be definitely confirmed. The fact remains that the Santa Fe made the first concession, and a general advantage in rates resulted to the Kansas plants. At the present time the salt is marketed anywhere this side of the Mississippi river, conditions making that the natural division line.³⁸⁵

At the same time that these plants were building for the manufacturing of salt by the evaporating process there were mines opened at various places in the salt belt for the mining and crushing of the rock salt. At many places there are layers of the salt that are practically pure, and save for a little gray shale there is nothing to give trouble in the production by this method. Salt mining also was considerably overdone at the very beginning, for as there are always some impurities in the salt gotten by this method it cannot compete with the evaporated salt, and some of the mines were soon closed. Kingman (southwest) was the pioneer, and local capital put down a shaft in 1888 that produced salt for about two years. Soon afterward a Chicago company put down a large shaft, said to be one of the largest in the world, and began mining on a large scale. The company had financial difficulties in 1893, and the plant went into the hands of the iron company that put in the machinery. It was closed for nearly ten years, but has been producing considerable quantities of salt recently, all of which is shipped to Chicago. In 1890 a shaft was sunk at Lyons by local capital, associated with some St. Louis men, and the company has been producing

NOTE 383.—Robt. Hay, in Seventh Bien. Rept., Bd. of Ag., Kan., p. 95.

NOTE 384.—Seventh Bien. Rept., Bd. of Ag., Kan., part 2, p. 96.

NOTE 385.—Interview, 1908.

salt regularly ever since. At Kanopolis there was also a mine sunk about 1890, which has been actively producing all the time. This mine was bought by the Lyons company some years ago, and the product of the two shafts are marketed together. The mines do not run full capacity, for the Lyons shaft alone could produce 1000 barrels a day,³⁸⁶ more than enough to supply the demand for rock salt for all the territory west of the Mississippi river.³⁸⁷

The methods of production in the evaporating plants have been radically changed since the first plants were built twenty years ago. Then the universal method was that used by our grandfathers in sugar making, where the heat was applied directly beneath a large open pan, and the liquid boiled until the salt was deposited on the bottom of the pan, and raked out to dry. This method was slow and required a great deal of fuel, besides making a coarse grade of salt. For this reason the steam-grainer method was soon introduced, patterned after that used in the Saginaw district of Michigan. The brine is heated by the passage of steam through the pipes, which are placed about midway of the depth of the pan. The salt made in this way is of fair fineness, and, since the introduction of automatic raking devices for drawing the salt from the bottom of the pans, is cheaper than the old method. It is now used to a great extent by all the Kansas plants, and almost exclusively by some of them. The last change in methods of production is that called the "vacuum-pan" method, which was introduced by the largest of the Hutchinson companies in 1895. Evaporation is facilitated by this method by preserving a vacuum above the pan all the time, and a much finer grade of salt results. This is the only plant of the kind in this section of the country.

The center of the salt industry is, as it has been from the beginning, at Hutchinson, where there are four rather extensive works, and a fifth that produces small quantities of salt. Probably half or more of the salt of the state, however, is made in the one plant known as the Morton plant, said to be the largest single salt plant in the world. About one-fifth of all the salt produced goes in bulk to the packing houses along the Missouri river, for use in packing and curing meats. About two-thirds of the balance is put on the market in barrels, and the rest in sacks of various sizes for domestic purposes.

Since 1907 the salt factories have been using gas in their boilers from the pipes of the Kansas Natural Gas Company, the advantage being principally due to the convenience in firing, and the saving of labor incidental to the use of coal.³⁸⁸ The solar plant is no longer in operation at Solomon City, it having yielded to the superior methods employed by the other and larger establishments, while only small quantities of salt are produced by the fac-

NOTE 386.—Min. Res. Kan., 1898, p. 103.

NOTE 387.—The methods employed in these two mines are very similar to ordinary coal-mining operations. The salt is undercut in the mines with compressed-air drills and blasted down with dynamite. The blocks are hoisted to the surface and run through the breakers, and sorted down by a system of screens into nine different sizes or grades. As it passes from the breakers it is hand-picked by boys and girls to get rid of the discolored pieces containing impurities, much as the anthracite coal is sorted. After the sorting process, the lumps are crushed into various sizes and degrees of fineness to suit the demand for which it is intended. The salt reaches the market in all conditions, from the huge blocks sold for ranch purposes to the various grades used in packing hides, icing refrigerator cars, and in the manufacture of soap and glass and the like. The evaporated salt is not used for any of the purposes for which the rock salt is produced, and the two industries, therefore, do not affect each other in the least.—Min. Res. Kan., 1898, p. 99 *et seq.*

NOTE 388.—Interview, 1908.

tories at Anthony and Sterling, probably not more than a few hundreds of barrels a year.

It will thus be seen that the salt industry has followed the tendency of the other industries of this section of the country. There was a great activity about 1890, followed by a slight falling off in the volume of business, and attended by a centralization of the industry in the hands of a few operators. The output is now steadily increasing,³⁸⁹ and the bulk of it is in the hands of one company, and it is certain that at the present time there is at least a gentleman's agreement between all the producers, which has reduced harmful competition to a minimum.

An interesting phase of the development of the salt beds that is likely to prove to be as important as interesting, is the erection of a large soda ash plant, with a daily capacity of 120 tons, at Hutchinson. This plant is said to be the only absolutely independent plant³⁹⁰ in the world manufacturing this very important product,³⁹¹ and the only one west of Detroit. There has been a constantly growing demand in the Middle West for this product, and especially since the coming of glass factories the economic importance of such a plant near to the seat of the demand has been very apparent. Twenty years ago there was an investigation of the field, almost as soon as the salt factories were opened, but nothing came of that investigation, for what reason it is not known. The organization of the company for the building of this plant was begun about three years ago, in January, 1906, and the stock was sold quietly among local investors, to avoid attracting attention to the work until it was well under way. There are a number of interests in the manufacturing section that use the product who are interested.

The plant will cost about half a million dollars, and will begin operations some time in the spring of 1909. It is built on the most approved lines, has

NOTE 389.—The production of salt by the Kansas factories by two-year periods since 1889 is as follows:

Year.	Barrels (280 lbs.)	Av. price.	Value.
1889.....	450,000	\$0.45	\$202,500 00
1891.....	855,586	.357	304,775 00
1893.....	1,277,180	.369	471,548 00
1895.....	1,341,617	.36	483,701 00
1897.....	1,224,980	.34	417,626 94
1899.....	2,172,000	.35	760,200 00
1901.....	1,271,015	.60	762,609 00
1903.....	1,455,582	.50	800,730 74
1905.....	2,123,109	.39	837,739 00

[Table from Min. Res. Kan., 1903, p. 46. Figures for 1905 from Bulletin No. 83, Census Manufactures U. S., 1905.]

NOTE 390.—There are five other plants in the United States, at the following places: Syracuse, N. Y., Saltville, W. Va., Detroit, Mich., Wyandotte, Mich., and Barberton, Mich. There are six European plants, one in England and five on the continent. All these plants, save the one at Saltville, W. Va., and the Barberton plant in Michigan, are controlled from a central office at Bernberg, Belgium, and the two independents are living and operating under close agreements with the centralized plants. This industry dates only back to the erection of the first plant by the Solvay Bros., at Bernberg, in 1866, followed by the Brunner-Monde plant in England in 1882. Then the Solvay people built the first American plant at Syracuse, N. Y., in the heart of that salt field, in 1889, and the Solvay Process Company, a branch from Bereschniki, Russia, built the Detroit Solvay Process Company's plant at Detroit. The central organization was formed by an early coalition between Messrs. Brunner and Monde and the two Solvay brothers, and they hold stock in every plant in the world save the two American plants named above. The profits of the business under this arrangement are said to have been enormous.—Interview, 1908.

NOTE 391.—The principal interests within reach of the Hutchinson plant using soda ash are: The glass factories, which use as high as forty per cent in making some grades of glass, especially bottle glass; the makers of soap and washing compounds. One Kansas City soap maker used 2000 tons last year in making his ordinary output of soap. Paper mills, woolen mills, pottery factories and laundries use large quantities of it. The oil mills of the South use it, and it forms the basis of most of the boiler compounds, as well as of many chemical preparations. Baking powders and cooking soda are made from derived ingredients, chief of which is soda ash.

all the improvements, and will, it is estimated, be ten years ahead of any other plant in this feature of equipment. The principal materials used are salt brine, which is pumped from the wells of the company drilled on the site of the plant, and limestone, which is to be had in Marion county, not more than thirty miles away. It is said that at the present prices the profits of the business will amount to from six to eight dollars a ton.

There has been a great deal of complaint in the Middle West on account of the tribute the manufacturers have had to pay to the soda ash combine. It is a large item to pay the freight alone on the amount used by many of the factories, and it is an invariable rule that all shipments are per bill of lading, and, if there is a discrepancy, the consignee is without redress against the company. The future of the company is, as a matter of course, wholly conjectural, but there is no visible reason why it should not prosper, for there is ample demand to keep it running among the men interested in one way or another. It is rumored that the largest of the salt factories is contemplating the erection of a similar plant, if this one prospers, but that cannot be confirmed.

CEMENT AND CEMENT PLASTERS.

In discussing this division of the mineral industries of the section, there are three wholly distinct subjects to be handled, in so far as the development of various cement and plaster enterprises are concerned. First of all there is the gypsum cement plaster industry, originating in the accidental calcining of some rock gypsum at the camp fire of one of the earliest settlers of Blue Rapids,³⁹² the seat later of the first gypsum plaster factory in the region west of the Mississippi. Even earlier in importance on the markets is the production of natural cement (popularly known as hydraulic cement) at Fort Scott, which had assumed commercial pretensions before 1870. Lastly, there is the wonderful growth of the Portland cement industry in Kansas and Oklahoma, dating from 1899, and depending upon the advantage of natural gas fuel to a large extent. As much on account of the convenience in treatment, as for any logical reasons, these divisions will be considered in the order named.

The first gypsum plaster produced in the state was from the northern, or Blue Rapids end of the district of gypsum-bearing formations already mentioned in another part of this paper. The properties of the gypsum rocks at Blue Rapids being well known locally before the Civil War, it needed only someone to start making the plaster to create a demand. In 1871 some of the gypsum was burned and taken to Elmira, Ohio, and the quality proving good, the Coon brothers of that place came to Blue Rapids in the following year and began the manufacture of "plaster of Paris" over a stove in a five-barrel kettle.³⁹³ In 1875 the business was enlarged by the addition of water power for grinding the gypsum rock and the increase in the kettle capacity of the plant. The valuation of the plant as

NOTE 392.—It was in 1858 that this first gypsum was burned in this accidental way, and the settler used the calcined gypsum in making plaster to "chink" the cracks in his cabin. In the following year the plaster was used in the plastering of a number of houses in the new town, and the advantages of the gypsum beds along the river at that point were so apparent that the commissioners who laid out the town reserved a strip 100 rods long and 320 feet wide along the river containing the known deposit.—Univ. Geol. Surv., Kan., vol. V, p. 51.

NOTE 393.—A number of accounts of the plaster industry are in print. The best are articles by Haworth, in volume VII, Kansas Historical Collections, and in volume V, University Geological Survey, and an article by Grimsley in First Bien. Rept., Bureau of Labor, pp. 144-147.

remodeled was given at \$10,000, and it continued actively in operation until the failure of the firm in 1887. Two years later the mill was almost destroyed by floods, and was never rebuilt.

Though never rebuilt, and of no great actual importance, the first gypsum mill demonstrated the value of the gypsum rocks about Blue Rapids, and in the same year that the first mill was in its financial straits, a second was built by H. G. and F. W. Fowler, who organized the Blue Rapids Plaster Company, which operated until it was bought by the United States Plaster Company, of Toledo, Ohio, about 1900. In the same year, a second mill was built by the Kansas Cement Plaster Company, making the number of mills at Blue Rapids three in all. Soon after the destruction of the Coon mill another was built by the Great Western Plaster Company. The first operations of all these mills followed the plan of stripping the earth from the surface of the ledge of gypsum rock where it outcropped along the banks of the Blue, but it was soon found advisable to run drifts into the deposits and get the materials in this way.

In 1873 the secondary deposits of gypsum "dirt" was discovered by accident by a farmer in the southeastern part of Saline county while plowing and burning a "fire guard" along his farm, and the important district in Saline and Dickinson counties was opened to the gypsum industry.* The first mill in this section was built in 1889, by a company of Salina men, who formed the Acme Cement Plaster Company. About the same time the second mill using the earth gypsum was built at Dillon, about ten miles east of the first mill. Up to 1900 there had been in all eight mills built and operated in this central area, nearly all of them using the earth gypsum. Other deposits than those named were found at Rhodes and Burns, in Marion county, at Longford, in Clay county, and at Mulvane, in Sumner county.³⁹⁴ The importance of these discoveries of earth gypsum lies in the convenience of handling of the raw material in the first place, and in the fact that they seem to make more satisfactory plasters in some respects than the rock gypsum, and usually command a higher price on the market than those made from the rock gypsum.³⁹⁵

Still another important development in the gypsum industry at this time was the building of the Medicine Lodge plant, in Barber county, in 1889. A magazine article on the Barber county beds attracted the attention of some English capitalists in 1888, and their interest resulted in the building of the Keene Cement Company's plant in the following year. This company has always manufactured a high grade of plaster, and has been the only one in the state to market to any extent in the Eastern cities. The plant was under the management of two brothers named Best, and the output has become famous as "Best Brothers' Keene Cement."

