Flame, Furnace, Fuel: Creating Kansas City in the Nineteenth Century

Twyla Dell

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Department of Environmental Studies

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Defense Date: June 13, 2008
FLAME, FURNACE, FUEL:

CREATING KANSAS CITY IN THE

NINETEENTH CENTURY

By

Twyla Dell

A dissertation submitted in partial fulfillment of

the requirements for the degree of

Doctor of Philosophy in

Environmental Studies

at

Antioch University New England

(2009)
To Carl, for everything
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ABSTRACT

Though this work is a fuel and energy history of Kansas City from 1820 to 1920, it also provides a tool to describe and analyze fuel and energy transitions. The four parts follow the rise and fall of wood, coal and oil as their use grows to a peak and, in the case of wood, declines. The founding and growth of Kansas City as an “instant city” that grew from zero population to over three hundred twenty thousand in a hundred years embodies the increased use of fuel and energy in an urban setting and serves as a case study. This work differentiates between these two elements throughout the one-hundred-year history to offer a clarification in terminology and theory. The narrative begins in the Wood Age, continues to the peak of the Coal Age and introduces the Oil Age as it was to 1920.
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GLOSSARY

One of the purposes of this work is to add clarity and depth to the understanding of fuel and energy transitions. The following definitions emerged from the work in progress as greater conciseness of thought was forced upon the pages.

Culture: The sum total of human custom, mores, technology and artifacts defined by kind, amount and quality of fuel available.

Energy: Invisible, may or may not be combustible; available in potential from sun/eco-system, may be converted to muscle and mechanical power; produced by interaction between humans and eco/econo-systems; follows bell curve of life and health of ecosystems from which fuel is also derived; ability to do work; is reduced by the amount of work done; exists separately from fuel; output measured by calories, horsepower, watts, kilowatts, joules.

Energy component: Subset or one of many parts of the energy suite like waterways and ecosystems as well as individual technologies and energy suppliers of the energy suite like wagon trains, slavery, railroads, automobiles/highways, telephones/communications—what would indicate the kind of fuel that is used to create it or to support the use of that component as it is used in that population/culture.

Energy suite: A matched set of natural and man-made components with a common fuel denominator and the resultant energy generated by all available means in that suite. Each of the major fuels—wood, coal, oil—comprise individual energy suites identifiable by the kinds and numbers of dwellings, cultural artifacts, transportation means, technologies and extraction methods for fuel. These suites are commonly identified by the names Wood Age, Coal Age and Oil Age.

Energy system: Complete interaction of man participating in an eco/econosystem and includes whichever fuels are being used. An energy system is comprised of these parts:
1) work, 2) process heat—powering machines, making metals, and 3) space heat.

Energy transition: An exchange of quantities, qualities and kinds of energy.

Fuel: Visible, combustible, measurable, a finite amount available from abundance to scarcity, a result of human gathering/harvesting/mining/drilling/converting; the ability to heat; output measured by BTUs and calories; follows bell curve of fuel use through four stages; converts energy through fire to heat, light, power machines to exert energy to do work; is reduced by the amount of fuel burned; inefficiently used and profligately wasted. When fuel is burned, it produces heat and light; when burned in a machine, it
produces energy; the combination of fuel/conversion/energy and animal or machine produces power. The same may be said for animal and manpower, they being the “machines” in question. Fuel is a tool to express the values of a culture through the use of fire.

Fuel system: The total production, technological, financial, regulatory activity of fuel extracted, delivered, used and disposed of for a particular fuel. A system that manages and stores fuel for use and delivers it as needed. Plural, the total of all fuels and their activities.

Fuel transition: An exchange of one exclusive or predominant fuel for another in a particular human population.

Hierarchy: Component, system, suite; components from wind to wagons create the system of organized fuel and energy that creates the suite defined by technology and artifacts that evolve from the dominant fuel that create the culture of a population.

Overlap: An overlap occurs when one fuel starts to come onto the commercial scene, another loses ground and the two energy suites overlap processes, technologies and uses as they pass each other over a particular time frame. In other words there is a crossover of different components as one fuel succeeds and the other recedes. Technologies adapt to the needs of each fuel and evolve from one suite to another.

Power: The result of access to energy in various forms that can be measured in mechanical output, physical and political strength, might, force, control and command.

System: The interaction of organized parts that function as a whole to deliver an outcome, for example, wood harvest and delivery along rivers to power steamboats.
INTRODUCTION

What if there were elements in historic narrative that once recognized would change the way history would be seen and evaluated? There are. These elements are the kind, quality and quantity of fuel and energy available as they create and support cultures around the world. What has been needed is a means to identify them. This study introduces both a new point of view and a new tool. The first is to see history through a lens of interrelated fuel and energy use, and the second is to use a tool to describe the life cycle of fuel and energy transitions in a historical setting.

Recognizing fuel and energy as underlying agents of cultural survival and growth is an emerging point of view. Differentiating between fuel and energy in any given historical scene further provides the historian with a new way to define these two interrelated forces in everyday life and to identify, compare, and analyze each of their life cycles. Functioning like a fuel and energy yardstick, the periodization tool developed here provides a means for measuring the rise and fall of fuel use and the stages that accompany such changes.

Human history has been written and interpreted with these elements embedded in the story but steadfastly overlooked except at extreme moments of scarcity or unexpected abundance. Between these two poles the presence of fuel expressed as energy to power human effort has been unwittingly ignored in favor of politics and personalities. Now in the twenty-first century as we become acutely aware of both fuel and energy and their centrality in our lives, it becomes possible if not wise to review the past in these terms.
With industrialized nations on the brink of a transition from oil to “alternative fuels,” a worthy question to consider is this: What exactly is an “energy transition,” and where are we in the early twenty-first century in this one? This seems an important point to explore since the global economy depends on steady supplies of fuel, but an impossible question to answer because there has been no way to accurately measure the beginning, middle and end of such a transition. We can loosely estimate the amount of fuel available, but do not have the ability to look longitudinally at the process of using it. In other words, until now the only indicator has been conjecture over the remaining quantity of oil.

One way to answer the “Where are we in this transition?” question is to create and apply a new tool to fuel use, not a vertical measurement like a dipstick in a well, but a horizontal periodization across time with indicators to express changes in the fuel and energy picture. This linear tool selects fuel and energy milestones as periods to analyze and compare. Once this tool is described, it can be tested in a historical study that is both unique in time and place and universal in its measurement of fuel use. A historical study can give an in depth view of a completed transition.

Support for periodization of fuel use has been adapted and predicated on the work of geologist M. King Hubbert, who in 1956 forecast that the United States would reach its peak of oil production in the 1970s. His prediction was widely dismissed at the time, but the peak year for oil production in the United States actually took place in 1970. Subsequent to this realization, this concept of fuel rising and falling in a bell curve has become known as “Hubbert’s Peak.”\(^1\) It is to the idea of the bell curve of fuel use that the periodization tool described in this study is applied: How does a human population respond to changes in fuel
supply when fuel is discovered, developed and expanded to its fullest extent and then declines?

Isolating a population’s fuel use in historical narrative and testing such a tool on their story poses two challenges. The first is the need to find a discreet population small enough to study whose story spans the two major fuel transitions from wood to coal in the nineteenth century and coal to oil in the twentieth century. The second is to differentiate between an energy transition and a fuel transition and to be able to identify them in the historical record.

**The Case for Kansas City**

The first challenge is satisfied with the choice of the founding and development of Kansas City, Missouri. That city’s story begins with the date of the Missouri Compromise, a year before statehood. Through its first hundred years the growing population used three different fuels—wood, coal and oil. Kansas City grew from a fur-trading outpost of one or two families to a nationally recognized metropolis with a population of 324,410 in 1920. Such phenomenal growth in such a brief period provides a manageable and revealing timeline for studying the shifting uses of fuel and energy.

Even though this case study focuses on Kansas City, Missouri, over a recent hundred-year period, the Wood Age from which the city was born and built had been in full development for many millennia. Kansas City’s growth was merely a frontier expression of the kind of technology, efficiencies, values and habitual practices that were expressed by founding settlers in that spot. In effect, Kansas City was the latest ripple of growth from the exchange of wood for coal in England in the seventeenth century. Wood became scarce enough to force
iron mongers, glass makers, cannon and cannonball makers to commandeer coal sources and put them to work to carry on a growing economy. In the first third of the nineteenth century America began to compete with England in forging metal with coal as industrial fuel. By the mid-nineteenth century the western frontier of which Kansas City was a part felt the latest wave of fuel use in steamboat and railway arrivals.

Kansas City offers a fertile cross section of geographic and political currents that provide a rich interpretation of both fuel and energy. The village at the bend of the Missouri River before turning northward was one of the major gateways for emigrants from east to west during the nineteenth century. From the original fur-trading post to the California and later Colorado Gold Rush to the Oregon and later Oklahoma land rushes, Kansas City participated in and outfitted the westward movement of many thousands of people. Their impact on the progress of Kansas City is an important factor of its growth. The western migration itself constituted an energy transition of major proportions felt by both white settler and Native American.

In the year 1820, however, another culture, another level of human energy expression occupied the area. Only a few hundred Osage Indians hunted there at that time, but large populations of them lived throughout Missouri and Arkansas. As the territory became a state, the United States government systematically removed the Osage on behalf of eager Euro-American farmers ready to plow the land for the first time. The Osage and their energy transitions also need their story told and compared with those of the white settlers.

Another important element of this discussion is the subject of slavery as an energy component, part of the energy suite of the Wood Age. Founded as a slave state in the
Missouri Compromise of 1820, and eventually surrounded on three sides by the free states of Illinois, Iowa and Kansas—Arkansas to the south was a slave state--Missouri straddled the major political discussion that would dominate the next four decades. The question was whether and why an enslaved population should be forced to labor without pay versus a free population with a choice in paid labor. In essence, the slavery question was an energy question. Could an economy be sustained by the primary energy source of human labor and compete with one that was developing into mechanical power?

Slaves were treated as energy units bidden to do needed work until machines themselves replaced their hand labor. The slavery question alone challenges us to look at a long-held political situation through the energy lens as a fuel and energy exchange. These factors show Kansas City as a defined place and population literally at the center of geographic, political and energy-related currents, making it ideal for this study.

**The Difference Between Fuel and Energy**

A second point of clarification emerges after choice of location of the study: the need to define the difference between energy and fuel and the difference between an energy transition and a fuel transition. Most references to energy transitions in both literature and media more accurately should refer instead to the term fuel transition. These two processes are closely related but not synonymous. Fuel combusts. As a uniquely human concept, fuel serves us for basic comforts. We burn fuel--natural materials from the Earth--to provide both heat and light. When our ancient ancestors learned to use fire for these purposes, they
separated themselves forever from their fellow creatures, from being “anthropoid,” and became truly human.

That original use of fire was not a one-time historical event. It is an ongoing process that began some eons ago, has been used daily since, has grown to use more than wood, and has grown to encompass more than heat and light. Our modern lifestyle stands on massive amounts of fuel burning in remote locations from our daily lives, but, nevertheless, burning, to provide heat for comfort, cooking and manufacture of goods as well as for giving light. A fuel transition, then, is the period during which a population using one predominant fuel begins to use another, eventually replacing the old fuel with the new, such as moving from wood to coal to oil to some other combination. A fuel transition is an exchange of one exclusive or predominant fuel for another.

If energy does not combust or “burn,” it is not fuel. All fuel is energy, but not all energy is fuel. What then is an energy transition? Energy is the ability to do work, whether by man, animal, water, wind or machine. Three components of an energy system have been described as 1) work, 2) process heat--powering machines, making metals, etc., and 3) space heat. An energy transition, then, would be the move from being able to do a little work with any of those potential forces to doing more work, or, conversely, the move from being able to do a great deal of work to doing little or no work by whatever energy is available. An energy transition is an exchange of quantities of energy.

Without fuel in the form of combustible materials or energy in the form of calories, or energy generated by fuel or force of wind or water, among other sources, no work can be done. To describe the relationship between fuel and energy is to say, quite simply, that some
kind of energy creates fuel that goes into a body or machine to create energy coming out. Remote sources of fuel like solar energy create such things as wind energy. Other times “fuel” in the form of food goes into animals and humans to produce energy to do work. The greater the amount of fuel going into a converter such as an animal or a machine, the greater the amount of energy is available to do work. As part of this study, the differences between fuel and energy in daily life are described as they affect the local population.

Between 1820, as Missouri developed into an actual state and 1920 when Kansas City grew to a major industrial and commercial complex, it experienced rapid changes in fuel and energy. The city, the state and the nation, along with the industrializing populations of the world moved from a wood-based fuel economy to a coal-based fuel economy to the beginnings of an oil-based fuel economy. That is two fuel transitions in a single hundred-year period--wood to coal and coal to oil--revolutionary events in world history. Percentages of national fuel use looked like this:

<table>
<thead>
<tr>
<th>Movement</th>
<th>Between 1820 and 1885</th>
<th>Between 1885 and 1920</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased</td>
<td>Coal from 1% to 50.3%</td>
<td>Coal from 50.3% to 72.5%</td>
</tr>
<tr>
<td>Increased</td>
<td>Oil and gas from 0 to .7%</td>
<td>Oil and gas from .7% to 16.3%</td>
</tr>
<tr>
<td>Decreased</td>
<td>Wood 99% to 47.5%</td>
<td>Wood from 47.5% to 7.5%</td>
</tr>
</tbody>
</table>

That is a fuel transition! In fact, several of them since all the fuels were in a state of flux. These amazing statistics echo with human response to the changes in fuel: technological innovation to handle different fuels, market activity, urban growth and materiality, all of which are ways to view the historical record. The flame of wood was replaced with the furnaces of coal to the various fuels generated by oil, each of which required different technologies. Each one of these transitions created new work, new artifacts, and new kinds of
transportation while bidding good-bye to old patterns and customs now swept away by the changing fuel picture.

The Four Stages of Fuel Use

This study divides each fuel’s development and use into measurable sections of the population’s interaction with a particular fuel. This periodization tool is divided into four stages:

- Stage I: Discovery and Development describes the initial interaction with a fuel source and the tools used to extract, refine and deliver it to market. This study will describe that
stage repeated in wood on the frontier of western Missouri, and as both coal in the eighteenth century and oil in the nineteenth century begin their debut in America.

- **Stage II: Systems Organization** describes the period during which early methods of producing the fuel begin to mature, systems are put in place to efficiently organize production given the technology available, and better financial, transport and delivery systems develop.

- **Stage III: Expansion and Defense** describes a fuel’s growth to its maximum potential as market forces of supply and demand attempt to deflect its growth.

- **Stage IV: Niche and Decline** shows a fuel finding its most appropriate concentrated use based on its qualities and market pressures. As a fuel becomes obsolete or too expensive or scarce it goes into ultimate decline.

Embedded in the graph in Figure 1 are any number of changes in technology, transportation, labor, consumer education, demand and use, government reaction, market bonanzas, price clashes and fluctuations, consumer goods and levels of comfort and convenience. These figures show fuel transitions in process, moving from one fuel to another, wood to coal to oil as dominant or rising fuels. The term “energy consumption” is used to describe not only the fuels of wood, coal, oil and natural gas, but the energy of hydropower as well.

The title of this study, “Flame Furnace, Fuel: Creating Kansas City in the Nineteenth Century,” reflects the changing personality of fire in the lives of the settlers on the western edge of Missouri over a hundred year period. **Flame** suggests the open flame of a wood fire for hearth and light source, while **furnace** suggests the necessary encasement needed for a
coal forge and the accompanying industrialization of metals that followed the use of coal. *Fuel* reflects the number of fuels that grew from the discovery of oil-- different kinds of crude oil, kerosene, propane, gasoline and eventually more. All of this change occurred in a hundred year span here and around the world.

To change from using one exclusive fuel to a “fuel basket” in a hundred years is an amazing event in human history. Imagine having lived through the transition from wood to coal and coal to wood as millions did, but whose changes in fuel got very little attention compared to the machines that these fuels made possible. The romance in these changes at the time was all about the steamboat, the railroad, iron and steel, the stove, the increasing material output from mass production, not about the fuels that made them possible.

In this study the four stages of fuel use coincide with the four parts of this work: Part I: The Greatness of the Wood Age from 1607 to 1820 begins with wood at its peak and ends with coal being discovered in the 1700s with that fuel developing in Stage I: Discovery and Development. The Osage Indians in the Kansas City area experienced their own changing fortunes with energy. Within this period, while still at the height of using wood or buffalo dung as fuel, the Osage experienced their own energy transition as they acquired the horse, changing their fortunes as it changed their mobility. Meanwhile, the Euro-American settlers arrived and recreated their own energy suite from forests previously untouched by axe.

Part I shows the settlers in a Stage I use of wood on the frontier when most wood was cut from the farmer’s own property to clear fields for planting and to build log houses. The world of wood as fuel is the one experienced by people throughout history until the invention of the steam engine. This world is described here in both the Osage and Euro-American lives in the
little settlement on the shores of the Missouri River before the first steamboat landed. This is the Wood Age at its height in two different cultures, hunter-gatherer and agricultural, before mechanical power arrived to change their lives. This period ends with Missouri statehood.

Part II: The Great Awakening of Fossil Fuels from 1820 to 1870 describes the arrival and meaning of mechanized water travel and the early industrialization of fuel delivery as wood transformed from passive fuel to heat and light to active fuel to turn an engine. The period from 1820 to 1870 is rich with fuel and energy transitions. The Osage were removed from their forest environment, their own energy suite, and forced to relate to an agricultural one on the plains. The white settlers broke down the forest and turned it into agricultural land. The steamboat invaded these two Wood-age life styles and acted like an arrow to the heart of the Wood Age. Its mechanical crawl up the river eclipsed the keel boaters on the Missouri as it brought to a close eons of muscle-powered efforts to go up river without the benefit of engines.

Steamboats puffed up the Missouri River in the 1820s using mechanical power for the first time in this area. Even as the sound of steam engines rang out on the western edge of the then United States, muscle-driven wagon trains to the West increased from Kansas City along the Santa Fe, California, and Oregon Trails. These energy components of human and animal muscle, wind and water characterized the Wood-Age scene in an overlap of energy suites. This period ends with the Hannibal bridge opening across the Missouri River in 1869, an event connecting the continental railroad as important as the golden spike at Promontory Point, Utah, and introduces Kansas City to the country as a railroad hub.
Such components as wagon trains and water mills comprise what may be called an energy suite. Like a set of furniture all of one period and design, energy components reflect the dominant fuel upon which the population relies. When in the Wood Age, most things were made with wood, hearths were heated by wood, and manufacture was constrained by the amount and kind of wood available. That energy suite passed into history as various components of it were replaced by those of the new fuel, coal.

The Coal Age overlapped many energy uses before replacing those of the Wood Age. The energy of human and animal muscle was more slowly replaced than the fuel of wood for coal. These parallels of fuel and energy expression spanned and powered a good part of the nineteenth century. Pre-steam wagon trains and post-steam, engine-driven wooden boats, for instance, worked together to develop the West. Such overlaps are common in these transitions because few events create clean-cut changes in either fuel or energy.

Systems emerged to supply the steamboat with wood first, and then coal in a haphazard, but increasingly organized manner. The post-steam world of Kansas City grew as the result of systems emerging to organize fuel delivery for steamboats on the river, a pathway that coal would follow as it reached for supremacy. At the same time, wagon trains trudged overland pulled by mules, oxen and horses in the quintessential Wood-Age fashion. Pre-steam and post-steam energy sources worked to support the emigrant travel from East to West.

This period from 1820 to 1870 closed with the climactic clash of competing energy suites—the Civil War—one mechanizing and one clinging to hand labor, an ancient way of doing business that would soon be supplanted. The intensifying competition had raged for
decades between an economic system based on forced labor and an encroaching world of increased machinery and volunteer labor. Emancipated slaves found their way in their own energy transition buoyed along by a rising tide of coal. At this moment in history Kansas City became the connecting point between eastern and newly opened western markets with the spanning of the first railroad bridge across the Missouri River in 1869. This single, historical event propelled Kansas City into the age of industry with coal as fuel.

During this same period coal began to be used to provide motive power for the steamboat on water and the railroad engine on land, thus introducing the beginning of a major fuel transition in America. This period laid the groundwork for coal’s ascension to its peak.

Part III: The Great Exchange from 1870-1900 describes the growing peak of coal use as Stage III: Expansion and Defense explores the commercial dominance of wood as it defended itself against other fuels. When any product expands in the marketplace, it meets resistance from other similar products or from bottlenecks of labor, finance, transport and technology undeveloped enough to handle the increase. The implication of Stage III: Expansion and Defense is that during this period fuel use expands to its greatest extent. Price, quantity, quality, transportation and customer acceptance all become factors in inhibiting or expanding each fuel’s use.

With the arrival of coal came wholesale change in both fuel and energy. Coal made possible the ability to do more work in ingenious new ways. Iron making with coke from coal, the equivalent of charcoal from wood, increased both quality and output of items made of iron from railroads to ornamental gates. Small electric light companies used direct current
to light a few dozen homes and provide business establishments with light generated by a stationary steam engine and a pile of coal out back in a shed.

Gaslight vied with electric light for supremacy. City councils, merchants, and eager entrepreneurs began to speak of the “demise of the equine” within two centuries of the Osage Indian’s acquisition of the horse. The expansion of coal, the defense of wood against coal, and the beginning of the demise of wood in Stage III describes the interaction of fuels, technology and human needs as played out in the growing population of Kansas City from 1870 to 1900. As the lines in Figure 1 show, coal use crossed over wood use in 1885. The Coal Age came into its own in Kansas City in this period as it did around the world.

At the same time the discovery of oil in 1859 meant that coal, now in a robust rise as mechanical fuel, would soon be threatened by oil. Coal had not yet overtaken wood and oil was at its heels. At first the liquidity of oil meant that it immediately began to replace animal and vegetable oils as lubricant and light source. Whale oil increased in scarcity and price and needed replacing. The increased mechanization made possible by the use of coal in metal production meant increased demand for oil and lubricants to run them smoothly. This brief period shows for the first time in history three fuels in three different stages being used at once. It was not until the turn of the twentieth century that new discoveries of oil at Spindletop in Texas, and the internal-combustion engine brought oil into use for transportation and the automobile into eventual favor over trains.8

Part IV: The Great Synergy of Multiple Fuels from 1900-1920 shows wood fuel at Stage IV: Niche and Decline. By the beginning of that period petroleum had made its way into Kansas City homes in the form of kerosene for lighting, while various petroleum-based
lubricants began to replace animal and vegetable oils in local industries. New sources and types of crude oil expanded the market as automobiles proliferated and demanded easy access to fuel. Steam engines still provided the majority of energy to do work, but both natural gas engines and electric motors fueled by coal provided power. Wood as a source of industrial fuel virtually died out, though many homes continued using it as fuel until the mid-twentieth century, particularly in rural areas where wood was still readily available and coal delivery remained problematic.

This stage shows how a once dominant fuel or one that has passed its peak whether dominant over others or not, declines in use in general or finds a niche, or is converted, as in the case of wood, into another market entirely. On a rising tide of different fuels from kerosene to gasoline and resultant energy, Kansas City grew to a thriving metropolis by 1920, resembling only in location its original humble beginnings as an Osage hunting ground and a fur-trading outpost in the Wood Age.

Now coal and oil competed in an increasingly mechanized marketplace as both became transportation fuels and were used in home and industrial power and lighting along with natural gas and electricity. This part describes the fourth stage of fuel use with the historic demise of wood as example. The accompanying part of the fuel and energy story follows the bell curve downward for wood and upward for oil.

The purpose of this hundred-year exposition on fuel and energy transitions is to provide a framework for the study of both that will expose the intricacies of moving from one fuel to another, and from one form of energy to another. In the course of this story, the affected populations left one fuel behind while taking on two more with all their characteristics and
tradeoffs. Each fuel created its own demands in technology, its own set of advantages and drawbacks, its own forms of pollution, and its own learning curve that impacted the people exploiting the fuel for the first time. In general, each new fuel contributed to comfort and convenience, a new suite of complementary artifacts and experiences, safety and speed, tangible economic efficiencies and growth, and the intangible impacts of increased vistas and changed viewpoints.

Population of Kansas City, Missouri

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>1850</td>
<td>7,800</td>
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<td>1860</td>
<td>4,418</td>
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<td>1880</td>
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<td>1900</td>
<td>163,752</td>
</tr>
<tr>
<td>1910</td>
<td>248,381</td>
</tr>
<tr>
<td>1920</td>
<td>324,410</td>
</tr>
</tbody>
</table>

Figure I-2.: Population of Kansas City, Missouri 1820-1920 These population figures show the amazing growth of Kansas City of over 3,240 per cent growth in a century. Population figures vary for the town itself before 1860. Federal census figures for Jackson County exist for 1850 at 2,529, including 500 slaves.10

The rise and fall of “Peak Wood,” preceded the rise and fall of “Peak Coal,” or as it was called at the time, “King Coal,” each with its unique characteristics. Each had its combination of fuel and energy relationship. In the beginning little wood and a great deal of animal and human, wind and water energy powered Peak Wood. As mechanical energy took over human tasks and increased energy flow through, the relationship changed between fuel and energy to more fuel, less human and animal energy.

Now the rise of “Peak Oil” shows a huge energy flow through powered by machines burning unheard of quantities of fuel a hundred years ago, and little human and animal
energy needed in a complete reversal of quantities of fuel and attendant labor. All of these signals in the historic record speak to the changing role of fuel in people’s live. With the search and identification of these stages in the historical record and in current events, the fall of Peak Oil may be better recognized through the use of this four-stage measuring tool. We can begin to see indicators and milestones emerge before our eyes from a fuel and energy point of view.

Without some form of measurement to help map the virtually unrecognized region of fuel and energy transitions, we have to rely on “how much oil is left” as our only indicator. With such a tool and its milestones we can begin to understand where we have been and look for particular indicators where we are and where we may be going.
PART I: THE GREATNESS OF THE WOOD AGE, 1607-1820

The amounts and types of energy employed condition man’s way of life materially and set somewhat predictable limits on what he can do and on how society will be organized. The influence of energy is seen to be ubiquitous, with economic, political, social, psychological, and ethical consequences intermeshed.¹


In the long reign of wood as both the predominant fuel and building material, humanity grew from filling its most basic needs for fuel for today to its most sophisticated desires for building long-lasting empires. By the time America’s shores were breached in the seventeenth century by the incoming tides of immigrants, the world’s populations had together reached a mature stage of wood use expressed in low- and high-energy systems. The amounts of energy available depended on the technology developed to use them. Those with little technology lived free of permanent accouterments while those with high-energy systems lived in a world of permanent buildings, domesticated animals, agricultural food production, technology and artifacts.

The graph above indicates that from 1607 onward, when British colonists first established a permanent colony at Jamestown, Virginia, and, indeed, for eons before, humanity used wood nearly one hundred per cent of the time for fuel. Coming to America only meant

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perpetuating that practice with new forests. But this chapter begins at the end of this long era.
By the time permanent white settlement arrived on the shores of the Missouri River in 1820, the Coal Age was going on two hundred years in England, had already arrived in Philadelphia and New York and Boston in the late 1700s, and would arrive shortly at the limestone pier on the Missouri River eventually to be known as Kansas City.

Most of the inventions of the Wood Age had been made in earlier eras. Little new technology lay on the horizon for wood—except to move from heating and lighting to motive power for machines—from passive to active fuel, but no one yet thought in those terms.

Beginning at the End of the Story of Wood Use

As Figure 1-1 proposes, this narrative begins with wood use as fuel at Stage III, since wood had been fuel for the entire human population of the Earth from the moment the first tree limb was deliberately thrown on a fire. For thousands of years humanity passed through the early stages of using wood for fuel, described here as Stage I: Discovery and Development of the fuel source, and Stage II: Systems Organization of cutting and distributing wood for fuel. In these early stages populations organized themselves into villages, towns and then cities.

As civilization progressed from that point to the nineteenth century, populations used their skill and creativity to organize wood supply into elementary systems of use. Being heavy and hard to carry overland, wood was moved by water whenever possible. Communities lived as near to forests as practicable where the woods were used and reused until they were gone and the population moved on in search of new stands of timber. Over time wood as a raw
material became central to creating the infrastructure of human life. Humans everywhere depended on their access to wood and used it to fulfill their needs in homebuilding, clay-pot firing, metallurgy, shipbuilding, wheels, wagons, and weapons.

Maturity in fuel use means that the best ways to harvest the fuel have already been developed, and the methods of distributing that fuel--the cultural marketplace--had acquiesced to wood’s properties and limitations. Different woods served different purposes, most all of which had been discovered and exploited by carpenters and ship builders, cooks and blacksmiths.

Wood had expanded to dominate the fuel market because it was virtually the only fuel available in quantity. When only one fuel dominates, its quantity and qualities dictate life completely. Except for variations of environment, people lived by the prevailing technology that interacted with wood as both building material and fuel. The quantity of wood they had and its features dictated the quality of their lives.

Wood dominated the materials market as well. Little metal was available because of the limitations imposed by wood’s qualities, quantities, and man’s abilities to coax from a charcoal fire those precious sharp metal edges that meant so much to craftsmen and warriors, cooks and artisans. Wood expanded to fill every available niche of human endeavor. As far as defending its fuel position in the market place, it needed no defense because no other fuel challenged it.
Pioneering Means Starting Over at Stage I

Certainly the newly arrived colonials would have to scramble swiftly through Stage I: Discovery and Development of wood sources, one of their easier tasks in setting up their outpost along the heavily wooded Virginia shore. Within the first few days they would have organized some system to cut, saw, size and transport to guarantee a steady supply of wood in a brief Stage II: Systems Organization period, but would do so without the centuries of experimentation their forefathers endured. The systems of wood identification, classification, use and distribution had already evolved, something the pioneers instinctively brought with them.

From 1607 onward shiploads of immigrants arrived and settled, the pilgrims to Plymouth Rock in Massachusetts in 1620, with the other eleven colonies forming shortly thereafter. Georgia, the last colony, received her charter in 1663 thus completing a solid row of European crown colonies from what is now Maine to the Spanish Floridas. These colonies became the beachhead of English commerce in America, this frontier representing the Old World and its ways across the Atlantic Ocean from time-worn Europe. To this thin strip of land, a higher energy system was introduced and practiced for two hundred years before it arrived at the western shores of the Missouri River fifteen hundred miles inland.

Along with their meager belongings the colonists imported their cultural blueprints that had been passed down to them from uncounted generations. These intrepid newcomers to the Virginia shore knew how to fell a forest, how to strip a tree, how to turn it into walls, roofs, doors, floors, boats and ships, fences, wheels, wagons, weapons. They imported patterns of what life looked like in the Wood Age resides in their cultural DNA would be repeated up
and down the east coast of America. Two hundred years later that blueprint would again be applied on the western edge of the new state of Missouri, where the settlers would start at the beginning again to recreate their time-honored way of life depending on wood.

The Ripples of Change: International, National, Local

Internationally, then, by 1820 when the white settlers converged on what would become Kansas City, the British had already moved on to coal and had launched the Fuel Revolution in the mid-1700s. That meant that because wood had become too scarce and dearly priced to support their economy, the British had moved from wood as fuel to coal as fuel and had begun to manufacture materials made of iron in massive amounts where once iron had belonged to the few. New production included such creations as iron bridges, iron pots at reasonable prices, iron gates for the rich, and many more cannon and cannon balls. Machines using waterpower and later, steam engines, had begun to replace the handwork of the family as production unit. This process would be repeated all over the world up to and including the present time.

Nationally by then, the eastern seaboard of America had already endured shortages of wood and been forced to take up coal in some quantity by the early 1800s. Locally at the Kansas City site, white settlers, according to the time-honored blueprint,
repeated the patterns of clearing land for farms, cutting trees, building log cabins and wood houses and burning wood for fuel that would eventually make wood scarce along the Missouri River.

No hint of mechanization, or change of pace, or invention of machine yet crossed the imagination of the new settlers, but once coal began to circulate as an alternative fuel, change became inevitable. Coal could produce coke, a superior and ultimately cheaper element for making metal than charcoal from wood. Coal’s abundance would replace charcoal’s growing scarcity. Coke, charcoal’s replacement, would first produce iron abundantly then steel and more of it than could possibly be produced by charcoal fire. The process of creating charcoal on “iron plantations,” razed whole forests yearly and could not sustain a young country’s need for fuel.7

No one on the shores of the Missouri River in 1820 could imagine that within forty years over 700 machine-driven steamboats a year would stop at this spot, nor could they in any way conceive that a city of over 324,000 citizens would flourish there a hundred years hence. Nor could they know that after untold millennia of domination, the Wood Age would crumble within fifty years.

The Relationship Between Fuel and Energy

The fuel and energy suite of the Wood Age is predicated on massive amounts of human and animal labor as energy and very little technology based on wood as a passive fuel for heat and light. Though the basic mechanisms of the rise of humanity had long since been invented, the wheel, the lever, the inclined plane, the screw, the sail, eventually the stirrup
and the windmill, human and animal labor provided the energy that powered civilization along with wind and water power.