With the erection of the Barber county plant in 1889, the number of gypsum plaster mills in the state of Kansas was raised to nine, and all of them were doing a fair business. There was a little more than a half million of dollars invested in the mills and lands, or about one-fifth of the investment in the industry in the United States in that year, but the output was not at all proportional to the rest of the country, it being but about

NOTE 394.--First Bien. Rept., Bureau of Labor, Kansas, p. 145.

NOTE 395.--Min. Res. Kan., 1901-'02, p. 63.

*Supra, p. 10.

one-fifteenth of the whole. These figures, however, do not show the exact conditions of the industry, without the consideration that the output of the New York and Utah establishments, and a large part of the Michigan mills was sold uncalcined as land plaster. After deducting this amount from the totals, the actual production of plaster of Paris by the Kansas mills was a little more than a fifth of all the plaster made in that year.³⁹⁶ There never has been any considerable part of the Kansas product sold in the crude state, the farmers of the state seeming to have a prejudice against its use.³⁹⁷

The number of mills continued to increase through the early '90's, and the production increased steadily until 1895, which was the banner year for the plaster mills of the state. In that year the output was nearly 73,000 tons, with a value of close to \$300,000.³⁹⁸ The figures for this year have not been equaled since, either in the output or valuation, except for one year, 1906. One reason for this is not so much the falling off in the demand for the product as for the shifting of the center of the industries to a certain extent. The Texas deposits were beginning to send their products into part of the field that the Kansas mills had supplied in the later '90's, and as early as 1899 one of the largest companies operating in Kansas had built a mill in Texas from which they shipped a large share of their trade.³⁹⁹ The approaching exhaustion of the deposits of earth gypsum in the state also had its effect, in that it led to discontinuing the operation of a considerable number of mills about this same time, as the workable deposits were one after another exhausted. The mills using the earth gypsum had in general enjoyed an advantage in cheaper production and higher prices, and these advantages were diminished with the exhaustion of the most favorable of the deposits.

Commercial conditions of the gypsum plaster industry were, on the whole, very satisfactory through the '90's, and the products of the Kansas mills found a market through the Western states and as far east as the Ohio river, while the Barber county mill, already referred to, marketed some of its products as far east as the Atlantic coast. "The freight on such goods soon amounts to as much as the first value of the goods themselves. . . . During 1897 the common rates from Kansas to St. Louis were three dollars a ton, and to Chicago four dollars a ton. This is more than the manufacturers of the same class of goods in the state of New York paid to get their goods laid down at either Chicago or St. Louis. Still, in the face of these difficulties, the superior quality of the Kansas products enabled them to compete favorably in some of the Eastern markets with materials manufactured much nearer to the point of consumption."⁴⁰⁰

The beginnings of the movement toward centralization that the other industries of the section had experienced in many cases even earlier than this were felt in the gypsum plaster industry about 1900. The moving spirit in the centralization was the American Cement Plaster Company, organized at Lawrence, in 1898. It opened its mill at Mulvane, in Sedgwick county,

NOTE 396.—Eleventh Census, Mineral Industries, pp. 699-701.

NOTE 397.—Univ. Geol. Surv., Kan., vol. V, p. 133.

NOTE 398.—Min. Res. Kan., 1903, p. 40.

NOTE 399.—Ibid, 1899, p. 51.

NOTE 400.—Min. Res. Kan., 1897, p. 64: "Kansas cement plasters have finally found their way into almost all the markets of America. They have traveled as far east as Boston and New York, and westward to San Francisco. . . . The greater part . . . are sold west of the Ohio."

southeast of Wichita, early in 1899, and already had a large plant at Quanah, Tex., supplying a large part of its trade. In 1900 this company virtually acquired two other companies, with three mills in the Kansas district, and about the same time started its large mills at Grand Rapids, Mich., in the heart of the gypsum fields of that district. This made the Lawrence company by far the largest producer in the Kansas field, and its extensions into the Texas and Michigan fields made it probably the largest single operator in the country.

The following account of the consolidation is taken from the state reports for 1900.⁴⁰¹ "The Salina Cement Company changed management, Messrs. A. and J. A. Henley, of Lawrence, Joab Mulvane, of Topeka, becoming the principal stockholders. A new board of directors was elected in June, and the offices of the company moved to Lawrence, the business being done under practically the same management as the American Cement Plaster Company. . . . The Great Western Cement Plaster Company, of Blue Rapids, was recently bought outright by members of the American Cement Plaster Company, and the offices moved to Lawrence, although the business is still being done at Blue Rapids under the old firm name. . . . In this way the owners of the American company have obtained control of the two others, and transact the business for the three companies from one office in Lawrence." The United States Gypsum Company, organized about 1902 with offices at Chicago, and operating the old Fowler plant at Blue Rapids, and a second plant built at Blue Rapids a little later, began to branch out about this time, and took over the plant of the Roman Cement Plaster Company in Pratt county in 1899, and the Wymore Cement Plaster Company's plant at Hope, Kan., which had been operated by a company of jobbers with offices at Wymore, Neb., for about a year.⁴⁰² This second merger of producers left but three mills that were producing independently, including the Medicine Lodge plant in Barber county, which has always refused to give out any information as to its operations.⁴⁰³

The effect of this merger, which brought the monopoly of the cement plaster industry into the hands of two strong companies, was soon apparent. The American Plaster Company closed its original Kansas mill at Mulvane in the same year that it bought the other companies out, and one plant acquired from the Saline company at Dillon was never reopened. Their obvious purpose was to restrict the production in order to better trade conditions. The business at that time was sadly overdone, and the prices were becoming all the time more unsatisfactory, so that there was nothing in the business for any of the Kansas mills.* The organization of the United States Gypsum Company, which practically completed the work of centralization of management, completed the plans that the Lawrence company had in mind. The immediate result of the two combinations was an increase in price of gypsum plaster from an average of about \$4.30 for the past four years to an average price of \$5 a ton in 1902, the first year of the operations of the second consolidation.⁴⁰⁴ This level of prices has not been maintained since that time, but at no time since the consolidations has the price been so low as before.

NOTE 401.—Min. Res. Kan., 1900-'01, p. 64.

NOTE 402.—Ibid., 1900-'01, p. 65.

NOTE 403.—Ibid., 1902, p. 42.

NOTE 404.—Ibid., 1903, p. 40.

* Interview, 1908.

The principal change in the industry on the commercial side since 1902 is the practical discontinuance of two at least of the smaller mills that were operating independently, so that now the two companies have a single competitor in the Medicine Lodge plant. The smaller mills were under the additional disadvantage that the building of the Oklahoma mills had on the Southern market for the Kansas plasters, and between the influences they left the field. The number of mills in Oklahoma (and the Indian Territory) in 1905 had reached seven, and the investment of capital had reached two-thirds of a million. The value of the products of the Oklahoma mills reached about \$150,000, or more than half that of the Kansas product, and the addition of this supply has had a considerable effect on the industry in Kansas. Commercial conditions are practically the same as they were ten years ago, so far as the territory reached is concerned, though the Eastern market is limited more on the east than it was ten years ago, and very little of the product of the Kansas and Oklahoma mills goes east of the Mississippi river now. There is still an opening to the northwest, on account of the fact that there are no mills in that section of the country, and no materials that are known as a basis for any in the future. The freight rates, however, reduce the demand in that direction, and lime plasters are used to a considerable extent where the cement plaster would be used but for the cost.

There are now, even with the reduction of the number of active mills, more plants in the Kansas field than the tributary territory demands, and many of them are running only a part of the time. The demand depends of course only upon the activity of the building trades, and there is not sufficient building going on using plaster products to call for any large amount annually. The demand in Oklahoma has been pretty largely taken care of by the new mills in that section, and probably will be, as the amount of gypsum in that state, while not definitely mapped, is known to be ample for some years at least.⁴⁰⁵

Another thing that the centralization of the plaster industry has accomplished is the introduction of more improved methods of manufacture than prevailed while there was a larger number of small plants furnishing the plaster output of the state. Up to 1900 there was no considerable improvement in the general methods of calcining the gypsum, or in the handling of either the raw materials in reaching the plant, or in the disposal of the calcined gypsum as it came from the kettles. The kettles themselves are huge barrel-like steel cylinders of boiler steel, set on end on a masonry base, and the heat is applied directly beneath, and the gypsum is stirred by clumsy revolving arms within it as the burning process goes on. It requires twenty-five or thirty horse-power to run such a stirrer, and accidents to the machinery are frequent on account of the strain. Waste of heat, and waste

NOTE 405. — The following letter from a member of one of the two leading companies operating in this district gives a fair view of the present situation in the industry in general: "In 1907 there were six or seven mills in operation in Kansas. A number of the mills have been discontinued since 1900 on account of the raw material being exhausted and the mill being moved to another deposit (in the case of those using the earth gypsum only) or discontinued entirely. The mills in Oklahoma have taken care of most of the increase in the demand for gypsum products, and have had their effect on the Kansas mills. Our market for the Kansas mills extends east to Chicago, and some in Indiana, but the freight rates are very high that far away, and as there are other mills in that territory it is almost impossible for the Kansas mills to get that far or much farther east. We have shipped some of our material to the far Northwest, but that is on account of there not being any good material found in that territory. There are now a good many more mills in this territory than the demand requires, and a number of them are shut down entirely, while several others are running only a part of the time. . . . I have just been at one of our plants . . . and find that business has been very quiet there, and we have averaged running only a small part of the time."

of power in stirring, with a large amount of personal experience needed to determine the degree of burning required,⁴⁰⁶ have made this method objectionable to progressive manufacturers. Improvements were looked on with distrust for a long time, however, and not until the American and the United States companies got a monopoly was it practicable to fit the mills up with more approved machinery.⁴⁰⁷ The plant of the American people at Mulvane was one of the first to introduce the gravity system in getting the raw materials to the calcining kettle and a system of conveyors to take it from them to the store sheds, thus eliminating practically all hand labor. The continuous calcining system employed in the Portland cement plants has not yet been adopted by the gypsum plaster mills, for what reason it is not easy to determine.

There are no gypsum mills in the state of Nebraska, and so far as is known no gypsum deposits that are workable. The mills in Oklahoma are recent, and no separate figures for the output in barrels are obtainable, the federal reports listing Oklahoma and Texas together. On a basis of prices about the same as that in Kansas for 1905, however, the valuation given by the census for 1905,* \$130,716, the output would be in the neighborhood of 37,000 tons, or a thousand tons less than was produced in Kansas for the same year.⁴⁰⁸ The output of the Kansas mills by four-year periods since 1889 is shown by the following table:⁴⁰⁹

Year.	Tons plaster.	Av. price.	Value.
1889.....	17,332	\$5 44	\$94,235 00
1893.....	43,631	4 16	181,599 00
1897.....	50,045	5 05	252,811 00
1901.....	49,217	4 25	209,172 00
1906.....	64,351	4 48	642,859 00

NATURAL CEMENT.

The natural cement industry in this section of the country has never amounted to much outside of one place (Fort Scott), where, on account of the peculiar fitness of the impure limestones, the industry has flourished since 1868, and the two mills that have been in business there for the last twenty years are still producing cement in competition with the Portland cement plants. Outside of this Fort Scott industry, therefore, there had been little in the way of cement manufacture in the section until the building of the Portland cement plants. There has been little lime burned in the

NOTE 406.—“In some mills a long tube thermometer is kept in the plaster, . . . but the plaster adheres to the tube below and so gives a lower reading. . . . In other mills electric wires run to an automatic registering thermometer which is said to give good results. . . . The expert calciners, however, depend more upon the appearance of the plaster in the kettles than upon thermometer readings. Inexperienced calciners who depend wholly on a thermometer reading plunged at times into the kettle may make very poor plaster out of the very best materials.”—Univ. Geol. Surv., Kan., vol. V, pp. 102, 121.

NOTE 407.—“The great objection to the present kettle system of calcining gypsum is the great amount of heat required to calcine the mass of cold gypsum thrown into a kettle with a thick steel bottom. Much heat is wasted by radiation from the kettle. Another objection is the large amount of horse-power required to stir this mass of gypsum and keep it from overburning at the bottom. The heat required tends to warp and burn out the kettle bottoms, which are heavy and expensive to replace. The methods of calcining . . . have not improved much recently, and it would appear that there is much room for it.”—Univ. Geol. Surv., Kan., vol. V, p. 103.

NOTE 408.—Min. Res. U. S., 1906, p. 1074.

NOTE 409.—From Mineral Resources of Kansas, 1903, p. 40, save for the figures of 1906, which are from the Mineral Resources of the United States, 1906, p. 1074.

* Bull. No. 30, Mfgs. Oklahoma, etc., 1905, pp. 34, 35.

state, the bulk of the lime that has been used coming from the more convenient limestone ledges in Missouri.

Small works for the manufacture of cement were built in Fort Scott in 1868, and in 1869 the size of the works was increased to a capacity of ten barrels a day, with a capital investment of \$4000.⁴¹⁰ There was little demand for hydraulic cement at that time, but as Louisville was the nearest supplying point east, and the price from there was ten dollars a barrel to Kansas points, the Fort Scott company cut the price to five dollars and got all the business there was at that time. The demand for the cement has greatly increased through the use of cement by the railways in their construction, beginning with the building of the Missouri, Kansas & Texas railroad into Fort Scott, and from that time the other roads began to use it to some extent. In 1871 the capacity of the plant was increased to fifty barrels a day, and the product began to reach all the eastern half of the state. The price in the meantime had been reduced to three dollars a barrel. The capacity of the plant was twice increased in the '70's, and in 1879 the plant was bought by the C. A. Brockett Cement Company, of Kansas City, and the capacity increased again, to 700 barrels a day.

In 1887, encouraged by the constantly growing demand for hydraulic cement in various kinds of construction work, a second plant was built at Fort Scott, and in a few years its capacity was increased to 700 barrels a day, making the possible production 1400 barrels a day. Improved machinery and a better understanding of the methods of production had operated to decrease the cost of production many times, and the price had fallen to a dollar a barrel in the '80's, and has fallen steadily since that time until it reached a level of about forty cents a barrel in 1895, and has risen again since 1900 to about fifty cents on an average. The Fort Scott cement gradually displaced lime mortar in the better grades of construction, and the quality and cheapness enabled it to reach the markets of all the adjacent states. About 1900 an agreement was reached between the two companies to avoid competition, and since that time all the product has been marketed through the Fort Scott Cement Association, with offices at Kansas City.⁴¹¹ Since the building of such a large number of Portland cement plants from 1902 to 1906, the competition has been keen, but has not been able to force a reduction in the output of these plants. Since the building of the second plant at Fort Scott there have been over two and a half million tons of cement produced, with a value of at least a million and a third at the mills.

The following table⁴¹² shows the output by two-year periods since 1888:

Year.	Barrels.	Price.	Value.
1888	40,090	\$0.75	\$30,000.00
1890	150,000	.70	105,000.00
1892	110,000	.69	77,000.00
1894	50,000	.50	25,000.00
1896	125,567	.40	50,226.00
1898	160,000	.38	60,800.00
1900	127,339	.40	50,933.00

NOTE 410.—The properties of the rock were first suspected in 1867, and a sample sent to Prof. Louis Aggasiz, then of Harvard University. The facts of the following account are based chiefly on a letter by Mr. C. A. Brockett, president of the oldest of the plants, and printed in *Mineral Resources of Kansas* for 1897.

NOTE 411.—First Bien. Rep., Bd. Ag., Kan., p. 148.

NOTE 412.—From *Mineral Resources of Kansas*, 1903, p. 42; figures for 1904 and 1906 are from the *Bulletin on the Cement Industry*, by E. C. Eckel, 1906, p. 28.

Year.	Barrels.	Price.	Value.
1902	154,681	\$0.50	\$77,340.50
1904	210,922	....	79,456.00
1906	238,311	....	129,781.00
Totals	2,670,673	....	\$1,368,514.50

PORTLAND CEMENT.

The Portland cement industry in this section of the country is one of the recent developments in manufacturing; being only about ten years old as yet, and the principal development has been made within five years. For this reason it is impossible to put together the information that is at hand and forecast the course that the industry is likely to take. There are a number of the plants that have run but a short time as yet, and some that are still building, and there are no statistics to be had that show much more than the beginnings of the present conditions. It is, however, one of the most interesting phases of the industrial life of this section of the country, and it would be unfair to pass it by without an attempt to suggest its importance. The development of ten years has raised the production of Kansas and Oklahoma from nothing to a potential capacity at the present time of one and a half times the production of the United States ten years ago. Two years ago the production of the Kansas cement plants, four in number at that time, was a little more than 3000 barrels. This year there are fourteen or fifteen plants in Kansas and Oklahoma, in the gas belt, with a combined capacity of nearly 37,000 barrels a day, or thirteen million barrels for the year if the mills should run on full time.

The Portland cement industry is a comparatively new one in the United States even, but it is worthy of notice that already there are two centers fully developed which produce by far the larger share of the product of this country. The first is that of the Lehigh district in Pennsylvania, where the industry started, with the near-by section in New Jersey. Now comes the development of the Kansas-Oklahoma field, increasing at double the rate of increase in the Eastern field,⁴¹³ with a capacity equal to that of the Pennsylvania field four years ago. One feature of the building of the cement mills in this section that makes it impossible to get a proper perspective of their importance at the present time is the manner of their organization. The first two or three plants were built by *bona fide* business men who invested their own capital. But since that time the majority of the companies that have projected and built plants have done so by means of the sale of stock by promoters to the investing public, which was just then losing interest and opportunity in the oil and gas fields for reasons that are suggested in the following section.* As a result the manufacture of cement has been given practically the same character as some of the promoted enterprises in the oil boom. With only a few exceptions, it must be said, however, that the building of the plants and the manufacture of cement has been pushed forward in perfect good faith by the promoters, and nearly all of them are well equipped and substantial.

The difficulty lies in the fact that there is not enough construction work going on in the immediate territory naturally tributary to the trade of this section to use any large proportion of the product that the mills here are

NOTE 413.—Min. Res. U. S., 1906, p. 909 *et seq.*

* See note 432.

equipped to supply. They must, therefore, depend on the sale of their products over a very large territory to keep the mills running. A further consideration just at the present time is the fact that on account of trade conditions in this section in the past year (1908) there has been a practical suspension of all large construction work until the money situation improved, and the demand for cement was considerably less last year than in years just past. For these reasons, and for the additional reason that only half of the plants built are fairly reaching the markets with their products now, there has been no opportunity to try out the trade conditions under normal circumstances and form any estimate of the wisdom with which the center of production has been built up. With this qualification of conditions, the development of the industry will be outlined.

It is to the unbounded faith in natural gas that was prevalent in this section a few years ago that the growth of the industry is principally due. To be sure, the raw materials here are not inferior to any in the country, and exist in practically inexhaustible abundance,⁴¹⁴ and there would probably have been Portland cement made here in the course of time without the gas fuel. But it was the discovery of gas at Iola in 1895, which has been discussed, and the demonstration of its advantages by the zinc smelters almost immediately, that led to the location of the plant of the Iola Portland Cement Company at that town in 1899. The first cement was made in 1900, and it found immediate favor on the market. The capacity of 2500 barrels a day was soon doubled, and large dividends were paid out on the four and a half million dollars of common and preferred stock. It is impossible to state the profits of this plant, other than to give the increase in operations, which included a further increase in capacity of the Iola plant to 6500 barrels, and the erection of another plant at Dallas, Tex., of half that size, all out of the undivided profits, while the dividends went on without interruption.

The Iola company was controlled largely if not entirely by Eastern capital, and the prosperity that was slipping out into the hands of aliens may have had something to do with the remarkable interest that followed the first two or three years of successes of the new industry. The first movement for following their example came from George E. Nicholson and A. B. Cockerill, two men active in the smelting business at Iola since the late '90's. In 1903 they organized the Kansas Portland Cement Company and built a mill at Iola, which started in March, 1904, with a capacity of 1500 barrels a day. The profits of the business so far exceeded those of the smelters that these men increased their capitalization to \$1,600,000 in a short time, and increased their plant to 2500 barrels a day. Almost at the same time two more companies were organized. One of them, the Western States, whose plant was opened at Independence in 1905, is one of a long chain of similar plants in the country⁴¹⁵ and opened with a capital of three and a half millions, and a capacity of 3200 barrels a day. About the same

NOTE 414.—"Kansas could supply the world for a million years from the limestone and shale in her borders."—Interview, Haworth, 1908.

NOTE 415.—This is the fourth of a line of five magnificent plants built under the Cowham system since 1900. They are operated separately, and have no trade connections with each other beyond the fact that Mr. W. F. Cowham, the originator of the idea, is president of each, and the stockholders who take the large blocks of stock are common to each. The plants are: The National, at Jackson, Mich.; the International, at Toronto, Canada; the Southern States, at Rockmont, Ga., completed just before the Western States at Independence; and lastly, the Northwestern States, built at Mason City, Iowa, in 1907.

time the fourth plant in the state was opened at Neodesha with a capacity of 1800 barrels. These four plants, the only ones in the state in operation through 1906, made over three million barrels of cement, and the new ones, the Western States and the Indian at Neodesha, made about twelve times as much as in their first year.

The activity following the organization of these two plants that began operations was unprecedented, and with not more than one exception out of the ten plants that were projected almost immediately they were financed on a basis calculated to enrich the promoters while at the same time raising the means of building the plants and putting them in operation. The promoter usually kept a large block of the stock for his work, and had the interest that it gave in the business for his efforts. Thus only the investors stood to lose anything. While the financial plans varied somewhat, the main trend was in the direction of sale of the preferred stock, with a bonus of the common stock, usually in a like amount, while the promoter kept the rest of the common stock.⁴¹⁶ Big profits were the theme of the promotion, and as high as thirty per cent on the investment was claimed as a sure thing for the first year. It is a fact that under cheap gas conditions, the fuel cost amounted to about a third of the actual operating expenses in making a barrel of cement, which it was said could be made for fifty cents a barrel, while the average selling price has been regularly about two and a half times that amount.

One of the new plants, to be sure, seized upon a plan that distinguished it in a way from the others. That was the Ash Grove White Lime Association, which had been producing white lime at a number of points in Missouri for years, and had a regular trade built up with their selling agencies for a large amount of Portland cement that they had to get of other manufacturers. The plan was a reorganization of the old company on the customary lines, save that the dealers were induced to take the stock, and a market was assured the enterprise from the start. The plant has been in operation but a few months, so that it is not possible to see the actual success of the plan.

Two of the remaining companies promoted during 1906 were outside of the gas belt, and counted on the use of fuel oil in burning their product. One was built near Kansas City, about twenty-five miles west, and has not been a success so far. It was found necessary to change the fuel system almost as soon as the plant was given a trial, and as the financial difficulties came on just then it has not been in operation to any extent since it was built, and so far has been a failure. The other is in Yocemento, Ellis county, and claims two advantages for its location to balance the advantage the gas belt offers. The materials that it uses are easier to handle than any other in the district, and a real saving in power and equipment is certain. The other is the fact that it is in a commercial position of vantage in that it is nearer to the needs of a great deal of middle western railway construction than any other mill. How far these advantages will make its operations

NOTE 416.—The following extract from a representative prospectus shows the tenor of the representations: "The maximum cost of producing Portland cement in the Kansas belt is 50 cents per barrel. For the purposes of this illustration we will make it 55 cents. The lowest selling price during any one year has been \$1.25 a barrel. Figured on this basis, a net profit of 70 cents will be realized on cement. . . . One thousand dollars invested in preferred stock would yield an annual return as follows: Seven per cent on \$1000 gives \$70; twenty-five per cent (the balance of the estimated profits) on \$1000 common stock gives \$250, making a total equal to thirty-two per cent on the investment."

profitable it is impossible to say, but the plant has been in as constant operation as any of the most favorably located since its completion a year ago.

There are still two cement plants that have not begun operations, and whose future is wholly dependent upon the adjustment of conditions in the future. They are at Independence and Humboldt, in the heart of the gas belt of Kansas, and both are of average size and equipment. Last year there were two producing mills in the Oklahoma end of the gas district (in the old Indian Territory field, at Ada and Dewey) capable of producing 5000 barrels a day. How far there will be a movement southward, such as has been observed in the smelting industry, it is impossible to conjecture. In all probability there will be no more plants built for some time, however, and future locations will depend somewhat upon the fate of the gas supply.