As coal came on the scene in America, a reflection of what had already occurred in England, it introduced a massive generation of energy. Within an average human lifetime a change in the relationship between fuel and energy shifted from muscle, water and wind to energy generated by machines, what we now know as the Industrial Revolution. It may more truthfully be known as a Fuel Revolution because it was the kind and amount of fuel available that shifted the relationship between wood fuel and human energy.\(^8\)

In two hundred years the exchange of sustainable fuels for fossil fuels would completely reverse the ratio of fuel to energy so that “heavy lifting” would seldom be done by human or animal and most all mechanical work would be done by machines. This study looks at the first hundred years of that transformation at one little outpost in the middle of the country that would be caught up in the same world-wide transformation.

Chapter 1: The Land and Its Inhabitants as Energy System describes one of the four basic components of the Wood Age energy suite at the Kansas City site: earth, air (weather), water, and fire. Its inhabitants include the plants and animals typical of the Midwest as well as the Osage Indians who lived among them.

Chapter 2: Fire: Women’s Work or Men’s Work? compares Euro-American wood use with Native American wood use and the differences in gender involved with practicing fire between the two cultures.

Chapter 3: The First Energy Transition shows the first energy transition in this study, the introduction of the horse into the Osage Indian population.
Chapter 4: Diet as Energy Component discusses the range of food available to a population in a low-energy system and what they had to do to get it.

Chapter 5: An Energy System Expressed in Politics illustrates the way a high-energy system expresses its advantage to a low-energy system.

Chapter 6: Slavery as Energy Component looks at the institution of slavery that arrived with the white settlers and marked it as a community with ties to the ancient past of slaveholders and users and economics based on that set of values.

Chapter 7: Water as Energy Component includes the water power that both cultures used for transportation, but which the settlers also used for milling. Each one of these components played a large part in the success of Euro-American settlers, and each was used as a resource to support the operation of a high-energy system brought in by them.

Chapter 8: The Beginnings of a Fossil Fuel Energy Suite introduces the beginnings of coal use in America, the introduction of the fuel that would change the way Americans lived and worked and manufactured their artifacts. Like an alien species introduced into an ecosystem, coal changed the food chain, the speed of reproduction and the offensive and defensive measures of the marketplace. Perhaps for the first time, merchants realized the advantages of a fuel in creating greater advantage in the marketplace. Having taken wood fuel for granted as the only fuel, they found themselves upstaged, out priced and better manufactured by coal users.
CHAPTER 1
THE LAND AND ITS INHABITANTS AS ENERGY SYSTEM

To look at the beginning of settlement by the Euro-Americans in a land already occupied by the Osage Indians is to create an opportunity to rethink that history in terms of fuel and energy use. Seen through this lens, life before the first steamboat arrived is a complete energy suite of people, animals, wind and waterpower working together to produce a certain standard of living with wood as fuel. Both cultures lived in a resource-rich but technology-poor environment. Unknown to them were deposits of coal and oil beneath their feet, the “underground forest” or “underground reservation,” as those resources would later be called.9

In settling an area thick with forest, the Euro-Americans felled their own trees and chopped their own wood or had slaves do it in what may be called a pre-commercial use of fuel.10 The populations of both Osage and white cultures found and burned their wood without the exchange of money or trade of goods in any kind of formalized marketplace. None existed for fuel wood on the frontier, nor was one needed. Both cultures lived with the plenty of fuel wood in this central Midwest location but with a scarcity of the energy resource of technology. Within those constraints one population lived at the height of the settled Euro-American agricultural version of the Wood Age while the other population lived at the height of a semi-nomadic hunter-gatherer version, which could only exist in the Wood Age.11 This chapter looks at both cultures through the lens of wood as fuel and the attendant energy available.
A Land of Rough Terrain

The area that became Kansas City showed the Midwest at its best, a mixture of timber and prairie, thick woods, open meadows, rolling hills—and limestone cliffs overlooking the Missouri River. Unlike the open prairie beyond the river, this westernmost stretch of Missouri grew a profusion of thick stands of white oak, black oak, hackberry, mulberry, box elder, walnut, ash, sycamore and cottonwoods. Some white oaks measured seventy-nine inches and some walnut trunks sixty inches in diameter and served as witness trees for John C. Sullivan, one of the government men who surveyed the area from 1818 onward as statehood was conferred.12

Even before the surveyors arrived, white “discoverers” had reported on the area. In 1804, the Lewis and Clark expedition noted coal deposits on the riverbanks on June 25th, just a day before arriving at the future Kansas City site, but no use had yet been made of them as fuel in an area thick with trees.13 The natural abundance of the land promised good support to a Euro-American population: good soil for crops, plentiful rivers for carrying their harvest to market, thick woods for building houses, bountiful game to eat--the new frontier of the nineteenth century beckoned.

Outcrops of layered limestone testified to the geologic history of ancient seabeds as “abundant outcrops of rather heavy beds of limestone accentuate the roughness. The larger streams that drain the high upland plains are also bordered by belts of rough country,” wrote William Zickman in his 1920 history of Jackson County, Missouri.14 The limestone bluffs on the south side of the Missouri River forced the current to deposit its load of good silt instead in Clay and Ray counties on the north bank of the river. This same current left exposed the
natural limestone pier on the south side that would make a good steamboat landing later on. On this site would rise the future village of Kanzas, as it would first be spelled. Within a hundred years it would blossom into a robust Kansas City.\textsuperscript{15}

Beaver lived abundantly along the many streams; elk and bear flourished and buffalo ranged here but most abundantly on the western plains, along with a profusion of white-tailed deer: “Their tracks are as plenty as Hogs about a farm,” William Clark wrote on June 26, 1804, a few days after the expedition’s stop at the limestone promontory overlooking the confluence of the Kaw and Missouri Rivers. Brown bears, wild turkey, raccoons, a stunning array of wildflowers, “rasberreis perple, ripe and abundant,” tall sweet grass, and all manner of birds from eagles to the now extinct Carolina parakeet—not to mention snakes and insects, “Musquitors, Ticks and Knats verry troublesome.” They also saw “emince number of Deer on both Sides of the river . . . and great quantities of Bear Signs where they had passed in all Directions thro the bottoms in Serch of Mulberries, which were in great numbers in all bottoms thro which our party passed.” As for the cliffs, “Hills on the L.S. this evening higher than usial <sic> about 160 or 180 feet.” In other words, a land rich in food, water, cover and fuel, available for the taking.\textsuperscript{16}

Neither Lewis and Clark in 1804 nor the first white settler, French fur trader Francois Chouteau in 1820, encountered a settlement at the site though the larger territory was occupied by a tribe of an estimated six to seven thousand Indians known as the Wah-Sha-She, Wazhazhe or Ouazhagi, later pronounced in English as Osage.\textsuperscript{17} They were part of an estimated, though unsubstantiated population of some 378,000 Native Americans in the Midwest alone. A white traveler such as Daniel Boone in 1798, however, rode from
Kentucky through Illinois to western Missouri without meeting a soul in two months. The Native American numbers, thinned by disease and guarded by their natural wariness, kept out of sight.\textsuperscript{18}

**Handle Them as Tactfully as Possible**

The Osage Indians dominated the “middle waters” of Missouri and Arkansas. Their force could not be ignored. They were fine warriors whose highest goal in life was to die in battle, so visitors soon learned to avoid provocation. Approaching them meant being particularly sensitive to their strength and prowess, hence the directive to handle them carefully.\textsuperscript{19} The Osage enjoyed a hunter-gatherer life of efficiency and long endurance whose meat diet was augmented by small vegetable gardens. They lived in symmetrical, semi-permanent villages, with few tools, and one domesticated animal—the dog. Relatives of the Dhegiha Siouans along the Ohio River, they gradually moved west into Missouri.\textsuperscript{20}

Once involved with the French in fur trading in the seventeenth century, they expanded as far west as the Rockies and as far south as the future states of eastern Oklahoma, Kansas and Arkansas.\textsuperscript{21} Strong in both stature and belief in themselves, they occupied a strategic position in the Midwest that made them a formidable presence for any neighbor or interloper. Simplicity in technology did not keep them from being in command of their territories.

The Euro-Americans arrived with an agricultural system that required to make it work horses, oxen, mules, wagons full of possessions, axes, plows, a few machines such as corn and coffee grinders, and even a small population of slaves. On the bend of the Missouri River before it turned north, at the western edge of a newly defined political boundary, they
intended to build a settlement that would look exactly like those they had left behind in Europe and the east coast of America.

The white settlers would go about creating their lives there in exactly the same way with plow to till the land and gun to ward off danger, with “talking leaves” of paper, as the Cherokee called them, full of promises to the local Indian tribes to give them land farther West.\textsuperscript{22} The site that would become Kansas City hung on the very edge of East and West, the border between “Indian Territory” and “civilization,” as the settlers saw it.\textsuperscript{23}

Flames from wood fires for both cultures provided passive heating elements and meager lighting as they had throughout human history. The Osage stopped there with the use of fire except to add it to land clearing and defensive uses. The Euro-American settlers, however, came from a long tradition of using fire to make metal products. They used wood charcoal to make metal tools like knives, plows, scythes, guns and other implements that increased their energy level to convert natural resources to material goods. Each tool became a way of organizing energy to focus it for a particular task, and with that concentrated energy do more and faster work than without those tools. Having long since domesticated livestock and learned to plant crops, and having acquired and refined the wheel, they could bring possessions with them in wagons pulled by draft animals. The addition of a slave labor population to this mix meant the settlers lived at and commanded an entirely different energy level from the Osage Indians.

The white pioneers made wood into implements like gears for water wheels and mills as well as all tools from lathes to axes to kitchen tools with just the smallest cutting edge made from iron or steel because each metal piece had to be forged individually by hand.\textsuperscript{24} Because
they had metal cutting tools like axes, saws, lathes and knives, the Euro-Americans used wood as building material if it was at all available. They made only their most prominent buildings in stone, or by firing clay with wood-fired furnaces to make brick. Family housing was made with logs or cut wood. They carved wood into furniture and decorative pieces; they paneled walls and ceilings, installed plank floors and covered the sides of their houses with it. Every ship and wagon came from wood sources.

The Osage Indians had no metal tools, no wheeled conveyances, no beasts of burden, no permanent structures and few possessions. They moved with the seasons following game and planting small gardens of vegetables, while the white settlers lived in the same place in spite of the seasons, having the tools to keep warm in winter and cleared land to grow sufficient produce to diversify their diets. White settlers always intended to build at least a village if not towns and cities of permanent dwellings, streets, churches, schools and other accoutrements resulting from their interpretation of the Wood Age.

Though the Osage lived relatively simply by European standards, their lives included a rich, invisible world of belief based on observation of their natural surroundings, respect for order that meant living in tune with the environment, a sophisticated governance rising from experience in living in small family groups supported by a semi-nomadic base. Though they had no written language they passed on carefully monitored and memorized rituals and stories of their people’s way of life.

They were circumspect about every action so that none were disorderly, disrespectful or intrusive. They lived in this respectful manner toward nature “at the contact line between the prairie-plains and the woodland.” Their way of life rested on a complete working
ecosystem as carefully interwoven with their surroundings as generations of native wisdom made possible. Euro-American settlers, however, with their more complex energy system, easily intruded on that lifestyle and irrevocably forced an exchange of low-energy for high-energy systems.\textsuperscript{27}

The Osage had a strong belief in honor and bravery shown by waging battle or by provoking skirmishes with other tribes to test their own bravery.\textsuperscript{28} The Osage were contentious to begin with because of their strongly held desires to be seen as brave warriors. Located as they were in the geographic midsection of the continent, they played a key role in allowing traffic to and from fur-bearing lands. Fortified with guns and horses, the Osage dominated other neighboring tribes as well as the fur trade traffic and exacted tribute from the Europeans in both gifts and diplomatic favors.\textsuperscript{29}

Both the Spanish and the French knew about the Osage and their touchy temperament: “The Osages are the worst two tribes that we have on the Missouri and at the same time the strongest, the more so if they unite,” wrote one Spanish official to another in 1790. “For this reason it is necessary to temporize with them to some extent, handle them as tactfully as possible in order to restrain their excesses, as the few forces in the country do not permit anything else.”\textsuperscript{30}

The Great Osages, as they called themselves, lived in one village on the Osage River some seventy miles south of that limestone pier. Soon after Lewis and Clark’s visit, the federal government built Fort Osage, some 25 miles east of Kansas City on the Missouri River as an outpost to trade fur for goods with the Osage and as a military force to protect white settlers. No more than a few white families settled at that time farther downstream where the fur-
trading post was located. The Osage hunted along the Osage, Gasconade and Neosho Rivers south of the Missouri River to the headwaters of the St. Francis and White Rivers and on into Arkansas. They were estimated in 1825 to have a population of about 1,200 people at this site. Of these, 350 were warriors and hunters. It was reported that 55-60 were elderly and the rest were women and children.

Another branch of the Great Osages lived about a hundred and 40 miles southwest of Fort Osage in one village on the Neosho River. Their numbers were estimated to be about 400 in population with a hundred or so warriors. The Little Osage, as they named themselves, lived another hundred miles or so south on the Neosho River in three villages along with the remaining members of the tribe called Missouris, who had been folded into their numbers after small pox had destroyed their tribe a century before.

This population was estimated at about a thousand. George C. Sibley, Esq., Factor or fur trader at Fort Osage estimated the numbers of the Indians with whom he traded at the fort. The fort, built in 1808, acted as both a military outpost and a government trading post for the Indians to bring in their furs to exchange for knives, shirts, beads and other trade goods. It was the hope of the United States government that peaceful trade with the Osage would avert attacks on white settlers.\textsuperscript{31} Though an exact census of the Indian populations of the continental United States was never made, these numbers were taken at the time as a good estimate.
The ancestors of the Osage Indians and those of the Euro-American settlers had lived in separate hemispheres up to the sixteenth century when their cultures began to merge. Each
had survived and prospered at different levels of energy use while burning the same fuel. The Osage had developed exquisitely balanced skills to live in the undeveloped world of the Western Hemisphere in a thinly sheltered existence very unlike their Old World cousins.

They lived in the woods, on the ground, outdoors and knew that they themselves needed the same cover, food and water as did the animals they hunted for food. In spite of the large population of Native Americans occupying the continent for thousands of years and using and modifying its resources, great forests still stood, enormous numbers of game ranged, huge catfish swam in the rivers, flocks of birds beyond counting flew overhead.\textsuperscript{32} A land of plenty that boggled the imagination of newly arrived settlers had somehow endured eons of use by indigenous populations at a level impressive to Europeans.

The American Indians of necessity built their energy system on the values of perpetuating their landscape rather than consuming it. Their values, beliefs, mores, actions and artifacts, in other words, their culture, supported that understanding. As Native Americans everywhere had learned, “Over time they acquired a comprehensive understanding of the life-giving uses of resources around them and harvested little more than they consumed or traded for other like items.”\textsuperscript{33}
CHAPTER 2  

FIRE: WOMEN’S WORK OR MEN’S WORK?

The Osage division of labor followed traditional lines. Firewood was gathered by women who built the fires. Women kept the fires going by borrowing fire from the chief’s lodge from which all other fires were taken. Women tended the daily cooking fires. Men hunted; women prepared. Men protected the village; women planted gardens, built the housing, made clothing and blankets from animal skins and cared for the children. Women probably exerted as much muscle in gathering and transporting firewood as in any activity, and this task was women’s work.

The Native American approach to firewood completely opposed that of the white settlers. Native women gathered driftwood, twigs and branches. With a sprig of fire taken from the main lodge, they cooked over small fires and heated the confines of their teepees in winter or lodges in summer. Women used no hacking, sawing or cutting to gather their daily load. Those tribes who may have captured slaves sent them out on the onerous task of bringing home firewood, a journey that, toward the end of a population’s stay in an area, might take them several miles in a day.

The Osage lived along the banks of rivers not just for ready access to water, but for the driftwood that would wash up on the banks as well. Paul Wilhelm, Duke of Wurttemberg in his *Travels in North America, 1822-1824*, remarks several times about the “driftwood heaped against the bank,” which suggests a steady delivery of wood to a nearby tribe. Once an area had been picked clean of firewood, the village would have to move, or else longer journeys
to new gathering sites would become part of the women’s daily pattern, perhaps one of the reasons fires were kept small.\(^{38}\)

Another supposition can be made that lodges made of rushes and brush were very flammable and fires had to be kept small to avoid sparks setting off a quick conflagration. Women had to understand the properties of fire very well before starting to cook their meals. Having brought fire from the chief’s lodge to cook, women were aware of how capricious fire could be. It was considered beneficial to have fire from the chief’s lodge, and probably kept less-skilled people from starting the house on fire by striking flint on flint. It would make a European used to a stone hearth pause before striking tinder there.\(^{39}\)

Scholarly work is virtually absent on this subject of native fire uses because of lack of records or eyewitness accounts. Robert Heizer, in his compendious article published in 1963 on aboriginal use of firewood around the world, laments the scarcity of descriptive accounts by any ethnographer.\(^{40}\) It is just one of those details so “prosaic and mundane” as to be overlooked. He does offer some figures based on other ethnographers that a family might burn as much as 83 pounds of wood per day per family or 1,250 pounds per day for the village. These figures were an estimate from a San Francisco Bay area Indian culture. In a village of a hundred people, not an uncommon number, that would be twelve pounds of fuel per person per day. This seems a prodigious amount, unmaintainable and even dangerous in the confines of fragile domiciles.

Since firewood is almost universally gathered by women, say a third of the tribe being in the category of wood gatherers, a load of about forty pounds of wood each seems high in weight vs. body strength, voracious in terms of amount used, and unwise in terms of having
to move the village frequently, since what surroundings can support that kind of use for very long? Moving village sites frequently is not a characteristic discernable in the Osage literature, though as Robert Heizer suggests, the details may also have been too “prosaic and mundane” to bear recording. Many questions remain unanswered. While there is literature on Indian use of fire to alter the environment, there is scant information about use of firewood or their beliefs around fire in daily use.41 Here is one of the few eyewitness observations:

The white hunter, on encamping in his journeys, cuts down green-trees, and builds a large fire of long logs, sitting at some distance from it. The Indian hunts up a few dry limbs, cracks them into little pieces a foot in length, builds a small fire, and sits close by it. He gets as much warmth as the white hunter, without half the labour, and does not burn more than a fiftieth part of the wood. The Indian considers the forest his own, and is careful in using and preserving every thing which it affords.

Henry Schoolcraft, *Ozark Journal*, 1818-181942

By all descriptions, the pioneers made profligate use of fire for heat, hastening the day of fuel wood scarcity.

Clearing wood for planting of crops, of course, was a cornerstone of the white settlers’ use of the land, hence the clearing of whole trees vs. the twigs that the Indians might use. The Native American value was to leave the cover of the forest somewhat intact for both themselves and the creatures they hunted. Unlike the Osage women who used pliable saplings to build lodges, the settlers looked for large logs a team of men would cut down. An American log cabin used about 80 logs plus smaller timbers for gables and shakes and the fireplaces could hold a log two to three feet thick. A family might burn a half to a full cord of wood per day in the winter in a drafty log cabin.43
Figure 1-4. The Native American Fire Indians around their campfire shows a small fire for which the wood has been gathered by the woman tending the cooking. (These are not Osage but a generic Indian rendering, since the Osage shaved their heads and eyebrows but for a strip like a Mohawk down the center of the scalp. See photo of Ma-chet-seh in Part IV). L. Stebbins, One Hundred Years’ Progress in the United States, 1872.

Figure 1-5. The White Settlers Fire Settlers have an iron pot and an axe, two pieces of technology that give them great advantage in cooking and collecting wood, which is being cut by a man with the axe. The horses and wagon in the background show the high-energy system they enjoy even as pioneers on the frontier. L. Stebbins, One Hundred Years’ Progress of the United States, 1872.
The Osage actually transformed very little wood into utilitarian items, including their shelters. Osage women wove rushes for wall panels. Teepee poles had to be lightweight to move to the prairie and back and those walls were made of buffalo hide. Euro-Americans used wood as a necessary commodity to support their way of life, including such items as the zigzag fence to keep livestock in and to protect their crops from wildlife that used as much as 25,000 or more rails for every four miles of fence, often building them to a height of seven or eight feet.44

Though the woods were sacred to the Osage, they had certainly modified their environment through fire. Fire was their plow, and in this case, men wielded it.45 With it they cleared fields, cleansed them of weeds and controlled the regrowth. With it they selected ways and means to grow certain crops in certain places. With fire they kept the undergrowth in the forests checked so they could see game to hunt, form pathways for game to pass through to the hunter’s advantage, and glimpse approaching war parties.

“The soil was always prone to produce a lofty wild grass; and as this prevented the Indians from seeing and pursuing their game, they were in the habit of annually setting fire to it, and thus kept the underwood down,” reported a traveler in 1842.46 Without a plow, Native Americans found fire to be an artful agricultural tool they had used for millennia to shape the course of crop evolution on the American continent. The Indians induced wildlife to migrate by use of fire, burning away trees so that grass would flourish. What the Euro-Americans called “deserts,” were in many cases the grasslands sculpted by the Indian’s use of fire.47
An eye witness account from the 1820s tells the dramatic story of Indian fire use: “... Both banks of the Missouri soon witnessed this mighty struggle of the elements, which man had loosed for the destruction of organic matter... a truly horrifying but magnificent sight. ... Through the prairie fires, the grass becomes more luxuriant in the spring, but the forests are in part devastated and in many places in the western states one now sees only miserable bushes and the charred stumps of former forest trophies, once mighty and virgin forest.”

While both cultures respected fire and its unique qualities as a tool, the Osage, working within their low energy system, revered it. Fire was, after all, one of the four sacred elements—earth, air, water, fire. As part of their most fundamental organizing elements, the Osage actually divided themselves into tribes known as “gens,” or “fireplaces,” around which certain families gathered and became known for their animal totem. Groups of tribal elders whom they called Little Old Men gathered to discuss the matters of the tribe around the fire of the “two houses in the middle” of their settlement.

In the case of Euro-Americans, the hearth created a focal point of light and heat and represented the heart of the home. An Osage fire started by embers from this chief’s fire was considered holy and could give the power of life and health to those who used it. Since the Osage built large lodges of saplings and woven rushes sometimes twenty feet by ten feet high by fifty to even a hundred feet long and used by several families, the women stored firewood within the shelter and left open holes in the roof to let out the smoke. They sometimes even stabled their fastest horses within the confines of the shelter.
Indian tribes understood the economic limitations of firewood in ways the Europeans did not. Early on, a Jesuit priest, in attempting to convert Iroquois to the Catholic religion, exposed them to the belief in eternal fire for failing to heed such an invitation. The Iroquois rejected the idea:

When they first heard of the eternal fire and of the burning decreed for the punishment of sin they were marvelously impressed; still, they withheld their belief obstinately, because, as they said, there could be no fire where there was no wood; then, what forests could sustain so many fires through such a long space of time? This absurd reasoning had so much influence over the minds of the savages that they could not be persuaded of the truth of the gospel.\textsuperscript{52}

Of all the elements of the Christian myth presented to them, that which impressed the listeners the most was the eternally burning fire. The Indians, unimpressed with the threat of eternal damnation, knew how hard it was to keep a steady supply of firewood available.

The Osage had their own practices and fire myths. Men lit their ceremonial fires by using the friction method. One of two well-dried sticks had holes drilled through the center and slits that allowed air to enter the hole cut from one edge. A second stick was set into the hole and twirled rapidly between the palms. A little tinder, a little blowing and a lot of spinning created a flame that was transferred to the laid firewood. Ordinary fires were lit using the bow drill, but more commonly, borrowed from one of the “two houses in the middle” of the village, those of the chief.

Fire was both beneficial and destructive. As a tribe prepared for war, the warriors lit a big fire and danced around it. Before leaving, they pulled burning tree limbs from the fire and put pieces of charcoal into small bags each carried. When the warriors approached an enemy, they used the charcoal to blacken their faces to show the implacable quality of fire. This warning meant they would show no mercy to enemies.\textsuperscript{53}
Meanwhile, in a typical white settlement, the blacksmith’s hammer ringing steadily beside a glowing charcoal pit showed a different use of fire. The romance of flames, the reverence, had been replaced with practical labor to make things. For the Euro-Americans of the period to create fire, they carried tinderboxes with flint and steel to strike to create sparks on a bed of cotton or hemp. These smoldering embers were then transferred to kindling.

Fire to them, although vital, had become utilitarian. Because the settlers had tools such as axes and saws, they could fell large trees handily while for the Indians with their stone implements this was arduous work. The white men split the logs for building or for fire use. This required the upper body strength of men. Without the technology of the ax, wedge, saw and ox and wagon, the whites, too, would have gathered twigs and driftwood and guarded them carefully.

“If the Indians initiated America’s Wooden Age, the early settlers of New England, more than any other group of European immigrants, brought this age to fruition.” By the 1800s pioneers from the East carried the pattern to the Missouri River. Though the state was settled by Southerners, the peoples along the eastern seaboard all lived with access to the same level of technology. The word “frontier” implies a place of greater development left behind to be replicated at the new site. Such was the case with the Euro-Americans who carried the blueprints of their mature culture from the East in hearts and minds and wagons as they approached the western edge of the new state of Missouri.

A different kind of frontier awaited the sixteenth-century Osage when they acquired horses from the Spanish. A new energy frontier awaited them as they learned to use this magical beast to propel them off the ground and change their pedestrian ways.
CHAPTER 3
THE FIRST ENERGY TRANSITION

Perhaps the greatest difference between Osage and Euro-American settlers was the amount and kind of animal power available and their experience and attitude toward animal use. Once the Osage adopted horses, they were inseparable from them. Whatever little else they had in the way of possessions the stature of seeing the world from a horse’s back gave them pride and prowess:

As the Osage drew near, I was struck by his appearance. He was about nineteen or twenty years of age, but well grown, with the fine Roman countenance common to his tribe, and as he rode with his blanket wrapped around his loins, his naked bust would have furnished a model for a statuary. He was mounted on a beautiful piebald horse, a mottled white and brown, of the wild breed of the prairies, decorated with a broad collar, from which hung in front a tuft of horse-hair dyed a bright scarlet.

--Washington Irving, A Tour on the Prairies, 1835

This romantic image of the American Indian nobly astride his steed epitomizes the Euro-American impression of the culture. Yet the horse galloped into the lives of the native population in the sixteenth century to inject a degree of energy never before experienced. While the Old World had had the horse for some estimated five thousand years and had built their lives around it, the New World experienced both the power and tradeoffs of a new energy source for just two hundred years before steam power again changed their energy picture. For that brief period, the horse gave them “that hauteur and sense of superiority and arrogance which horses have given all men through the ages.”

For Euro-Americans life routinely included animals as beasts of burden. Animal muscle increased the motive power of the Wood Age dramatically. Draft horses, having been broken to the shoulder collar in Europe in the Middle Ages, worked in teams of two to eight to pull
wagons and coaches and to plow the fields. The heavy draft horses eventually used in agriculture were a byproduct of the age of armor when a man fully dressed in a suit required a horse strong enough to carry him. Oxen had traditionally been used for the heavy work of plowing, but horses gradually replaced them for farm work.56

Contrary to popular impressions of oxen vs. horses, a pair of horses could outdo four oxen in a day of fieldwork by twenty-five to thirty per cent. Well-fed horses and oxen could also outwork men on a day-long basis and do the work of thirteen to fifteen men, but oxen could get by on grass while horses required oats. Since overland travel required wagon space to be used for oats to feed the horse, few were used. Mules were more sure footed, had greater stamina than horses, were often cheaper and could get by on grass.57

Josiah Gregg, one of the first to record experiences on the Santa Fe Trail, noted in 1844, “At an early period the horse was more frequently in use, as mules were not found in great abundance; but as soon as the means for procuring these animals increased, the horse was gradually and finally discarded, except occasionally for riding and the chase.”58 Each animal had its niche, its devotees and its detractors, and must have been as much a subject of discussion, pride and wager as muscle cars were to the 1950s admirers.

The Osage, like their fellow Native Americans on the continent, were a pedestrian nation until the Spanish arrived with horses from Europe. They may have acquired horses from the Spanish directly or by way of more southerly tribes that traded in horses, the Ute, the Kiowa and the Comanche.59 The Spanish arrived in the sixteenth century coming up from Mexico, establishing ranches in Texas and New Mexico territories.
In Missouri territory French explorer Etienne de Veniard, sieur de Bourgmont in 1713 gave up his coat and pistol to a Padouca Indian chief, a tribe near the Osage, and was given a horse in return. A “large number” of their warriors made trips to “the Spanish country” to trade buffalo robes for horses. They traded one horse for three buffalo robes. The chief offered to Bourgmont two thousand warriors if he ever needed them. If all the Padouca warriors were mounted, that would be quite a herd of horses and an even greater bounty of six thousand buffalo skins required to pay for them.\textsuperscript{60}

The Osage Indians enjoyed and had perfected one energy system of self-sufficiency balancing their numbers against their ability to provide for themselves in a life style that integrated them into their Midwestern woodlands and prairie. Self-sufficiency meant they provided food, clothing, water, shelter and government for themselves within their tribe and within their clan. In that system they used what they needed and preserved what they could by drying meat and burying other foodstuffs for retrieval later in the season. They had no way to stockpile foods beyond their seasonal needs.

When they made contact with and began to trade goods with the European settlers, they were introduced to an entirely new energy system. The Osage left their self-contained lifestyle and entered the world of durable material goods, and, once begun, they could not reverse their exodus. The acquisition of beads, clothing, woven blankets and steel implements sent ripples through the Osage social organization because the manufacture and replacement of such goods was beyond the power of the Native Americans to replicate, and they wanted more of them. Their only currency was furs, which they began to trap at a pace
that outstripped the supply, but it was the horse and the gun that irreversibly changed their world.

A new energy level introduced by these two items imposes new demands. The change in the Osage energy level also changed their relationship with other tribes as they all acquired horses that gave them greater range, pressured the limits of their territories and with which they raided other tribes for more ponies. Suddenly, a tribe, even an individual, could acquire the currency of horses that could make one warrior more powerful than another. Horses changed the dynamics of their seasonal movement as well. More horses meant more pasture. Horses needed pasture, sometimes at the cost of field crops that sustained and amplified their diets. Sometimes, providing enough pasture for a growing number of horses meant moving out of the woodlands to the prairie.\textsuperscript{61}

The concept of a thousand-pound animal that one could sit astride and force to do one’s bidding had to have been astonishing to them. The Indians, upon their first sight of horses, referred to them as “big dogs” or “mystery dogs” and “fled weeping” in terror from what they had seen. Later, mainly because of its size, the name for a horse was changed to “Elk Dog.”\textsuperscript{62} Still, a dog of any size could be brought to serve, and with the white man’s example, the Indians soon domesticated the horse.

The point of view of a people who had never domesticated a large animal, says Osage author Louis F. Burns in \textit{A History of the Osage People} (2004) is quite different from those who had acquired them in time beyond memory. “Everyday use of animal power generates a mind-set toward power sources beyond the power of human muscle. This, in turn, directs the mind to other power sources and applications.” Without animals, the only power available
was human which circumscribed a much smaller area of influence, Burns argues. Aside from power issues, the lack of domesticated animals means that meat protein in their diet must always be provided by hunting wild animals.\textsuperscript{63} However frightened they were initially, the Plains Indians quickly passed from terror to understanding of the advantages of dominating such a beast. In some tribes they soon foreswore any notion they had ever been without the horse.\textsuperscript{64}

Power is the result of access to energy in various forms. The horses provided power to those who had them. Those who acquired them wanted more power, thus more horses and more energy at their command. Raiding soon overtook trading in many cases as the horse changed the dynamics of inter-tribal relations.

As individual warriors acquired more horses, a new idea of status was born that required accumulation of horses. One was not enough even though the horse’s usefulness was limited. Without the horse collar and without a wagon or plow or freight to haul, other elements of a horse’s worth were lost to the Indians. But with horses the Osage could hunt buffalo with greater efficiency and speed while covering longer distances at the same time.\textsuperscript{65}

Prior to the horse the practice of raiding had been confined to vegetables and occasional captives.\textsuperscript{66} The horse brought on a much greater level of action so that they could carry off more horses plus goods. Horses began to be used as currency, a new bargaining chip beyond furs to which the Indians had access as in the Bourgmont exchange, as previously described,
when the French explorer gave his coat and pistol for a horse. The chief had plenty of horses, but had never seen such a coat. A horse was an easy unit of exchange and a mark of the value he set on the coat and pistol. The horse also changed the dynamics of the tribe itself as some men began to acquire more horses than others, the less endowed were sometimes forced to borrow a horse and pay back the owner in loot acquired. This differentiation in possessions introduced caste into the previous equality within the tribe.\(^{67}\)

Women were affected by their warrior’s ownership of the horse since an increase in buffalo hides from better hunting methods dictated that women spend more and more of their time processing hides. Previously, they produced enough to replace worn or lost hides and a few to trade. Once hunting with a horse increased the yield and white traders demanded more hides, the women’s status moved from producing for family to producing for markets.

A warrior who had acquired many horses, perhaps as many as a hundred, was rich in status and burdened with the need to reciprocate gifts with other rich men. He roamed farther...
from camp to hunt for commerce rather than subsistence, and brought back more hides for his women to process. Meanwhile, women’s roles changed to running the camps. They married white men, forged alliances among groups of white people, and sometimes moved their camps to new locations. Slowly but surely the Indians were seduced by the white man’s need for commerce rather than subsistence, for accumulation of material possessions, and for metal pots and pans, knives and arrowheads. They chose to work with tools embedded with greater energy than bows and arrows, flint knives, and moccasined feet for walking.

At the same time the horse was introduced from northern Mexico by the Spanish, guns began to filter in from Canada through the English and French. While the horse and the gun both increased the Indian’s power and range of travel, it injected them into a world of trade over which they had little control. As soon as manufactured goods such as brass kettles, cloth, steel knives and hatchets infiltrated their energy system, the Osage left behind self-sufficiency and entered the web of trading their natural resources—furs and hides—for accumulation of goods they could not make for themselves. Moreover, they needed to produce more skins than could be sustained by natural populations of fur-bearing animals, and still defend against further intrusion of their energy system in an effort to minimize loss of self-sustainability.

In this brief period, the Osage lived suspended between low- and high-energy systems, still in their own villages and with their own culture, enjoying the overlap of manufactured goods and horses. Little did they realize what lay ahead for them as more and more energy-related changes flowed in their direction.
CHAPTER 4
DIET AS ENERGY COMPONENT

Diet indicates energy flow. The kind, quality and quantity of energy in the form of food that comes from the earth to nourish human bodies dictates the health and size of a population. The Osage diet nourished large warriors. Whether by genetic predisposition or by a diet rich in protein, Osage warriors often loomed over their American counterparts. John Bradbury in *Travels in the Interior of America, 1809-11*, was awed by the party of warriors he first observed. “The Osages are so tall and robust as almost to warrant the application of the term gigantic: few of them appear to be under six feet, and many are above it. Their shoulders and visages are broad, which tend to strengthen the idea of their being giants.”

A varied diet provided protein: Bear, deer, beaver, turkey, prairie chickens, water fowl, skunk, fish, birds eggs, sausage made from buffalo intestines filled with dried buffalo meat, berries, nuts, marrow and suet offered a wide choice of protein sources. Corn, squash, pumpkins, beans planted in gardens near the river, and wild plants like the wild potato or *do*, water lily roots and occasional sweets such as a kind of “fruit leather,” made from wild persimmon made a varied diet. Without milk and butter from cows they substituted bear or buffalo fat. Such a high protein diet gave them strength and stature. “They lived,” describes Osage author John Mathews, “in a region that had long periods of lush tranquility.”

Even though they roasted and dried meat in their villages, on the plains after a buffalo kill, the entire family drank the warm blood, and ate raw the organs, tongue, eyeballs, and other parts of the buffalo before packaging the carcass for transportation. In the field, cooking gave way to packing and moving the meat before other tribes encroached. They saved the brain for
tanning the hides, the hoofs for glue. Rib bones were ready to be roasted and cracked for their marrow. They fashioned spoons from horns and saved the sinews along the backbone for cord and thread. These also served as bowstrings when several were twirled together. In their villages, women made pottery and wooden bowls for cooking and serving. They stirred with paddles and ate with fingers, and, like all cultures, had manners, generosity and ways of sharing. John Bradbury described a visit in his diary, *Travels in the Interior of America, 1809-1811* in an Osage village. The Osage hosts passed around a wooden bowl containing squares of cake that tasted something like gingerbread made from the pulp of persimmon and mixed with pounded corn. They called the bread *staninca.*

Early white settlers had to adopt some of the same practices of living off wild game though many almost certainly had hogs and cows for butter, milk, and bacon fat and yeast for bread. Of course, they came from a culture that could create great delicacies with these ingredients and could be served on tables with white cloths and silver goblets to some fortunate few. But on the frontier, the white pioneers lived on what they could find and knew how to prepare just like their Indian counterparts.

Unfamiliarity to the countryside and the hard work of pioneering meant the settlers may have had a poorer diet than the Osage. The settlers had wood aplenty, but some had little else in those early years. Henry Rowe Schoolcraft’s *Ozark Journal*, December 7th, 1818, tells this story of homesteading:

They rose a dawn and built a “cabin-fire with eight-foot logs.” Then they pounded corn in a wooden mortar with a pestle attached to a spring pole, a common frontier mechanism when mills were not available to process grain. Then had breakfast and repaired moccasins,
sharpened tools and so on getting ready for the day’s work. The men spent their day clearing brush and felling trees until around five o’clock when they quit for dinner. They had no lunch. For dinner they ate hominy, corn boiled until it was soft, accompanied by bear’s bacon. No vegetables were available because no gardens had been planted. This meal they had twice a day without variation until the pioneers could expand their diet with more complicated and varied processes.75

This reminiscence reveals a great deal of difference in values rising from different levels of energy use. The Osage women could not carry and would not use an eight-foot-long log to burn for heat. They had no way of cutting such a piece or means of transporting it nor a fireplace in which to burn it. They would have ground corn between two pieces of stone rather than rigging a wooden mortar and spring pestle. The Osage cleared land carefully for defensive and visual purposes but not with an ax to clear land for planting. Their agility in living in this environment meant they often ate better with greater variety of foodstuffs than their white counterparts in the early stages of settlement.
CHAPTER 5
AN ENERGY SYSTEM EXPRESSED IN POLITICS

Author Louis Burns, an Osage himself, sets the zenith of the Osage domination of their territory between 1750 and 1800 when they enjoyed a “maximum margin of survival.”76 Aided by horses and interaction with both French and Spanish fur traders, they had increased their territory and expanded their dietary choices thereby increasing their health and welfare. Another tribe never conquered them, they never gave up their territory once claimed and never made war with the United States. By the early nineteenth century, however, the United States government had arrived at the door to their lodges and demanded more than the furs with which the French and Spanish had been content.

The Americans wanted land, and land free of native peoples. This demand started the slow unraveling of the Osage peoples. Providing furs and absorbing some articles of household use, or “cultural hardware,” as Burns calls it, was one thing, but being removed from their territory was quite another. With the former, they could hold their energy system and their culture intact; with the latter, however, their energy system crumbled and so did their culture.77

Was the high-energy system thrust into their midst like a sword into the heart, or did the Osage participate in their own undoing? John Joseph Mathews, in The Osages: Children of the Middle Waters (1961) suggests, “the disintegration of the tribe was in a seed within the tribal organization itself and the self-esteem of each individual.” Because of the Osage belief in bravery and honor they became an easy dupe for the white settlers. Every chief had “the urge to attain glory as a warrior and to be noticed and honored, the intense urge to be wise
and pontifical and make statements of wisdom . . . all the elements of his makeup which had contributed toward becoming noticed as a warrior or as an orator or a generous giver made of him a half-forged tool for the trader, the United States commissioners, the military leaders, the politicians. For a few brief hours of buzzy, personal glory the chieftain might sell his whole tribe into bondage."  

Whether their dispositions made them vulnerable, or their desires for metal knives and woven blankets to replace the grueling work of preparing buffalo hides, the Osage were deeply vulnerable to the ways and the power of the white man. They saw the white man as foreign objects and tried to describe them within their natural context: “Their eyes and their mouths were almost hidden by hair. Their mouths were like the den of an old, male, bank beaver overhung by rootlets.” The Osage related as best they could to the white man.

Every population has a rising curve, a pinnacle and a declining curve in terms of cultural expression supported by fuel and available energy. The Osage slipped from their brief pinnacle around 1800. The Osage lifestyle, in the judgment of Euro-Americans, filled an economic niche while they were needed as fur trappers. Once the fur supply began to give out and the land to fill with white farmers and land speculators, once the Louisiana Territory was divided into states, the incursions began.

The Osage energy system was legislated out of existence, beginning with the actions of President Thomas Jefferson in 1808. The very lands on which the Osage then resided Jefferson promised to the Cherokees, the Choctaws, and the Chickasaws when they were removed from Georgia and the Carolinas. Clearly, the white attachment to the land did not have the same meaning as the Native American attachment. Because the Indians lived so
embedded in their natural surroundings, every move they made, every aspect of their belief system keyed into the uniqueness of their natural environment. To remove any tribe from their native territory was to erode their identity and destroy their independence.

The first of seven treaties with the Osage and the United States came soon after the Louisiana Purchase. Each one trimmed away the energy system built upon their Wood-Age life, erased their territory, allowed a steady stream of “intruders” into their remaining lands and offered them the tools of an alien energy system. The first treaty in 1808 acted as a harbinger for the new century. In exchange for all the land south of the Missouri River and east of Fort Osage, most of the state of Missouri south to the Arkansas River, it offered dependence on the Americans for a startup in the new energy system, that of property to be farmed, implements with which to do it and a way to grind their grain harvest. Instead of continuing to live at the height of their own energy curve, they were asked to abandon without a fight their inherited and beautifully designed way of life to start over to plow virgin prairie with alien tools and to trade the harvest in an alien culture.

They would be given the greatest machine available of the stronger energy system, the mill, accompanied by a blacksmith shop, plows and cabins for the chiefs. The mill would grind the grain that the Indians ground for themselves, while the blacksmith would make and repair metal implements using charcoal and smithing tools, something in which no one had experience. The tribe members would have to learn the ways of the white culture quickly to survive and prosper in the new way of life. But the Osage disdained all of these implements. They would never put their hand to a plow; they ground their own corn; they
still preferred bow and arrow over the rifle; they were proud of having been given the log cabins but did not occupy them.\textsuperscript{83}

Figure 1-7. 1836 Map of Indian Territory This map shows the Osage have been moved from Missouri to a strip southwest below the Shawnee and above the Cherokee territory. Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Missouri.
The treaty also provided for trading at Fort Osage, twenty miles down river from the future site of Kansas City. Fort Osage would host hundreds of Indians trading their furs for goods. A thousand at a time would camp outside the gates, particularly after they had been forced to move to the western edge of Missouri. Meanwhile the first of the many eastern Indian tribes began to arrive with whom they would share their new territory. By the treaty of 1816 the Osage reluctantly ceded 3,000,000 acres of their remaining territory to the arriving Cherokees to the east.

The two tribes had already reacted in a hostile manner to each other in the same way the Osage had treated white intruders in Missouri and neighboring tribes edging their territory. This cession was ratified between the United States government and the Osage. Pierre Chouteau, uncle of Francois who traded furs with the Osage at the future Kansas City site,
brokered many of the treaties with the Indians, while William Clark of the Lewis and Clark expedition acted as governor of the territory.\textsuperscript{85}

The Treaty of 1822 closed Fort Osage and paid the tribe about $2,500 for merchandise in exchange for furs. The Council Grove Treaty of 1825 sought protection from the Osage for travelers on the Santa Fe Trail to New Mexico. The treaty moved the Osage out of Missouri and Arkansas into Kansas. The United States agreed to pay the Osage $7,000 each year for twenty years along with 600 head of cattle, 600 hogs, a thousand chickens, ten yoke of oxen, six carts, one blacksmith and a house built for each of the four chiefs.\textsuperscript{86}

The capitulation to the intruding energy system was summed up by Osage emissary Big Soldier who had been to Washington twice and said to George Sibley, the factor at Fort Osage:

I see and admire your manner of living, your good warm houses; your extensive fields of corn, your gardens, your cows, oxen, work houses (sic) wagons, and a thousand machines, that I know not the use of. I see that you are able to clothe yourselves even from weeds and grass. In short you can do almost what you choose. You whites possess the power of subduing almost every animal to your use. You are surrounded by slaves. Every thing about you is in chains, and you are slaves yourselves. I fear if I should exchange my pursuits for yours, I too should become a slave. Talk to my sons, perhaps they may be persuaded to adopt your fashions, or at least to recommend them to their sons; but for myself I was born free, was raised free, and wish to die free. . . . I am personally content with my condition. The forests and rivers supply all the calls of nature in plenty, and there is no lack of white people to purchase the surplus products of our industry.\textsuperscript{87}

He was, of course, putting too much faith in that interim period between his original way of life and the point at which “no lack of white people” would overrun it. It was a period that could not last however much he may have hoped. The Osage had been caught in the torrent of energy they themselves pulled from their land in the form of furs. Horses and guns became the least of their problems.
Once caught in the capitalistic trade of resources for money, they became indebted to their European traders and unwitting partners in their own demise. They became instruments for draining the fur-bearing animals from the natural eco-systems they called home. In one year alone in 1829 Francois Chouteau traded 150 packs of deerskins (about 10 in a pack), 20 bundles of good raccoons, three bundles of beaver skins and 350 otter from the Osage.

The Shawnee, who had also been transplanted from the East, brought another 100 beaver and 150 otter along with 50 packs of deerskins. In the second hunt Chouteau took in 236 bundles of deerskins that weighed in total about 25,000 pounds. Raccoons yielded 50 packs of skins, ten to a pack. Another 500 beaver skins, 800 otter, 500 and two bundles of bearskins completed the season. For this and other yearly bountiful catches that made the Chouteaus wealthy and drew in more fur traders and Indian suppliers, the Indians would receive brightly woven blankets of red and blue wool, cotton shirts, metal knives and cooking pots. They received yearly annuities from the United States government as well.

The Osage participation in the fur trade made them subservient to the white traders and, by extension, to the American government. The increased efficiency and productivity of their hunting hastened the arrival of fur traders such as the Choteaus and on their heels more settlers intruding into their territory. Once they had participated in fur trading, the Indians could not reverse the outflow of valuable furs and the influx of a superior energy system.

Once dominant over a large part of Missouri and southwestern territories, the Osage were soon relegated to a small strip on the west side of the state by 1825. They had been replaced by farmers whose relationship to the land collided totally with the food-water-cover ecology they had enjoyed with a natural ecology. The Osage then endured the arrival of other eastern
tribes, from the Kickapoos to the Delawares to the Shawnee, Cherokee, Sac and Fox. Finally, all Indian tribes were removed from Missouri entirely and relocated to Kansas and Oklahoma in 1825.89

The same event had occurred on the east coast fifty years earlier. The Mohegans of Connecticut had been forced to beseech the state legislature for assistance, admitting that the “times are greatly alter’d. . . . all our Fishing, Hunting and Fowling is entirely gone.” They had suffered then as their Osage brothers were suffering the same cycle. As William Cronon noted in his landmark book, *Changes in the Land, Indians, Colonists and the Ecology of New England* --(1983), the Indians had fallen victim to “disease, demographic collapse, economic dependency, and the loss of a world of ecological relationships they could never find again.”90

The Osage had no way to defend against such superior levels of energy directed against them. At first vital links to European wealth in fur trapping, the Indians over the course of two centuries became “superfluous,” as author Richard White, describes them, to American wealth.91 The Osage became ghosts of a way of life overcome by materiality.

Axes, plows, the wheel, horses, cows, machines, literacy and capital were not the only elements of a high-energy system the white settlers brought with them. They also brought slaves. In the Wood Age, as far back as history records, some peoples dominated others and used the less fortunate to do the onerous duties seen as beneath the effort of the conquerors. Energy by way of human muscle power, intelligent, amenable, or at least directable, created many a monument to the dominant culture. The settlement of western Missouri was no exception.
CHAPTER 6

SLAVERY AS ENERGY COMPONENT

One of the energy sources available to white settlers in the Wood Age in Missouri was the institution of slavery. The area that would become Kansas City began with slavery:

Long ago, in 1824 and 1825, two counties sundered by the Missouri River, and flanked by the Western border line, sought at the same time their incorporation by the Legislature. On the North, the inhabitants, mostly emigrants from Kentucky, and advocating that gentleman’s elevation to the presidency, calling their county Clay, and its seat of Justice, Liberty. On the South, as if in rivalry, emigrants from Virginia, Carolina and Tennessee, selected the name of Jackson for their county, and Independence for their City.  

--William Gilpin, Western Journal and Civilian, 1854

Settled by Kentuckians who followed the illustrious family of Daniel Boone and his sons to the area, or from Virginia and the Carolinas where the soil was already depleted from tobacco growing, the state was destined for slavery. It had been, of course, the slavery side of the great Missouri Compromise that created it in 1820. Missouri would become a slave state and Maine would enter as a free state. All the lands north and west of Missouri would be free states.

The Missouri Compromise reflected the wishes of its early inhabitants who had sparsely settled on the eastern side of Missouri. They represented the larger South, Kentucky, the Carolinas, Virginia whose system of slave labor had become an elaborate and remunerative economy for those living in grand plantation houses and working larger and larger land holdings. The Missouri Compromise itself represented a clash between not only the idea of slave versus free but the design of different economies on the eastern seaboard. “[A] substantial majority of the residents had come from slaveholding states, and many of them
viewed slavery as an institution essential to white supremacy. No significant antislavery sentiment existed in the territory."\textsuperscript{94}

A population estimated at “a little short of a hundred thousand” wanted the power to govern themselves and to vote in national elections. They also wanted slavery as part of their state’s rights.\textsuperscript{95} After a good deal of wrangling in the United States Congress, the Missouri Compromise allowed Missouri to enter the union as a slave state but barred slavery within the Louisiana Purchase north of Missouri’s southern border except for the state itself. Missouri was not designed, as neighboring Kansas would be, as a free state, with settlers often funded by abolitionists in Boston whose anti-slavery doctrine made settlers into soldiers for the abolition of slavery.

\textbf{The General Inconvenience of Living Without Them}

Missouri would be settled instead by people from a context of slavery who could not imagine life without it and pressed for its continuation. Even Patrick Henry, a Virginian, and a passionate voice for freedom as America became a nation, admitted, “I am drawn along by the general inconvenience of living without them.”\textsuperscript{96} Among the population of the state of Missouri in 1820 of 70,168 lived a population of 11,234 slaves, about sixteen per cent of the population. It was that imbedded convenience as well as economic value that held slavery in Missouri.\textsuperscript{97}
Slavery served as the laborsaving device available in the Wood Age for those who did not have to do the labor themselves. Either human or animal labor performed most work. If someone did not wish to perform the human labor and could afford slaves, he could have a slave do it for him. Each slave was a laborsaving unit to his or her master. As such, slavery was part of the ante-bellum energy story. Until each slave was replaced by a machine driven by electricity or fueled by coal or oil, people did the work themselves, hired it done, forced slaves to do it or left it undone. Seven counties just east of Jackson were known as “Little Dixie” for their hemp and tobacco farms where slaves were used to plant and harvest. Jackson County itself showed a small but sturdy population of slaves.98

Slave-owning families arrived in a trickle in the 1820s. James Shepherd came to Jackson County from Virginia in 1824 with a family of slaves, and “like the rest, the men had been taught the use of the broadax.” Two of James Shepherd’s slaves, Pete and Sam, were “known as about the strongest men in the country, either white or black.” Shepherd contracted out the

Figure 1-9. Slave Bill of Sale “Received of Thomas Johnson eight hundred dollars in full payment for a negro girl named Martha of a black complexion and about 15 years. The above described negro girl I warrant sound in body and mind and a slave for life and free from all claims. West Port MO. May 26th 1856, David Burge.” Missouri History Museum, St. Louis, Missouri.
two slaves to build the first courthouse in Independence and they hewed the logs that formed the infrastructure for the building. At other times Sam and Pete were hired out to cut wood for salt making in Saline County, a process that required a generous supply of wood to evaporate the brine.\textsuperscript{99} The two men could reputedly cut and stack four cords of wood each per day and call that just “a fair day’s work.” Whether that is a Western tall tale or genuine output, such productivity is four times better than national statistics suggest. A 1942 government report estimated this productivity: “A skilled axmen could cut, split, and stack perhaps 1 cord of hardwood in a day. An unskilled man would require two or three times as long for the same results.”\textsuperscript{100}

By the 1830s, with a Jackson County population of two thousand, eight-hundred twenty three, the settlers owned one-hundred ninety-three slaves held by sixty-two slave owners, about six per cent of the population. This suggests that most settlers had no access to this source of energy and did their work themselves. One man owned twenty-five slaves, but most owned a smattering of one to three. Boy and girl slaves under ten years of age each numbered forty-one. This number would multiply in the next census.\textsuperscript{101}

In 1832 a family set out from Nashville to the frontier—then known as Missouri, in the quintessential overland trek. James Porter, son Jesse, his wife and the twenty-five slaves she had been given as her wedding present arrived with cattle, horses, hogs and slaves and bought at a dollar and a quarter an acre three hundred sixty-five acres at what is now Twenty-third Street on the north and Thirty-first Street on the south by Vine Street on the east and Holmes on the west. This area is now “inner city.” The demographics of the little family were typical of what made up the population of the village.
The little bunch of household goods was taken from the wagons. Axes were dug from boxes and the broad black hands of the slaves began felling trees. A clearing was made. The logs were stripped of their branches and hewed into regular lengths. The sound of axes echoed back and forth in the stillness of the forest. The growth of weeds and grass was trampled underfoot by the slaves of the settler. Plenty of rock was roundabout for the cabin’s foundation. Plenty of oaken logs for the walls, plenty of walnut for the floors and window casings. James Porter and his slaves worked for weeks building the five room . . . story and a half structure with a kitchen set off a few feet away. . . . After this house was completed, cabins were built for the Negroes. Each head of a family was supplied with one, and they were built in a sort of a semi-circle about the home in easy call of the master. 102

--N. M. Harris, An Old-fashioned Wedding in the Oldest House in Kansas City, Kansas City Star, 1907

Fields were cleared and planted, the harvest bounteous and life was good for the Porters, one of the founding families of the city. Twenty years later when Jesse was old enough to marry, the Porter home hosted his wedding reception at which legions of “colored servants” made and served food. No dancing was to be enjoyed because Porter was a Methodist, but the party celebrated with plenty of frivolous games and songs. In the slave quarters, however, no such restrictions prevailed. “Nothing could control the negroes’ feet when the fiddles sawed out old ‘Leather Breeches’ or other stirring, tempting jigs,” remembered one observer. “When Sam played the fiddle and Bill picked the banjo and Rafe rattled the bones I had to hike out of hearing myself to maintain the dignity of caste.” 103

In the 1840 census those eighty-two slave children under ten in 1830 had grown in number to two hundred and seventy four for boys and two hundred and forty four for girls, suggesting an influx of slave families. Ten to twenty four was the age bracket with the greatest numbers, two hundred sixty six for young male slaves and two hundred sixty one for young female slaves, which meant this population of childbearing age would soon increase their numbers.
The white population fell largely into agriculture at seventeen hundred and three vs. commerce at sixty three. Those involved in commerce would have been outfitters, storekeepers, bricklayers, cigar makers, ferrymen, carpenters, tavern keepers, barbers, confectioners, Daguerrians (photographers), gardeners and such. Manufacturers and traders comprised a group of one hundred forty seven who actually made articles on site such as blacksmiths, wagon-makers, saddle makers, brick makers, cabinetmakers, and others who engaged in outfitting supplies for travelers and outfitting homes for residents. Learned professions and engineers, mainly lawyers, numbered twenty with nine people engaged in “navigation of canals, lakes and rivers.”

By 1850, beginning a golden decade of pre-war growth, the population of the county had grown to fourteen thousand with two thousand, six hundred and twenty nine slaves, twenty-one per cent of the population. The under-ten group of boy slaves had grown to four hundred eighty three and for girls four hundred ninety five, indicating that young men and women slaves of child bearing age were producing children, and also suggesting an influx of new young slaves. The ten to twenty-nine age group (the census had changed the age ranges) was seven hundred thirty nine for young men and seven hundred and nine for young women.

By 1860 the white population had grown to eighteen thousand, eight hundred eighty two with three thousand, nine hundred forty four slaves, about twenty per cent. Also by this date the census takers counted seventeen Indians left in the county. This number was not included in any previous census. Of the three thousand, nine hundred and forty four slaves in the county, the town of Kanzas held seventy-four males and ninety-two females, not a large number. These slaves were owned largely in households of one or two slaves, used primarily
as cooks, housekeepers and general chores, but the sheriff in Blue Springs, a village near Independence, owned ten, and a lawyer in Independence seven. The town of Westport held one hundred thirty-four slaves, John Calvin McCoy, one of the founding fathers of the town owning six.  

Pressure from Free Staters and local abolitionists caused a good deal trouble in the 1850s. Missourians dreaded a free state forming on their Western flank where their slaves could be free merely by stepping over a state line drawn in the dust of wagon tracks. Missourians tried to stuff the ballot boxes of Kansas elections toward slavery, menaced the free-staters, squatted on Kansas lands or showed false papers of ownership. By 1859 slave owners had been persuaded by the agitating events to ship their slaves to the South to save their investment. Slave prices were high in the “golden age of slave values.”

In 1853 a young male slave in Missouri sold for $1000 while his equivalent in Virginia sold for $100 less. In 1859, local resident Thompson McDaniels, a slave dealer, herded a group of about a hundred male slaves in chains and handcuffs aboard a steamboat from the Westport Landing pier. They had been bought in Jackson County and were to be sold in the Deep South where they were considered safe, though they would probably be sold at a lesser price.

Because white Southerners had much more in the way of possessions and tools they both needed and could afford large numbers of slaves. More possessions indicated more wealth; more wealth requires more labor to care for and produce it. In contrast to the Osage Indians, the white settlers had as part of their high-energy system many helping hands. As a matter of
comparison, the Osage took slaves but kept only children and traded the rest. Before European occupation they took slaves as revenge against other tribes.

Once the Europeans arrived, the Osage often traded and retraded slaves with the British and French for supplies. The French tolerated the practice, but the Spanish discouraged it. To the southwest of the Osage lived the Caddo tribe who sometimes fell victim to the Osage. The Osage would use “bluff war” to scare and taunt the Caddo, making threats with obscene gestures across a river. Their faces painted in red and yellow and with their stature over six feet, the Osage warriors menaced the tribe merely by showing up. The Caddo lived in fear of being captured and sold. As a result the Caddo finally had to move away from the Osage.
The land of western Missouri offered plenty of resources to both Osage and white settlers. The energy capacity of the latter was augmented by their slave population that intensified the used of the wheel, the metal edge and the domesticated animal.
CHAPTER 7
WATER AS ENERGY COMPONENT

Part of the energy suite of the white settlers was the ability to move goods on water. Rivers were not just something to cross or the river banks just a repository for firewood. They were arteries of commerce developing in the huge Midwestern section of America. In the new age of science in which everything was measurable and namable, Lewis and Clark measured the current of the Missouri River at St. Louis at five and a half to seven miles per hour, a current that would make a keelboat man bend to the deck to move his craft up river. At the future Kansas City site the expedition measured the Kaw River four hundred miles later at two-hundred and thirty yards wide and “wider at the mouth,” while the “Missouries” measured five-hundred yards wide. Lewis wrote, “The waters of the Kansas is very disagreeably tasted to me.” 110

The Missouri River is about seven-hundred-fifty feet elevation, with Kansas City elevation about a thousand feet. The river had been discovered by the French missionary Father Jacques Marquette and guide Louis Jolliet in 1673 and fully described and mapped by 1716 by Guillaume Delisle, a French cartographer in Paris based on the notes and observations made by Etienne de Veniard, sieur de Bourgmont. This French explorer came down the Mississippi River from Quebec and forged congenial relationships with the Missouri Indians, Osage, Otoe, Padouca and other tribes, even taking some of them to Paris for a visit to the court of Louis XV and returning them to the wilds of Missouri in 1725-6. 111

The Osage Indians lived along the banks of and traveled the waterways of rivers small and large from the Mississippi to the Missouri, Osage and Arkansas Rivers. They had fashioned
canoes of hollowed out cottonwood, walnut or cedar logs fifteen to twenty feet long and three to four feet in diameter. Those could carry three men. These were not the birch bark canoes of the Northeast where birch was plentiful and waters more placid, but the sturdier wood canoes made for stronger Western rivers.

When white settlers began to use dugout canoes, they outfitted them with a watertight compartment in its center in which to pour bear oil or honey for transport down river since both were highly prized and no casks were available.\textsuperscript{112} The pirogue, one of the many varieties of early boats, consisted of two canoes with a platform built between them for cargo, usually furs on their way to market. They could also, depending on size and sturdiness, carry up to 20 passengers.\textsuperscript{113}

Another approach worth noting is the floating craft the Mandan on the upper Missouri used. Fur trappers in that area borrowed the technology. With few trees, they used the next most plentiful resource, buffalo skins. The Mandans built small round boats for river crossings using a single buffalo hide stretched across a willow frame. If wood was scarce, a buffalo shoulder blade could serve as a paddle for the smaller versions; “The bull boat,” a larger version made by whites and so named because the hide of a \textit{bull} buffalo was larger and believed to leak less than that of a female, was also round, made in the same manner and gave room enough for one man and up to a third of a ton of cargo.

John Bradbury notes in \textit{Travels in the Interior of America in 1809, 1810, and 1811} that he rode in one across the river furnished and paddled by a woman of the Gros Ventre tribe near the Mandans on the Knife River.\textsuperscript{114} They were met by six women, “each of whom had a skin canoe on her back and a paddle in her hand. . . . The squaws placed our saddles in the canoes,
where we also disposed ourselves, leaving the Indians to drive our horses over the river . . .”

They paddled across the river (the paddle probably a shoulder blade from an elk or buffalo), which was “about eighty yards wide at this place.” An even larger version about thirty feet long by twelve wide could carry up to 6,000 pounds of furs; the larger ones were propelled by two men with poles. Small or large, the bullboat had to be unloaded and repitched every day with a mix of tallow and ashes and dried out every night to keep it afloat.

These canoes or small bullboats gave the Indians the transportation they needed to cross a river or paddle to a hunting ground on the opposite side, though the Indians were less often on water than on land. Without sail and without means to build a boat large enough to require a crew, they loaded furs and meat from hunting grounds in smaller packages than the white settlers did on their keelboats. The lack of technology dictated the scale of their water travel.

Out of the Womb of the Ark was Born the Nation

Such technology on the part of the Native Americans served them well within the context of their culture. Their bull boats and canoes made for two passengers gives scale to their economy. Their use of the land as their main transportation course, their pedestrian culture that dictated light loads, burdens wrapped in buffalo robes and sinews shouldered for the walk back to the village repeat that small family scale of production without wheels, beasts of burden or a great use of waterways for travel.

For the white settlers their command of wood as building material made larger boats available. Having already sailed across the Atlantic in hundred-foot boats fashioned with
large timbers, cut with saw, carved with blade, carpentered with fancy molding and decoration under full sail, Euro-Americans expected to be able to travel by water, commanded to travel by water, but in the Middle West sails were poorly used. Upstream traffic required men walking along the banks and overhanging trees made sails problematic to use. A more practical water craft was needed.

“Out of the womb of the ark was born the nation,” observed one author on attempts to conquer the western rivers. It may not be too much of an overstatement to say that flatboats, often called “the ark,” and keelboats, the smaller, more navigable boats, created America as a growing nation. With the political and natural forces encouraging migration, the boats became the means to an end. In the critical period between the end of the French and Indian War in 1763 and the arrival of the steamboat in some numbers in the second decade of the nineteenth century, keelboats birthed the trade and provided the mechanism for transport from farmer or fur trader to market and return.

In Western Rivermen-1763-1861, Ohio and Mississippi Boatmen and the Myth of the Alligator Horse (1959), author Michael Allen divides the keelboat era into two periods, from 1763 to 1823, the pre-steamboat or pre-industrial era, and from 1823 when steamboats began to take over the rivers until the beginning of the Civil War when all river traffic stopped. The end of the French and Indian War so agreed by the Treaty of Paris in 1763 put an end to the constraints on the population on the to move west.

Pittsburgh became the keelboat-building capital and the beginning point for many a cargo of staples for western-moving pioneers. Flatboats outnumbered keelboats to begin with, but by design they were a one-way ticket. Smaller and lighter keelboats could go up rivers and
tributaries where flatboats could not. Each boat served two different and important purposes.\textsuperscript{119}

Without centuries of road building available to them as was true for Europe and with magnificent and plentiful rivers, Americans demanded a boat that could take the place of a wagon on a road. That was the keelboat, the truck of the American waterways until steamboats took over. It was the only boat that could make the trip both upstream and down. Built on a keel with ribs, it could be from forty to eighty feet long and seven-to-twenty feet wide with a covered cabin amidships of about five foot depth, and a shallow draft of two feet.

Figure 1-11. The Keelboat on Ohio River This craft required a full press by men on each side using poles to push upstream. The man at the stern moved the rudder while the man in the chair called out a chant to coordinate the activity on the “running board.”\textsuperscript{120}

The boat was pointed at both ends for easy turnaround. A narrow runway along each side gave purchase to keelboat men who could push the boat up river using long poles for leverage. As many as eight to twelve men on each side poled from the bow, bending over
double to increase pressure on their padded poles then walked toward the stern as they pushed the boat forward. At the stern the boatman pulled out his pole and ran forward to plant his pole again as he stood on the narrow strip of what became known as the “running board.”