An important deal was consummated in January, 1908, by which three of the large Kansas cement mills were consolidated under one management with a capitalization of twelve and three-fourths million dollars. They were the Kansas Portland, of Iola, of which G. E. Nicholson is the moving spirit, the Independence Portland, of Independence, and the Indian Portland, of Neodesha. These three plants have a capacity of 8300 barrels a day, and the capital of the company is nearly one-third that of all the companies built and building in the section. The operations of all the plants are now in the one company, the United Kansas Portland Cement Company. The financial plan was openly one of shaping the capitalization to meet the estimated earning power of the three plants. It was figured that two and three-fourths million barrels a year would be the output, and the capital was proportioned by multiplying each barrel of estimated output by four dollars and a half, of which the preferred stock was a third and the common two-thirds. The consolidation came at the time when the plants were closing on account of the falling demand, and so far there has been no result from it other than the closing of two of the plants a large part of the time.⁴¹⁷

Last year (1908) was a disastrous one for the Portland cement trade in general, and there was not more than a fifth as much cement made in the Kansas mills and the two Oklahoma establishments as they were capable of producing, simply for the reason that there was no market for it. Fully half the plants were closed, and the rest were running only a part of the time. There was no cement marketed with the railroads, always the heavy consumers, and other lines of trade were slack. Just at present it is safe to say that there are more plants built than there is any need for. But owing to the impossibility of estimating the future of the rapidly growing demand for Portland cement in so many lines of work, it would not be safe to make that statement as true for any considerable length of time. With the materials that are at hand in as convenient location as nature has

NOTE 417.— Just as this report goes to press it is announced that an important merger of all the Nicholson plants in Kansas, Texas, Iowa and Tennessee, six in number, are to be consolidated. Mr. Nicholson himself admits that other plants in Kansas and Oklahoma may be taken into the merger, and appraisements of eight others are known to have been made in the last few months. If such a combination is made the company will be the largest producer of cement in the world. The object of the move is undoubtedly to regulate the production and sale of the Western cement. The price has never been satisfactory since the bulk of the mills began to produce in 1908 and later, and at one time last year prices fell to eighty cents a barrel. A meeting of manufacturers in the autumn of 1909 succeeded in raising the price twenty cents a barrel with the aid of a rising demand for cement, but greater economies in marketing are absolutely necessary to make the business profitable, if it does not become necessary to permanently close some of the mills that have been erected. By this means the loss of overconstruction will be shared by all the plants in the country, and will not fall particularly on any one. If the deal goes through there will be but a few independent mills in this section, and they will rank as small producers in comparison.— See *Kansas City Star*, January 11, 1910.

placed them, and with the advantage of natural gas fuel, which is still considerable, it is at least possible that there will be a busy future for the plants now built. The market for them is restricted to the territory west of the Mississippi, and the Michigan and Iowa plants are cutting it off on the north, so that at present the Rocky Mountains and the Missouri river limit the territory for all practical purposes of description.

The Portland cement industry, on the whole, has brought less capital into the country from the outside than any other of the mineral industries, save the brick and tile perhaps. Practically, only two of the large companies are held outside of the Missouri valley, and many of them number their stockholders among the business and professional men of the towns and villages of the eastern half of Kansas and part of Missouri. One of the Oklahoma plants, for instance, is held almost entirely by Kansas business men. The industry does not have a very important effect on the industrial society of the state, outside of the economics of the stockholders, for the number of workmen is relatively small to the magnitude of the products. Part of the labor, especially the mechanical workers, is highly skilled, and another part is of the most ordinary sort. These latter have, in general, clusters of a dozen or two houses in the vicinity of the mills, and are a thing apart in a way from the rest of the society, while the skilled workers are not distinguished by their life at all. There is not a generality of organization among the cement workers, and the most of the workmen are unorganized.

The following table shows the location, capitalization and capacity of the plants now (January, 1909) in operation or ready to begin:⁴¹⁸

NAME.	Location.	Capital.		Capacity.	When built.
		Common.	Preferred.		
Iola Portland.....	Iola.....	\$1,500,000	\$3,000,000	6,500	1899
United Kansas.....	Iola.....				1904
	Independence.....				1905
	Neodesha.....	4,125,000	8,875,000	8,800	1905
Western States.....	Independence.....	1,500,000	2,000,000	3,200	1905
Fredonia P. C. Co.....	Fredonia.....	250,000		500	1905
Humboldt P. C. Co.....	Humboldt.....	1,000,000	1,000,000	1,500	1909
Ash Grove P. C. Co.....	Chanute.....	1,500,000	2,000,000	2,500	1908
Ajax P. C. Co.....	Independence.....	2,000,000	2,000,000	3,000	1909
U. S. P. C. Co.....	Yocemento.....	400,000	500,000	1,500	1908
Bonner P. C. Co.....	Bonner Springs.....	1,000,000	1,500,000	1,250	1908
Monarch P. C. Co.....	Humboldt.....	2,000,000	2,500,000	5,000	1908
Dewey P. C. Co.....	Dewey, Okla.....	1,000,000	1,500,000	2,500	1908
	Ada, Okla.....	750,000	750,000	2,000	1908
Totals of plants.....		\$17,025,000	\$25,625,000	37,750	

OIL AND OIL REFINING.

As a preliminary to the discussion of the growth of the oil-refining industry in the "mid-continental" field, including Kansas and Oklahoma, it will be profitable to supplement the discussion of the production of crude oil in a previous section* with a brief summary of the production and present

NOTE 418.—This table, as well as many of the statements in this discussion of the cement industry, is made up from information collected in bits from the prospectuses of the various companies, and from interviews and letters where they could be had. For that reason few references have been made to published accounts, which in the main show very little of the real conditions in the industry.

*Supra, p. 55.

condition of the oil supply. Oil has been marketed in Kansas for many years in small quantities, the first being in 1889, when 500 barrels were reported.⁴¹⁹ "The yield gradually increased to and including the year 1906, when a total of 113,571 barrels were produced. From this it gradually declined to 82,215 barrels in 1899. The new development set in shortly after this, and the production rapidly increased to a maximum, in 1904, of 4,250,779 barrels, since which time the production has gradually declined. . . . For the year 1907 the Prairie Oil & Gas Company bought (in Kansas) 1,696,428 barrels, and the independent refiners and consumers of fuel oil consumed an amount not determined with exactness, but probably more than half a million barrels a year, which should be added. . . .

"During this period the production of oil in what is now the state of Oklahoma gradually increased from the first developments, nearly ten years ago, to and including the year 1907. Developments south of the state line were very rapid and satisfactory during the years 1906 and 1907.⁴²⁰ In 1904 the production of the entire field was only a little over five and a half million barrels, showing that but little drilling had been done south of the line at that time. For the year 1905 it aggregated fully twelve million barrels; in 1906 nearly twenty-two million barrels, and in 1907 the magnificent amount of 47,556,905 barrels,⁴²¹ making the mid-continental field the most productive in America."⁴²²

It has already been stated the development of the oil field really began in 1895 with the advent of the Forest Oil Company into the Neodesha field, and the erection of a small refinery at that place by the Standard Oil Com-

NOTE 419.—This first oil was produced in the Paola shallow wells, the pioneer field of the Western country. "No oil was found at Paola until 1888, when some people drilled in a fair well at a very shallow depth. Most of the drilling at this time was for gas, and the real oil development did not begin until a year ago (1904). Enough wells were drilled at Paola, however, to build a small refinery in the early part of the '90's. . . . From 1888 to 1902 the work done in this section was of little note, there being a few wells drilled, but no real development commenced until the general activity started in Kansas."—*Ind. Rep. Oil and Gas Mag.*, 1905, p. 6.

NOTE 420.—A great impetus was given to the development south of the Kansas line during 1905 by the political situation in the Kansas legislature, incidental to the movement which culminated in the bill to build a state oil refinery to "check the Standard Oil." This will be noticed in the subsequent pages.

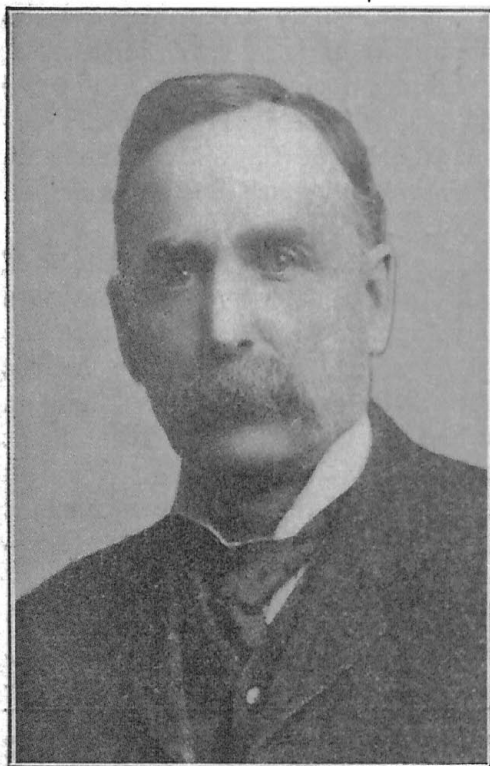
NOTE 421.—The following table, taken from the report on Mineral Industries of the United States for 1906, shows the production of the Kansas-Oklahoma field up to 1907. Figures for 1907 are by H. G. James, of the *Independence Reporter*, and for 1908 by Erasmus Haworth, geologist of Kansas, whose figures for the values are used through the table.

Year.	Production.	Price, bbl.	Value.	Percentage total production.
1889.....	500	....	.....	.....
1890.....	1,200	....	.....	.....
1891.....	1,430	....	.....	.....
1892.....	5,080	....	.....	.....
1893.....	18,010	....	.....	.04
1894.....	40,130	\$0 48	\$19,262 40	.08
1895.....	44,467	64	28,458 88	.08
1896.....	113,741	63	71,656 83	.19
1897.....	81,723	60	49,033 80	.14
1898.....	71,980	70*	50,386 00	.13
1899.....	69,700	75	52,245 00	.12
1900.....	81,186	80	64,948 80	.13
1901.....	189,151	80	151,320 80	.27
1902.....	368,849	90	331,964 10	.42
1903.....	1,071,125	1 10	1,178,237 50	1.07
1904.....	5,617,527	97	5,449,001 19	4.80
1905.....	12,013,495	60	7,208,097 00	8.92
1906.....	21,718,648	41	8,904,745 68	17.17
1907.....	46,161,654	40	18,464,661 60	.....
1908.....	50,741,678	42*	21,311,504 76	.....

* Estimated.

NOTE 422.—*Univ. Geol. Surv., Kan.*, vol. IX, pp. 199, 200.

pany, which the Forest represented, in the spring of 1897.⁴²³ The first thing that company did was to buy up the holdings of Guffey & Galey,⁴²⁴ the men who had done all the development at that time, consisting of 212,340



C. D. WEBSTER.

A pioneer oil refiner of Kansas.

acres of leases, on which were some sixty-five producing wells, not counting a dozen gasers, and four 25,000-barrel iron storage tanks at Neodesha. Within the next two years the Forest had continued the development as their refinery needed the oil, and brought in a total of eighty-three oil wells, the majority of them in the neighborhood of Thayer, in Neosho county, about fifteen miles from Neodesha.⁴²⁵ The importance of this field was sufficient to justify the laying of a small pipe line to Neodesha. This was the beginning of the great pipe-line system that the Standard has since extended from the Oklahoma field to Whiting, Ind., and on to the Atlantic coast.⁴²⁶ The policy of the Standard at the beginning seemed to be to simply prove the field, without making any attempt to bring it to a maximum of productiveness. Local producers, however, continued to bring in wells, and there was no market for the oil, save for a limited market with municipal gas plants, unless the Standard took it. This situation forced the Standard into the market to take care of the oil that was offered, and to this end the building of the pipe-line system was inaugurated.⁴²⁷

NOTE 423.—The refinery at Neodesha began operations in May, 1897.—*Neodesha Register*, May 21, 1897.

NOTE 424.—October 12, 1891, M. W. Miller, of Osawatomie, began the development of natural gas in Wilson county. In April, 1893, he sold out his interests to J. M. Guffey and John Galey, wealthy residents of Pittsburg, Pa., who continued the development until, on November 1, 1895, the Forest Oil Company of Pennsylvania, generally known as the Standard Oil Company, purchased their entire interests in the Kansas field, including leases in seven counties.—*Wilson County Sun*, Neodesha, November 22, 1895.

NOTE 425.—Ind. Rep. Oil and Gas Mag., p. 9.

NOTE 426.—“While the development of Guffey & Galey had convinced the Standard that considerable oil existed in Kansas, the industry was largely of an experimental character. Independent operators had succeeded in developing only small quantities of oil in remote sections, but they desired the Standard to buy it. To accommodate a few of the heaviest producers, tank cars were provided, and storage tanks were put up at Neodesha, where a short pipe-line system had been inaugurated. In 1903, operations around Chanute, Humboldt and Montgomery and Chautauqua counties had grown to sufficient proportions to induce the Standard to extend its local pipe lines to connect with these fields, and on August 1, 1903, began the systematic registering and publication of runs and shipments. On that date the total stocks on hand amounted to 257,196 barrels. The total production of the Kansas field at that time amounted to about 90,000 barrels a month.”—Ind. Rep. Oil and Gas Mag., p. 9.

NOTE 427. “Realizing that the inauguration of a system of pipe lines and storage facilities would immediately develop the entire Kansas field, the Standard at once began an elaborate extension of all its facilities, including two extensions to the Neodesha refinery, and the commencement of a much larger one at Kansas City (their Sugar Creek plant). The parent company, after a careful consideration of the matter, appropriated \$35,000,000, to be used as needed in Kansas and Indian Territory in connection with its Eastern system. Tank farms were bought and work begun, and pipe lines extended everywhere production developed.”—Ind. Rep., Oil and Gas Mag., p. 9.