The boatman steered with a long rudder and the crew often rowed with oars, getting as much leverage from the water through muscle as possible. Occasionally, a sail could catch the wind and help out, but overhanging branches along the banks where they were forced to sail where the current was weakest made that problematic, or “when the wind blowing So hard Down the river that She could not assend,” making camp was the only solution.121

A later traveler suffered a similar situation near Fort Sibley on the Missouri River. The water was very deep and muddy. The swift current required a great expenditure of muscle power to move the boat along. The river bank itself, a dense tangle of vines, offered no progress to walk along the bank pulling a towline. Poling also had its problems. The men sometimes fell into the water leaving their poles stuck in the mud. As a swimmer, the pole man had no leverage in pulling out the pole. In one particular trip Paul Wilhelm’s crew gained a distance of thirty paces in a day. Those who could swim hacked away at logs and tree limbs with axes to gain a passage for their boat. In the end they made two miles that day.122

When water passage even with this grueling application of muscle became impossible, the keelboat men, “sometimes rowing, Poleing & Drawing up with a Strong Rope” ascended the waterway. The flat-bottomed boats with short oars could get near a bank. The number of crewmembers was determined by the amount of cargo, with one boatman for every three-
thousand pounds of freight. The capacity of the boat ranged from fifteen-thousand to twenty-five-thousand pounds.

They may have had to use a long rope fastened to a tree trunk or boulder on the bank and then the crew on the bow pulled hand over hand or used a pulley in a practice known as “warping” snug up to that mark, while part of the crew held the boat there as others ran ahead to find another anchoring point. Or the crew could act as horses did for canal boats and walk on the bank with the rope to the boat over their shoulders, dragging the boat after them, a process known as “cordelling.” In all, conditions were poor for keelboat men. Author Everett Dick remarked in his book Vanguards of the Frontier (1964), “Today’s men could not be persuaded to endure the rigorous toil and hardships of the first decades of the nineteenth century.”

These hardy boatmen often ended the day covered in mud from working the bank. Camps were crude at best. Sometimes they had no meal more than “meet and water,” as did George Drewyer and William Clark of the Lewis and Clark Expedition near the Kansas City site in 1804. “I got mired,” Clark wrote, “and was obliged to Crawl out, a disagreeable Situation & a Diverting one if any one who Could have Seen me after I got out, all Covered with mud, I went my (sic) Camp & [s]Crapped off the Mud and washed my Clothes.”

A trip from New Orleans to St. Louis and back could only be made twice a year by a boat and crew as the round trip took between four and six months to complete. The ascent took seventy to eighty days though a crew could bring a boat by cordelling from Louisville to St. Louis in twenty-five days. The crookedness of the Mississippi River required a boat to cross the river any number of times to avoid caving banks or strong currents, snags, sawyers
(submerged trees) and sand bars, finally adding an estimated five hundred miles to a trip already close to four hundred miles.\textsuperscript{125}

A voyage down and back sometimes occupied nine months. In time this commerce increased until it gave employment to hordes of rough and hardy men; rude, uneducated, brave, suffering terrific hardships with sailor-like stoicism; heavy drinkers, coarse frollickers in moral sties like the Natchez-under-the hill of that day, heavy fighters, reckless fellows, every one, elephantinely jolly, foul-witted, profane, prodigal of their money, bankrupt at the end of the trip, fond of barbaric finery, prodigious braggarts; yet, in the main, honest, trustworthy, faithful to promises and duty, and often picturesquely magnanimous.\textsuperscript{126}

\begin{flushright}
--Mark Twain, \textit{Life on the Mississippi}, 1883
\end{flushright}

The flatboat was the keelboat’s bulky, ugly cousin, “the ark itself,” generally measuring from fifty to seventy five feet in width. Square at both ends and built upstream to take goods from the hinterlands to New Orleans, they were simply too large for any amount of muscle power to pull, sail or pole them back upstream, though it was occasionally done, but most were broken down at journey’s end to supply housing material, offering up a pile of one-inch-thick cottonwood planks, the wood found a welcome in the downstream building market.\textsuperscript{127}

John Bradbury observed that they passed in one day more than a dozen arks bearing produce to New Orleans. Bradbury’s keelboat put a good distance between his boat and theirs because they “made considerable distance with our oars.”\textsuperscript{128} In other words, they were rowing upstream on the Mississippi, something that could be done with a keelboat.

Such muscle came only from the young and adventurous. Pittsburgh created a trade in keelboats and young men to man them. With a strong back for rowing, warping and cordelling, and knowledge of the river as a skill set, as many as ten thousand young men plied the western waters as entrepreneurs and crew to deliver and trade goods from one end of the western waterways to another.\textsuperscript{129}
In this trade, the riverman was the fundamental factor. Only by means of his brawn and his genius for navigation could these innumerable tons of flour, tobacco, and bacon have been kept from rotting on the shores. Yet the man himself remains a legend grotesque and mysterious, one of the shadowy figures of a time when history was being made too rapidly to be written . . . It is therefore only dimly, as through a mist, that we can see the two lines of polemen pass from prow to stern on the narrow running board of a keel boat, lifting and setting their poles to the cry of steersman or captain.

--Archer B. Hulbert, *Waterways of Westward Expansion*, 1903

When French fur trader Francois Chouteau brought his young wife Berenice and two infant sons to the site that would become Kansas City in 1820, they arrived from St. Louis in a keelboat full of household goods and trading materials for the Indians with a crew of keelboat men and slaves. The trip took three weeks or more of arduous work on the part of the boatmen to make their way up the five hundred miles of snag-infested river. Berenice sailed down the river several times on a pirogue or keelboat with her growing family and to deliver one of her nine pregnancies. A fearless woman, used to the ways of the frontier, she nevertheless, showed great courage to sail the tempestuous Missouri up and down delivering babies and returning with them on a keelboat to her husband’s fur-trading outpost.

Chouteau first built a log cabin and a log warehouse, but his family and his standard of living required a real home, which he built in the French style like those of the period in St. Louis. Most lumber in the early day was shipped in on keelboats and later steamboats from Pittsburgh via St. Louis. By 1855 saw mills proliferated on the West Bottoms of Kansas City then known as the Kaw bottoms, “being located in the midst of what was then very dense forests,” according to Charles F. Quest who arrived that year from Kentucky and worked as plasterer and mechanic.

As steamboats made their way west on the river, Francois and Berenice could at first make the trip from St. Louis in nine days, enjoying the social life and company on board the
steamboat, but eventually made the trip in five days! The first steamboat to try going up the Missouri River, the Independence, made the trip in 1819, though it didn’t reach the site of Francois Chouteau’s landing, the age of mechanization had begun for the future Kansas City.¹³²

**Mill Power: Corn Meal and Possum Hash**

Water did not just serve as a surface for transportation, it also supplied energy for mills to grind and saw. Falling water provided the energy for inanimate mechanical energy for which there was no real substitute but repetitious labor done by man or animal. Mills to grind and saw or to manufacture textiles made production of their outputs somewhat labor saving.¹³³ Many smaller rivers run through Jackson County—Big Blue River, Little Blue, Sniabar, Indian Creek, and Turkey Creek plus many springs—and offered easy watering and mill sites to the settlers. Water served mills as pre-industrial electricity, the energy to turn wheels to make things move, to do one’s bidding in creating power to grind or saw. The big difference was that mills were both seasonal and stationary while the electricity that would replace them could be routed to any building or light pole.

For over half of the nineteenth century, water-driven mills accounted for approximately twenty-five per cent of energy us in America, and for over fifty per cent along the western edge of Missouri where wind power was virtually unused.¹³⁴ The only mechanized part of the lives of the Euro-American settlers was the mill, and a mill required either a strong stream of water or horse or oxen to turn the wheel to grind the grain to produce flour. Two kinds of
mills commonly operated first, the grist mill and the saw mill, the only services available in rural areas and often found side by side.

In New England the bulky, noisy, cranky “water machines” of the Wood Age could also manufacture such delicate items as nails and pins. A patent was issued in 1795 for a nail-making process that soon produced two-hundred-thousand nails per day and reduced the price over the next century to “the penny nail.”

Other specialized mills in the East produced paper, powder, and textiles, while still others supported iron forges, blast furnaces, foundries, salt works and sugar refineries. But that was in the East. In the pioneering effort of western Missouri, the difficulty of procuring mill stones and the scarce population meant just the most elementary corn- and wheat-grinding mills stationed along a medium-sized stream. In 1840 the population of the western states combined, Missouri being the outer perimeter of that geography, had a population of over four million, with a little over five thousand grist mills and almost seven thousand saw mills. This made one mill each available to every eight hundred people. Population was thin, and milling hard to come by, thus the hand held grinder and the occasional long wagon trips to the mill.

Of all the energy sources available to early settlers in the Wood Age, the grist mill provided a nucleus around which to build a community. This “central expression and identification of the Wooden Age” was often the only three-story building around, imposing authority on the landscape while it squealed and roared, sloshed and growled, providing the drama of moving parts that nothing else did. The mill acted as the harbinger of the Industrial Age. It also served as a magnet for commerce. The miller often combined with a blacksmith
to offer services and a store for retail business. The average capital outlay to start a mill in Missouri in 1850 was about five-hundred dollars. Such a mill could produce thirty to fifty barrels of flour and cornmeal a day in season with spring and summer waters.\textsuperscript{138}

In 1840 Missouri the census showed six-hundred-ninety such mills; the same census for the United States showed some fifty-thousand water mills operating.\textsuperscript{139} As in all things in the Wood Age, milling depended on the seasons. Spring floods turned the wheel swiftly; autumn’s sluggish energy moved it accordingly. The winter months when the stream froze made milling impossible before the steam engine.

The miller could pay cash for the flour he ground and/or keep part, a much-needed exchange not available any other way for farmers to trade in the market place. The miller often kept a portion of the flour he ground in payment for grinding. This flour the miller made available to customers who did not grow their own wheat and needed flour.\textsuperscript{140} If a farmer were to grow beyond sustaining his family at a subsistence level, he had to break into the market with a salable crop and get cash back to reinvest, pay off debts and buy ready-made goods at the store by the mill.

Without cash, the farm family had to make everything themselves and had difficulty rising above a cash-poor existence. Higher production of corn and wheat, a surplus of each sold for cash at the mill marked the beginnings of the market economy on the western edge of that area known as the “Western States,” and the beginning of prosperity for families working the land.\textsuperscript{141}

On their way up river to their new fur-trading site Francois and Berenice Chouteau would have passed the town of Franklin about halfway there. As early as 1819 farmers bringing in
corn to be ground could use one of the town’s two ox-powered mills to provide meal for their families in some bulk. They could get their tree trunks cut up for lumber at the second. Twelve yoke of oxen powered the larger of the two mills.\textsuperscript{42}

In 1826 an early settler near Chouteau’s Landing, James Welch, built the first mill on record at the new site. He constructed an overshot wheel with a long upright pestle of hard hickory, which rose and fell into a mortar burned into the end of a solid oak block. Welch put into the mortar a peck of corn at night and set the machinery to produce “the coveted morning’s allowance of hoecake.” But possums being numerous would climb into the mortar while the pestle was up only to be pounded by it “before they could take a second mouthful of the coveted prize.” In the morning Welch would discover to his disgust another mixture of corn meal and “possum hash.” Thus began the pioneer effort at machinery in the “Kaw’s mouth country,” later to be known as Chouteau’s Landing, the Levee, the town of Westport Landing and finally Kansas City.\textsuperscript{43}

Evidently that was the extent of milling south of the river for some time. A horse-driven mill in Clay County directly across the river, run by the grandfather of the eventually notorious Younger brothers, could be reached by pirogue or flatboat where settlers in Jackson County could grind their grain, “crossing and recrossing on this ferry” until 1836 when settlement south of the river could support a mill.\textsuperscript{44}

Getting grain to the mill to produce a barely edible loaf of bread represented arduous work and long suffering. James Williams recollected his trips to the horse mill in 1848 in nearby Cameron, Missouri:
Every old settler knows it was a job to get wheat ready for the mill, but it was a bigger job to get it made into flour fit for bread. . . . “My, how sore our hands would get binding bearded wheat. We’d then stack in a circle so we could put it on the ground in a circle and put horses on it and ride them around in a circle on it. We called this operation tramping out wheat.”

At first entirely entrepreneurial, the establishment of a mill and the subsequent rise of the “mill community” created such value that they began to be seen as a public utility. By the 1840s the Missouri General Assembly received petitions to damn streams and rivers to construct mills. The petitions were solicited with the overtones of being for the public good and stimulating community growth and stability. The Emigrant Aid Company of Kansas motivated immigration in 1854 and 1855 by establishing mills in nine fledgling communities.

For farmers in remote areas and for travelers as well a unique invention known as the hand mill could suffice to produce a small amount of meal for a family dinner. Captain Merriwether Lewis carried a hand mill with him on the Lewis and Clark continental exploration. It was mentioned on June 11, 1805, as part of his inventory. Henry Rowe Schoolcraft mentioned in his 1818-1819 Ozark Journal wandering eight hundred miles above the junction of the White River with the Mississippi and finding a remote cabin and fields of Farmer M’Gary who offered his handmill for grinding corn and his smokehouse filled with bear and other meats. Pounding the corn was done “with a wooden mortar, with a pestle attached to a spring pole” that repeatedly pounded the corn. G. W. Featherstonhaugh also mentioned this contrivance in the 1840s.
The little village had its own mill infrastructure that over a century grew to be one of the forefronts of Kansas City industry. Early pioneer Joseph S. Chick arrived in 1836 and described the mill scene: “Corn and wheat were generally ground at the local mills. The principal mill was a treadmill run by Wm. Parish and located about Cleveland and Thirty-third Streets. Mr. Jenning (sic) had a water mill on Brush Creek at the crossing of the Westport and Wornall Road, another was located at the crossing of Indian Creek near the state line, and James H. McGee had a corn cracker on McGee, or what is now O. K. Creek and about where Penn Street crosses. The demand that these local mills could not supply was met by a large water mill on the Little Blue owned by John and Robert Aull. It seems to me there was more water in the streams then than at present as this mill run nearly the year around.”

Fifteen mills in all dotted the countryside around the growing village between the early days and the Civil War. Some of them became steam-powered mills as such engines became available in the 1830s and onward. McGee’s mill sold an “old engine” to Kansas-bound settlers in 1854 as they crossed over into free-state territory to set up a community at Lawrence. One of the longest enduring mills was Watts Mill, the site of which is now at 103rd Street and State Line Road in Kansas City, Missouri. Built in 1832 on the north bank of Indian Creek it serviced wagon trains ready to take off for the Santa Fe Trail. These parties would camp nearby using woods for firewood and to hunt wild game for food. The mill operated until 1939 and was torn down in 1949.
From small seeds mighty industries can grow. A 1925 Kansas City Journal newspaper article boasted that the industry had grown to be third in the output of flour. “The combined output of Kansas City mills in 1924 was 5,412,957 barrels. Eleven flourmills, with a total capacity output of 25,250 barrels daily, are operated here. Figured at an average price of $7 a barrel, the combined value would be $367,780 daily.”

The twentieth-century wheat harvest resulted from nineteenth-century transformation of the prairie. The untitled landscape the Osage dominated with their buffalo-hunting horse culture yielded to the plow. Buffalo disappeared from overhunting and mass killing. Far from woodland valleys and plains teaming with game, Indians were corralled into rectangular
reservations to make the prairie available to large-scale wheat production. One culture’s low energy system yielded to another’s high-energy conquest.

As greater materialism changed life on the Missouri frontier, the entire United States was itself advancing into unknown territory, that of using a fossil fuel for the first time. Though English cousins in Great Britain had already adapted to coal use because of a scarcity of firewood, the young country as a whole had plenty of wood and saw little need to move in that direction. Both political events and growing scarcity of municipal sources of firewood on the eastern seaboard would force a change, however, and in the process introduce coal to wide use that would launch it as the next dominant fuel.
CHAPTER 8
THE BEGINNINGS OF A FOSSIL FUEL ENERGY SUITE

The Coal Age dawned in America while the country still had immense forests, many as yet even unmapped, but where wood had become scarce, a new fuel was needed. By the eighteenth century such eastern cities of Philadelphia and Boston had already created plans to extend their grasp for wood supplies beyond the fringes of their cities or to try a new fuel. Established in 1620, Boston had run short of fuel by the end of its first hundred years. In search of new woodlands the Massachusetts government acquired access to both New Hampshire and Maine forests as sources of wood supply for fuel, building and trade.\textsuperscript{154}

Massachusetts competed with the British Crown over wood since the English had a fleet of ships to build and mast. The British Navy also appropriated the forests of Maine and New Hampshire for their trees were considered “the largest in the world” for masts.\textsuperscript{155} The Maine-grown white pine and hemlock were perfect for masting, from twenty-nine to thirty-seven inches in diameter, and as long as a hundred feet. Such a tree required thirty-six yoke of oxen to move it through the forest to the wharf and a small army of men to load it. Indifferent to the white settlements’ need for wood or the Indians’ warring reaction to having their forests plundered, the British as well as the Dutch and the French sent mast cutters into the New England forests and loaded their ships with masts throughout the early 1700s. By 1746, all British ships were outfitted with masts from New England and losing such a supply was deemed to be “fatal to his [Majesty’s] service.”\textsuperscript{156}

Britain’s own forests and those of the Baltic states of Sweden, Norway, Denmark and Poland, formerly the masting forests for Europe, had already been thinned for the European
flotillas. Those countries looked upon New England as a prime area of national interest and defense, but the Native Americans who lived there disputed such a high-handed claim. Their strategy to stop deforestation was to slay all the oxen the mast cutters employed to move the large heavy pieces as well as to kill the wood cutters themselves who had to be protected under heavy guard to assure their survival and production of masts.158

Where Coal Mines Are, There, and There Only Will Manufacturing Flourish

Lack of “Fewell” in Boston throughout Massachusetts became a problem. By the late 1700s and early 1800s, Boston citizens increasingly used coal. Complained one Captain Lieutenant Artillery (sic) in 1783 at nearby Springfield, Massachusetts, “We have several hundred Bushells of Coal on hand . . . if I May exchang som of it for Wood . . . for at present We have no wood—nor money to by aney.”159

Coal in the American colonies was first seen in Virginia near Richmond in 1701: “We went up to ye Cole, w’ch is not above a mile and a half from their settlement on the great upper Creeke, w’ch, rising very high in great Raines hath washed away the Banks that the Coal liyes bare, otherwise it’s very deep in the Earth . . . .160 It is not known when coal began to be commercially sold, probably in the middle of the eighteenth-century, but it eventually found its way to the wharves of Hampton, Virginia, and into the boats that took it north to growing cities.161

Wood was presumed to be the preferred fuel for home and hearth if available and coal only for “Forges and great Towns, if ever they happen to have any; for, in their Country Plantations, the Wood grows at every Man’s Door so fast, that after it has been cut down, it
will in seven Years time, grow up again from a seed to substantial Fire Wood." This written in 1720 shows an optimism of an abundance of fuel in both coal and wood to be had for the taking in the years ahead. Indeed, that proved to be true for a century and more.

Bituminous coal was mined first in both Virginia and Pennsylvania. Once anthracite fields were found in Pennsylvania in 1768, that, too, was mined and used. Unlike the soft, smoky bituminous coal, anthracite was hard and brittle, virtually odorless and smokeless, difficult to light and also hard on the grates made for wood, but consumers adapted to it. Until 1845 when people talked about coal in Pennsylvania, at least, they meant anthracite.

This “hard coal” was in demand in Philadelphia by 1790. Artisans and blacksmiths “accepted hard coal as superior fuel for doing business. The hotter temperature and time saved” made anthracite the preferred fuel for those using it in small industry, having learned it was “a more efficient type of fuel.” Citizens increasingly needed it for their own hearths, and came to rely on shipments of coal from the mountains in northeastern Pennsylvania as well as from Ireland at around a thousand tons a year. White settlers had manufacturing in mind for coal use, had mentioned in letters and maps the outcroppings of coal and other minerals all over the eastern portion of the United States from the 1600s onward. Europeans knew metals meant value and coal meant greater efficiency.

Deep earth mining in the Old World had been around since ancient times and continued to be used where needed in the New World by Europeans. The white man’s way of work varied considerably from the that of Native Americans, no more so than in recovering fossil fuel. No historical records, according to Howard N. Eavenson in The First Century and a Half of Coal Mining in American Industry (1942), show Native Americans engaged in coal mining
for heat or metallurgy. They did no more than color their bodies, probably with the charcoal of wood and not coal.\textsuperscript{168}

Ironically, the only reference to Native American industry in coal in the entire country surfaces in the written record of “Lieutenant Beckwith in 1853 near Westport, Missouri, on the Santa Fe road near the Kansas River. He was probably in KS, past Fort Leavenworth. His record of June 26 states: ‘On a branch of the Wahkarrussi, where the Oregon trail strikes it, a seam of bituminous coal crops out. This is worked by the Indians, one of whom we met driving an ox-cart loaded with coal, to Westport.’ This is the only mention that the Indians had any interest in commercial mining.\textsuperscript{169} Which tribe was represented there would be a guess at best.

The Osage, as was true of their fellow Native Americans, did very little, if any, underground work. They defined their lives as living between the impenetrable earth and the endless sky.\textsuperscript{170} They met their needs there, valued the fellow occupants of their lands, both human and animal, and honored the vault of night and day above them. They worked gardens, hunted for food and furs, and traveled distances with the seasons, all done on a horizontal plane.

The white man’s ancestors, whose descendants were now represented on the Missouri frontier, had once done the same, but over millennia had discovered the “three Ms” of high-energy civilizations, minerals, mining and metallurgy, so that the verticality of life of populations moving into high-energy systems may have set in about the same time as mining.\textsuperscript{171} Metallurgy accompanied mining and helped to enhance wealth vs. relative or extreme poverty. In other words, the deeper the mines, the greater the mining work force, the
greater the wealth pulled from the depths, the greater was the wealth of a few compared to
the many who labored for it.

The horizontal and bi-pedal, pedestrian approach to life to which the Osage limited
themselves offered everyone a fair share of the tribe’s resources. Even with the introduction
of horses, the tribe enjoyed want and plenitude in fairly equal distribution, the relative
differences in food and creature comforts between horsed and horseless, was ultimately
small.

The Osage and fellow Native Americans were not the only peoples to overlook mineral
wealth. The Australian aborigines did as well. Metals were not necessary for a rich cultural
existence. “In taking his first steps from the Stone Age into the Age of Metals, man crossed a
great divide. But considering his long and skillful use of the other materials around him, that
advance took place quite late in human history. In fact in some parts of the world it never
took place at all.”172 Certainly it did not among the Osage.

But in the minds of the Euro-American settlers, though working against a western
backdrop of enormous forests, those resources had become out of reach for cities on the
Atlantic coast. Transportation of cut timber had been a problem for all of human history. If it
could not be readily cut at a river’s edge and sent down stream, timber was very difficult to
transport.173 For this reason the young American cities looked to the next available fuel at
hand: coal had a future with them. They had experienced first hand the superiority of the
industrializing strength of Great Britain, understood the source of that strength, and envied it
for themselves.
Admitting “they new little” of coal’s value in Pennsylvania in the late eighteenth century, businessmen and political activists were keenly aware that “superior wealth, power and energy of Great Britain is found on her coal mining.” It leads to manufacturing, which activity from a pioneering, agrarian point of view must have seemed exotic and desirable. Manufacturing would lead to roads and railways and “improvement all over the country. Furthermore, coal mining would bring into play the science of chemistry and manufacturing, “vanish idleness,” and create a class of engineers who would help them compete against Great Britain on an even footing.\textsuperscript{174}

Coal found its way into daily life in Virginia in the early 1700s, though living in a land as wooded as colonial America made it less necessary to use than it had been by their British cousins. By the turn of the nineteenth century, however, wood had grown scarce enough that Philadelphia, engaged in burning coal delivered by British ships. Two early steam engines using Virginia coal operated the water works in the center square during this decade. By 1810 and 1811 some thirteen thousand tons of coal were delivered to American ports per year, but as the War of 1812 took over the waterways, coal tonnage fell to under 3,000 tons a year. By 1814, only six hundred ninety one tons were delivered.\textsuperscript{175} Clearly, Philadelphia, if not all of East-Coast America, entered its first major fuel crisis.

The British showed their wealth, power and energy in the War of 1812. The loss of coal shipments by sea forced local merchants in Philadelphia and Wilkes-Barre to scramble for local supplies. By April 1813 the British blockage of coal had caused Virginia bituminous coal to triple in price. Artisans had to pay high prices for coal themselves and were forced to pass on the increase to local citizens.\textsuperscript{176} Jacob Cist, Wilkes-Barre resident and would-be coal
merchant, his brother-in-law George M. Hollenback and others began to both find supplies of anthracite and to market it. Citizens, used to Virginia soft coal, had to be coaxed into using it. At first they thought it was black stone and used it as gravel in walkways. At one point Cist sent a black servant with straw along with the bucket of coal to show people how to light a fire under anthracite.177

The enterprising group of merchants soon marketed anthracite to the city of Baltimore, to glassmakers and others. Baltimore in 1813 used between seven thousand and ten thousand tons of coal per year brought by ship. Coal delivered by streams like the Susquehana from Pennsylvania to Baltimore cost one-hundred-thirty-five dollars for sixty tons, fifty dollars for the ark or flatboat to send it down river, and one hundred dollars for freight from stream to furnace. Storage costs were added for a total of $1,320, and still nearly a thousand dollars profit could be taken from such a transaction.178

The early years of the War of 1812 saw a slow increase in coal from the Lehigh coal field of Pennsylvania destined to become one of Pennsylvania’s most flourishing anthracite regions. Jacob Cist spent a great deal of time getting blacksmiths and forge operators to experiment with anthracite. Some learned to use it while other preferred the Virginia bituminous, but war conditions forced most artisans to use what was at hand. Those who used the hard coal found it efficient. It reduced production costs, heated iron in half the time and increased production.

By the time the war was over in 1815, anthracite had a firm hold on the coal market.179 Uses of coal proliferated up and down the East Coast. Another byproduct of early coal use was streetlights in Baltimore fed by coal gas by 1816. First invented in England and used to
light the streets of London by 1812, Baltimore experimenters chartered the Gas Light Company and began producing coal gas for street lighting, the first use of mineral gas for illumination in this country. New York City and Boston soon copied the model.\textsuperscript{180}

The War of 1812, fought over British restraint of trade and impressments of American sailors on the high seas, had the unexpected consequence of initiating an independent coal mining industry in the United States.\textsuperscript{181} With that would come the coal gas industry in Baltimore to light the streets of the city and the increase in iron working that made the proliferation of the railroads possible.

In this way coal use began in America: The ripples of the scarcity of trees in England by the sixteenth century forced the mining of coal there. The need to clear the mines of water with a better mechanism than horse, pulley and bucket forced the invention of the steam engine. Increased coal as fuel and parallel experimentation of coal conversion to coke in place of charcoal from wood led to increased iron making in England. The increased manufacture of cannon and cannonballs led to its supremacy at sea, making it possible to found colonies on the eastern shore of what would become America.

This seventeenth century series of events led to the dominance of Great Britain over the colonies that led the forests of New England to be sacrificed for masts as well as for building and fuel. Fights over wood rights between colonists and British navy became grievances to match others the colonists had against the British throne. The ensuing Revolutionary War led the United States of America being founded as a separate and equal nation shortly to be challenged again by the British on the high seas that led to the War of 1812. The ensuing coal embargo and resulting scarcity, along with the realization that Britain’s power came from
coal and that the United States had its own coal mines, forced the young nation to start its own march into the Coal Age.

Though the tiny settlement on the western edge of Missouri would feel little of this turbulence directly, the combined strength of British industrialism and the eastern states’ borrowing their technology and creating their own would send wave after wave of collective enterprise, innovation, optimism, growing populations and westward-moving urgency to the shores of the Missouri as it turned north. The steamboat that would soon arrive on the western waters of the recently purchased Louisiana Territory, of which the new state of Missouri would become a part, is a direct descendant of the steam engine in England invented because of that country’s scarcity of wood. The pre-steam world of wood, that one-hundred per cent saturation of wood as humankind’s only fuel, was forced to open to another fuel.
PART I CONCLUSION

The scenes depicted in this part may be called the world of “Peak Wood.” Life in the Wood Age is described here at its finest, re-enacting the age-old pattern of the frontier, with all its expenditure of animal and human muscle, harnessed and unharnessed water power, pace, and level of material possessions.

Peak Wood was a seasonal world. When the weather changed, activity changed. When the water froze, it froze mill power and boat use. Peak Wood belonged to the seasons. There was no insulation from them. Each season demanded its activity and if that was missed that year, there was no way to replace a missing part of the cycle by artificial means. Peak Wood lasted from at least two-hundred-and-fifty thousand to perhaps a million years of human control of fire.182 That wood-oriented way of life was practiced with gusto and precision by both low- and high-energy cultures as coal began to be used on America’s East Coast. What happened there would soon enough be exported to the western edges of the country.

The little hamlet that clung to the Missouri River’s edge in 1820, a mere scattering of cabins, did not hint at the metropolis to rise. Little overt evidence of the fuel revolution that began in England in the 1600s reached this far into the wilderness, but as it gained momentum the transition would break on the shores of the Missouri River like a wave of energy embodied in coal mining, in the steam boat, in the influx of population, the changing economy from agrarian subsistence to market economy and to the transformation of the land from intricately woven pastoral ecosystems to separated natural resources divided, subdivided, commoditized, priced for sale and harvested for immediate use. That revolution
from ecosystem to natural resource would signify a transformation in the way people lived and enriched their culture with material goods.

The tradeoff was clear. Every acquisition and transformation of the ecosystems the settler took over meant a loss of context and storehouse from which the Osage drew their life. The Osage carried out their culture rich in beliefs and ceremony without a high level of energy available to them. Both populations would be impacted by the change to coal, first in Great Britain in the seventeenth century, then on the American side of the Atlantic in the eighteenth, and finally at the mouth of the Kaw in the nineteenth century. Once the transition to coal had begun, its superiority in metallurgy and its relative cheapness because of its abundance would promote its use. As author Martin Melosi says, “[T]ransitions are not necessarily due to energy scarcities. Price, technology, transportation accessibility to sources, consumer preferences, environmental impact, and several other economic and non-economic factors can influence a transition.”

The first energy transition was the arrival of the horse for the Osage into a Wood Age, low-energy, pedestrian system. The second energy transition would be for the American settlers, a mechanization of transportation, the steam engine. The engine would outstrip the ability of wood to supply its fuel needs and add to the demand for coal.

Wood’s inviolate territory for well over two hundred-and-fifty-thousand years had been penetrated. It would take less than a century for coal to replace it as the dominant fuel, but never at the level at which wood functioned for all those years. Wood was humanity’s cradle in every sense of the word. Coal came along and launched humanity into an energy-driven adolescence.
PART II

THE GREAT AWAKENING OF FOSSIL FUELS, 1820-1870

The use of steam in propelling water craft was... the lightning of heaven subdued and put in harness by the genius of man...

--William Z. Hickman, *The History of Jackson County, Missouri* (1920)

Perhaps nothing in the 1830s onward was more exciting than having a steamboat arrive at the limestone pier then known as “the levee” or Westport Landing that would become Kansas City. Villagers, passengers, merchants, wagonmasters, hawkers and gawkers ran to the waterfront to greet passengers, do business, and just generally watch the amazing scene of a mechanized river boat laden with people, animals and goods being unloaded by sweating slaves and free men amid the din of hundreds of voices raised at once. The steamboat had summarily replaced the keel boat and all that sweat, danger and toil was now a thing of the past.

This was something new in the fullest sense of the word—never seen before. Yet the fuel was old. The steamboat was a Wood Age invention. This combination of new and old, old and new courses throughout this part of the narrative. As soon as a new fuel was introduced into the picture so long dominated by wood, new technology was invented to capitalize on its...
properties. Though the boat burned wood at this point, it arrived powered by mechanically
generated power, not wind, human or animal energy, but by an *engine* within—“the lightning
of heaven put in harness by the genius of man.” Nothing like it had ever been seen before,
certainly not in this neck of the woods. The engine, built in the Wood Age was a response in
Britain to a new fuel. It would soon burn coal and become a bridge to the Coal Age.

The arrival of the steamboat increased the energy flow through manufactured replication
and signaled the raw beginning of the next fuel age that ushered in the Industrial Revolution.
*Industrial* meant machines, metal against metal, chugging, heaving, moving, making,
burning, heating . . . “Lightning from heaven” was an apt description. In the mindset of the
nineteenth century the steamboat could only be seen as a favor bestowed by God. (The use of
the word *harness* is a subtle reminder of the main motive power of the Wood Age, the horse,
that had been the prime mover. An old image described a new invention.)

Figure 2-1 now shows a slow decline setting in for wood and an equal rise for coal as the
great transition between sustainable wood fuel and fossil coal and oil fuel began. In this fifty-
year period, coal would become the fuel of choice for railroads, steamboats and iron makers.
It would change the face of labor throughout the western world as mechanical extraction
replaced human hand and back, and mechanical production made inroads into the long, long
history of hand-crafted work. As if that were not enough change, the ability to extract oil
from the ground was developed in 1859 in Pennsylvania, and its rise as the next new fuel was
meteoric. In just ten years the demand for oil rushed it through the many steps of Stage I:
Discovery and Development into Stage II: Systems Organization. People understood, at last,
what a new fuel meant in terms of wealth, transportation and manufacture though they barely had technology to handle it.

Part II reflects the changing fortunes of the three fuels on the graph: Three fuels at work at the same time within a fifty-year period! After eons of one fuel, and a hundred years of two fuels, now communities would soon have the choice of three fuels plus mechanical power! The introduction of the first mechanical converter to transform fuel to energy would change 1) the way things were made, 2) the speed of travel 3) and the fuel and energy components of their world.

In the last decades of the Wood Age different forms of fuel and different levels and kinds of energy clashed and flourished. Coal brought change to the world ushering in a period of chaos as old and new components matched and rematched in their evolution toward a new balance.

**Chapter 9: The Second Energy Transition: Old Fuel, New Technology** looks at the marvel of the steamboat on western rivers and the demands fleets of them made on the work force to extract both wood and coal to keep them commercially active. From the east the Coal Age encroached as steamboats and railroads began to favor coal.

**Chapter 10: Overland Travel: Old Energy, New Territory** describes overland pioneer travel, using the components of livestock and wagon train on the Santa Fe
Trail and the Pony Express. Traveling west from the Missouri River’s elbow meant exploiting the Wood Age energy components to their fullest extent. Scale, time and distance found new meaning on the overland trails.

**Chapter 11: Civil War: Old Energy Component, New Energy Component** outlines the clash between North and South as played out in western Missouri. A civil war would be fought by the two polarizing edges of the Wood Age, hand labor in the form of slavery in the old paradigm and mechanical labor in the form of technology in the new. As the Wood Age faced its demise there were those who were willing to fight to the death to detain its passing. The most compelling energy component on land was the railroad itself.

**Chapter 12: The Railroad: Old Fuel, New Technology** indicates the changes made by the introduction of the railroad, describes the “iron horse” arriving in the west as oil arrived in the east. The railroad increasingly run by coal had hardly made inroads on Kansas City when oil was discovered in Pennsylvania. Nevertheless, the ripples of change would keep coming.

**Chapter 13: Oil: New Fuel, Old Technologies** shows the beginnings of a *third* fuel for the first time in history, the introduction of oil. Extraction was more exacting still than either wood or coal, hence the delayed start of oil drilling. But once the technology met the fuel in the right combination, the wells sprouted like mushrooms, first in a small, remote location in Pennsylvania, then eventually across the country and around the world. Wood had been the cradle, coal the sturdy child, but oil was adolescent going into young adulthood. It would
bring the country of age with all the advantages its citizens could possible imagine and then some.

A brief comparison of these fuels shows the increased fuel power available in moving from wood to coal to oil. A cord of wood is a 4x4x8 foot stack of wood including air space and bark. One cord contains approximately 1.2 tons of dry wood or 2,400 pounds. A barrel of oil is 42 U.S. gallons. About 7.2 barrels of oil equal one ton of coal. The per unit mass of coal varies greatly among different types of coal.\textsuperscript{2}
CHAPTER 9
THE STEAMBOAT: OLD FUEL, NEW TECHNOLOGY

An energy suite has been defined as a matched set of components with a common fuel
denominator, and the Wood Age described in Chapter 1 offers ample example of that suite—
human labor, wood as fuel, centuries-old patterns of clearing land for farming. Part II shows
the inevitable changes in that suite as coal was introduced as a new fuel—the steam engine,
the railroad, adaptation to its needs, the erosion of horse-powered vehicles, the beginnings of
mass production of goods. Those changes brought in new components of fuel and energy that
altered the way work was done, what things were made, how people traveled and so on.
From ancient times onward humanity had evolved and expanded within the wood-for-fuel
framework to the point in the nineteenth century when that suite began to unravel and turn
the task of heat and light over to a new fuel.

But while that fuel transition occurred in the East and in Great Britain and Europe, the
change had not yet arrived at the western edge of Missouri. That area, beyond which lay
Indian Territory, epitomized the often-repeated homesteading pattern of the latest frontier.
Forward lay the “Great American Desert” of the West.³ To cross it required all the energy
this Wood Age outpost could muster. This section of the study focuses on the huge amounts
of animal energy and human organization needed to make commerce work across the
southwest prairies.

The little communities that would become Kansas City lay at the far edge of the
mechanical growth fueled by coal. As the last white settlement before Indian Territory, the
area was caught in the ancient patterns of the Wood Age, but repeated in a new place. This
wood-powered suite would be exploited up to the 1870s even as steamboats became a real force and railroads began to encroach. As the end point in water travel, pioneers to points west totally depended on Wood Age systems to cross overland.

But as Mark Twain said about himself, “The reports of my death are greatly exaggerated,” so the reports of the demise of wood are greatly exaggerated. As a fuel, it was about to come into its finest hour. In its last moments as ubiquitous fuel to humanity for hearth and blacksmith forge, wood was reborn as fuel for motive power and a bridge to the Coal Age. Flame took on a new persona altogether. For the first time in human history flame provided movement by heating water under pressure to move a boat upstream under its own power without sail or human or animal muscle. This amazing event created the means to stitch together the far-flung settlements beyond the Allegheny Mountains. Mechanized water travel became a daily miracle that owed its life to wood. As Brooke Hindle, author of America’s Wooden Age, noted, wood was the first fuel used by both steamboats and railroads, thus the steam engine belonged to the Wooden Age. It took decades of steam engine use to shift to coal-driven engines.4

Through the steam engine the old fuel provided new energy in a barely settled world. Any new systems being built to create lines of trading, transportation or farming were still supported by both a wood (fuel) and a wooden (building material) infrastructure. While the steam engine added mechanical power to their lives, the settlers still had to fall back on their old fuel for the miracle to work. Wood was now being used for both passive and active fires as well as for building.
Fortunately, the Kansas City area had an abundance of wood. Pioneers without exception commented on the thickness of forests, their grandeur and inexhaustibility, and lamented their loss while enthusiastically chopping down trees in the name of establishing home and business. At an “old settlers meeting” of Jackson County in 1871, founder of Westport, Missouri, John C McCoy, reminisced about his life in the area still wild even in 1840:

Around on all sides was a dense forest, the ground covered with impenetrable brush, vines, fallen timber and deep impassable gorges. A narrow, crooked roadway winding from Twelfth and Walnut streets, along down on the west side of the deep ravine toward the river, across the Public Square to the river at the foot of Grande avenue. A narrow, difficult path, barely wide enough for a single horseman, running up and down the river under the bluff, widening its way around fallen timber and deep ravines.⁵

Even as late as 1859 “the way from the limestone pier to the village of Westport (a distance of about four miles) “led through almost unbroken forest,” “a dreadful state of mud, mostly uphill and through a considerable piece of oak and walnut timber.”⁶ Gushing promoter of the Kansas City mystique C. C. Spalding noted in 1858, “A good portion of these grounds is, indeed, prairie, and the balance is covered with heavy growths of timber, which will forever furnish us with a bountiful supply of framing lumber. Opposite our city there is one dense body of timber of over 2000 acres, while to the east and south of us every one of our rich and fertile farms is supplied with large quantities of the first quality of timber.”⁷

During the years of the early settlement, the West Bottoms along the Kaw Riverfront as it merges with the Missouri River was known as the French Bottoms in which lived a small settlement of French trappers. William Mulkey “sold saw logs for years off the land where now lies the residence portion of the western section of the city. The squirrels and deer were so bad that they were pests, rather than game. It was nothing in those times for a party to start
out and come home with 700 or 800 squirrels. The deer were also extremely plentiful and could be shot so easily that it was not sport to kill them. When I first came here (in 1828) there was nothing on the site of the city but dense forests.”

Another citizen, Charles F. Quest, observed this in 1855: “At this time all that part of what is now Kansas City except the river front, where the business was carried on, was heavily timbered and broken only at rare intervals by little farms. The West bottoms, then known as the Kaw Bottoms, (the name had changed in the intervening years) were given up to the saw mill business, the mills being located in the midst of what was then very dense forests.”

But it was not just the forests but the stretches of meadows and streams that challenged and excited the pioneers in their travels. Part II of this study emphasizes the geography of the spot, the rivers, the plains, the “unprecedented proportions” of distance and natural ecosystems. It was a time to be stunned by the plenitude and beauty of undeveloped places while eagerly planning ways to break them down into smaller pieces, usable commodities, economic building blocks. Wonder and a zest for conquest rode side by side. Fortunately, the plentiful wood supply would stoke the engines of steamboats and progress.

The Lightning of Heaven

For lack of population in the first two decades of steam boating not much traffic made its way up the Missouri River, though Cadet Chouteau, half-brother of Francois, financed the Yellowstone in 1830-31 for a total cost of $8,950, the steam engine being half the cost, to go to the upper Missouri River to bring back loads of furs. He surprised Francois and Berenice by his arrival on April 30, 1831, after only two weeks on the river from St. Louis. The rest of
the trip upstream, however, was fraught with difficulty and disappointment. The Yellowstone’s draft was too deep and the boat became stuck for 12 days. The crew found, to their dismay, even in spring only four to four-and-a-half feet of water, “when the river is very low, and one’s steamboat is ‘drawing all the water’ there is in the channel,” as Mark Twain describes this kind of condition in *Life on the Mississippi*. The Yellowstone arrived at Fort Tecumseh, 1300 miles upriver from St. Louis, on June 19th and shoved off on June 30th to return carrying among its buffalo robes and furs, 10,000 pounds of salted buffalo tongues. The Yellowstone made the return voyage to St. Louis on a higher river in two weeks.¹⁰

Most of the early steamboat traffic confined itself to fur trading for which reason the comparative speed was profitable. Whoever could get to market faster with the furs gained

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Figure 2-3. *Early Kansas City Waterfront, 1853*. This ferry in the foreground taking cattle across while a Conestoga wagon waits. The single line of buildings against the bluffs behind and the rocky pier in the middle foreground accurately depict the geography and population of the town of Kanzas. The steamboat and the ferry overlap energy components from two different energy suites, the ferry in the Wood Age and the mechanized steamboat moving toward the coming Coal Age. Jackson County Historical Society, Independence, Missouri.
the most, but soon other passengers requested transportation. Missionaries to the Indians, trading supplies for the Indians, Indians themselves as delegations to St. Louis and even Washington and back, children on the frontier from families like the Chouteaus who could afford to send their children to school farther downriver—such was the nature of steamboat passengers and traffic in the 1820s and 1830s. The town of Franklin, opposite today’s Boonville some two hundred and fifty miles down the Missouri River between St. Louis and Chouteau’s Landing, had welcomed its first steamboat visit in 1819 by the *Independence*. It had no regular service until the 1830s. In 1819 the *Independence* took 13 days to make the trip to Franklin from St. Louis. By 1831 the *Yellowstone*, with improvements, reached the Kansas City site in five days. The *Western Engineer* chugged its way farther up river to Chouteau’s Landing in that year as well but not until 1834 did the *John Hancock* make “the first landing of record” at Chouteau’s site, and regular service may have said to begin at that date.

Farther east, steamboat traffic had started down the Ohio River as soon as Robert Fulton and his partner Robert Livingston could introduce steam boating to the western waters. The *New Orleans*, a one-hundred-ton vessel powered by steam from coal made her first trip from Pittsburgh to New Orleans in fourteen days in 1812. Pittsburgh had been the center of keelboat and flatboat building; now it assumed the task of building steamboats. Pittsburg had become the de facto supply center for the western world by building boats and selling supplies that would soon include coal. It was described even in 1813 in uncomplimentary terms: “Mud and smoke are the great evils of the town. Whoever can make up his mind to
breathe dirt, and eat dirt, and be up to his knees in dirt, may live very happily and comfortably here.”

The very idea of steam boating drew on a complex series of materials and techniques. From old materials and old ways came the new invention. The first steam engines were often anemic and offered little in the way of energy for the amount of fuel they used. In 1818 the first steamboat built for Lake Erie sailed the upper lakes from the shipyard at Black Rock near Buffalo on the Niagara River. Named Walk-in-the-Water, after a well-known Michigan chief, she sailed from Buffalo to Detroit in forty hours in good weather using about thirty-six to forty cords of wood per trip.

Gathering materials to build such a ship remained a Wood-Age process—loading materials on small single-masted sailing boats or sloops to sail from New York to Albany and transferring the materials by hand to six-and-eight-teams of horses and wagons from Albany to Buffalo, to arrive in Buffalo twenty-five days later where the steamboat would be built. On its maiden voyage the rapids between Black Rock and Buffalo were beyond the power of the steam engine to make on its own, and eight yoke of oxen had to assist pulling from the bank, much like the cordelling maneuver of the keel boatmen.

On the western edge of the Missouri River, the settlement joined the nation in the unavoidable clearing of wood for fuel for their Wood Age life style. The river, once exclusively used for canoes, bullboats, keelboats and flatboats, now welcomed the mechanically driven newcomer. The steam engine burned wood and needed a constant supply. No sooner had steamboats proven their ability to move than captains began to race
them as well. A little of the romance from the early 1850s shows up in a boat race between two powerful steamers.

The fastest boat to hold the speed record was the *James H. Lucas* from St Louis up the Missouri River to St. Joseph. A challenger, the *Polar Star*, demanded a race; the prize was a rack of elk horns legendary in their size. The Lucas’s captain used pine, barrels of rosin, “a few tons of fat pork” while his bow “turned the water like a plowshare.” The race was bow to bow until the Lucas pulled ahead between Kansas City and St. Joseph and won by three hours and twenty minutes. The elk horns with silver plaque were duly awarded the Lucas that kept the record without further challenge.\(^{15}\)

![Racing Steamboats on the Mississippi](image-url)

*Figure 2-4. Racing Steamboats on the Mississippi.* This scene is similar to the race described on the Missouri between the *James H. Lucas* and the *Polar Star*. (See Appendix for full description of the race.) The sail boat and small passenger boat suggest an overlap of energy suites. L. Stebbins, *One Hundred Years of Progress*, 1872.
Not only does this vignette on a small stretch of the middle Missouri River display some of the excitement of the new technology, it also suggests that the captain of the *Lucas* picked his winning fuel to be pine, rosin and pork fat, evidently fuels either plentiful and power-packed or just those available in an emergency.\(^{16}\) It also shows that the American fascination with speed now had a new expression in mechanized travel. What a thrill it must have been to move faster than a horse could run, to move *upriver quickly*, and to race another mechanized behemoth on the surface of the previously unyielding current.\(^{17}\) Fifty years later an author would remark that the transportation world had matured: “Their sporting, drinking, gambling, fighting, have given place to business, temperance, prudence, and refinement, while wealth rolls up in the cities as a result of the speedy and cheapened transportation which the steamers have effected.”\(^{18}\)

**Wooding Up**

Originally, boat crews had to stop and cut their own wood, but did not have to worry as would the crews on ocean-going steamships of taking up most of the deck or hold space for a supply of wood or coal to make the distant shore.\(^{19}\) As traffic increased, the obvious commercial exchange presented itself and “woodhawking” became a new way to earn a living, albeit a seasonal one.

Early steamboats, of course, found no ready-cut cords of wood waiting along the banks of the rivers. Supplying wood to a steam engine caught the enterprising frontiersmen unaware of such an opportunity. Farmers fortunate enough to own riverfront property discovered an unexpected cash crop, sometimes their best one, particularly if they possessed good wood.
Well-seasoned cordwood, the captain’s best hope for speed, varied from one wood yard to the next and from one riverbank to the next. Hardwoods like oak, ash or chestnut were favored for long-lasting fuel, cottonwoods least favored for burning quickly or green wood with its high water content.  

Competition for wood at good prices depended on individual woodhawks lowering their prices to beat another farther upstream or on the amount and kind of wood available. Competition for passengers and freight also became fierce, according to travel stories of the time. Captains ranged from duplicitous to undependable to quixotic. Boats were loaded to the gunwales with deck passengers plus those who paid for cabins. The boats lined up at the piers, literally miles of steamboats,” some two to three miles long, of tall, ascending columns of coal-black smoke,” diagonally parked at major ports to take on their loads, but none of it moved without fuel, usually wood.  

A Kansas City observer wrote this about a steamboat that stopped to take on over a hundred cords of wood. The captain ran the outside wheel to keep the boat close to the bank and burned up the entire hundred cords of wood in doing so.  

A hundred cords took the work of over a hundred men and perhaps as many as a hundred acres of woods to yield the wood for this particular event. Across the state at this time, St. Louis in 1852 received some 3,000 steamboats yearly and the total rated capacity of these was about 50,000 tons, making St. Louis the third largest port in the country in the amount of steam tonnage exceeded only by New York and New Orleans.  

The multiples of cordwood per steamboat per year become staggering in a short amount of time. Woodcutting, woodhawking and wood procuring became a major industry almost overnight as steamboats moved as far as wood could take them. In hardwood forests an acre
would yield a cord and more of good wood. Marginal lands would yield about a third of a cord per acre.  

Coal was simply not to be found on the western rivers until the 1840s, and not in any abundance until the 1860s. Though coal fired the first steamboat’s maiden trip, the New Orleans, in 1811-12, which departed from Pittsburgh, the soon-to-be epicenter of the coal country, coal scarcity could only be cured with time. Coalmine operators by the late 1830s began to advertise in such eastern newspapers as the Cincinnati Gazette and the Pittsburgh Daily Gazette and Advertiser the availability of coal over wood. Soon coal mine owners set

Figure 2-5. Wooding Up This scene of passengers who signed on for wood hauling in exchange for passage plus crewmen loading the steamboat was common until woodhawking grew more organized. The inset, lower right, shows an unidentified close-up of a river and, presumably, its wooded banks. This work is in America Illustrated, edited by David Williams, 1833, 50. For a closer look at frequency, size of load and price of wood and coal, See the receipt book of the steamboat Columbian in the Appendix of this dissertation. Also see Figure 2-8 for a map of a river’s wood lots.
up coal stops along the river banks and coal boats with bags of coal for ease of handling followed along to transfer their bags to waiting steamboats.\textsuperscript{25}

Modifications needed to be made to the fire box for coal, but could not be made if coal was not consistently available, all of which slowed the progress of coal. Sometimes a combination of wood and coal kept the engines humming in spite of the inadequacies of the firebox.\textsuperscript{26}

Steamboat captains and engineers created a number of small systems for themselves in procuring fuel, particularly if they were in competition with each other to arrive first. For a race, the wily captain contracted in advance along the route with dependable woodhawkers for coal flats and wood.\textsuperscript{27} If he is in the lead in the race, he might buy all the seasoned wood and leave only the green wood for his competitor. The racing boats from New Orleans did not slow down before St. Louis (the route on which keelboat men had previously labored so mightily against the upstream current) except to allow a woodhawker to intercept them.

During the race, woodhawkers would meet the racing steamer by a pre-arranged signal, a series of whistles or bells, with a wood boat bearing as much as thirty cords of wood. With a double crew for quick loading, work went fast: “You should be on board when they take a couple of those wood-boats in tow and turn a swarm of men into each; by the time you had wiped your glasses and put them on, you will be wondering what has become of that wood,” Twain commented.\textsuperscript{28}

The best boats in a race made fourteen miles an hour compared to keel boating up river at sometimes as little as three miles in a day. Other times on the Upper Missouri where wood became scarce, the engineer or captain might contract with woodhawks on the way up for
fuel to be used on the way back. Ever resourceful, he might send a yoke of oxen to shore, his crew throwing a chain around a few logs and taking them on deck where his men could saw the wood while on board. Other times, crew members rousted out “deck passengers” paying the least fare or none at all who traded passage for labor in” wooding up,” to cut and carry wood back on board. In some cases a farmer could leave wood at riverside with a mark on a stump as to price, and the captain would leave money or a chit in exchange for the wood, but, in the early years, at least, a good deal of wood was simply stolen along the way either by steamboat crews who needed wood and found no one to pay along the “almost untenanted shores,” as described by Twain, or because many of the woodhawkers lining the river bank were squatters with no title to the timber or the land.29

The supply line that could be loosely called a system was made up of many small wood and some coal sellers vying for attention along the riverbanks. Their sheer numbers made the system work though they were for the most part individually owned and operated. Their supplies were uneven, and their practices often questionable, but over the course of the 1830s, 1840s and 1850s, the opportunity to sell wood and coal to over a thousand steamboats plying the western waters gave employment to countless men—perhaps the very ones who had formerly been keelboat men.30
Figure 2-6. Wood Lots along Ohio River Undated map of river ports along Ohio River indicate the stops for woodlots along the river bank on any of the western rivers in the prime of steamboating days. See the log of the Steamboat Columbia in the Appendix to estimate the activity to get a steady supply of wood. After the Civil War the focus turned to the railroad. Steamboats began to burn coal and wood hawking died out. Waterways Journal, St. Louis, Missouri.
Wood delivery as a system remained catch-as-catch-can even as other parts of the new transportation mode evolved. The Pilots Benevolent Association grew out of necessity to relay information on the challenging and changing river conditions. Pilots quickly sensed a power position and flourished in its secrecy and stringency, controlling traffic on the river until pilots took on an imperious role and a steamboat could not move without a pilot from the association. The number of pilots increased through the kind of “hands-on-the-wheel training” that Twain himself experienced, cuffed about the ears by one pilot, respected and taught by another. 31

Both pilots and steamboats proliferated. The number of steamboats on the rivers after 1811 grew to 69 by 1820, to 151 by 1830, to 494 in 1840, to 638 in 1850. By 1860 the numbers in the “stately procession,” as Twain fondly described them, had grown to 817, and by 1866 to over a thousand, the year of greatest traffic for steamboats before the continental railroad began to erode steamboat traffic. By 1868 the number had fallen to 874. 32

The average running time or season for steam boating increased over the years. At first the average round trips per year between the two ports of Louisville and New Orleans was three. By the Civil War period the trips had increased to twelve. Also, in the early years before 1820, the average running time or season for a steamboat was ninety days. The season in 1850-60 for boats between Louisville to New Orleans had increased to one-hundred forty-one days per year, probably thirty to forty days fewer for boats in colder climates. 33 During 1857 the river remained open and profitable for nine months of steam boating in Kansas City with a total number of 725 steamboats calling at the levee. 34
Wood consumption became more voluminous over time as engines became more efficient in creating steam, and, thus, more powerful: Average daily consumption rate was approximately one cord for each 20 tons before 1820, one cord for each twelve tons during the 1820-29 decade, one cord for each ten tons 1830-39, and one cord for each eight tons 1840-60. Price per cord before 1830 was at $2.25. From 1830 to 1860 it was $2.50.\(^{35}\)

The increased numbers of steamboats increased the demand on the countryside for fuel. In 1818 a 400-ton steamboat took 20 days to travel from New Orleans to Louisville, and it consumed about 360 cords of wood in the process. In this case, the consumption rate was about one cord of wood for each 22 tons every 24 hours, one cord for each 12 tons of the boat’s measurement. The average fuel consumption rate of New Orleans boats (about 275 tons each) around 1840 was about 35 cords of wood per day, or one cord for each eight tons every 24 hours.\(^{36}\) On the round trip the steamboat could burn upwards of 500 cords of wood at a cost of approximately $1,250.\(^{37}\)

The 1850 census reports for the vessels operating in the Louisville-New Orleans trade again provided a basis of comparison. Based on those returns the annual fuel costs of a 310-ton steamboat would be approximately $11,600. Those for a 360-ton steamboat would be approximately $12,250 round trip form New Orleans to Louisville.\(^{38}\) None of these abstract statistics, however, tell of the furious activity among woodhawkers to supply this amount of fuel from the receding forests. These unsung heroes of early industry personally uprooted, chopped, sawed, cut and delivered to the banks of the middle-western rivers the mountains of wood to be used for early motive power.
Woodhawks

Woodhawking, though piecemeal, awkward, unreliable, amateur and sometimes illegal, supplied the nation’s hunger for speed and transportation in the form of cut wood, lard, coal in bags . . . whatever a crewman could throw into the boiler to keep the ship moving. This was Stage II evolving *systems organization* at its earliest: rudimentary technology, scarce labor, spotty supply and continual scavenging to create the “lightning of heaven subdued and put in harness by the genius of man.” The one constant in this fledgling system was the demands of the growing steamboat fleet. That only increased. Speed, convenience, eager pioneers, advancing trade and highly profitable routes pressed more and more boats into service.

The first reliable statistics for wood use in America show a per capita consumption in 1850 of all wood use of 4.39 cords of wood compared to 0.36 tons of coal, which meant Americans burned an estimated 100 million cords per year for all purposes, almost entirely for heat and cooking. So that even though these prodigious amounts of wood were wrenched from the nation’s ecosystems for steam boating on the western waters, they were small compared to the nation’s need as a whole for its citizens to heat their homes and cook their food. By 1860 wood use had dropped to four cords per capita and an almost ten per cent decrease in wood as fuel. By 1900 it had fallen from an all-time high of over 90 per cent to 21 per cent, an amazing decline, and mute testimony to the changing fuel procurement and labor patterns.39

The woodhawks themselves represented some of the working poor of the western movement while assisting to move masses of people on their way West. If they lived along
the river itself, they commonly suffered “ague,” or malaria, living in clouds of mosquitoes and fighting nettles, chiggers and snakes. Paul Wilhelm, Duke of Wurtemberg, noted a similar experience during the same period: “Barely penetrating a hundred paces into the thicket, we were swarmed upon and covered by mosquitoes to such an extent that we could scarcely see and recognize each other at a distance of twenty paces.”

Sometimes woodhawks harvested wood stocks without permission or ownership for a little ready cash or built their humble shacks on stilts over the muddy bank. One traveler visited a tidy whitewashed cabin with furniture and stove while waiting for wood to be loaded, while another remarked at the clay-colored men who toiled in the mud at the river bank to load wood.

Living a meager, hard existence by even the standards of the day, these men used their muscle to power the beginnings of steam-powered industrialization. Unless they had a spring nearby from which to drink clear water, the woodhawker may also have had to use the river water “so charged with mud and sand that it is perfectly opaque, and in a few minutes deposits a sediment an inch thick in the bottom of a tumbler,” according to Francis Parkman, chronicler of The Oregon Trail in 1847 remarked on the grittiness of Missouri River water.

Woodhawking was rough work and they often tried to earn a little extra by disguising a stack of poor wood with an outer cover-up of good wood. One steamboat captain recited his experience in dealing with these woodhawks in his early days: “As a second clerk, I was early taught to hold my own with the pirates who conducted the woodyards scattered along the river.” Twenty-cord stacks piled eight feet high and ten lengths of the measuring stick
(eight feet long) was the unit of measurement most often used if that much wood was available.

The woodhawks often hid green or wet wood in the interior or rotten or crooked stock or “sticks,” and the clerk had to inspect not only the length but take out the ends of the cords and peer within to check the quality of the wood. If he detected cheating, he discounted the price appropriately. Then the woodmen and the crew “exchanged a blue-streaked volley of vituperation,” which often passed for entertainment among the passengers until the clerk and the woodhawk agreed on the deal or broke contact.43

Figure 2-7. The Gilliss House  This was a famous hotel on Westport Landing, “beautifully furnished” and “the best hotel in the western country,” according to the Daily Western Journal of Commerce, August 26, 1860. The hotel was torn down in 1890.44 Missouri Valley Collections, Kansas City Public Library.

The woodhawks along the river who supplied the bulk of the fuel were so common as to be unscrutinized, made invisible by their numbers and appearance, embracing and emitting
the necessary grit and grunt of their station in the economic life of the frontier. A former governor of territorial Kansas dressed himself as a woodhawk or woodchopper to flee from border ruffians in the town of Kansas in 1854. It turned out to be the perfect disguise. The slavery question heated the border town to a boiling point as the former Indian lands across the river were proposed to come into the Union as free states Kansas and Nebraska.

The governor of the territory of Kansas, A. H. Reeder, a staunch abolitionist, had a price on his head and hoped to escape with his life. To do so, he had to cross the Kaw River and catch a steamboat going east. A few leading citizens of the town of Kansas City, including Colonel Kersey Coates and Dr. Johnston Lykins plotted to help the governor escape. In the dead of night he was secretly rowed across the river and hidden in the waterfront hotel the Gilliss House until the Southern militia came to search for him. Colonel Kersey Coates of the still-standing Coates House, then guided the governor up the steep limestone cliffs behind the levee town to a one-room cabin occupied by an elderly couple who agreed to take him in and use their attic as a hideout. Reeder hid there for several days until, disguised as an Irish woodman, and carrying a sack of kindling, an ax over his shoulder and a long clay pipe in his mouth, he climbed down the hill and sat on a wood pile in the wood yard adjacent to the pier.

Figure 2-8. Kansas Governor Andrew Reeder The governor escaped Southern sympathizers by hiding at the Gillis House. Dressed as a wood hawk--note sack of kindling on his back—he fled to the East to tell his harrowing tale of life in the wild West. Jackson County Historical Society.
waiting for the steam boat. He escaped to Illinois and eventually to Washington D.C. to tell the tale of life on the Kansas border and his anonymity as a woodchopper. A photograph capturing him in that guise survives. A painting was later made from the photograph.\textsuperscript{45}

Reeder’s persecution was based on his refusal to certify fraudulent voting results to make Kansas a slave state, an act that riled pro-slavery factions on both sides of the river. He was made to resign by President Franklin Pierce for “private, speculative interests” because Reeder moved the capital of Kansas to Pawnee where Reeder had property.\textsuperscript{46}

**Wood or Coal?**

Coal became more available for steamboats even on the shores of the rivers and both supplemented the woodhawks’ wares and competed with them. The records from the steamboat *Columbia* show the use of wood and coal over a period from 1849 to 1851.\textsuperscript{47} The receipt book, predated with an 184\_ blank accommodates the two fuels with column one for amounts of coal received and column two for amounts of wood received. This shows the reality of two fuels in use with coal in the first column and wood in the second, indicating the rising availability of coal. (See the Appendix for the full record.)

The records show that when farther east and nearer the source of coal, the steamboat used coal with occasional injections of wood. Farther west, the boat used more wood. On the Pittsburgh to St. Louis run the Columbian used more coal than it did on the Pittsburgh to Cincinnati run, bearing out the impression that wood was used farther west because coal was not that available. Assuming that it took a day on average for a skilled man with a broadax or saw to chop a cord of wood, each of the loads of multiple cords of wood sold required a good
deal of concerted labor. Of course, digging coal did as well, and it may be that this coal came from outcroppings along the river banks or slope mines hauled to the riverbank in wagons.

A few named wood yards are listed as sources. Coal ports on the list competed with the wood yards. Unlike the woodhawks, coal dealers began to advertise in local newspapers to notify the public of their existence as an alternative fuel to wood. Sometimes the boat took on several loads of fuel in one day, suggesting supplies may have been undependable or meager. Mark Twain noted both coal and wood barges plied the river during his years as pilot in the 1830s.\textsuperscript{48} Since the \textit{Columbian} shared these waters with many other ships per day using the same fueling stops, the output of wood and coal among these stops was tremendous.

An army of woodcutters and coal diggers with little more than broadaxes, picks and shovels had to work to supply this insatiable demand for fuel. The number of small purchases in this record suggests that the boat rarely had enough fuel to go far. On two dates, one in July and one in September of 1851 the boat picked up 2000 bushels of coal. No explanation for this is currently available, but given the loads of goods and passengers these boats carried, room for such a load of fuel would have been at a premium.

Taking on such a load of fuel meant that the boat may have been empty of cargo. Also note that the measurement of a “bushel” (35 liters of dry goods) originates in an agricultural context, not an industrial one.\textsuperscript{49} Twain noted that “in the heyday of the steamboating prosperity the river from end to end was flanked with coal-fleets and timber rafts, all managed by hand,” suggesting supply was adequate and the shores teemed with producers of fuel.\textsuperscript{50}
Figure 2-6, page 117, the map of fuel stops on the Ohio River bears this out. Twain later lamented in the 1880s that “when there used to be four thousand steamboats and ten thousand acres of coal barges and rafts and trading scows, there wasn’t a lantern from St. Paul to New Orleans, and the snags were thicker than bristles on a hog’s back; and now when there’s three dozen steamboats and nary barge or raft, the government has snatched out all the snags, and lit up the shores like Broadway, and a boat’s as safe on the river as she’d be in heaven.”^51 The Columbian’s log of fuel purchases in the appendix is a trip in imagination to reconstruct the daily need for fuel and to endure its disorganized delivery. Even so, the log indicates a well-organized system if not a very elementary one to feed the new machine.