Once started by this encouragement, the development was very rapid. Then the failure of the Beaumont oil bubble is thought to have caused a further increase in the oil activity in that it turned a great deal of the capital that had been attracted there into the Kansas field. The development of the field that has been outlined in an earlier section will answer in the main for this purpose when it is remembered that nearly all of the prospecting up to about 1904 was for the sake of oil, and the fact that attention was given to the gas in the other account should not obscure that fact.

The summer of 1902 saw a considerable activity in the oil field, and the output of the year previous was more than doubled. The Standard doubled the capacity of its Neodesha refinery in that season,⁴²⁸ and in the following spring, attracted by the prospects of the Kansas field, C. D. Webster,⁴²⁹ an old oil refiner from the Pennsylvania field, began the erection of the first independent refinery in the state⁴³⁰ at Humboldt, the richest part of the newly developed field. The plant was projected for a daily capacity of 500 barrels of crude oil, but it was finished with just half that capacity. The first oil was refined in February, 1904, and placed on the market. The plant and marketing facilities represented an outlay of about \$80,000, and the refinery is equipped

NOTE 428.—Interview, 1908.

NOTE 429.—At Chanute, Kan., in the year 1907, C. D. Webster made the following statement to William E. Connelley:

"Born on Trout river, Franklin county, New York, June 8, 1852. Attended school at Malone, N. Y., and at the age of eighteen went to clerk in a store in that village. At the age of twenty-one he went to Port Henry and engaged in the clothing business, in which he continued until 1876, when he went to Bradford, Pa., and engaged in the clothing business; and later became interested in oil production at Bradford. When the Tidewater pipe line was built (the first built to tidewater over the mountain) he built a refinery at Philadelphia, on the Schuylkill. This he operated until the Tidewater company sold out to the Standard Oil Company. Webster would not go into the Standard company, though offered \$100,000 for his property and a salary of \$5000 a year. He organized the Sunlight Oil and Gasoline Company at Philadelphia, in which he is still a stockholder. He organized the Reflex Refining Company, which built a refinery at Philadelphia, and then came the bitter fight with the Standard Oil Company, whose teams followed his wagons and gave away oil and gasoline. This lasted four years and ruined Webster. Then he went to Titusville, Pa., and organized the Webster Gasoline Company, manufacturing gasoline by a special formula. The venture was profitable. His partners sold out to the Standard Oil Company, but Webster would not go into the Standard, and finally lost all his interest in the property.

"Webster then went to Boston and there organized the Webster Oil and Gasoline Company, but through rebates the Standard drove him out of business. Webster then began in a small way to sell oil, securing his oil from Pennsylvania and selling from wagons to retailers. The Standard Oil Company then put two teams after each one of his wagons and sold oil at half price until Webster was ruined. He then secured a contract to light certain streets in Boston with naphtha, upon which the Standard Oil Company bought all the naphtha on the market, and Webster was reduced to the last extremity. He bought a peddler's wagon and began to retail oil from house to house. The horse was old and lean and his wagon dilapidated, but his business increased, and in two years had eleven teams selling oil and had a large warehouse, for which he paid \$2200 a year rent. Then the Standard Oil Company put teams after each of his wagons and sold oil at one cent a gallon. It sent its agents around disguised as book agents to get names of his customers that it could not get otherwise. Webster hired halls in Boston and appealed to the people to stand by him, and the Boston Post aided him; but he was finally driven from the field.

"From Boston Webster went to Providence, R. I., and secured contracts for street lighting, inventing a naphtha burner and contriving to secure enough naphtha to run his lamps. To operate this contract he had organized a company in Boston, which is still in existence. This contract netted him \$20,000 in three years. Having now some money, he returned to Titusville, Pa., and bought a refinery, which he operated until forced out by the Standard, when he moved his refinery to Marietta, Ohio, and rebuilt it at a cost of \$130,000. Here his health failed. His refinery made \$7000 the first month, and he was offered \$120,000 to give up the fight, but he refused. The Standard secured control of the crude oil production in that locality, and Webster was again driven to the wall. For some time he was out of business, but organized the Knickerbocker Oil Producing Company in Philadelphia and bought a large production in the Marietta field. This company was successful, clearing over \$50,000 the first year. Webster sold his interest in it and came to Humboldt, Kan., and became the pioneer independent refiner of this state."

NOTE 430.—A small refinery was built at Paola about 1890, but it was in operation only a short time. "The refinery was built by the Paola Oil, Gas and Manufacturing Company, and had a daily capacity of twenty-five barrels of oil. The company did business for a couple of years, until the price of refined oil went down, and the plant went into the hands of Henry C. Jones, receiver, who had charge of it for five years, when it was sold to the Standard Oil Company, who removed the parts still standing to Neodesha. This refinery was the first west of the Mississippi river."

for the manufacture of kerosene, cylinder, engine and fuel oils.⁴³¹ Just ahead of the opening of this Webster refinery the political agitation which finally resulted in the state refinery law (later declared unconstitutional), the common-carrier law and others was in full swing, and the sentiment against the Standard Oil and in favor of anything independent made business prosper for the new refinery.

This agitation, which was carried into the state legislature and was pushed until it resulted in the passage of four laws, is one of the most interesting phases of the oil development of the district. The advertising of the fields in 1902 and 1903 attracted a remarkable number of oil promoters into the district, and simply from the force of circumstances they centered their activity in the Chanute field. There were reasons for this, chief of which was that there was nowhere else in the proven territory in Kansas that they could get leases satisfactorily. The Prairie had the most of the proven lands in the southern end of the state by this time, and the speculators organized their companies for the exploitation of the Chanute field. As is usually the case in such times, there were companies organized that could never in the very nature of things pay a cent on their stock, so ill-advised were their operations. But everybody wanted to get in on the good things that they saw other people making, and the organization of companies went merrily on. When the movement reached its height there were 262 companies located in the Chanute field, with a capitalization of two hundred million dollars.⁴³² Then the development in the southern end, which redoubled in 1903, attracted the activity southward on the outskirts. At the same time the increase in production ran so far ahead of the facilities for handling the oil that the price began to fall steadily early in 1904, and this increased the demoralization of the companies around Chanute.

Looking about for something upon which to place the blame for these conditions, the Standard and its operating company, the Prairie Oil and Gas, came in for the blame for consequences of all that was bad. Another thing that added to the sentiment against the Standard at this time was the fact that there had been in force a buying order to the effect that all oils bought

NOTE 431.—The *Iola Register* (daily) for May 13, 1907, has this to say of Mr. Webster, the owner and promoter of the new refinery: "Mr. Webster is probably the oldest refinery man in the state, and has to his credit the erection of eight different plants—three at Philadelphia, two at Titusville, one at Marietta, Ohio, one in Boston, and the one at Humboldt. He has been in the refining business for a period of twenty-eight years, and has experienced all the ups and downs of the business. He is also at the head of the Webster Oil and Gasoline Company, of Boston, which does a retail business in refined oils made by independent refiners. . . . There is little about the oil business that Mr. Webster does not know. He has good reason to be familiar with the methods of the oil trust, for he has been fighting it all his life, and only his dogged determination to win has enabled him to come out on top." The quotation illustrates the angle that many of the contemporary papers give to any of their articles that touch the doings of the Standard Oil at this time.

NOTE 432.—A report on conditions existing in the Kansas oil and gas fields in December, 1907, prepared by William E. Connelley at the request of Attorney-general Jackson for use in his suit of ouster against the Standard and associated companies, contains a table giving the names of companies who were producing oil in Kansas in the summer of 1904, together with their location and capitalization, and followed by this summary: "The capitalization given amounts to \$186,713,000. It is not pretended that this amount was paid up and put into the business. The figures show the total capital stock of these companies where the amount of capital is given. These companies number 350. The above total would allow an average of more than \$530,000 each. If it is counted that but ten per cent of the total capital stock was paid in, then the amount invested by these companies is \$18,671,300, which is not far from the correct amount. Some of the capital stock had nothing paid in on it, and other stock had very little paid in on it; but many of the largest companies paid in a large proportion of their capital stock. The capital stock of the companies listed here with the amounts left blank, that of those companies the names of which were not secured by me, and that of the individuals whose names are unknown, would probably be \$125,000,000, and I believe this a conservative estimate. Treating this amount as the total amount of the listed companies was treated would yield \$12,500,000, which, added to the \$18,671,300, equals \$31,171,300, the sum invested by independent producers in the Kansas oil fields."—Manuscript in office of attorney-general, Topeka.

by the Prairie agents should be graded arbitrarily as North Neodesha and South Neodesha, and the former brought twenty cents a barrel less.⁴³³ This differential, made for the want of any other convenient means of distinguishing between the heavy oils of the northern end of the field and the better grade oils, was looked upon as unfair discrimination⁴³⁴ by the Chanute men, and it is probable that in many cases the difference in the quality of the oil did not amount to that much. At any rate, that was the chief grievance of the Chanute oil men, who organized "The Chanute Oil Producer's Association" in August, 1904.⁴³⁵

It was in 1904 that the Prairie finished the eight-inch pipe line to Sugar Creek, near Kansas City, Mo., where the Standard was building an 8000-barrel refinery, on the trunk line of the Standard pipe-line system to Whiting, Ind., which was completed early in 1905. This pipe-line system, with its ramifications in the Kansas-Oklahoma field, was the only considerable pipe line in the field at this time, and the heavy production at the southern end of the field of the lighter and superior oils at this time operated still more against the northern men, who, more convinced than ever of their grievance, started on a crusade against the Standard.⁴³⁶ Shortly after the meeting of the Chautauqua Producers' Association at Sedan, in January, 1905,⁴³⁷ a meeting of all the producers of the state was called to meet in Topeka, and an organization was effected January 19, 1905, and the fight began in earnest.⁴³⁸ Up to this time the agitation had been confined almost wholly to the oil men themselves, but by taking the discussion into the state capitol at the time of the session of the legislature, the lobby that was organized succeeded in making it a political question and gained the ear of the state for their demands.⁴³⁹

The campaign in Kansas resulted in the passage by the legislature of four bills, three of which are now in force, and one—the refinery bill—for a time considered the most important of all, has been declared unconstitu-

NOTE 433.—Univ. Geol. Surv., Kan., vol. IX, p. 215.

NOTE 434.—The proportion of heavy oil in the north Neodesha field was not greater, or very little greater, than in the south Neodesha field. There was heavy oil in both fields. The great amount of oil in both fields was of the highest grade according to the scheme of grading used by the Standard Oil Company. A large proportion of the oil in the Oklahoma field was of higher gravity than in the Kansas field. —W. E. Connelley.

NOTE 435.—Ind. Rep., Oil and Gas Mag., p. 10; Chanute Daily Sun, August 2, 9, 1904.

NOTE 436.—Ind. Rep. Oil and Gas Mag., p. 10.

NOTE 437.—"This organization was effected . . . at Sedan, and more nearly accomplished the object sought than any other organization of the Kansas producers. . . . The first real business of the association was the adoption of the following resolution: 'Resolved, That it is the sense of this meeting that all drilling operations should be suspended as far as possible, and that the landowners be asked to join in the movement to limit operations, and to that end to consent to extend drilling contracts.' The effect of this resolution was to stop all drilling in Chautauqua county within a few weeks after its adoption. . . . The same action has been attempted a score of times in other fields, but has never been more than partially successful." —Ind. Rep. Oil and Gas Mag., p. 11. This was the one sensible action aimed at the raising the price of oil and giving the inferior oil a chance in the market by reducing production. In March, 1905, the Prairie already had seven million barrels of oil in storage, and was adding rapidly, with no other use for the oil offered. —Independence Reporter, March 29, 1905.

NOTE 438.—"The Kansas Oil Producers Against the Standard Oil Company," by W. E. Connelley, Kan. Hist. Coll., vol. IX, p. 94.

NOTE 439.—The state association instructed its legislative committee to endeavor to secure the following legislation: (a) The building of a state refinery, of not less than 1000 barrels capacity; (b) the prohibition of the pumping of gas wells; (c) the prevention of discrimination in prices by manufacturers or dealers of any manufactured articles; (d) making all pipe lines more than four inches in diameter common carriers; (e) the creation of the office of gas and oil inspector; (f) the prevention of the use of "gas pumps" to increase the flow of oil wells. —Ind. Rep. Oil and Gas Mag., p. 10.

tional by the supreme court,⁴⁴⁰ and is therefore dead. The bill declaring pipe lines common carriers was designed to force the Standard to transport the oil of the producers through its lines for delivery to the independent refineries at a graduated distance tariff. The point has been raised that the pipe line, being a private one, the state has no constitutional authority to order their use by any and every applicant.⁴⁴¹ Although the law has been in force several months, no one has sought to take advantage of its privileges.⁴⁴² The other bills that became laws in this session were the antidiscrimination bill,⁴⁴³ and the maximum rate bill, providing a schedule of charges for transporting oil in pipe lines, and giving the railway commissioners power to prescribe maximum charges for transporting oil in tank cars, not to exceed in any case the charge by pipe line.⁴⁴⁴

About the only result of this agitation, so far as the Standard was concerned, was the suspension of operations in Kansas for a few months, and the transfer of their activities to the territory south of the state line, the heavy development of the territory around Bartlesville, Dewey, and the famous Cleveland pool in old Oklahoma demanding their attention. "In Kansas the development was not great in 1905. In fact, for six months (February to July, inclusive), it was impossible to market more than a fraction of the oil which might have been produced from the wells drilled. As a result, surprisingly few wells were drilled in Kansas."⁴⁴⁵ The production of the Kansas wells, though almost as much in 1905 as in 1904, has been declining steadily ever since, and the bulk of the oil of the mid-continent field, beginning with 1905, has come from the south side of the line, where the standard has intensified its development since then.⁴⁴⁶

Apparently a direct result of the agitation in favor of the independent producers in the legislative session of 1905 was the building of a large number of independent refineries in the various oil towns of the field, largely in Kansas. It is more than probable that the mere moral support that the agitation gave to the project of building independent establishments had as much to do with this result as the direct benefits that any of the legislation brought. The common-carrier law accomplished but little, for the bulk of the Standard's mains were laid before it was passed, and therefore did not come within its operations. The smaller feeders, by the very provisions of the law, were not included, and the independents were left pretty much to the development of their own refinery connections, and the effect is seen in the large number of small establishments that grew up, each one located in a

NOTE 440.—State v. Kelly, 71 Kan. 811.

NOTE 441.—The supreme court has decided that this applies only to lines laid after the passage of the law.

NOTE 442.—Ind. Rep. Oil and Gas Mag., p. 31.

NOTE 443.—Provides that there shall be no favors to sections or persons in the sale of manufactured articles. "The law works a greater hardship on the small concerns than it does on the Standard. Jobbers of merchandise also complain that the law handicaps them in securing trade or in preventing competitors working their territory."—Ind. Rep. Oil and Gas Mag., p. 32.

NOTE 444.—Kansas Laws of 1905, chapter 315.

NOTE 445.—Univ. Geol. Surv., Kan., vol. IX, p. 211.

NOTE 446.—The figures submitted by the Prairie in answer to the interrogations of the attorney-general of Kansas, in the suits in the supreme court for violation of the antitrust laws, give the purchases of oil in Kansas for three years as follows: 1905, 3,244,062.96 barrels; 1906, 3,128,287.17 barrels; 1907, 1,696,428.85 barrels. The amount of oil in storage in 1908, as given in the same statement, was thirty-four million barrels, of which only ten million barrels was in Kansas.

small territory that it could reach with its own feeders. As for the railway rate, there is such a small part of the oil that is ever offered for transportation in that way, unless it be for fuel purposes, that it hardly affects the refineries. The antidiscrimination bill may have been more effective. Certain it is that the Standard has not at any time since made any effort to fight the small refineries by cutting rates. But there is no means of knowing whether they would have done so without the law. In fact, the attitude of the Standard in its relations to the independent refiners in the mid-continent field has seemed one of good-natured indulgence. The manyfold preponderance of the company in its operations would have made it short-sighted business policy for the Standard to have pursued any other policy, and the men who have had the management of its affairs in the Western field seem to have appreciated this situation thoroughly.

The fact remains, independent of any speculations as to what the memorable session of 1905 did, that within that year there were five independent refineries built and put into operation in the Kansas field, and two were built in Oklahoma. The second of the independent refineries was really put into operation in the summer of 1904, ahead of the political agitation. It was built at Muskogee, I. T., with a capacity of 250 barrels a day, but the oil failed within a short time and it was necessary to ship in oil from other points to keep the refinery going. The second Kansas independent was the Paola Refining Company's plant, which was finished in August, 1905, with an initial capacity of 250 barrels a day. It was built by local capital entirely, and marketed its output in the surrounding towns. Before the end of the year there were also erected the Uncle Sam Refining Company's plant at Cherryvale, capacity 250 barrels; Superior Refining Company,⁴⁴⁷ at Longton, capacity 150 barrels; Sunflower Refining Company's plant, at Niotaze, in Chatauqua county, 150 barrels. Three others were building at the end of the year, to have when completed a joint capacity of 1300 barrels. Thus the building of the year when completed gave the field a refining capacity of about 13,000 barrels a day, of which the two Standard refineries made up about 10,500 and the independents the other 2500.

The oil-refining business seemed to be something of a mania, especially in Kansas, from this time on, and there were six refineries completed in Kansas in 1906, distributed as follows: Two at Chanute, one at Kansas City, one at Atchison (the property of the Uncle Sam Company), one at Rollins (near Chanute), and one at Bronson, in Allen county.⁴⁴⁸ It was also a year of great extensions on the part of the Prairie, for the opening of the famous Glenn and Weber pools near Tulsa, as well as the development of the Cleveland pool, in old Oklahoma, made it necessary for that company to build miles of pipe line in order to hold its own in the field. "The year 1906 was an active one for the Prairie Oil and Gas Company, which erected and filled 336 iron tanks in the field. When the last report was made the company had 295 tanks. On January 1, 1907, it had 631. A year ago the company owned seventeen farms on which tanks and pumping stations were erected. To-day it has thirty, . . . an increase in 1906 of thirteen farms."⁴⁴⁹ In the same year the Prairie built nearly a thousand miles of pipe line, making a total

NOTE 447.— Built and owned by one man.— *Mid-continent Oil Fields*, 1907, op. p. 32.

NOTE 448.— *Mid-continent Oil Fields*, 1906, p. 16.

NOTE 449.— James, *Mid-continent Oil Fields*, 1906, p. 4.

of 2671 in the field, not counting the line from Kansas City to Whiting, Ind. "The Prairie has been compelled to fairly network the field from Tulsa to Kansas City to take care of the tremendous production. In order to force the oil through these pipe lines pumping stations are necessary, and last year the Prairie built nineteen, making the total number now forty-three."⁴⁵⁰

The next year (1907) was also marked with great activity in refinery building, the year ending with twenty-five refineries either in operation or just ready to begin operations. There were two refineries about completed in the Oklahoma field, one belonging to the Uncle Sam company, making three for it, and one building at Tulsa for Mr. Webster who had the refinery at Humboldt. The full capacity of these refineries amounted in all to more than 30,000 barrels a day, of which the two plants of the Standard contributed 23,000 barrels, its Sugar Creek plant having increased to 17,000 barrels, and the Neodesha plant to 6000 in the meantime. Of the new refineries, only two were of more than 300 barrels capacity. The National Refining Company, one of the large refineries of the Ohio district, with plants at Marietta, Cleveland, and Findlay, Ohio, built a 1500-barrel refinery at Coffeyville, and laid pipe lines into the Indian Territory, as well as all over the southern end of Montgomery county, Kansas, to supply it with the crude oil.⁴⁵¹ The other was built at Independence, by the Standard Asphalt and Rubber Company, an independent company whose specialty is the extraction of the asphaltum base of the lower-grade oils. Their refinery, which is incidental to the business, has a capacity of 1500 barrels of crude oil a day. This plant will be mentioned again.

The year 1907 was also marked by the advent of another factor in the mid-continent field. This was the building of two pipe lines to the Gulf of Mexico, one by the Gulf Pipe Line Company, which was completed from the Glenn pool late in the summer and began pumping oil immediately. The Texas company, also building towards the Gulf, had reached Dallas, Tex., in October of that year, and began pumping oil about the 1st of January, 1908. Both of these companies had been in the field for some time, developing their share of the Oklahoma oil, but had to depend on the shipment of their production to the coast by tank car, and the tremendous development made it advisable for them to lay their own pipe lines to take care of the production of their lands. The two companies handled in the year nearly nine million barrels of crude oil, nearly all of it in this way.⁴⁵²

The building of refineries in 1908 went on apparently with undiminished zeal, but this year the activity was confined to the Oklahoma field, which now has eight independent refineries, two of which, however, at Tulsa, are closed. Coffeyville is the only point in Kansas that is sharing in the recent building, and has two small refineries about completed at the beginning of 1909. For the first time the independent refineries did not seem to prosper, but for what reason it is hard to say. Those at the northern end of the field, however, were doing practically nothing nearly all the year, for what reason it could not be determined, for their managers steadily refused to give out any information. The Atchison refinery of the Uncle Sam com-

NOTE 450.—James, *Mid-continent Oil Fields*, 1906, p. 23.

NOTE 451.—*Coffeyville Daily Journal*, April 6, 1907, p. 45.

NOTE 452.—Haworth, in *Eng. & Min. Jour.*, January 4, 1908, pp. 81, 82.

pany⁴⁵³ was closed during the year, and all of the plants at Chanute were idle.⁴⁵⁴ It is more than probable that the gradual failure of the wells⁴⁵⁵ of that end of the field is at the bottom of this decline, for, so far as can be learned, the other independent plants were prospering. The year preceding was very satisfactory for all of them,⁴⁵⁶ and outside of the decline of the northern field there was no apparent alteration of conditions.

With but one exception, there has been little attempt to make by-products out of the oils of the mid-continent field. Practically all the heavy base of the oil is sold in bulk to the railroads, or shipped to municipal gas plants to be used as fuel. The Rollins refinery, near Chanute, did, it is true, equip its plant for the extraction of the paraffin which is in all of the oil in this field, but for some reason it never accomplished much at it. So far as can be learned, that is the only attempt to extract the paraffin. None of the Standard refineries in the field pay any attention to it, but it has been intimated that the Standard company has been instrumental in keeping out this branch of the industry in other plants.⁴⁵⁷ The exception stated is the Standard Asphalt and Rubber Company, which began the erection of a large plant at Independence in 1906 for the purpose of extracting the asphaltum base of the waste oil that the other refiners sold for fuel. Early in 1907 it began operations, paying a premium on the heavy oils⁴⁵⁸ that contained as a rule a larger proportion of this element in the base, and began marketing all grades of asphalt roofing, insulating, paving and waterproofing materials.

NOTE 453.—The struggle of the Uncle Sam Company is one of the interesting features of the growth of the independent refineries in the Western field. It was organized and promoted by a man totally without capital of his own to back it, and planned with the optimism of the true plunger for the largest independent enterprise in the field. Lands were leased, three refineries were built—one at Atchison, one at Cherryvale and one at Tulsa—and a pipe-line system laid from Bartlesville to Atchison to supply them. Dependent upon subscriptions of stock to carry the project, the promoter, Mr. H. H. Tucker, was finally arrested in 1907 on the charge of using the mails to defraud. After a sensational trial, the company being in the hands of a receiver in the meantime, he was released, and again took up the management of the company. The stockholders paid out the indebtedness of the company, and it is now doing the largest independent business in the field.—James, *Mid-continent Oil Fields*, 1907, p. 5; *Cherryvale Republican*, October 19, 1906, January 5, 1906.

NOTE 454.—Mr. Connelley, who has recently visited the oil fields (February, 1910), says that the independent refineries at Chanute are again operating. Besides the experimenting necessary to determine the best method of refining oils in this district, one of the great drawbacks of the independent refiners has been the marketing of their oils. At first they adopted the methods of the Standard, shipping their products to more or less distant points and employing agents for their local sales. The Uncle Sam was the only company, besides the Standard, employing pipe lines. As independent refineries increased their managers found that, added to the ordinary hindrances of railroad transportation, was the growing competition and the necessary and constant effort to adjust the business to new conditions. But time and the antidiscrimination law has to a great extent solved the market problem, and the independent refiners can now depend upon the individual enterprise of local merchants who purchase their oil from the refineries and assume the responsibility of their own shipping and local distribution.—Interview of editor.

NOTE 455.—It is claimed by some that the Kansas oil fields are exhausted, and that they were but light fields at the best. This is not true. Almost every company that has gone to the wall had nine-tenths of its holdings still to drill. Further drilling will bring to light many new pools in the Kansas fields: so far the oil has scarcely been touched in Kansas.—Mss. in office of attorney-general, Topeka.

NOTE 456.—James, *Mid-continent Oil Fields*, 1907, p. 4: "All the small refineries of the field have apparently done well during the past year, and most of them have added to their capacity. Many of them have added lubricating departments to their plants. As to the advisability of this there has been some question, but the refiners themselves state these departments are large money makers. The plants at Paola, Niotaze, Erie and Longton have just completed these additions. The Standard refineries do not attempt to make greases in Kansas."

NOTE 457.—"Every plant that contemplates making paraffin has been quietly bought up by the Standard interests."—*Chanute Tribune*, August 9, 1907.

NOTE 458.—*South Kansas Tribune*, October 3, 1906. "The Standard Asphalt and Rubber Company has contracts for 1500 barrels of oil daily, from which it will distill the lighter oils, and manufacture the 'Sarco' products from the waste."—*Ibid*, January 23, 1907.