**Master of the Levee**

In the 1850s in Kansas City “all business was conducted at the levee.” In this “Golden Era” of pre-fossil fuel driven machinery, with sixty regular boats running between St. Louis and Kansas City on a constant basis plus a fleet of coal and wood barges—woodhawkers flourished here, too-- and transient boats or tramps, the levee dominated water commerce as the wagon trains dominated land. “It was not unusual at this period to see five or six large steamboats at the Kansas City levee at the same time. In the season of 1857, seven hundred and twenty-nine steamboats arrived at Kansas City. So great was the volume of business that the steamboats ran day and night.”^52 As early as 1840 it was not uncommon for two or three hundred men to assemble at the river landing to buy and trade when the boats arrived.^53

A boat might arrive with three hundred or more passengers, her hold almost bursting with freight besides being crowded with horses, mules, oxen and wagons on the main deck, and
with furniture, boxes, even a piano or two piled on the hurricane deck as high as it would stick. In 1857 in the seven months of seasonal navigation, the village at the limestone pier still known as Westport Landing, Kanzas, or increasingly more often as Kansas City, played host to crowds night and day. The hotels on the landing hired boys to approach a passenger and ask if he or she were looking for a hotel. If the answer was yes, the boy would snatch the passenger’s satchel and run for the hotel that paid him a tip while the startled passenger, adding screeching and shouts to the noise level, scampered after the boy to retrieve the disappearing luggage.\(^{54}\)

The middle decades of the nineteenth century witnessed an elaborate and extensive series of systems created to manage the westward thrust of population and trade. The wagon master, the steamboat pilot/captain duo, the local merchant and the wharf master formed a nucleus of focused energy as they each directed traffic in their spheres of influence. Nothing could happen without the work of all in concert. Everyone else worked to support these positions one way or another, the investors and owners above them, the supporting legions of men below them, the townspeople who ran small retail and industries because of this traffic, and their customers using the flow of goods from one end of the trade to the other.\(^{55}\)

The cattle, freighting and delivery belonged to the firm-handed wagon master; the steamboat traffic’s success belonged to the skilled pilot to navigate among the many snags in the river and the captain to manage the fuel, the guests and the cargo; the buying and selling belonged to the shrewd-eyed merchant; the success of unloading and loading goods and passengers successfully at the levee belonged to the wharf master.
Perhaps never before or since have so few professions carried so much weight in a community. During the raucous and fluid scenes at the levee, these professionals supported each other’s ventures and together hammered out systems on a daily basis to meet the needs of the town and its hordes of visitors. In this way the Wood Age was given its greatest expression. Not only was wood used as fuel for the engines of the steamboat, but to power the engines of commerce, along with its necessary concert of animals serving as carriers, water as the highway, timber as the raw material. (See Appendix II for the complete description of the Master of the Levee).

The sheer volume of activity forced systems to evolve. Stage II: Systems Organization required a greater and greater draw of wood from the surrounding forests estimated at thirteen-thousand acres to supply fleets of steamboats as well as armies of eager emigrants their fuel and shelter while camping out and readying for the great trek west. For the towns a steady supply of wood was needed for blacksmithing and wagon making as well as hearth and home though both lumber and finished wagons were in the early years, at least, according to Josiah Gregg, steadily manufactured and shipped in from Pittsburgh.

The energy system required an intricate network of communication on paper by agents, merchants and bankers with orders for finished products sent out near and far. Resources from around the world were turned into everything from calicoes to windowpanes. Then they were packed and shipped from as far away as India, China, England and the East Coast of the United States. Closer still, the great depots of Pittsburgh, St. Louis and New Orleans shipped them on to arrive at the levee in Kansas City to be split out by sweating laborers to thousands of hands and households in the great seasonal surge from April to November. As soon as the
ice went out and until it formed again, goods changed hands in little towns fully engaged in outfiting these hordes in everything from western attire to hotel service before the hullabaloo died back down for the winter and its original, if growing populations breathed a sigh of relief. There is something to be said for seasonality and its enforced downtime.
CHAPTER 10

OVERLAND TRAVEL: OLD ENERGY COMPONENTS, NEW TERRITORY

Though using the water highway remained the preferred transport, overland travel to the West began at the western edge of Missouri. Upon arrival, settlers found they still had water to cross—either the smaller Kaw River or the nearby Blue River. To cross to either bank of the Missouri River remained a challenge, and a brisk business in ferries began to flourish. In one way or another the pioneers had to cross the river by ferry or “take the bank” with cattle power. In 1827 the first ferry went into business three miles south of the site at a place called Uneaw’s Ferry and competition for local water transport began.

After the Choteaus settled in and others began to gather in the 1820s, the clerk of the Circuit Court issued a license for one year against a security tax of $2.00 which allowed said ferryman to charge $1.50 for a loaded wagon and five horses, $1.00 for an empty wagon and five horses and $ .75 for a light wagon or Dearborn, 12 ½ cents for every head of “meat cattle,” each head of hog, sheep or goat, five cents, each footman 12 ½ cents. 58 Ferries proliferated up and down the Missouri River and across the Kaw River from both banks as travel to the area increased and teams and wagons crossed the frontier’s last waterway on flatboats to begin the great American pioneer adventure of the nineteenth century.

Dugout canoes gave way to rafts that gave way to primitive ferry boats of logs lashed together. These gave way to sawn timber and were guided by poles then oars then drawn by ropes. Eventually, horses were employed to turn the stiles until steam engines replaced them in the early 1850s. 59 This quick evolution of simple technologies to cross the local rivers
showed the speed at which old ways were replaced by the new. Until the railroad bridge was built at Kansas City across the Missouri River 1869, the local population used one of these forms of energy to cross the local rivers.

**Taking the Bank**

As the trickle of settlers increased to a flow, the Independence landing six miles down river lost popularity. Though the town served as the county seat and remained an outfitting center for wagon trains, the wagons from Independence starting the long trek west had to cross the Blue River, often a treacherous event, while the limestone pier on the Missouri River farther west was just that—farther west on water, and the temptation to go even five more miles on water caused Independence to lose some of its luster. In 1824 one party in crossing the Blue had to “dig down the banks and lower the wagons and dearborns on ropes.” The Blue was uncrossable at high water, which sometimes delayed a train for as long as two weeks.  

For those who started from Independence, the Blue River was their first obstacle. Crossing a river with a wagon train often began with a man on horseback testing the depth and current. If the stream was found to be deep enough, all the cracks in the wagon needed a coat of pitch from the bucket hanging on the side to keep the wagons from leaking. A river as large as the Missouri could only be crossed on rafts or ferries, but a smaller, shallower river like the Blue could be breached by wagons.
After the initial foray by a lead rider and a route chosen, nearby underbrush had to be cut to line the slippery banks to give traction to the horses or oxen to pull the wagon down into and out of the river. Then a “great deal of yelling and swearing” helped drive the whole venture across and up the opposite bank. If travelers were lucky and the ground was not too soft or the brush all gone, a crossing could be accomplished with minimal risk and struggle. A great deal of energy was expended by man and animal with no help from fuel as we have come to know it though certainly participants were fueled by food.61

Doctor and merchant Josiah Gregg, who bought goods for the Mexican trade, observed, “When caravans are able to cross in the evening, they seldom stop on the near side of a stream—first, because if it happened to rain during the night, it may become flooded, and cause both detention and trouble; again, though the stream be not impassable after rain, the banks become slippery and difficult to ascend. A third and still more important reason is, that
even supposing the contingency of rain does not occur, teams will rarely pull as well in ‘cold collars’ as wagoners term it—that is when fresh geared—as in the progress of a day’s travel. When a heavy pull is just at hand in the morning, wagoners sometimes resort to the expedient of driving a circuit upon the prairie, before venturing to ‘take the bank.’”62

Pioneers clung to river for just such reasons as these. City pride would later give bragging rights to the town of Kansas location:

. . . . Kansas City stands upon the outpost of our internal navigation, the last and extreme western locality, with a geography giving command and connection with our vast river marine . . . . Directly here, in the Great Bend of the Missouri, the westward wake of the steamboat ends. There is no more west to pay respect and tribute to the genius of Fulton. 63


And so, from there the “overlanders” began the long walk, seven to eight hundred miles to Santa Fe, New Mexico, double that to the coast of California or Oregon. They set off with good cheer and more than a little naiveté about what the trek would require of them. The frontier town of Kanzas became the “jumping off” point to abandon the last water transportation available, to literally jump off the deck of a steamboat and start walking. Thousands did.64

The Last Town in the West Under the Stars and Stripes

By 1833, John Calvin McCoy built a cabin along the trail a full 12 miles west of the Independence landing. This soon became a store that attracted other businesses to spring up. McCoy laid out streets and named the growing community Westport, as it became the entrance to the West. Indian country lay less than a mile beyond, where the end of the state of Missouri and the beginning of the Indian Territory began, populated by relocated Indian tribes.
Westport was indeed “the last town in the West under the Stars and Stripes.”\textsuperscript{65} McCoy and his community influenced steamboat captains to drop their cargo farther west at the new landing, the limestone pier, at what is now the foot of Grand Avenue, three miles west of Chouteau’s Landing, and six miles west of Independence. Since the goods deposited there were largely ordered by Westport businessmen, the limestone pier became known as Westport Landing. The town of Westport on the overland trail four miles southwest of the levee soon began to compete with Independence for trade with the growing traffic of pioneers along the three trails that converged here, the Santa Fe Trail going southwest to New Mexico to trade with the Spanish, and the California and Oregon Trails going west and northwest.\textsuperscript{66}

\textbf{Figure 2-10. Santa Fe Trail “The Santa Fe Trail from Missouri to New Mexico,” Mark L. Gardner, \textit{Santa Fe Trail National Historic Trail} (National Park Service, Southwest Parks and Monuments Assn, Tuscon, AZ, 1993).}
From the first, Westport’s buildings clustered around the stream running through the area and a mill began business at the intersection of Mill Street and Westport Avenue. Large bodies of people from the eastern United States as well as foreign immigrants flocked to Westport, stepping from the decks of steamers at Westport Landing and making their way through the timber to the village to outfit and organize their wagon trains. They needed cattle, mules, horses, most of which were supplied by the counties east of Kansas City in an area called “Little Dixie.”

Wagons, harness, cookware, earthenware, foodstuffs were all for sale in Westport with all the outfitting trade done in cash. Since the pioneers arrived in droves, money was as plentiful as they were. The tents of the migrants blossomed on the fields “like the camp of a great army. These parties made themselves up into trains, as they were termed; some employed mules for transportation purposes, some oxen, others horses, and not a few strong-spirited men loaded a few supplies into a cart drawn by a single mule, and walked beside it.”

The Mexican American War slowed the traffic to Santa Fe in the 1840s, but the discovery of gold in California in 1849 brought a torrent of opportunity seekers who flooded the Missouri border. Each of the small towns from St. Joe to Westport was surrounded by campers. Three thousand Mormons camped on the spacious fields, a plus for that location, between Westport and Westport Landing waiting to begin the trek to Salt Lake City.

They were in a fine forest. Some were sleeping in their wagons, but the most had tents and the woods and fields in all directions were covered with these white and fragile dwellings. Oxen are used for teams. Men, women and children were scattered about on all sides. Blacksmiths’ hammers were heard, and the hum of preparation came up from all parts of the camp. It was a singular sight . . .

To the Spanish Country
After outfitting themselves from eager merchants, the travelers usually spent their last night camped out around Westport, Independence and the levee by the thousands waiting for all manner of small events to occur so they could begin their trek. Eyewitness Josiah Gregg rejoiced at the moment of departure: “At last all are fairly launched upon the broad prairie—the miseries of preparation are over—the thousand anxieties occasioned by wearisome consultations and delays are felt no more.”

Nearby farmers provided mules, oxen, horses, ground corn and flour from mills; saddle and harness shops provided miles of reins and harnesses; wagon-makers turned out wagons of every type for the many who came in by steamboat. The many forests provided fuel. Wood was still the reigning monarch of materials here as well as the absolute fuel. Wagons had to be made of seasoned wood or calamity was sure to strike. Wood was deceptively temperamental. It had to be “thoroughly seasoned and dried” to avoid shrinkage. Once the wood shrank from the iron bands holding the wheel together the wagon breaks down. A loaded wagon could weigh over two tons and could be loaded with three- to six-thousand pounds of freight. To raise a wagon like with jacks in mud or dirt, to set props under it was an art in itself as well as a hurculean task. The entire job could take a day and delay the entire wagon train. Wagon masters hated the delays; they were costly and laid the wagon train open to raids and lack of water.

Independence bustled with workshops typical of the nineteenth century—small, often open-airied, with primitive tools, a few men, fewer amenities. On sites around the square stood small manufacturing shops of wagons, harness, saddlery, blacksmith making shoes for horse, ox and mule, and at least one place making for those oxen “a great many oak yokes
and bows.” Up front in these busy shops a customer could find a counter perhaps and beyond that a small group of men in each shop industriously filling orders for waiting wagon trains. “A large number” of workers crafted leather works, from tanners to saddlemakers. Merchants brought in or had made on the spot every kind of necessary item for the wagons to take west.73

What wasn’t shipped in from Pittsburgh or St Louis or New Orleans was fashioned in Independence or within a few counties as soon as the local population could muster the raw materials and expertise to do so. Even something as small but vital as a whip was crafted in Independence to use on the trail to urge on oxen and mules. Local author William Z. Hickman, growing up in Independence, remembered that the same slaves Sam and Pete who could cut four cords of wood in a day with a broadax also braided ten-to-twelve foot long whips on a winter evening. In fact the whip-making business belonged to the “negro men of the country” who spent any idle time in the winter braiding whips to be sold in the spring when the traffic on the Santa Fe Trail started up again. They bought up hides, cut them into strips and braided the whips for sale to merchants or bull-whackers for about fifty to seventy-five cents each.74

Sam and Pete’s work once again became legendary. As the wagons left the levee in the 1850s to start the long trek to Santa Fe, “a team of twenty-four mules would have four to six Mexican drivers. They would start down the levee and around up Grand Avenue. Every driver prided himself on the loudness with which he could crack his whip, and in a train of ten or twelve wagons the whip cracking would sound like the firing of muskets, only louder.”75
Before the hordes arrived in the 1840s and 1850s a thin thread of commerce between “the Spanish Country” and the little settlements of Independence, then Westport and finally Kansas City established itself. The destination was Santa Fe, New Mexico, where manufactured goods from the American East could be traded for Mexican silver dollars.

William Becknell of Franklin, Missouri, organized the first trip overland to Santa Fe in 1821, making the trip successfully with 17 men and returning in six months using pack horses only. Until 1830 the expeditions left from Franklin then moved to Independence. Overland travel required large numbers of animals and patient endurance on the part of both traders and travelers. Becknell had taken a long shot in organizing the trip; Mexico had just separated from Spain and the politics of changing markets attracted this man from Franklin, Missouri. For some reason Becknell, a rural businessman and deeply in debt, felt it was his destiny to gather men to make the overland trip. Profit lay out there close to 800 miles and over 65 days away, the kind of profit not available at Boone’s Lick on the Missouri River. He was right. Along with other goods he sold he made a small profit and was able to forestall his debtors.

On his second trip he sold his $150 wagon for $700. Becknell had discovered a silver mine! Once started, overland trade leaped forward with as much organization and as many intrepid men, hardy cattle and goods available. Overland trains soon grew to over 300 oxen, 36 wagons, and 30 men to load, guide and carry sixty to seventy-five tons of goods from Independence to Santa Fe or farther north to Fort Laramie and Salt Lake City.  

Whatever commercial venture from Kanzas, however, had to contend with the Indian populations who had been relocated on land foreign to them, had been systematically
disenfranchised from their way of life and were prone to take out their resentments on travelers through their newly acquired land.

The Crazy Osage

In the summer of 1823 a new expedition started out from Franklin to Santa Fe. Three hundred miles out, two men from the expedition in search of stray horses were captured by the Osage and were “stripped, barbarously whipped, and robbed of their horses, guns and clothes.” The Osage, already removed from the ancestral lands and on the government dole, did not like the intrusion of more whites moving through their newly acquired territory. “Various circumstances combine to fix this outrage on the Osages, who receive regular annuities from Government,” Becknell wrote, “and have a school among them through its beneficences and the charity of individuals. They have before been guilty of similar offenses and have long been distinguished for their predatory habits, and are daily becoming bolder; and unless checked by prompt measures we fear they will cause a great disruption to western intercourse.” The Treaty of 1825 between the Osage and the United States government signed at Council Grove was created to stop the Osage from raiding the new trade to the Southwest.

Wagon masters protected their wagon trains from marauding Indians by driving the wagons in four parallel lines. In that way they could circle quickly and avoided the vulnerability of a long, single line of wagons. “Thus far also we had marched in two lines only; but, after crossing the Pawnee Fork, each of the four divisions drove on in a separate file, which became henceforth the order of march till we reached the border of the mountains.
By moving in long lines as we did before, the march is continually interrupted; for every accident which delays a wagon ahead stops all those behind. By marching four abreast this difficulty is partially obviated, and the wagons can also be thrown more readily into a condition of defence (sic) in case of attack.\footnote{79}

Figure 2-11. \textit{March of the Caravans} As part of organizing systems in the Wood Age the wagon masters learned that a “four abreast” series of wagons proved to be a stronger and more efficient way to cross the open prairie. Note outriders along both sides who served as messengers. (Courtesy Library of Congress)

As a result of such attacks, another treaty was drawn up in 1837 to protect travelers to and from the New Mexico territory. This treaty included the Kiowas and Muscogee tribes as well as the Osage. Their names bespoke their mindset just as the European settlers’ names bespoke theirs. The Indian names ranged from the Learned Dog, to the War Eagle, to the One Who Gives Horses, to the Crazy Osage, a completely separate and exotic mindset from the other culture indicative of forests and wildlife, open vistas and identity with living things
with which they were familiar. They signed the “talking leaves” of the white man and relinquished their territory once again.80

Dispossessed from their original lands, the Osage showed by signing their names to this latest contract that their origins were from another time and place. The need for such an agreement shows they felt violated by further intrusions in their new territory. Their lives were not the same, and to fight the wagon trains or to let them pass were their two unhappy choices. The treaty asked that citizens of the United States be “freely permitted to pass and repass through their settlements or hunting ground without molestation or injury, on their way to any of the provinces of the Republics of Mexico or Texas, or returning therefrom.”81 Whatever injury they gave in the way of property damage they would have to repay from the annuities from the government or from their crops or buffalo robe trade. Caught between two energy levels, the new one foreign, their own repudiated, they lived between two worlds.

Trains of Unprecedented Proportions

Overland trains to Santa Fe continued. Mexican silver dollars and a hungry and isolated market lay in the shimmering distance. By 1839 the first prairie schooner was introduced to the Santa Fe Trail. Before then caravans of pack animals and a few wagons had been used. Yokes of six oxen (twelve oxen) or four to six spans of mules (eight to twelve mules) drew these wagons with sufficient muscle power to pull a load of about three to seven tons. In that same year, the first large shipment of goods was sent from Westport using sixty-three wagons each carrying about six-thousand pounds and drawn by six yoke of oxen.
With extra oxen for replacement, a herd of some eight hundred would have had to be provided for going and coming back. The level of organization became a matter of larger and larger scale for a trip of this magnitude, the trip being about 775 miles, according to Josiah Gregg’s chart measuring from Independence to Santa Fe. Agents Boone & Bernard in Westport now organized and directed shipments to agents Meservey and Webb in Santa Fe. Formal business dealings instead of entrepreneurial expeditions had extended across the wilderness from one high-energy location to another.82

Between 1822 and 1843 when the Santa Fe trade was interrupted by the increasing hostilities over the Mexican-American border, freight increased from a total of fifteen thousand pounds carried by pack animal and seventy men to four-hundred-fifty-thousand pounds, two-hundred-thirty wagons and three-hundred-sixty men. Such animal labor would include a herd of around three thousand animals.

This increase created a large industry, the demands of which the towns of Independence, Westport and Kanzas rushed to fill.83 By 1861, in spite of the Civil War, wagon trains headed out with four hundred wagons, four- to five-thousand head of oxen, seventy mules and around four hundred men to Denver, making two trips per season.84 This output was before what author William Lass calls “the freighting boom of 1864-65,” during which overland hauling reached “unprecedented proportions.”85

Lass suggested the irony of increased Indian attacks on oncoming wagon trains: “The energetic thrust of organized freighting exposed the Indians to an even greater struggle of abrasive civilizations.” Still connected both emotionally and physically to buffalo and local habitat, the tribes had two choices, to either accommodate the white man or to try to resurrect
and protect their vanishing way of life. One meant giving up and embracing the new energy system while the other meant war. The Indians who disrupted the trade and emigrant routes inadvertently stimulated the traffic through their lands. The trade required military protection and the military, once there, required supplies, stimulating even more wagon trains. More wagon trains meant more money.

**Border Money**

Material goods and property meant a kind of infrastructure the Osage along their rivers and trails of central Missouri could never have imagined, nor could their Indian compatriots on the Great Plains. Meanwhile, Indians along the Indian Territory border, so-called until it was renamed the Kansas-Nebraska Territory in 1854, had annuities to spend. The government paid them for their lands in twenty-year annuities of several thousand each year plus mills, blacksmith shops and cabins for their chiefs. The annuity money was profitable trade and brought even more people to the frontier to take advantage of it.

The three scrappy frontier towns of Independence, Westport, and Kanzas formed a tiny triangle four to twelve miles apart on the face of the vast continent, but they were electric with potential; their citizens were eager and able to serve the political and economic waves of the rising West. Each settlement had the luck of either political or natural geography. Independence, still deemed the “very frontier of civilization,” had initiated the Santa Fe Trail trade and first put out a pier for steamboats.
Westport, on the other hand, about twelve miles west had situated itself right up against Indian Territory from which streamed Indians with annuity money to spend at local trading posts. They engaged in the “truck and dicker” trade with the Indians and “the sale of last minute knickknacks to emigrants.” 88 This was no small trade and Westport became the hotspot to go to for the local tribes. By 1858 Westport factories turned out two-hundred-forty new wagons, two-thousand ox yokes, three-thousand tarpaulins and twenty-five-thousand dollars worth of harness. Between 1855 and 1858 Westport reached the zenith of its prosperity with a population estimated at five thousand. 89

The third point on the triangle, the levee itself, four miles north of Westport and six miles from Independence, had the advantage of the limestone pier on the river. The steamboats first brought trading goods for the Indians at Westport, then goods for the emigrant trains and
outfitting business, and, finally, served the residents of the growing town itself. The pier had been known from the days of the fur trade and continued to grow unaffected by the change of hands of the territory from European powers to the United States. Once John C. McCoy, founder of Westport, had a road of sorts cut through the limestone banks to the river to accommodate the wagonloads of goods from the steamboat deck, Westport’s future was assured. The future of Westport Landing depended on the town’s trade, and Westport’s trade depended on agents at the levee to do their work for them.

Westport served the Indian trade. Delawares, Munsas, Stockbridges, Shawnees, Kansas (or Kaws) Kickapoos, Osages, Pottawattomies, Weas and Peorias all now lived beyond the border and had government money to spend at the crude stores where they traded in blankets, pots and pans and trinkets. The Sacs, Foxes, Otoes, Missouris, Wyandots and Cherokees would also settle in across the Kaw River. Ninety thousand Indians lived across the state line, each tribe with a twenty-year annuity of some thousand to thirty-five-hundred dollars that was proportioned to tribe members. That alone offered a worthy market to stimulate business.

Between 1820 to 1830 Alexander Majors of the famous freighting company, Russell, Majors and Waddell, noticed that “there were a great many peaceable tribes of Indians, located by the government all along the western border of Missouri in what was then called the Indian Territory and has since become the States of Kansas, Nebraska, and Oklahoma Territory . . . . They were paid in silver, either in whole or half dollars, and the head of every family received every cent of his quota.”
Westport did a great business selling blankets, pots and pans, trinkets and foodstuffs. Francis Parkman in the spring of 1846 described the scene that had matured over two decades: “Westport was full of Indians, whose little shaggy ponies were tied by dozens along the houses and fences. Sacs and Foxes, with shaved heads and painted faces, Shawanoes and Delawares, fluttering in calico frocks and turbans, Wyandots dressed like white men, and a few wretched Kanzas wrapped in old blankets, were strolling about the streets, or lounging in and out of the shops and houses.”

Parkman does not mention the Osage standing a head taller than some of their compatriots, but they, too, traded at the stores though they had been relocated farther south and may not have shown up as often. In the space of a generation the wilderness the Indians knew, the way of life that had integrated them into natural ecosystems had been overtaken by the bustle and commerce of capitalism. Hunting and gathering in the wilds of Missouri had been replaced with shopping in Westport!

Blessed with a confluence of geographic circumstances that boosted it above other just-established, hardscrabble towns across the West, the area played host to thousands each season preparing to make the march west as soon as the grass on the prairies could support livestock. Every May the retreating woods hosted more legions of travelers making arrangements. This income gave the three little communities hard cash during a time when many towns their size existed on agricultural crops exclusively and bartered their goods while scrambling for hard currency.

The market economy of Kansas City was not dependent on agriculture alone. Spalding admits that not all that trade yielded hard currency, that a fair amount of bartering went on.
“The trade of the city for the last year, which has been done exclusively with currency and exchange, amount as near as it can be estimated by our best business men to $1,200,000.” Such income including the trade from those white settlers moving into the Kansas Territory after 1854 estimated at about seven hundred thousand dollars $700,000 for the year of 1857, led the St. Louis Leader to exaggerate just a little. “[T]he business of Kansas City is now more extensive than the business of any other place in the world, in proportion to its population.”

By 1857, one of the golden years of steam boating for Kansas City, Spalding wrote this:

It is the river, and our commerce thereon, that gives us position and command. . . . Without the Missouri river we should occupy no more commanding position than any inland town or hamlet.

But they did occupy that spot; the river was no ordinary secondary tributary but the mighty Missouri, the shores of which received thousands of emigrants in a season. The overland migration to Oregon, California and Utah between 1849-1860 grew from an estimated 45,700 in 1849 to 250,000 in 1856 to nearly300,000 in 1860. A good number of those pilgrims arrived at the limestone pier by steamboat the remainder came overland by wagon train. To a town of 700 people, this flood of humanity meant an incredible flow of cash, and residents jumped at the chance to partake of it. The armies of people arriving and departing overworked both facilities and townsfolk to attend to their needs. One hotel on the levee boasted of having served 29,000 people in one season.

Though all these figures are estimates, many emigrants kept records of passing wagon trains along their own route. One traveler reported that their wagon train passed 250 wagons one morning in 1850, then were passed by a hundred others before noon and passed by at
least 500 more on another day. The highway was crowded with travelers. Another emigrant wrote that he had observed a thousand wagons passing Fort Kearny one day in May in 1850.99

Fort Laramie staff attempted to keep an accurate record of emigrants, or “overlanders,” as they were sometimes referred to, and offered their own figures for that route in 1850. On May 14th, 1,950 men (no women or children mentioned) passed through on 215 wagons. By June 2nd, 9,972 men and 2,797 wagons passed by. On the last date of August 14 they
recorded 39,506 men and 9,927 wagons passing through. They did not mention the enormous numbers of livestock that had to have accompanied such a flow of humanity. Such numbers must have kept an army of observers attentive to the stream of traffic. This record is from one vantage point on one route, so it suggests enormous numbers who traveled west on the various routes.100

**Such Acres of Wagons! Such Herds of Oxen!**

Perhaps the Wood Age offered its greatest expression of vitality, strength and range in the combination of men and animals that performed amazing feats of directed energy to cover long distances. One example is the wagon trains from Kansas City to Santa Fe and return; another is the Pony Express from St. Joseph, fifty miles up river from Kansas City to Sacramento and return. Each combined men, animals, scale and distance to stretch the capacity the Wood Age to its greatest potential. Their journeys were no one-time Greek Marathon to be extolled as a single event throughout history. The trips these men and animals took made their colossal expression of energy, bravado and endurance commonplace in their repetition. To pull of this kind of energy expenditure over and over again required systems of efficiency.

First came the trek to Santa Fe, New Mexico, a distance of 800 miles, which began with pack mules in 1822 and then wagons only from 1826 onward. They carried from 150,000 pounds in 1828 to 450,000 pounds in 1843, according to the records of Josiah Gregg, one of the first diarists of the trail. The 1843 trip included 230 wagons, 350 men and at least 3,000
head of oxen at six yoke (twelve oxen) to a wagon and spares, plus mules for the men to ride and a few horses. They brought back 300,000 pounds of goods.\textsuperscript{101}

Such an outlay to fit and fill a wagon train required tremendous stores of supplies to begin a journey. Horace Greeley, the editor of the \textit{New York Times}, remarked in 1859 as he witnessed a similar event at Leavenworth, Kansas, that had to be repeated at every departure point: “Such acres of wagons! such pyramids of extra axletrees! such herds of oxen! such regiments of drivers and other employees!”\textsuperscript{102} He goes on to explain: Each wagon carried a couple of extra axles lashed under its body\textsubscript{2} to be used “in case an old one gives way under a heavy jerk.”\textsuperscript{103}

The men drove their teams of oxen by walking beside them between twelve to fifteen miles per day since that was the only way to keep the oxen steady on their route. Alexander Majors ran a highly disciplined crew whom he trained with a watch before letting them start their wagon train, thus instituting systems of efficiency on the trail along with organizing and loading supplies before the trip started. Majors trained his drivers to each find six pairs of oxen at once out of the herd in the corral, to yoke them together and to hitch all twelve to their wagons in 16 minutes! Majors showed “how quickly the men who are thoroughly disciplined could be ready to ‘pop the whip’ and move out, when unskilled men were often more than an hour doing the same work.”\textsuperscript{104}

The men were divided into “messes,” six to eight men in a group with each an assigned duty to carry water, fuel and stand guard, plus the best cook of the lot to serve up the grub. They guarded the cattle day and night, watched for overgrazing by avoiding two trains camping together, and killed swarms of rattlesnakes as well. “The rattlesnakes on that road
(to Santa Fe) in the beginning of travel were a great annoyance, often biting the mules and oxen when they were grazing. At first, mules were used altogether for traveling, but they would either die or become useless from the bite of a rattlesnake, and the men would sometimes be sent ahead of the caravan with whips to frighten the snakes out of the pathway, but later on, the ox-teamsters, with their large whips, destroyed them so fast that they ceased to trouble them to any great extent."

In the spring of 1859, the last of the golden years of steamboat traffic, the Kansas City paper, the *Journal of Commerce*, described Commercial Street at the levee to be “jammed with Santa Fe wagons.” By virtue of the Herculean work by teams of oxen and “messes” of men millions of dollars changed hands every season from April to November. These figures available from 1854 could only grow larger by 1859: Some $8,266,463 dollars exchanged hands among the merchants, the wholesalers with their warehouses, the wagon masters, the steamboat captains, the banks and the small manufacturing shops.

A fourth of that money, $2,138,200 included livestock and draft animals, to a large degree supplied by “Little Dixie” up and down both sides of the Missouri River, merchandise at $3815,502, warehousing at $545,000 and exports at $1,767,761. The exports were comprised of the goods brought in from New Mexico and the western mountains. The hard discipline of the wagon masters and their hardy men paid off. Though the teamsters earned $1 a day for themselves, they earned the growing city a thriving economy."
The Pony Express: Full of Pluck and Daring

The epitome of Wood Age exploitation of available means came in the form of man and beast attempting to compete against the growing excitement of speed generated by the new machines. While steamboats churned and whistled upriver representing the new energy suite, man and beast, the perennial combination of the Wood Age, attempted to take speed to new levels in a time-honored combination. A last-ditch effort to prove that the old ways were still strong, still good enough to compete may have motivated these efforts. The following is a story of an innovative use of energy in the last moments of the Wood Age using what had been available for eons but whose stretching of ability and endurance had not been considered until faced with such lucrative trade and competition.

The progenitor and inspiration for the Pony Express, it is said, arose from the example of a single man whose ride, witnessed by no less than Alexander Majors, made the impossible seem available for those with “pluck and daring.” The amazing feat of traveling the 800 miles from Santa Fe to Independence was done by F. X. Aubry in five days and thirteen hours beginning September 12th, 1853. Aubry, a guide and trader, had already made the same trip the year before in eight days on a bet of a $1,000 that he could make the ride in ten days.

Aubry did not stop except to change horses and resaddle, though he had to deliver messages to several trains on the trail. He walked 20 miles, broke six horses during the ride and slept in the saddle by roping himself to it. A twenty-four-hour rain made the trail muddy and streams high. Aubry arrived in Independence, by some accounts stuck to the saddle with his own blood, and was carried into the hotel where he first ate ham and eggs before retiring...
on the evening of September 17th. His “foaming horse half ran, half staggered” the final few steps.\textsuperscript{110} Aubry carried only a canteen of water and “a bundle of sun-dried buffalo meat.” He rode each horse a hundred to a hundred and twenty-five to two hundred miles before changing, picking up a horse at a pre-arranged spot or buying a new horse “at any price” if needed and letting the spent one go. His own yellow horse, Dolly, Majors said “was one of the finest pieces of horse flesh I ever saw.”\textsuperscript{111}

Aubry understood the business of speed. When he started running wagon trains to Santa Fe it was customary for only one trip to be made in a season. Aubry soon doubled that to two and then increased the run to three and increased profits proportionately. Not satisfied with that, he rode ahead of his wagon trains to Santa Fe launching them as early in April as newly grown grasses would support his livestock. Upon arriving he placed an ad in the paper of the arrival of his goods and sold all from the wagons when they arrived, bypassing warehouses and retail as the first wagons of the season while his competitors were still in Missouri. The Santa Fe \textit{Republican} called him “the Telegraph,” or “Skimmer of the Plains,” and said he traveled with “a rapidity that was almost supernatural.” Aubry’s exploits were reported nationally in the \textit{New York Weekly Tribune} and later retold in \textit{Harper’s Weekly}.\textsuperscript{112} His rides have remained an unbroken distance-speed record.