The "Sarco" products, so called, the output solely of this Kansas plant, are unique, for there is no other establishment like it in the world. All the processes are protected by patents, and are known fully to only the employees of the plant. The processes are the result of a series of experiments performed by G. F. Culmer, the manager of the Independence plant. He commenced experimenting with crude oil as early as 1894, and a company was organized to manufacture the products in the Eastern fields. A rupture with the company resulted in the organization of the new one at Chicago in 1906 and the building of the plant at Independence. The products have an advantage over the natural asphalt in that they are free from impurities and can be suited to any temperature desired in the process of manufacture. For cold climates a softer grade is made, that will melt at 100° F. if desired, and the melting point can be raised to nearly 400 degrees. Another feature of the industry is the manufacture of rubber, by mixing in the proper proportions the softer grades of this asphalt and reclaimed rubber. The result is a rubber that cannot be distinguished from the ordinary rubber of commerce, and is tough enough for automobile tires and the like.

The "Sarco" company bought the Paola ⁴⁵⁹ refinery in 1907, and increased its capacity to about a thousand barrels a day, to put all the finishing processes on the oils that are distilled at the Independence plant. The company owns its own tank cars, and ships the finished oils back to Independence for distribution to the trade on account of certain advantages in freights that are secured thereby. The industry employs in all about a hundred men, and markets the products practically all over the United States. The offices of the company are in Chicago, and the management of the commerce is in that office.⁴⁶⁰

Only recently the demand for road oils in this section of the country has led the Standard to equip its refinery at Sugar Creek with a plant for the manufacture of three grades of road oil. This is the only plant that makes a specialty of this branch of the industry.⁴⁶¹ At one time for about two years the Standard refinery at Neodesha manufactured a "petroleum coke" out of the oil that ordinarily went for fuel, and sold it to the Cranby smelter at Neodesha, but the process of manufacture was expensive, requiring a great many men in all the processes, and it was discontinued with the termination of the first contract with that company.⁴⁶² With these exceptions the refinery business in the Western field is confined wholly to the production of the distillate oils, and the fuel and lubricating oils out of the heavy residue that is left in the distillation.

It would be possible to continue the account of the development of the oil fields, and to multiply the details of the operations of the refineries to a much greater length, but in this connection it would hardly be profitable. In spite of the number of independent refineries that have sprung up in practically every town of the state that has any visible oil supply, the fact

NOTE 459.—The Paola refinery has since been removed to Independence and consolidated with the "Sarco" plant.—W. E. Connelley.

NOTE 460.—Interview, 1908.

NOTE 461.—Kansas City *Star*, November 30, 1908: C. W. Owston, of Chicago, head of the road oil department—"Kansas City's park board was the first that we could interest in road oil. . . . It grew so that we had to put our chemists at work looking for better grades at a reasonable price. It will be necessary to build several new plants to make the three grades required. One will be at Sugar Creek."

NOTE 462.—Interview, 1908.

remains that the Standard dominates the field over any combination of interests. The Prairie last year took up more than three-fifths of all the oil produced in Kansas and Oklahoma, its estimates for its pipe-line runs for the year being over thirty-three million barrels. The other two pipe-line companies, the Gulf and the Texas, each handled a little over five million barrels. The independent refineries, twenty-three in all, used only a little more than three million barrels, or less than one-tenth that taken up by the Standard.⁴⁶³ Scattered as they are all over the field, and with limited facilities and capital, they can do no more than operate as a check on the Standard in the local market, if indeed it needs one.

In summarizing, it is only fair to give the credit of the wonderful development of the field to the operations of the Standard. Not that it has been in any sense a work of charity, or even of public spirit, but the fact remains that without the vast amount of capital that it turned into Kansas and Oklahoma from 1902 to 1905 there would have been hundreds of oil wells sealed up indefinitely waiting for a demand for the oil, just as has been observed in the case of the gas supply, even after the advent of the Kansas Natural Gas Company with its millions of capital. No one has attempted to estimate the life of the field, and it is probably impossible to do so with any degree of certainty, but there is no diminution of the production yet, outside of the shallow field in Kansas. The Oklahoma wells are still producing, and from all indications will continue to do so for years to come, and continue to add to the wealth of the district.

BRICK AND TILE.

The manufacture of brick has been a relatively important industry in all this section of the country from almost the first settlement of the different localities, and it is, and has been from the first, one of the most widely distributed.⁴⁶⁴ The clays that are found in almost every one of the many strata of the shales that are exposed throughout the whole Missouri valley offered a convenient and fairly good material for the manufacture of the ordinary building brick, and the country has been self-supplying in this respect since the very beginning of brick construction. The whole section, exclusive of Oklahoma, which is not old enough to have been subject to exactly the same conditions, experienced a great activity in substantial construction twenty or more years ago, during the prosperity wave preceding the depression begun in 1888, and brickyards sprung up and flourished in almost every town. Southeastern Nebraska and all of eastern Kansas felt this activity especially, and built scores of small yards that lived only until the passing demand was over. At one time in this period there were over fifty brickyards in the city of Omaha alone, or almost as many as there are in the whole state of Kansas at the present time. In 1890 there were more than a half more brickyards in Kansas than there are now.⁴⁶⁵ The decline of the era of municipal improvements in the early '90's marked the passing of scores of these yards from the list of manufactures.⁴⁶⁶

NOTE 463.—Haworth, in *Min. & Eng. Jour.*, January 9, 1909.

NOTE 464.—In 1857 the business of the brick and lumber yards of Kansas City, population 5000, amounted to \$479,543.49, 591 brick or frame buildings being erected that year.—*Annals of the City of Kansas*, 1858, p. 93.

NOTE 465.—Census 1890, part III, pp. 742-745.

NOTE 466.—"Beyond the areas of cheap fuel, the principal factor for the location of factories for the manufacture of clay goods is that of the market. . . . During the periods of

There is no way of determining the exact magnitude of the early brick-making operations in this section, even if it would be profitable to do so. It was about 1890, however, that the activity was greatest in the state of Nebraska, while the figures show that the Kansas brickyards produced more brick as early as 1880 than they did until after 1900.⁴⁶⁷ The decline in number of plants and value of products had begun in Kansas before the end of the '80's, and continued until after the panic year of 1893.⁴⁶⁸ Since that time the actual number of brick in Kansas has increased with fair regularity, while the number of yards has steadily decreased. After the era of building and improvement, however, the course of the industry has not been similar in the two states, Kansas and Nebraska. In the latter state the number of yards is still relatively large, and the size correspondingly small, while the industry is still widely scattered over the state. The yards are there located in the places where on account of normal building activity there is a moderate demand for brick all the time. In Kansas, on the other hand, centralization of the brickmaking industry set in in the later '90's, beginning with the organization of the Coffeyville Vitrified Brick and Tile Company and the opening of its gas kilns at Coffeyville in 1896. With the rapid building of the gas-using brickyards in the eastern part of the state about 1900, the movement began to centralize the industry in the gas belt in a small number of extensive plants, until now there are about half as many plants as there were thirty years ago and the output is five or six times as great.

Since the advent of gas-burned brick upon the market, the industry, chiefly in Kansas, has been practically revolutionized, and only in the smaller towns of the middle western part of the state do the same conditions prevail that were characteristic of the whole section fifteen years ago. Now all the brick produced in Kansas that figure in the market are those made by the yards in the gas belt, and from the shale beds themselves. In fact, it is to the advent of gas-burned brick that the importance of the state as a brick producer is wholly due. Save for the fuel advantage, there is no reason why the industry should not have remained just as it has in Nebraska, widely scattered and uncentralized, each yard relying on its immediate neighborhood, and no more. Nearly forty of the sixty odd yards in Kansas at the present time are in the gas belt, and it is from them that nearly all the vitrified paving and face bricks are made which figure in the markets outside the state. It is also worthy of note that no other part of this section of the country, the Oklahoma belt not excepted, is self-supplying in these grades of brick, but all draw their supplies largely from the Kansas yards.

The first gas-burned brick were made at Coffeyville, in 1896, and two years later the same company built two other yards, one at Cherryvale and the other at Independence, both of them using gas fuel. With the extension of the operations of this company began the centralizing tendency in

municipal improvements and building, brick factories sprung up and flourished for a time to supply local demands, and later declined or entirely disappeared. There is scarcely a town in all eastern Kansas that has not at one time had a factory for the manufacture of brick. Some of these factories still exist, while many of them, having served the purpose for which they were constructed, are discontinued."—Min. Res. Kan., 1897, p. 82.

NOTE 467.—See Tenth Census, vol. II, pp. 119, 120; Min. Res. Kan., 1903, p. 38.

NOTE 468.—Min. Res. Kan., 1903, p. 38.

the brick industry that has been observed in all the other industries of the state. The popularity of the vitrified brick that they made led to the building of a fourth plant at Chanute not long afterward, and the company at the present time is not only the largest producer in the gas belt,⁴⁶⁹ but probably in the country, having a daily capacity of not less than 500,000 brick. In addition to this the company has for years marketed the whole output of a large plant at Buffalo (fifteen miles west of Chanute), and with this product the company controls not less than a third of the brick output of the state.

There has been a constantly growing demand for vitrified brick for purposes of municipal improvement in the eastern Kansas towns for a little more than ten years, and the organization and success of this first large gas-using company was soon followed by others of considerable size and importance. The two largest were organized about the same time. The Pittsburg Vitrified Paving Brick Company, which did not for some time use gas, however, had two large plants, both in Pittsburg, about 1900, with a combined output of 100,000 daily. The other, The Iola Brick Company, also operating two yards about the same time, using gas, however, had an equal capacity. The Pittsburg company also bought up a large brickyard at Leavenworth with a capacity of 60,000 daily. Other large yards were those at Lawrence, built in 1899, with a capacity of 30,000; a second plant at Chanute, with a capacity of 50,000. Humboldt, La Harpe, and later the other towns of the gas belt, followed with fairly large yards.

With all this activity in the gas belt, however, the coal-burning yards at Atchison, Lawrence, Topeka, Ottawa, Leavenworth and Salina continued to get a large share of local business, and occasionally invaded the field of the larger gas-burning yards.⁴⁷⁰ The building of new yards was practically completed in three or four years after 1900, and the conditions have been practically the same ever since that time. The face and paving brick of the Kansas yards soon began to find favor in the outside markets, and with the multiplied magnitude of their production the exportation of those grades of brick became important. For several years the commercial territory of the Kansas yards has been parts of the adjoining states of Nebraska and Missouri, and, to a certain extent, Iowa, while they find an outlet to the south as far as the Gulf ports, and New Mexico on the southwest.⁴⁷¹ The common building bricks, of course, do not go nearly so far, but for some time Kansas has made much more of these grades than is used within her borders.

The brickmaking industry is thus practically centralized in the eastern quarter of the state of Kansas, so far as the commercial importance of the industry is concerned. Nebraska has about twice the number of yards, and nearly half the capital and production of Kansas, but the yards there make but a small proportion of vitrified brick, the common building brick for local trade being the principal item. Oklahoma, also about equal in number of yards to Kansas, has an investment of less than a third as much capital, and less than a fifth of the output, a still smaller proportion of which is vitrified brick.⁴⁷² There are also two plants in Kansas making sand-lime brick, the only ones in this part of the country. They are located

NOTE 469.—Min. Res. Kan.

NOTE 470.—Ibid, 1903, p. 37.

NOTE 471.—Ibid, p. 39.

NOTE 472.—Census Manufacturers, 1905, Bull. 62, p. 70 *et seq.*

at Wichita and Bonner Springs, the latter about twenty miles west of Kansas City. They are comparatively new industries, but in 1906 there were some 800,000 brick marketed. The Wichita plant has increased its operations several times since it started, and has put about twelve million on the market in all. The products are standard and face brick for building purposes, and the most of those from the Wichita plant go into Oklahoma and Texas, while a few go east on account of the color. Western Kansas takes a portion of the output,⁴⁷³

One influence that may have had something to do with the fact that there are now but very few brickyards west of the middle line of the state of Kansas is the growth of the manufacture and use of "artificial stone," made of cement and sand. The growth of this business has been very rapid, especially in the last two or three years, and has undoubtedly had the effect of supplying a portion of the demand for common building brick. This class of building material has the advantage of cheapness and ease of manufacture, and recommends itself especially to those portions of the state where the clays are not especially superior and fuel is expensive. In 1905 the census reports give twenty-three of these artificial stone factories in Kansas, and sixty-five brickyards. Two years later the state report⁴⁷⁴ gives seventy-one factories for the manufacture of artificial stone and fifty-six brickyards. Nebraska is experiencing somewhat of the same movement, hardly to the same extent, perhaps, while it is still less noticeable in the new state of Oklahoma. These cement blocks are not the ideal building material by any means, and it is impossible to forecast the future of this industry or its effect on the brick industry.

The manufacture of sewer pipe has never been of especial importance in connection with the clay manufactures of this section. One reason, no doubt, for this fact is that the number of large cities or towns is relatively small, and there has been until quite recently a comparatively small demand for this class of products. There has been for many years a large establishment at Kansas City, Mo., for the manufacture of sewer pipe, and nearly ten years ago a large plant was built at Pittsburg, Kan., which has been doing a considerable business. The Kansas City concern had at one time planned to build a large plant at Chanute, but it never materialized, for what reason is not known. Drain tile of any sort is a very small part of the clay products of any of the sections other than the Kansas belt, and even there it is only a relatively small portion of the whole product. Hardly any of the new gas-burning yards are equipped for its manufacture at all, and concentrate practically their whole effort on the production of brick.