Inspired by Aubry’s audacity, reckless speed and using his example of having mounts stationed along the route, Alexander Majors and his partners Russell and Waddell organized the Pony Express in 1859, at the behest of the governor of California who urged sending mail across the expansive West from St. Joseph to Sacramento.\textsuperscript{113} Without the telegraph, news had to go by way of a southern stagecoach route that took months. The telegraph had been tested
by Samuel Morse with the completed line in 1843 from Washington to Baltimore with the message “What hath God wrought?” Telegraph companies sprang up and began relaying train schedules on the East Coast by 1851. It was still new when Aubry made his most famous ride to Independence in 1853, had rested there overnight and made his way to St. Louis by steamboat and carriage, arriving a scant 10 days after leaving Santa Fe. He handed a letter to the editor of the St. Louis *Daily Reveille* from the editor of the Santa Fe *Republican* dated September 12th that began “Allow me to introduce you to the man to whom the telegraph is a fool.”

The telegraph, that harbinger of industrial energy, had already competed and won against horses in the East, but not in the West. The telegraph ran from San Francisco to Sacramento on the West Coast; from the East Coast it ended in Kansas City, which had acquired it in 1858, and to St Joseph on the east side of the Missouri River. That left another 1,500 miles or so to cover for communication with the growing might of the new state of California. Two of its major cities, San Francisco and Sacramento, were connected by telegraph.

St. Joseph was chosen as eastern terminus since it was the furthest point west reached by the railroad and the telegraph from the east. The Pony Express route began there. The first task of the rider was to take a ferry across the Missouri River, and then to ride ten to fifteen miles to a station to change horses for which the driver was allowed two minutes to change his *mochila*, or saddle bags with mail—papers as “airy and thin as gold leaf,” according to Mark Twain’s account—and get his log verified by the station master. The riders themselves changed out every 80 to 100 miles and kept the mail running both day and night during all seasons. The company guaranteed delivery in ten days for most of the year though allowed
twelve to thirteen days in winter. The horses averaged about ten miles per hour in good weather.\textsuperscript{117}

Twain’s eyewitness account captures the drama and the impossibility of the endeavor after the stagecoach driver shouts, “Here he comes!”

Every neck is stretched further, and every eye strained wider. Away across the endless dead level of the prairie a black speck appears against the sky, and it is plain that it moves. Well, I should think so! In a second or two it becomes a horse and rider, rising and falling, rising and falling—sweeping toward us nearer and nearer—growing more and more distinct, more and more sharply defined—nearer and still nearer, and the flutter of the hoofs comes faintly to the ear—another instant a whoop and a hurrah from our upper deck, a wave of the rider’s hand, but no reply, and man and horse burst past our excited faces, and go winging away like a belated fragment of a storm!

--Mark Twain, \textit{Roughing It} (1872)

The ad to recruit riders in the St. Joseph \textit{Daily Gazette} read, "Wanted: Young, Skinny, Wiry Fellows not over 18. Must be expert riders willing to risk death daily. Orphans preferred. Wages--$25 per week."\textsuperscript{118} The average age turned out to be about 20—the youngest 11 and the oldest 40—and the average weight about 120 pounds. Eventually 183 men rode the Pony Express for the eighteen months of its existence.

The trail led through Kansas, Nebraska, northeast Colorado, Wyoming, Utah, Nevada and California, across the Continental Divide and over both the Rockies and the Sierras. It was not the easiest route geographically and was populated as well by Indians and white gangs eager for confrontation. The rider carried no pistol which would add to the weight. His only defense was to outride any aggressors. A series of 165 stations serviced the trade and provided for about eighty pony riders on route “day or night, stretching in a long, scattered procession from Missouri to California, forty flying eastward, and forty toward the west, and among them making four hundred gallant horses earn a stirring livelihood” over the nearly
2,000-mile distance.\textsuperscript{119} As soon as the telegraph reached Sacramento, the Pony Express disbanded and became a legend of speed and distance in the Old West.

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“Think of that for perishable horse and human flesh and blood to do!”\textsuperscript{120} The combination of man and animal overcame distance, hardship and expense to achieve the dreams of the entrepreneurs who put together the logistics. No combination of these sources of energy seemed too great to conquer the remaining portion of the Wild West. The Pony Express combined a single man and rider on a route laid out like a delicate string of beads, a series of stations at which first horse then rider changed while the mail continued on in a highly organized mechanism. The wagon trains contrasted in bulk, speed and weight, but held to the same kind of organizational structure. Each was designed to wrest from the animals the maximum the Wood Age could offer in the way of speed and efficiency. Men’s minds could grasp the coming speed of industry even as they forced animals to do their best to carry out the scale and distance. Human energy provided the daring while the animals provided the muscle.
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CHAPTER 11

CIVIL WAR: OLD ENERGY SUITE, NEW ENERGY SUITE

Can it be that the great American Civil War was actually fought over fuel and energy systems? Ultimately, yes. Old and new systems clashed to answer what system shall replace another. At the time the South seceded from the Union, layer upon layer of insult and injury, righteous indignation and resentment, protectivism and exploitation may have obscured the fact, but, quite simply, a waning Wood Age and a growing Coal Age came to blows, and the Coal Age won.

Between Two Fires

One fire burning wood was undoubtedly the South upholding its manual labor system powered by slavery. A growing industrial base powered the opposing fire burning coal in the North. In retrospect, they may be seen as the open flame of the Wood Age and the enclosed furnace of the Coal Age. If human energy is part of the Wood Age scene, then it is irresistible to look through the energy lens at the institution of slavery and its sudden and final termination as an energy system. It is also important to look at the Civil War as a means to that transition. This four-year event was a political war with energy consequences. When it was over, industry replaced human labor as the prevailing mode of doing work for the nation, though the South would lag for another hundred years. The first set of fires was the political division between the North and South; the other was industry vs. slavery, or active versus passive fuel.
As the Kansas Territory opened in 1854, both Abolitionists and Pro-slavery factions rushed to settle. Naturally, the Pro-slavery families brought slaves or had them shipped in. The St. Louis News announced on March 21, 1856. Once the Kansas or Kaw River opened to steamboats in 1856, emigration of slaves to Kansas began. At least 500 slaves arrived from the Ohio River, down that river to the Mississippi at Cairo, up that river to the Missouri and up that river to the town of Kanzas to go on up river into the interior of that state to work on farms. The slaves were “in almost every case taken in the cabin, while poor white families going to the same place take passage on deck.”

Thus was the South continuing to expand its way of life in a formally declared free state.

Across the Kaw River by 1860 Kansas City, Westport, Independence and Jackson County as a whole contained fifteen per cent slaves. With “Little Dixie” directly to the east and emigrants demanding large numbers of mules, oxen, miles of rope from hemp, plus bacon, tobacco, and other agricultural produce, the legion of slaves in that area rose as high as twenty-five to thirty-seven per cent slaves. The seven counties hugging the Missouri River on both north and south banks directly east of Jackson County known as Little Dixie engaged in agriculture at a commercial level. Even if the farmers had started out as immigrant farmers from Kentucky, Virginia and Tennessee working at a subsistence level, the demand for large supplies of goods and fertile loess soil drove farmers to expand and use forced labor to increase production.

Each slave was a unit of energy to do work: “. . . [T]he negro slave was absolutely subject to sale at such times, to such persons, and on such terms as pleased his master. The ownership was as absolute as that of a horse or a watch. . . . and able-bodied slaves who
began to lose their vigor and vitality were sometimes sold because no longer (sic) profitable as work-hands.”

Individual and collective human labor to do work at the bidding and direction of others made up slavery as a system. These slaves labored for fear of punishment—being “sold down the river,” or whipped or otherwise punished for failing to do the work they were compelled to do. Their labor, however freely given, was dictated by another, not chosen for them. As an energy system, slaves served the needs of the owners of large plantations in the South to till, plant and harvest crops of cotton, tobacco, rice, indigo and hemp.

In a pre-industrial world men took the place of mechanized labor that allowed acreages to be planted far beyond the powers of a single farmer and his family. Slaves also chopped wood, built houses, cared for livestock, and supplied the domestic labor of child care and household duties from cleaning to cooking to serving food. The acquisition of slaves increased the energy supply on a plantation. As the Osage acquired horses their energy flow increased. As the plantation owners increased their slave holdings, their energy flow increased. Each group was able to do the kind of work needed to support their lifestyles. The Osage needed to hunt farther and faster for which the horse was ideal. The plantation owners needed to produce more crops over large acreages, for which a good number of slaves was necessary.

Slavery produced more agricultural products than could be had by any other form of labor or mechanization at the time. Owning slaves increased wealth because slaves were property and favored the accumulation of capital. “That other countries and other states were
prosperous without slavery, and had greater accumulations was neither understood nor recognized by the south."**125**

The war was fought because those within the slave-based energy system could not give up their mental construct of what “should be.” Like the Osage before them who organized their world around fitting into their natural surroundings, slaveholders organized their world around slavery as an institution. They built their economic life, the home life and their morality on their

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**Figure 2-14. United States Slave Population** This report from the 1860 U.S. Census indicates the slave population in Missouri before the Civil War. Though Kansas City's slave population was small, about 500 in Jackson County and far fewer in the town itself, this work force provided vital services in planting crops, supplying fresh vegetables, providing manual labor, tending cattle, doing household work among other duties that kept the community running. From the Eighth United States Census, 1860.
position as slaveholders with the right to command labor to do their bidding. To consider another way of life by freeing the slaves whose freedom they suppressed and feared was an idea they could not entertain at all.

The plantation owners were also overwhelmed by the superiority and intensity of energy systems powered by machinery. While the Osage were overpowered by Wood-Age energy, plantation owners were overwhelmed by Coal-Age energy. Their defeat in the Civil War was a capitulation to the growing industrial might of the Northern states and that was increasingly powered by coal. It became clear that the Northerners “were marching with modern civilization, while the defenders of slavery were standing for the obsolete, the abnormal and the impossible.” The two opposite forces of energy--coal-fired factories in the North and slave-dependent plantations in the South--could not be reconciled. Once the war started, it could not be stopped until the case for industrial strength had been made on the battlefield, in the factories and across the fields. Barbara Freese, in her book, *Coal: A Human History*, summarizes the industrial advantage of the North:

Northern trains brought in thousands of troops and a constant stream of munitions to the battlefields, enabling larger and bloodier battles. And industrialization ultimately ensured a Union Victory. The North had a decisive industrial advantage of the South with ten times more factory production, fifteen times more iron, thirty-two times more firearms production, most dramatically, a 38-1 advantage in coal.

Though the northeastern portion of the United States had moved to a combination of wood for home use and coal for industrial use, Kansas City on the frontier fought the Civil War in the Wood Age. No railroad yet ushered in the Coal Age. Coal may have been available by the wagonload pulled by horse or oxen from nearby outcroppings, but wood could still be had in ready quantities and aside from the steamboat traffic and more mills running on steam
engines, the city could boast of few industrial works and fought the war with the last vestiges of the old order.  

Because of the “border troubles” of the 1850s when the Kansas and Nebraska Territory opened as a free or anti-slavery territory in 1854, “the city was virtually right between two fires during the entire period of the war.” Missourians had voted to stay in the Union but as a Confederate state. Kansas City was “a pro-Union island in the midst of a confederate sea” which meant that many business relationships with surrounding commercial establishments were severed. The wagon trains continued to the Southwest now under military guard as far as Fort Larned, Kansas, about 150 miles out, and the town continued to trade with the military at Leavenworth in Kansas about 50 miles northwest and upriver. Many commercial establishments suffered a total decline, however, and quickly went out of business.

With little energy coming into the town in the form of trade and with large numbers leaving to escape the tension of war, the town “fell into disrepair” and no further building or upkeep continued until the war ended. Such was the sudden loss of business, steamboat traffic and tax base that at the close of 1861, the city treasury reported cash on hand of $87.73.

The last issue of the Kansas City Daily Journal of Commerce came out on June 16, 1861. (It would resume in April of 1862). The newspaper had been reduced to one page and called for fifty thousand men to fight invading federal forces. Bushwackers, Red-legs and Jayhawks already terrorized the countryside on behalf of real or imagined insults against their beliefs. It was not safe to go beyond the city limits without escort, even to travel the four miles to
Westport. Inside the town itself in and around the levee “strains of martial music, flying flags, and the rumble of artillery had taken the place of the busy hum of commerce, painfully reminding the citizens of how the times had changed.”134

Union Army soldiers from Kansas entered Jackson County and often set any slaves free they met along the way and provided escort across the state line. “It was but a step across the line to a land of freedom, and nearly all took advantage of the opportunity. Wherever the Kansas soldiers found a family of negroes on a farm, they would order them to load up their master’s wagons with what they wanted and follow after them. Owing to this removal of the negroes, there was no one left to harvest the crops and cultivate the fields around Kansas City.”135

Figure 2-15. Freed Slaves Freed slaves make their way under protection of Union soldiers as the Civil War drew to a close. John Starret Hughes, “Lafayette County and the Aftermath of Slavery, 1861-1870, Missouri Historical Review (Volume LXXV, No. 1, October, 1920).

The valuable property of individual slaves as much as $1000 apiece disappeared before the eyes of their owners. Young adult males, especially, brought at least a thousand dollars
before the war, though by 1863 none could be sold for even as much as five hundred dollars. The area was soon without slaves, but the point became moot with the

*Emancipation Proclamation* signed by President Abraham Lincoln on September 22, 1862, early in the war. As the Union Army penetrated the Confederate states, they freed thousands of slaves each day they marched into new territory. An estimated four million were set free by July, 1865, and the United States Congress ratified the *Emancipation Proclamation* as the Thirteenth Amendment to the Constitution on December 18, 1865.

Realizing the inevitability of the political situation, the Missouri government had voted to end slavery within the state on January 11, 1865. The end of slavery is the only energy transition that took place in so short a time, in one day, so to speak, with the issuance of the Proclamation, though it took another three years to dismantle the structure of slavery. It is unlikely that another energy transition will occur so completely and so suddenly. The only comparison of that kind of swift energy transition today would be the permanent loss of electricity, a force that has created the many labor-saving devices we now depend on, including remotely fueled heating and light. If we can imagine that occurring now, we may understand some of the harshness of the loss of slaves as energy to slave owners on the one hand, and the sudden freedom and loss of accountability of the slaves on the other.

Many slaveholders gave up their slaves to Union forces to join the army in hopes of getting reimbursed for their generosity in supplying troops. The *Proclamation* made it possible for former slaves to join the armed forces. The Union Army’s provost marshal in nearby Lexington County took in seventy blacks in one day. “Every negro received saves a white man,” he said, “and we must confess that our sympathies are decidedly for the white
man. We advise all the owners of slaves to put them at once into the service taking a receipt therefore.”

Whether the former owners received anything in return is not clear. By the end of the war an estimated four-hundred-thousand former slaves had served as liberators of their own people.

War itself by virtue of its definition comprises a high intensity of energy as well as fuel. Massive troop buildups with firepower and armaments supported by an infrastructure of supply and fuel creates an energy force of dreadful power. The losing side nearly always has to reconstruct itself from disconnected pieces of former systems often found obsolete and in need of replacement with newer, more energy-intensive systems. While the winning side has amassed its energy flows to a pinnacle and proceeds to grow from there, the losing side has lost its intensity through destruction of infrastructure and decimation of skilled personnel to organize, repair, build and lead the new energy structures. Such was the case with the South.

The former slaves who became free, having served as property, now had no leadership for their new paradigm. “Emancipation signaled change, but it provided no blueprints for growth.” No longer supported by their former masters, some wandered the countryside looking for subsistence, for employment, for someone to make decisions for them as they had been taught. Some turned down jobs from their former masters and stood idly on street corners without an alternative. Not unlike the Osage before them, they had been freed of the structure that dictated their way of life and could not immediately create a new one.

The Missouri census of 1870 showed more than two-thirds of the freedmen worked as farm laborers. Women took in washing and ironing, worked as domestics, as cooks and seamstresses, depending on their skill level. One black woman entrepreneur, Alpha Smith
Minor, opened a dress shop in Kansas City, “Lady’s Ready to Wear.” The freed blacks had no political power, and though the men had the right to vote, most could not do so for lack of literacy or courage to go to the polls. Looking for places to congregate, the freedmen and women formed all-black churches that became their places of strength and in which emerging leaders would be trained.

The whites also suffered from uncertainty and loss of stature. “The slaveholders’ institutional structure of social control had vanished.” Those who had been slave masters now had neither “the racial supremacy nor the security which slavery provided. . . . Although slavery as a system of forced labor had ended abruptly, the racial accommodation persisted tenaciously.”

The economic loss was a bitter pill to swallow; the social loss may have been even greater. “One of the great evils of slavery,” noted Berenice Morrison-Fuller who had been born and raised on a Missouri plantation, “was the arrogance it created in the master. Absolute power over the lives and destiny of others is a terrible responsibility and few are capable of sustaining such an ordeal. . . . It was a terrible problem for a man of tender conscience, quite impossible for the fanatical abolitionists to understand. Ideally and theoretically, their ideas were right, but practically, they were fraught with a great injustice and cruelty.”

The Southern plantation owners now had to hire farm workers, which many of them did from the ranks of their own former slaves who became tenant farmers, or work the farm themselves, or sell their land. “We may be mistaken,” wrote one newspaper editor, “but we think all intelligent gentlemen will hear us out that the farmers of the county will begin a crop in the spring of ’63 with a thousand field hands less than they did in ’61.” Many freed
slaves stayed on the land with compassionate plantation owners taking care of them, while many more former slaves turned to nearby towns and cities, sometimes crowding 40 into a tenement to provide a roof for themselves. Dislocated whites also fled to the city and lived a day-to-day existence.¹⁴⁹
CHAPTER 12
THE RAILROAD: OLD FUEL, NEW TECHNOLOGY

When the railroad arrived at the juncture of the Missouri and Kaw Rivers, the Wood Age settlement was overtaken by an undeniable statement of mechanical power from the Coal Age flourishing farther east. Until then inroads had been small. Like the first knives given to the Osage Indians, steamboats laboring up the river had constituted a small invasion of an old energy system. Then steam engines began to replace mills, though by no means all of them, some of which endured well into the twentieth century. The telegraph had coursé its way to the river and then on to California, but land traffic remained Wood Age and the river the time-honored route of travel. Now all that would change.

An Abundance of the Raw Material

Coke from coal, the mineral equivalent of charcoal from wood, began to be developed in England from 1709 onward by Abraham Darby to work with metallurgy. In his area of the Midlands, wood had become prohibitive in price. Darby began to experiment casting iron with coal and had no success until he learned the process of “purging the coal of sulfur and other unwanted elements before using it for fuel.” This trial and error period on a small scale lasted decades. Abraham Darby II took over his father’s work in the 1740s. While his father had sold cast iron cookware at reasonable prices, Abraham II thought to sell the furnaces themselves. Eventually, he was able to demonstrate that coked coal could produce “more iron with coal than had any conventional charcoal furnace in the history of the trade.” 150
Coke’s density created a much higher heat than wood charcoal. Coke made large quantities of cast iron possible and the material ranged in use from the first cast-iron bridge in Shropshire, England, in 1780 that still stands, to ornamental gates for estates of the rich to the humble cooking pot that became ubiquitous at every hearth.\textsuperscript{151} Coke replaced charcoal as the heat element of choice in that country by the 1750s, but not until more than a century later in the United States because of the relatively ample supply of wood available in this country.\textsuperscript{152}

On the Missouri frontier they could boast of knowing coal, of advertising coal-and-wood-burning stoves, of having cannel coal available to steamboats at the limestone pier. In fact, they seemed to have plenty of coal, and, as always, wood, according to local promoter Henry Spalding in 1858:

\begin{quote}
We have an abundance of the raw material for the furnace, and all kinds of machinery, either for the construction of the labor-saving implements of the country, or the manufacture of useful or ornamental fabrics.\textsuperscript{153}
\end{quote}

Not surprisingly, the above quote linked fuel with the city’s destiny. Fifteen years before Kansas City embraced coal as a fuel, Henry Spalding, the voice of the business community of the still nascent Kansas City, knew what fuel could do and where it belonged--in the furnace, as well as the fireplace. The town was ready for manufacture. Furnaces meant machinery; machinery meant manufacturing “labor-saving implements,” and ultimately progress and prosperity. Wood could readily be identified with hearth and home, but even here moved to the forge and furnace, while from the beginning, coal served as much of an industrial fuel as for home heating. But until the 1870s Kansas City worked with coal as an alternative to wood, not as the mainstay. By 1858, stoves of both wood and coal were being
advertised for sale in the city directory. Both fuels were available; in what quantities is unknown.\textsuperscript{154}

The experimentation with coal happened on the East Coast. Coal burned hotter than wood and required an enclosed structure to focus the heat for metallurgy, hence the arrival of the furnace and the grate to hold the fuel. Wood in general burns from nine to seventeen million BTUs while coal burns from sixteen to twenty-six million BTUs.\textsuperscript{155} The difference in heat intensity challenged inventors when all metallurgy was created with wood charcoal. A grate that would withstand the heat of a coal fire was a constant challenge. This problem was solved in 1808 when Jesse Fell first designed a grate to burn anthracite coal. By 1818 coal stoves made by Texler in Bethlehem, Pennsylvania, were sold locally, but weight, cost and transportation kept them from being widely distributed.

By 1821 metal workers experimented, using anthracite in blast furnace smelting instead of charcoal. This marked the difference between low and high productivity in iron in America as it had a century before in England. Abraham Darby’s breakthrough distillation process of “‘cooking’ off the volatile gaseous matters, including tars, oils, and gases, at a temperature between nine-hundred and eleven-hundred-fifty degrees Celsius, so that the fixed carbon and ash are fused together” may have been the industrial shot heard round the world. Repeated in America in the 1830s, the process of the hot blast furnace using pre-heated air to fire the coal in 1837, took less fuel and less time to reduce the coal to coke.\textsuperscript{156}

The first anthracite-fueled hot-blast furnace was fired up in Allentown, Pennsylvania, on July 4, 1840.\textsuperscript{157} Experiments with both anthracite for metallurgy and the hot-blast furnace technique had gone on for at least eighty if not more years. Scores of men had contributed to
the process, some coming from England to sell their knowledge to American iron forgers. Eventually, the process would be called successful and America could and would produce greater quantities of iron than Great Britain by the end of 1890s and any other nation by the beginning of the twentieth century.\textsuperscript{158}

By 1825 anthracite was used to fire boilers of a steam engine in a nail factory in Pennsylvania. By 1831 coal-burning stoves with serviceable grates came into general use on the eastern seaboard. In 1838 the Reading Railroad began to convert to coal-burning engines using anthracite, and by 1840 anthracite smelting of iron ore had become doable thus increasing the output of pig iron and lowering the price at the same time.\textsuperscript{159} By 1840 over a million tons had been mined; its use quadrupled by 1850. Within twenty years coal would dominate fuel use greater than any other fuel other than wood at seventy-two per cent. Bituminous coal, the next-densest grade, comprises forty-two per cent of the coal available.

By the 1830s bituminous was used in manufacturing, for steam engines for both railroads and steamboats and in home heating. Its black smoke pouring from chimneys was once seen as more of a blessing than a curse. Smoke meant employment but at the same time it meant air pollution that would grow as a problem and have to be dealt with in later years. The remaining coal reserves of the United States are made up of twenty-eight per cent sub-bituminous and twenty-nine per cent lignite. Only anthracite and bituminous contain enough density to work with metals.\textsuperscript{160} Bituminous soon began to be mined and used for manufacturing along the East Coast and in some cases home heating.\textsuperscript{161}

The introduction of coal increased fuel usage. For the first time in history, humanity had two fuels to use, one for home, the other for industry. By 1850, the first time verifiable
statistics are available, Americans burned an average of 4.39 cords of wood per person, and .36 of a ton of coal. Two fuels! A choice of fuel! This was new in human history.

The Iron Horse Drinks at the Mouth of the Kaw

The railroad boom began in Kansas City in the 1850s along with other towns in Missouri to gain access to eastern markets. “It was one thing, however, to plan roads in every direction, and quite another to construct them. The Kansas Citians never had enough money to invest heavily in railroads so they concentrated on persuading outside interests to build them.” Throughout the pre-war years, the leadership of Kansas City kept up continual pressure on both citizens and members of railroad companies to bring the “iron horse to drink at the mouth of the Kaw” by this busy little town on the levee. They gave barbecues, speeches, rallies and parades to keep the spirit high. In the summer of 1855 the Missouri Pacific was completed as far as Jefferson City from St. Louis.

In the autumn all the produce and crops north of that terminus were handled by steamboats with deliveries made inland by horses and wagons. Interior cities like Sedalia, Marshall, Warrensburg, Holden and other towns transported their goods from Westport Landing by freight wagons drawn by several pair of oxen or horses. Meanwhile, the Union Pacific approached from the West toward the town of Wyandotte across the Kaw River. A bridge had to cross the Missouri River at some point and Leavenworth, whose population had grown to 18,000 by 1865 because of the Army post there, and St. Joseph at 10,000 and Kansas City at 4,000 all vied for the bridge to come to their town. Without it, they would sink into relative idleness while the victor would grow into an urban empire.
In spite of the war, construction continued on several lengths of track. In 1864 the railroad proceeded in Kansas toward Wyandotte across the Kaw River from Kansas City. The first locomotive for the Kansas Pacific arrived on a steamboat from St. Joseph, Missouri, and was brought to the Kansas City levee. Though “the weather was exceedingly severe” on February 11th, attempts were made to unload the locomotive when it slipped into the Missouri River “from whence it was subsequently fished out with great difficulty and put on the track.”\textsuperscript{167} This brief summary can only give a glimpse of what a miserable event that must have been. Of course, the locomotive had to be pulled out by teams of oxen and mules, the old form of energy that could tug and heave the new form of energy into place.

As the townspeople fought to reinvigorate the town, the “bushwackers” still threatened them and the town needed to be protected. The guerillas cut the telephone lines daily between Kansas City and points south, and all messages received were routed through Omaha and Leavenworth. The Battle of Westport had yet to be fought on October 22 and 23, 1864, and the townspeople and Union soldiers put up fortifications while men drilled their maneuvers for three days. The \textit{Journal of Commerce} exhorted its citizens: “There should be no disposition to yield the town save in the last extremity.”\textsuperscript{168}

Union Major General Samuel R. Curtis with Kansas and Colorado troops twenty-two thousand in number defeated the Confederate Major General Sterling Price with 8,500 troops in a “severe battle” at the Big Blue River, Brush Creek, and what is now Swope Park and Forest Hill Cemetery where Price retreated leaving a field of dead and wounded of about 1,500 from each army. All were “humanely attended” by the women of the town, including some at the Wornall House across from what is now Swope Park. “By the low cot of the
wounded patriot is the peculiar province of woman,” wrote Thomas S. Case, one of the city leaders of the time. “It is her light footstep that brings comfort, her gentle hand that smoothes the rough pillow, and her soft voice that cheers the sinking spirit and recalls visions of happiness and home.”

The traffic of 30,000 troops at war left the area a wreck. “Kansas City suffered in the loss of everything that goes to make up a town. Her trade was crippled, her population divided in sentiment, and all energy and enterprise dead.” But even before the war was over, the leadership of Kansas City had revived and continued its efforts to bring the railroad to Kansas City.

The Missouri Pacific had not come through so the city fathers approached the Hannibal and St. Joseph railroad instead. Having since set their sights on a link with Chicago rather than St. Louis, the Kansas City leaders believed the latter railroad to be the better choice. That railroad was farther north, and the Hannibal and St. Joseph proposed to build the bridge across the Missouri. Numerous meetings with railroad leaders in the East and lavish promises of their readiness to service a railroad somehow swayed the decision makers to turn south at Cameron, about fifty miles northeast of Kansas City and directly east of St. Joseph. The Kansas City promoters had promised the railroad executives that the track from Cameron to Kansas City had already been surveyed and graded when, in fact, the surveyor had only walked what would become the route. Kansas City leaders won the argument with relentless pursuit of the prize. This insatiable spirit to improve their city would eventually become known as “the Kansas City Spirit.”
In true nineteenth-century prose, the 1870 city directory rejoiced: “At length the war cloud broke away and the sun shone out once more upon the hills,” and continued to describe the fast recovery of the city:

May 1865 found Kansas City with a population of about 6,000 and its real prosperity set in. Emigration poured in from all directions, business sprung up, trade became active again, laborers were in demand, houses could not be built fast enough to accommodate the new arrival; again the work of grading the streets was begun, the high banks along Main and Delaware streets gave way to large business houses, and were rented before built, and filled with goods immediately thereafter. And so the work has continued and still continues. ¹⁷²

In January 1867, the population had increased to 15,064, and the real and personal property of the city was valued at a little over $4,000,000. The railroads began to converge on Kansas City though the bridge across the Missouri, the key to Kansas City’s future, was still to come. ¹⁷³

The bridge became a major challenge for two reasons: The first was that many believed the Missouri could not be bridged. The river was too turbulent and unstable to support a bridge strong enough to bear the weight of locomotives and cars. The second was that Kansas City had no facilities for manufacturing the parts. “Kansas City at that time was almost on the frontier; there was but one small foundry and machine shop in the town, while not a barge suitable to carry stone could be found on the river. Special tools had also to be designed and erected . . . a steamboat was also found necessary to tow the barges. . . .” Everything had to be imported or built from the ground up. ¹⁷⁴ The masonry and quarrying of stone was contracted for locally, but the superstructure, not surprisingly would come from the Keystone Bridge Company of Pittsburgh. With appropriate festivities the corner stone was laid on August 21,
1867; the bridge was finished in May, 1869, and opened with the first engine crossing on Saturday July 3rd, 1869. The promise of the unfinished bridge drew people like a magnet. During the time the bridge was being built, the population of Kansas City more than doubled from 13,000 to 30,000, and “from being little more than a way-station on the Missouri Pacific Railroad, it had become an important railway centre, from which no less than seven lines of railroad were in full operation, while several more were projected.”
Figure 2-17. Bird’s Eye View of Kansas City The map shows the city after the bridge on right was built. The West Bottoms lies beyond in upper right separated from the city proper by the west bluffs shown in dark relief. Both railroad engines and steamboats aplenty chug their way through this picture, another scene overlapping wood and coal. From this time forward the emphasis was on the railroad and not on the steamboats. Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Missouri.

Kansas City had come of age, had been connected to the intercontinental railway system, could compete with Chicago and St. Louis in various markets, could and would brag about itself endlessly in the years to come. Though still a Wood-Age city, the abilities of coal in eastern factories had brought it to the door of the Coal Age. “These trains were not yet burning coal, but they ran on rails formed with coal, were pulled by engines made with coal and were financed by empires built on coal.”\textsuperscript{176} Coal and everything it could do in factories in the east beckoned to the growing city.
CHAPTER 13

OIL: NEW FUEL, OLD TECHNOLOGY

Before atomic power grew in a science laboratory among documenting attendants, no other fuel source has had its beginning marked by such a well-remembered, single-recorded day in history. Not that oil had not been used since time immemorial, but without a means of lifting it from the ground in quantity, little of it could be used at once. Only seepage from “oil springs” gave enough to sell in small bottles as a curative for most anything, if patiently gathered in some quantity by wringing out a blanket thrown over the water to absorb the oil.

An Excitement Unparalleled

Saturday, August 27, 1859, could be called the beginning of the Oil Age. This is the day officially entered into history as the moment when oil would soon be abandoned as a medicine and would became a commodity as fuel. Edward L. Drake’s tedious efforts near Titusville, Pennsylvania using salt-mining equipment to purposefully raise oil instead of salt water with oil in it finally paid off. His innovation was to drive a three-to-four inch pipe sixty feet into the ground using a five-horse steam engine for help to get to that level without cave- ins or water seepage. Salt-digging methods had always been to dig to bedrock before starting to drill. 177

On Sunday, August 28, 1859, Drake’s helper, “Uncle Billy” Smith, having actually spied the oil at the wellhead of the sixty-nine-and-a-half-foot pipe, took that as proof of the first oil strike. Drake, a former railroad conductor, had, by a circuitous route been hired by four partners in the underfinanced but optimistic Pennsylvania Rock Oil Company. Drake knew
nothing about oil drilling, but then no one did, but he was willing to put forth the effort to drill for oil the partners agreed was there, and to prove that enough of the liquid lay underground that it could be marketed in quantity. When Drake arrived at the wellhead summoned by Uncle Billy’s urgency, he rigged a pump to stop the flow that Billy and his helpers had tried to catch in washtubs, jugs and bottles, a total of about eight to ten gallons.178

The news traveled quickly and prospectors of black gold went berserk. One of the original investors of Drake’s well, attorney George Bissell in a partnership with three others who had backed Drake’s prospecting, visited the area in November of that year. He wrote home: “We find here an excitement unparalleled. The whole population are crazy almost. Farms that could have been bought for a trifle 4 months ago, now readily command $200 & $300 an acre, and that too when not a drop of oil has ever been discovered on them. So much for the bare hope of there being by any possibility a substratum of oil.”179

In testimony to oil’s strong reputation as a curative, Bissell came down with a heavy cold while visiting the well but saturated a strip of red flannel “with Rock Oil, about my neck and took repeated doses of the oil. I really think it would have resulted badly for me without this remedy. It is positively a specific for throat ailments of such a nature.”180 The powers of “snake oil,” as it had always been called, would hang on for many decades after oil’s “discovery,” but its power as fuel was undeniable.181 Before it left behind the healing arts, “snake oil’s” medicinal qualities were extolled in a poem for Seneca Oil, bottled as medicine and named for the Indian tribe that occupied the lands where it was first found:

The Healthful balm, from Nature’s secret spring,  
The bloom of health, and life, to man will bring;  
As from her depths the magic liquid flows,  
To calm our sufferings, and assuage our woes.182
Little did the writer realize the last two lines would become a metaphor for wealth and not health.