The following table shows the production of the principal articles of manufacture in the clay industries of the three states:

STATE.	Common brick.	Vitrified brick.	Drain tile, value.	Total value of products.
Oklahoma (and I. T.).....	70,007,000	1,950,000	(a).....	\$596,299 00
Kansas.....	214,273,000	75,826,000	\$13,212 00	1,906,360 00
Nebraska.....	131,290,000	(a).....	(a).....	1,006,743 00
Totals.....	415,570,000	77,776,000	\$13,212 00	\$3,409,302 00

(a) Included in figures with other states. The whole product of the sewer-pipe factories is included thus in the table from which these are taken. The tables are in *Mineral Resources of the United States, 1906*, p. 946 *et seq.*

NOTE 473.—Interview, 1908.

NOTE 474.—Twenty-third Ann. Rept., Kan. Bureau of Labor, 1907, p. 280.

GLASS.

The youngest of all the manufacturing enterprises in this section, and at the same time the most highly localized of all, is the glass industry, which began with the building of the plant of the Midland Window Glass Company at Independence, in 1902. Rather remarkably, all the building since that time has been practically confined to four towns in Montgomery county, of which Independence is the center. There are two others in Kansas, one at Chanute, and another, one of the earliest, a bottle-glass factory, at Neodesha, which was also opened in the summer of 1902. The growth of the industry, for some reason, has not extended across the line into Oklahoma, with the single exception of one plant, built sometime in 1904. It is more than possible that the reason for the failure to build southward is due to the fact that there has not been any considerable addition to the total number of glass factories since the advantages of that field became well advertised.

The coming of the glass factories is due to at least two influences, both of which were a little overestimated, according to the statements of the manufacturers themselves. The first of them was the failure of the gas supply in the Indiana field, upon which a large number of glass factories were dependent for fuel. The glass industry is of such a nature that gas is the only satisfactory fuel, and failure of the natural product necessitates the more expensive alternative of using manufactured gas. The failure of the supply, about 1900 and afterward, led some of the glassmakers to look about for a new field that could supply their factories. Then the development of the Kansas field since 1900, and the wide advertising that it received through the efforts of the commercial clubs and similar organizations of every town that had proven gas for which there was no demand, attracted their attention.

That the effect on the industry in Indiana was not as great and demoralizing as some of the glassworkers at first feared is shown by the continual building of factories in that district, using manufactured gas. The increasing cost of gas in the Kansas field in the last two years has also tended to diminish the advantage that it offered in the beginning, and when the disadvantage in the necessary importation of nearly all the raw materials from a long distance east is added, the field is nothing ahead of the Indiana makers. In one way it is at a disadvantage in marketing the product, for products cannot go east of the Mississippi river simply on a basis of equalization of freight rates, with production cost equal, and the larger share of the output of these factories has to find a market to the west and southwest, where the population is widely scattered in comparison to the Eastern markets, and the demand is therefore smaller.

Those two factors, however, brought a considerable interest to the Kansas gas field, and in the four years from the building of the first plant, in 1902, there were sixteen glass factories built, manufacturing window, bottle and lead glass principally. The first, and one of the largest, was the Independence plant, built in 1902, at a cost of about \$40,000. Its business prospered immediately, and the products (all window glass) found ready market in Colorado, Kansas and Oklahoma.⁴⁷⁵ The plant was soon remodeled and its output practically doubled. The next company in the state was the Cherryvale Glass Company, which put its plant into operation in June,

NOTE 475.—Ind. Rep. Oil and Gas Mag., p. 56.

1902, really ahead of the opening of the Independence plant. The specialty of this factory is lead glass, such a tumblers, lamp chimneys, globes and the like. It is the only one of this kind in the district.

In the season of 1903 a number of Wisconsin men organized the Neodesha Bottle and Glass Company, and built a bottle-glass factory at Neodesha. The specialty of this company is flint-glass bottles for the apothecary trade, which has been found sufficient in the field tributary to this plant to justify the erection of considerable additions to the plant, and equipping it for amber and colored glass this year.⁴⁷⁶ In the same year that these plants were started three more window-glass factories were built—the first by the Van Camp Glass Company, who came here from the Indiana field and built a \$20,000 plant at Caney, in the southwest corner of Montgomery county. They planned to use a sand found west of that place, which had been tested and found satisfactory for the manufacture of window glass.⁴⁷⁷ The Midland company, at Independence, also used a run of Kansas sand from a bank near Fredonia, and found it fairly good for this purpose, so it is said. The other two factories built that season were at Coffeyville, which soon became the center, and now has more than twice the number of factories of any other town in the district. The first⁴⁷⁸ was built by a company of local business men, who employed the services of an experienced glassmaker and built one of the largest factories in the West. Their output for the first year amounted to about \$200,000, and was marketed with the large jobbers of the Middle West.⁴⁷⁹ The other plant built at this time was also at Coffeyville, and was very similar in size and equipment to the plant of the company just described, and its first year of operation put \$150,000 worth of window glass on the market.⁴⁸⁰

This second Coffeyville company is worthy of a little more than passing mention, on account of the fact that it was the first of a number of coöperative factories built in the Montgomery county field. The officers and holders of the \$75,000 worth of stock in this company are all glassmakers from Indiana, and all of them followed actively the mechanical operation of the various departments of the factory. This factory also used the continuous-melting regenerative tank process from the first. The second coöperative company was the Western Window Glass Company, which built at Independence, in 1905, a twelve-pot factory. There were twelve stockholders in the company, all of them glassworkers, and all of them employed in the factory. This company was very near failure shortly after its organization on account of the destruction of the plant by fire soon after it was started. Only the assistance of the business men of the town, who backed the rebuilding, saved this coöperative venture from total failure.⁴⁸¹

NOTE 476.—Interview, 1908.

NOTE 477.—Silica, usually obtained in the form of sand, is the largest ingredient of all grades of glass, and has to be of a high degree of fineness, such as is seldom if ever found in the sands of the Kansas-Oklahoma district. Practically all the sand used at the Kansas factories, and especially in those making lead-flint glass, which requires a brilliant clearness, comes from Illinois and from Pacific, Mo., near St. Louis. "Most of the sand deposits obtained in this state contain too much clay and are too high in iron. If a good deposit of clear white sand could be found it would mean much for the advancement of the industry."—First Bien. Rept. Bureau Labor, Kan., p. 344. No sand has yet been found that contains the desired proportion of silica.

NOTE 478.—The Coffeyville Window Glass Company, capitalized at \$75,000, and using the continuous-melting regenerative tank, which is said to increase the output forty per cent at the same cost.

NOTE 480.—Coffeyville *Daily Journal*, April 6, 1907, p. 30.

NOTE 479.—*Ibid.* p. 29.

NOTE 481.—Ind. Rep. Oil and Gas Mag., p. 56.

There were nine glass factories in active operation in Kansas in 1905, and others in process of construction. The investment of capital was a little over half a million, nearly half of which was represented by the expense of building the factories. There were 718 workers employed, at a wage of nearly half a million, and the value of the products was nearly a million dollars. The cost of the materials used was more than a third of the value of the finished products, while all the expense of operation, including wages, salaries, fuel and the like, according to the statement of the factories,⁴⁸² was \$849,700, leaving a little more than a hundred thousand dollars as interest on the investment and profits of the business—in short, about twenty per cent of the investment returned this year, available for interest and profits. The figures of the same report, two years later, gathered from statements of the factories, show a less prosperous condition, though the returns were not at all unsatisfactory. The number of the factories in the two years had increased to fifteen, and the capital invested had nearly trebled, being in 1907 \$1,467,571. The number of employees had increased to 1720, or more than double the number two years before, and the total expense of operation was over a million and a half, with the value of the products only \$1,792,034, leaving the earnings available for interest and profits only thirteen per cent, as against twenty per cent two years earlier.⁴⁸³

Perhaps one of the branches of the glass industry most favored by the location in this district is the fruit-jar industry, which has been established at Coffeyville since the erection of the first factory by Wilson & McCulloch, as a branch of their business already established at Marion, Ind.⁴⁸⁴ The factory was soon sold to Ball Brothers, of Marion, and it was immediately enlarged to its present size. There are ten large machines, each employing four men, that are in constant operation, making this one of the largest fruit-jar factories in the country.

The second was built by the Mason Fruit Jar Company, also at Coffeyville, in 1906. This company, which is largely composed of Coffeyville business men, however, is a branch of the industry which has been at Marion, Ind., for years, and is capitalized at \$100,000. The manager and superintendent are old employees of the Mason factory at Marion. The factory has six machines, with a capacity of 1700 gross of fruit jars a week. Both factories use the continuous-melting regenerative process, and their combined product would amount to about thirty-five car lots a week when they are running on full time. These are the only fruit-jar factories in the western part of the country, and they can reach practically the whole of the country west of the Mississippi river. They have the further advantage over the other glass factories in that the market for their product is at its best in this Western fruit section, while the market for building glass is dependent on a more dense population, such as the Eastern factories supply.

One of the great disadvantages that all of the Kansas glass factories making flint and bottle glass (including the fruit-jar factories) have to contend with is the heavy freight rates that they have had to pay on soda ash, which is about one-fourth of the material used. The freight from Detroit, the nearest source of supply, is 27½ cents a hundred, or \$5.50 a ton. The erection of the new independent soda-ash plant at Hutchinson last year is

NOTE 482.—Tables, Bull. Bureau Labor, Kan., 1905, pp. 46-53.

NOTE 483.—Ibid, 1907, pp. 280-283.

NOTE 484.—Interview, 1908.

therefore a great help to the Kansas glass factories, for the freight rate on the product at the same factory price is less than a third as much from the Hutchinson plant as from the Eastern factories. The Hutchinson plant is as yet an untried industry in so far as its competitive relations to the Eastern factories operating in the combine, and the permanence and importance of its effect is still indeterminate.

The window-glass factories, on the other hand, which outnumber the bottle-glass factories considerably in this section, use as the base of their product not the soda ash, but the "salt cake," so called, or sodium sulphate, which is an important by-product of the process of manufacture of sulphuric acid. Being an incident and not an aim of an industry, the salt cake is cheaper, and is thoroughly satisfactory for the manufacture of this grade of glass, though it does not give as great a degree of toughness as is necessary for the various grades of glass that are subject to considerable changes of temperature. The bulk if not all of this product that the Kansas glass factories use has come from the works of the United Zinc and Chemical Company, at Argentine, Kan.,⁴⁸⁵ which has been engaged in the manufacture of sulphuric and nitric acids for twenty years. In this respect, therefore, the factories engaged in the manufacture of building glass have had an advantage over makers of the other classes of glass products, for the freight rates are moderate and the cost of the material quite reasonable.

A difficulty that practically all the Kansas glass factories have felt to a considerable extent from the beginning is that of keeping the necessary number of workers during the busy season. Practically all the blowers and cutters came from the Indiana field, and the same roving spirit that made them free to come here in the first place makes them the most undependable class of laborers in this part of the country, according to the testimony of the operators. While of American descent almost wholly at this time, they are, nevertheless, undependable, and gave so much trouble by their moving about that it was found necessary for the factories to associate for the purpose of regulating the hiring of employees to avoid taking away each other's help.⁴⁸⁶ These workers, especially those of the more roving character, have their own settlements in the neighborhood of the factories in many cases, and as they do not stay long in one place at the best, hardly form an integral part of the social body of the community. Many of the more skilled workmen, however, including those that were the first to come and aid in the organization of the industry, are not of this character at all, and are most desirable additions to the citizenship of the state.

As has already been suggested, conditions in the industry are such that the advantages that first recommended this field are considerably diminished, but in spite of that the importance of the output of the Kansas glass factories is increasing materially. With nearly two millions of annual production, it is thirteenth among the manufactures of Kansas, ninth in number of employees, and fifteenth in the amount of capital invested.⁴⁸⁷ Much of the future of the industry in this section depends upon the length of the gas supply and the discovery of more of the raw materials nearer to the factories. The manufacture of soda ash in the state will help, and the discovery

NOTE 485.—First Bien. Rept. Bureau of Labor, Kan., pp. 341, 342.

NOTE 486.—Interview, 1908.

NOTE 487.—Twenty-third Ann. Rept. Bureau Labor, Kan., 1907, pp. 280-283.

of good sand would be of considerable importance. At present the conditions practically shut the product of these factories into the southwestern part of the country, south of the Missouri and west of the Mississippi rivers.⁴⁸⁸

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NOTE 488.—Interview, 1908.

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The limitations of this paper did not permit anything like an exhaustive examination of the newspapers, and there is an unlimited amount of work that might be done along this line in the library of the State Historical Society, where all the newspapers of the state are on file, as well as practically all magazine and pamphlet publications in the state. Owing to the fact, however, that there has been no attempt to classify the material save by publications, the work is tedious in the extreme.