The partners suspected that the oil could be used for much more than medicine if found in enough quantity. They envisioned its being used for illuminants and for lubrication, but when quantity arrived via “Drake’s well,” as it was always called, no forethought had been given to managing the flow. The first problems oilmen faced were containment and transportation. Today we might expect such an anticipated fuel discovery to be approached with forethought, but at the time the idea of liquid fuel in large amounts simply could not be grasped. No tank cars, no barrels, no pipelines, no prepared roads or rail siding awaited the birth of the oil industry.

The nearest railroad lay twenty-five miles away in one direction and forty in another. Standard width of rails had not yet been decided, so oil in whatever container available shipped on one rail would have to be unloaded and reloaded on another to further its journey. Teamsters with horses and wagons provided the first transportation from well to rail and from rail to rail and charged a fee per barrel. At the end of that rail journey, the barrels would have to be loaded on wagons and drayed by horses or mules across the uneven streets of the town to the waterfront and loaded on board vessels for coastal delivery, then unloaded from the ship, reloaded on wagons and so forth.

It was an inauspicious beginning. For over two years the new oil drillers scrambled for containers and transport and wasted enormous amounts of the new fuel and time to get it to a market. As one observer noted, it was “a unique type of mining industry, with distinctive features of its own.”\textsuperscript{183}
Drake had a six-horse-power steam engine at his disposal, but that kind of help was occasional for the hordes of wildcatters who came in search of oil. Many of them drilled without mechanical help using two men to “jig” back and forth on a board at right angles to the drill that sent it down and back on a spring pole. They could complete a jig twice a minute and eventually make some progress in deepening the well at three to six inches a day. Horses were also used: they walked around the center of a shaft that supplied motion to the drilling bit. Oil was usually found at around 200 feet below the ground.

Getting a well drilled was one effort; getting it capped was another. At first drillers did not know that natural gas could lift the oil from the depths of the earth and send it flying skyward. By 1861 the first spouting wells spewed oil 60 feet in the air at three thousand barrels a day. The outcome of such events was enormous waste. Said one observer: “When the first [flowing] wells were opened . . . there was little or no tankage ready to receiving it, and the oil ran into the creek and flooded the land around the wells until it lay in small ponds. Pits were dug in the ground to receive it, and dams constructed to secure it, yet withal the loss was very great.”

An earlier effort at the illuminant market had already resulted in an underfinanced but optimistic company, the North American Gas Light Company in New York, that would crack the illuminant market with a liquid fuel from coal called kerosene. A Canadian physician and geologist Abraham Gesner had come to New York after being poorly received in his home country to capitalize on experiments he had done in Canada, and to produce the liquid from coal he himself had named kerosene or light from the sun, “which could be manufactured at a lower cost than the various burning fluids now most in use.”
Coal gas had been used for illuminants since the 1820s. The best light came from whale oil candles, also the most expensive. Those were made from spermaceti, the liquid found in the skull of sperm whales. Other illuminants included camphene derived from turpentine from wood that burned in newly developed glass lamps, and the usual animal fats burned in a shallow dish with a bit of cotton for a wick.

The time was ripe for better illuminants. Growing numbers of factories required greater light on short winter days than could be achieved with present light sources. This convergence of needs and experimental fluids forced the bottleneck to open for illuminants just before the Civil War.

The decades of refining both whale oil and coal gas had given the country a certain knowledge of chemistry that led to a great deal of experimentation. Such refining had created an infrastructure to experiment with other liquids as whale oil supplies dwindled form overhunting during the very decade in which this fever to create a new light source gained momentum. Kerosene from coal oil arrived in the mid-1850s and awaited only 1) a steady supply of burnable liquid that did not smell or smoke, and 2) a lamp in which to burn it, preferably one that would control these two problems. Furthermore, both liquid and lamp needed to be available at a price affordable in quantity.\textsuperscript{188}

Coal oil was already being produced in some quantity in Kentucky, Ohio, Maine and Pennsylvania. Soon coal \textit{oil} competed as a light source against the earlier success of coal \textit{gas} in cities using the gas as street and home illuminant, forcing the gas companies to lower their rates. What the Pennsylvania Rock Oil Company needed was a steady stream of rock oil that could piggyback on the infrastructure of coal oil as a competitive and, hopefully, cheaper
alternative illuminant. It had to be cheaper than the two-step process of mining coal and taking it through the process of distilling.\textsuperscript{189}

With all the light sources looking for a place in the market, whether good and expensive or inferior and smoky and/or smelly, the miracle that Drake had created galvanized people to champion this new and better illuminant. Once the technique had proven fruitful, the frenzy broke out on the remote Pennsylvania landscape.\textsuperscript{190} By 1860 landowners and stock companies purchasing leases peddled them for an acre or less of ground. During the 1860s, the Oil Creek valley was “cut up much like a sheet cake, but then swapped and sold with each piece swapped and sold many times before anyone took a bite.”\textsuperscript{191}

Between 1860 and 1870 the oil industry worked to find its legs and get its new product to market. Wildcatting was at a fevered peak but an unmistakable sign of underground wealth had not yet appeared until April 17, 1861 when the first gusher came in at Titusville, blowing 60 feet in the air powered by a pocket of natural gas and pumping oil at three-thousand barrels a day. Another appeared in May. Others followed soon after. Now the mad scramble moved to transporting the liquid to refinery facilities to keep up with the increased flow. Investors, now convinced of the riches available in the oil industry, stepped forward to underwrite exploration and drilling, transport and refining while the original coal oil quietly began to fade away.\textsuperscript{192}

The decade from 1860-1870 showed eager discovery and urgent development of the Oil Creek field, or the Oil Region, as it became known, or even shorter, simply the Region, the area surrounding the original well in Titusville, Pennsylvania.\textsuperscript{193} It was, after all, the only one at the time.
The discovery came just before the Civil War broke out, but the fact that development proceeded apace against the backdrop of the Civil War is interesting to imagine. Unlike coal that could be taken from the ground and thrown into a furnace, oil’s use was predicated on a number of containment and distilling steps before it could be put to work. The decade from 1860-1870 not only saw the destruction of war but the construction of the basic elements of oil’s rudimentary infrastructure upon which the whole industry would later be built. Beginning with the simple task of containing a liquid fuel, then transporting it, then distilling it, then finding a market for its various properties, then organizing these pieces into greater efficiencies, and finally finding ways to use it in the marketplace—in a world unused to its advantages, oil’s early life was very busy.

**Barrels, Barrels, Are the Great Want Now!**

The many iterations of technology that followed the prodigious flow of oil virtually overwhelmed the early participants in Pennsylvania while distance overwhelmed commercial efforts for frontiersmen. Missouri’s frontier and the Civil War combine with the early oil to suggest three theaters of energy at work at once: The first was the last act of the Wood Age on the Missouri frontier, case in point being the beginning of the Pony Express a year before oil was discovered. The second was the introduction of the Oil Age in 1859 in Pennsylvania, and the third was the Civil War itself, a prodigious user of energy, mostly men and horses, rail roads still burning wood—a nationwide mix of fuels and energy urgently focused on different ends.
Stage I of oil discovery and development was telescoped into a decade because it happened so quickly. Unlike coal’s slow, scattered, grimy and underground beginning that provided no pyrotechnics or flumes of spouting oil, what happened to oil happened quickly. The coal industry had done a good deal of the hard work by the time oil came along. Distilling from coal oil was a ready-made industry, railroads, though still primitive and far flung, nevertheless could be built to the site as soon as oil yield developed. As one author noted, “The coal industry developed; the oil industry was created.”
PART II CONCLUSION

This chapter is split between Wood Age energy and Wood, Coal and Oil Age fuels at work. Animal and vegetable elements began to phase out; fossil fuels eased in, and with them a growing use of fuel and an eventual decrease in human and animal energy. In 1850 fuel use was probably 10% fuel to 90% energy. It also consisted of 90% wood and 10% coal. By 1870 increased flow through of fuel with use of coal as well as increased use of wood changed the fuel picture to 25% coal and 75% wood. It is difficult to impossible to state whether the ratio of loss of human and animal energy to increased mechanical energy at the same time though it is inviting to do so. Too many undefined variables stand in the way of easy an conclusion, but over the course of the next fifty years, hand labor turned into machine labor and animals energy fell accordingly though neither was in any way quickly eclipsed though animal labor was less than six per cent of the energy scene by 1920.197

Early diaries describe the beauty of wilderness, while also narrating the struggles with undeveloped land, distance and privation, all of which took prodigious energy to engage in with only a little help from fuel-driven mechanisms. First person accounts extol the virtues and the dangers with a breathlessness of appreciation for the scene they know will soon vanish even in the days in which the diaries were written. They sensed then, as they stepped from throbbing steamboat decks, that the arrival of machines would change the world they had come to savor. Europeans had invaded America and brought their level of energy and its exploitable power with them. The pioneers carried that west as soon as circumstances permitted, willingly sacrificing the level of energy being enjoyed by the Native Americans and replacing it with their own. The previous generations of Europeans had carried disease
that destroyed native populations. Now the nineteenth-century arrivals carried with them the machinery to destroy the roots of the energy level on which the population based their culture. Observers could not help knowing they had arrived at a vanishing point of some kind.

Wood use in the post-steam world increased from a possible one cord per person for the Osages in 1800 to 4.5 cords per capita estimated for the then United States in 1850. Wood use was still primarily used to heat homes. In spite of the numbers of steamboats plying the western waters and rapacious cutting of timber to feed them, only about one tenth of the amount was used for steamboats. However, that amount would change after the Civil War as railroads began to compete for wood sources. Both steam-driven machines would use wood when they could; both would have to change to coal to expand their development to the fullest extent. Both owed their beginnings to wood as fuel for motive power. That fuel had to be delivered by some system to continuously feed the mighty machine.

Systems as we know them in the twenty-first century, far removed from the fuel that powers our world, may be more complex than we can grasp. Human desires get translated into actions that get organized into sequences that include all the parts of actors and objects at

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<th>Coal (net tons)</th>
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<td>0.96</td>
<td>5.28</td>
</tr>
<tr>
<td>1920</td>
<td>0.78</td>
<td>5.59</td>
</tr>
</tbody>
</table>

*The earliest year for which data are available.*

Figure 2-18, Fuel Wood and Coal Consumption per Capita from 1850-1910. Schurr and Netschert, 48.
some point in time and space. All is powered by fuel burning at remote locations. In the beginning of fuel use, however, systems were simple enough. The early fuel systems may seem comical now, but that rough scramble up and down the banks of the western waterways to fuel steamboats signaled the country’s best effort to work with wood on a quick turnaround.

To be transportable wood had to be close to the riverbank when it was cut. The roadless forests from which the wood was commonly cut did not lend themselves to hauling wood long distances by wagon though some of that was surely done. Wood’s bulk and weight worked best on water. Wood’s finest moment of supremacy could not support so much effort in terms of harvesting and supplying the needs of industrializing demands.

Humans still sawed and cut wood under poor working conditions, while animals still conveyed it distances, or flotillas of wood made their way downstream, not up. The upstream direction was the wonder of steamboats. To go upstream without cordelling! That was a miracle that would brought to the steam engine before coal had much significance in supplying that effort.

Activity was organized around the physical characteristics of the fuel itself. People did whatever it took to turn trees into a readily available fuel. Starting at the bases of the uncut tree, men organized tasks as efficiently as they could with the technology at hand. That first organizational layer became more complex and sophisticated the farther from the fuel site.

Layer upon layer of organization of tasks less directly identified with fuel and its delivery became evident and was carried out. Ultimately, the energy from the fuel itself via available technology and the fuel’s energy components dictated transportation systems. The systems
crated by the steamboat pilots’ association and those developed by the wharf master are examples of those systems built around wood as fuel in the new Wood Age.

The wood hawks provided the fuel that went into the steam engine that drove the steamboat that gave the pilot and wharfmaster reason for being. The merchant took advantage of the greater energy to buy and sell goods and organized his tasks accordingly in long paper chains of producers, distributors and customers. The wagon masters could afford to field wagon trains with thousands of head of cattle and thousands of dollars of goods to sell that came in quantity by steam engines powering the riverboats relying on wood for fuel.

The population along the Missouri River’s edge in the scrappy town of Kansas City found their lives improving dramatically by the amount of goods delivered to them, the industry springing up around them and the increased communications with others, whether taking the boat upriver to Leavenworth to shop for the day or to send and receive goods and messages from great distances.

Systems are comprised of parts that work together in both time and space to achieve a particular end. In this particular time and place, the heyday of the Wood Age and its exuberant expression on the Missouri frontier showed that Herculian tasks could be accomplished with the components of the Wood Age energy suite available. The activity around coal was similarly dictated by that fuel: shovels not saws, buckets not axes, flatboats to float coal downstream and so on.

Unlike timber that could be seen and whose types and quantity could be instantly estimated, the mystery of how much coal was available remained a question from the beginning up to the present-day estimates. Wood was still abundant across the country as
coal came into use, but the increase in industrialization that British industry had already demonstrated for a century began to be put to use in America.

The activity around oil was uniquely dictated by the characteristics of that fuel. Liquid fuel confounded people at first, but efficiencies immediately emerged as soon as participants in the scene could invent both technologies and systems to fit the needs of the oil on one side of the equation and their own needs on the other. Humans have manipulated the combination of fuel, energy and technology to suit their desires for millennia. Fuel requires only one thing from its users, understanding of its demands and limitations.
PART III

THE GREAT EXCHANGE, 1870-1900

...[I]nnovation was in the air—because the mid-19th century, especially in the United States, resembled a great laboratory both for the debut of intellectual invention and for the nurture of the alchemy needed to translate it into revolutionary applications to the physical world...

--Francis Schruben, WEA Creek to El Dorado: Oil in Kansas, 1860-1920 (1972)

Alchemy, indeed! The chief stimulus for the nation’s inventions was its two new fuels, coal and oil. With more fuel available than ever before in history and new processes for making iron, intellectual invention had a rich road ahead. Using the new fuels as prodigiously as they could be extracted, manufacturers, railroads and households made sizable inroads into wood’s territory. In this brief period of thirty years coal surpassed and replaced wood as the dominant fuel for the first time in human history while oil moved into the lighting and lubrication fields.

If hands, horse, water and wind were the pillars of the Wood age, how did coal replace those? Hands still handled fire but now increasingly it was from coal.
Horses still pulled their weight in city transportation but increasingly were replaced by streetcars powered by electricity. Wind as motive power was often replaced by steam engines by this time, and in this period water would become turbo power to generate electricity.

Such a wholesale overhaul of the fuel-energy network would bring about enormous changes in the workforce, in manufacturing, and in social classes. It was a fuel revolution that brought about an industrial revolution that began with coal being used to make steam engines in place of wood. Once a mechanical user of fuels, i.e., an engine, could be replicated ad infinitum, coal production flourished and began to replace the costlier wood.

Coal then occupied a two-pronged effort, first as fuel to manufacture the steam engines and then as fuel to be burned in the end product. As making coke was mastered, a century-long struggle between charcoal and coke finished with coke the clear winner. The finite amount of wood available compared to the seemingly infinite amount of coal was not a match. Coal won.¹

Part III shows the human side of coal production, the beginning of electric lights on a scale so small as to seem quaint, the transformation of transportation from live animal to mechanically powered conveyance, and the beginning of steel production. Even as small as oil production was in this period compared to coal, its qualities were so exciting and its promises so great that people could easily see oil was going to be a necessity in the fuel picture.

Chapter 14: Coal in Kansas City introduces he coming of fossil fuel to the local scene that shows the many resources available in the area to service the new arrival.
Chapter 15: The Production of Coal on a Human Scale reveals the underground world of the coal miner in these early days of mining.

Chapter 16: The Symbiotic Relationship Between Coal and Electricity gives some background to the electric light industry for which electricity was first used.

Chapter 17: The Horse Leaves the Carriage: Replacing animals with motive power begins the long farewell to the horse, one of the primary catalysts of the Wood Age.

Chapter 18: From River to Railroad reveals the shift in geography within the cityscape as a new energy component was introduced.

Chapter 19: The Changing Role of Wood shows a marked increase in quantity, processing, transportation and delivery of wood as lumber, now an industrial product subject to the commoditization of natural resources seen during this period.

Chapter 20: The Structural Expression of Coal: Steel introduces the new building material that would replace wood and stone as the process of using coke from coal made steel plentiful.

Chapter 21: Is Petroleum a Necessity? traces the rise of oil as it supplants coal and how America’s infrastructure adapts to the changing fuel source.

Part III sees the very quick displacement of wood for coal as the dominant fuel. No one could have imagined that it would happen within a thirty-year period, but once coke began to replace charcoal, and once steel-making in quantity took hold, coal grew in the exact dimensions that wood declined. Meanwhile, oil continued on its organizational path to solidify the gains in the illumination business. As far as fuel was concerned, these were busy
decades. The East pushed forth its multiplicity of goods; the West gladly received them and grew apace on the frontier. Fortunately for Kansas City, coal lay near by.
CHAPTER 14

COAL IN KANSAS CITY

The state of Missouri had ample supplies of coal, and as the railroad came to town coal mines within the city limits flourished. Coal mines erupted in people’s back yards, along the creeks and near the industrial area as if by magic. Though the deposits had rested their undisturbed, their time had now come, and eager hands dug out the resources of the Paleozoic laid down some 290 million years ago.

Twenty-five-thousand Square Miles of Coal

Missouri offered its early residents an abundance of coal for its greater fuel demands in the late 1870s and early 1880s. The estimate of coal deposits for the state in 1900 was 25,000 square miles in area, of which 10,400 were upper and exposed middle measures of coal. The remainder, 14,600 square miles were exposed lower measures.

The upper measures contain about four feet of coal; the middle measures about seven feet, and the lower measures about five workable seams, varying in thickness from eighteen inches to four feet and a half, and thin seams varying from six to eleven inches—in all about thirteen and a half feet of coal. Ninety years later, the coal report estimated 25,000 square miles of coal, giving strong credibility to the earlier estimate. The coal is bituminous with a medium to high sulfur content.

The difference between the two dates is in the point of view of the population involved in mining. In 1900 coal was seen as the “most abundant mineral in Missouri, and there are more persons employed in mining it than in mining any other.” But in 1992 the federal Energy
Information Administration found that “coal mining is a relatively small industry in Missouri, but coal is the principal mineral fuel produced, and the value of coal production accounted for an estimated 6 percent of the total value of all mineral commodities produced in the state, including oil and natural gas.” The first year that coal production was documented was in 1840 with 9,972 short tons (two-thousand pounds). The peak year for coal production in the state of Missouri was 1964 with 6,733,000 short tons. The 2004 coal production rate was 577,000 thousand tons.

Figure 3-2. Coal Map of Missouri This state map shows the location of deposits of coal in Missouri. Jackson County shows a small area of deposit in the upper left corner exactly where the city itself is located, making local mining a worthwhile activity in the early years of railroading in the city. Walter V. Seabright, “Coal Production and Consumption in Missouri,” Information Circular No. 3, 1949, Geologic Survey and Water Resources, Rolla, Missouri.”
The Pattern of Modern Enterprise

Immediately after the Civil War the town began to reconstruct itself. By 1869 it had brought back the booming business of outfitting emigrants with supplies, had engaged in a building boom and, most importantly, had built and opened the Hannibal Bridge, the first bridge to cross the Missouri, and welcomed the first railroad train service from across the river. Kansas City already a hub in the nation’s network of transportation, had become part of the Coal Age, though use of coal had been in its infancy due to lack of railroads.

The Kansas City City Directory of 1867-8 showed an ad for coal, a harbinger of things to come: “Always keep on hand at Kansas City the best of Lexington Coal. Office and Coal House, Corner of Delaware Street and Levee.” This coal came from Lexington County, the next one east of Jackson County, and a fairly large producer. This advertisement showed with a silhouette of a train and coal car that the coal yard was at the levee by the river, and its coal would do for both steamboat and railroad engine.6

Kansas City had its own local supply of coal to exploit. Jackson County, though having some coal deposits, would not become one of the major coal fields of the state but would need a strong, reliable supply of fuel to meet the needs of the flood of emigrants growing daily at its doorstep. The city residents numbered just 3,500 after the Civil War in 1865, but by 1870 they had increased to 32,263, a tenfold increase in growth that kept the town busy.7 (In 50 years it would increase tenfold again). Besides accommodating such an increase in residents, the City Directory of 1870 estimated that in the past year 260,000 people had passed through the area, of which 150,000 arrived by wagon or private conveyance, 70,000 by railroad and 10,000 by river. Clearly, an amazing land rush in progress passed through the
gates of Kansas City to the West. To accommodate 70,000 passengers by rail after having none had to be an event in itself.


Figure 3-3. Santa Fe Railroad This connection between Kansas City and Santa Fe would soon be reached by mechanized rather than wagon train. The train changed the way people crossed the plains and introduced them to the luxuries of traveling without travail. Electro-Mechanic, May 15, 1889, 156.

Though wagons still brought the majority by twice the margin, the new railroad promised transportation across the Hannibal Bridge to the Far West in a degree of comfort previous emigrants could hardly have imagined. The newly built train station in the West Bottoms handled the traffic way beyond the power of the levee to do so. “The trickle of westward pioneers who had braved the wagon trails turned into a flood of settlers riding the rails.

Now the door was open to ranching and farming, because the surplus could be shipped by rail to the urban markets of the East.” These figures give some reality to the expression “western migration.” Accommodations and outfitting of these emigrants became an all-consuming business for Kansas City, and more and more fuel was needed to support personal and industrial demands.
Kansas City’s use of coal slowly began to rise as one prospector after another sank shafts even within the city limits itself. One coal mine operated at 43rd and Kensington near the current Country Club Plaza and employed over a hundred men. The Brush Creek Coal and Mining had a coal yard at Second and Wyandotte and offices at the Gibraltar building downtown.\(^9\)

Other mine shafts cropped up around Kansas City, one in Rosedale, a suburb of to the southwest where “working beds of good coal eight feet in thickness within two miles of Kansas City” were found in the Rosedale coal vein. A shaft was sunk to a depth of 345 feet to find the eight-foot vein. Gas was also found at this site.\(^10\) Still another coal mine flourished for a time on Indiana Avenue known as the Cedar Springs coal mine. This was active from the 1880s onward.\(^11\)

The Bolen Coal Company was one of the largest houses in the coal line in Kansas City, “one of the integral parts of a chain of corporations controlled by the Gould family.”\(^12\) Jay Gould, who headed first the Union Pacific and then the Missouri Pacific Railroads, was “a builder and organizer of systems and as a promoter of local resources along the lines he controlled.” Gould realized that a railroad alone could not prosper without local business, and “pushed the development of resources and new industry along the line.” Gould inspected his properties and sent agents to buy property, as he did for Rich Hill, Missouri, which would become a coal supplier for Kansas City. Gould built a series of railroad branches from Fort Scott, Kansas, to serve the mining operation at Rich Hill, across the state line.\(^13\)

The main office of the Bolen Coal Company at the corner of 9th and Wyandotte streets (above the bluffs from the river), handled direct from the mines different well-known
varieties of coal. They were each named for the mine of origin, would supply most of the local trade and could be shipped in large quantities all over the West. The list sounds parochial and romantic in terms of mine of origin, a reminder of how local the world of Kansas City once was that coal could be identified and requested in this manner.

Word of mouth must have played a part in one’s choice of coal: Eureka, Ouita, Russelville, Denning, Coal Hill, Jenny Lind, McAlister, McAlister coke, Cherokee, Wier City, Pittsburg, Fleming, Yain, Inola, Oolagah, Lexington, Pasdus Lehigh, Labeled Farmers, Rich Hill, Panama, Foster, Worland, Richmond, Illinois, Iowa, Rock Spring, Wye, Colorado, Piedmont, Blossburg, Connellsville coke, Pennsylvania, Lehigh Valley Anthracite, Lackawana, and Connell. Coal varied in size, weight and sulfur content and could be sorted by that criteria and/or by originating mine. A coal yard nearby would have coal piles of those varieties and sell them directly to the customer.¹⁴

The list of coal varieties above testifies to the many different railroads going to the many different coal mines to bring back an array of coal for the growing industry of Kansas City. Some coal in that list, specifically, Connellsville coke, Pennsylvania, and Lehigh Valley Anthracite were imported from Pennsylvania. Both the coke and the anthracite would supplement the bituminous production of coal in Missouri, which produced small amounts of coke and no anthracite, a coal local to Pennsylvania.

Size mattered in coal. Each had a different market and user. Three main sizes were usually separated at the mine and loaded into different cars and were available for domestic purposes: block coal meant a chunk larger than six inches (it would pass over a screen with a six-inch opening), lump, between three and six inches, and nut coal between two and three
inches. Slack coal or screenings, one-half inch or smaller in size, eventually found a market feeding steam-raising plants.¹⁵
CHAPTER 15
THE PRODUCTION OF COAL ON A HUMAN SCALE

Even though trains charged in and out of Kansas City on a daily basis and passengers scrambled on and off in the new West Bottoms Union depot, the scramble for fuel took place underground hidden from view to arrive in wagons and eventually in rail cars. Discovering, mining, producing and transporting coal created a patchwork industry that was both local and national.

Miners and their Trade: So Degraded and Abject a Condition

First keelboat men, then woodhawks and now coal miners as well as oil men toiled at creating motive power in overlapping efforts in the nineteenth century. Unlike keelboat men whose every muscular effort moved their boats upstream, or woodhawks who saw the steamboats burn the wood they chopped and sold, coal miners did not see the end result of their work.

They belonged to another world underground taking part in an intricate concert of cooperative digging and hauling large chunks of coal out of the dark reaches of tunnels. These chunks saw daylight before the miners did, were sorted and loaded on wagons or railway cars and disappeared toward the growing cities of the young republic.

As early as the 1860s coal miners knew their lot was a hard one and wished for some way to improve their work. One of them wrote the Industrial Advocate, a pro-miner Missouri publication, early in 1867: “Politicians may grow eloquent, armies may be raised to fight, and philanthropists may wail over the poor 'Africans,' but let me tell you, and through you
the whole world, that never were the negroes in slavery in so degraded and abject a condition as the miners here are, and for a long time have been.”

A miner’s day began by being lowered in a cage with up to ten other miners into a deep shaft or by walking the distance of perhaps a mile into a slope mine to get to his room, an underground cavern leading off a more central hallway and mined by an individual miner. As an independent contractor or “tonnage man” the miner was assigned a room perhaps 30 feet by 150 feet from which to extract coal. His room was linked with many others below ground in a rabbit warren of organized mining activity threaded together by rails to move the coal to the surface.

The miner’s first task was to pick up the chunks of coal left from the blasting done the night before. Every afternoon before he left his room, the miner had bored holes in the coal face with his own auger, packed it with explosives he himself had bought and mixed, then set the charge and fixed the fuse with dirt to deflect the force of the blow backward toward the coal wall. The miner did not fire the shots himself. He had the fuses inspected by the “shot firer” who lit the fuses set by all the miners at noon and after they had left for the day.

Before cleaning up the coal, rock and dirt from the previous day’s blast, the miner stopped to test the roof of his room with his pick head to hear if the ceiling sounded solid. If it did, he stopped to take a look at the timbers supporting the walls and entryway to see if they had been weakened or dislodged by the latest blast. In the dim light available only from his own oil lamp fastened to his helmet, and sometimes with a hand-held lantern for added light, he made the inspection of his room on which his life depended. If all stood firmly, if no water had accumulated that needed to be bailed out, he set to work; if not, he had repair work to do,
timbering, supporting, building a “pack wall” with stone and dirt both for support and for
disposal of debris.\textsuperscript{18}

If the miner had an apprentice with him, a son, a nephew or neighbor boy, he set him to
work cleaning up, building the pack wall or bailing water while he lifted the large chunks
into the cart. The miner determined the size of the chunks by the depth, width and angle of
the undercut and by the amount of explosives used to chisel them out.\textsuperscript{19} Loading the cart
well, he had learned, meant the difference in better pay at the end of the day. The art of
loading he himself had learned at his father’s or uncle’s side, for he received no instruction
booklet on coal mining before he entered.

Large chunks he loaded up front and on the corners of the cart to stabilize it, filling in with
smaller pieces in the middle. He may have already measured the height his load could take
by riding the empty car back to his room with has elbow resting on the edge of the cart and
hand raised upward. When his fingers brushed the roof of the tunnel he knew exactly how
high he could load his cart and still get it through the passageway.\textsuperscript{20}

It would not do for coal to fall off the cart. That meant loss of hard-dug profit, a tangle of
carts in the passageway, a pileup, delay of other miners’ work. The cart ran on narrow-gauge
rails laid down from the mine entry or elevator cage down the main tunnel. From there the
rails spread out to each of the rooms where miners labored in sometimes elaborate layouts of
many rooms and haulage ways covering several acres underground. The miner and his young
apprentice pushed the cart, weighing as much as two tons to the entrance of their room
where, if the passageway were tall enough, a mule driver attached the cart to the train and
pulled it along with others to the shaft entrance. There the cart was hauled up by winches pulled by horses above ground, by steam engine or eventually by electric motor.\textsuperscript{21}

The miner and his apprentice, having cleaned up after the last blast and having loaded and sent out the first cart of the day, set to work to make an undercut on the coal face for the next blast. The miner began to chip away at the bottom of the seam next to the floor. He used his pick, the primary coal-mining tool, to dislodge gravel and dirt from the edge of the coal face while the apprentice swept up.

The miner picked away on his knees or by squatting until the undercut got deep enough that he had to lie on his side to continue to deepen the cut, approximately three to four feet into the face of the coal seam. The deeper the cut, the bigger the chunks of coal would fall with the next blasting. Some men developed an ambidextrous approach to the undercut work and could pick with their right hand to the end of the wall and then turn over and pick with their left hand all the way back.\textsuperscript{22} Of course, the miner faced the danger of his coal face collapsing on him as he dug deeper into the undercut.

This primitive form of mining required muscle, vigilance and concentration. The miner and his apprentice usually stayed below for lunch and resumed their labor, picking, loading, picking and loading. With each load the miner placed a metal disk on a hook on the cart’s side with his number on it so that on the surface, in the light of day, the “weigh boss” would credit his account. The miner was paid by his production, which varied by the quality and kind of coal, the absence of slate or dirt, the amount of coal available in the seam, the speed at which the miner was given an empty cart and other variables.
Each day the miner set a couple of charges to loosen the face of the wall. Each time the shot examiner or in some cases the shot firer inspected the shot before lighting it while everyone stepped out of the room, then, if all went well, returned to clean up the latest chunks. Later, as electricity infiltrated the mines, the shot firer used it to ignite the charge.23

Company men or “day men” supported the miners in their work. They spent their days timbering the roofs, checking for gas, greasing the wheels of the carts, driving the mules, laying track on the mine floors, directing traffic underground, minding the ventilation shafts and returning empty carts to be refilled. All these simple skills the daymen learned by the “helper system” of apprenticeship where many older boys got their training before taking over a coal room of their own. Since this miner had an apprentice to help him on a daily basis, he got an extra “turn” or cart per day to fill though, depending on the age of the youngster, the miner may have had to work twice as hard to fill the cart until the child became old enough and strong enough to relieve the miner from some of the heavy work of loading chunks of coal to best advantage in the cart.

Though the miner worked as an independent contractor, he was at the mercy of the mine operator in many ways. In an intricate balance between tonnage and fairness, the miner and mine operator worked for each other. The operator provided the miner with carts and other services, but not at such a pace that the miner could wrap up his two- or three-ton day by two o’clock and leave. The operator, as a company man himself, needed to oversee the other company men for their full day’s work, so the operator sometimes slowed the return of empty carts to keep the miner there all day every day the mine was open.
As cutting machines were introduced at the turn of the 20th century, production increased. The machine operator and assistant moved from room to room undercutting with two large jacks for which they were responsible to keep in good working order. This was a new and expensive piece of equipment that changed the rhythm and skill set of the miners. The machine cutter was expected to be available and operate the machine every day to increase production. He had less knowledge of the coal face than the tonnage miner and concentrated more on operating his machinery.  

Lighting was always a problem. Before electric lights were installed, dim light offered the miners their only chance to make out the coal seam and assess its direction, to check on the timbers, and to avoid tripping over obstacles. Before electricity men wore a variety of oil lamps attached to their helmets. The typical oil lamp looked something like a coffee pot with a spout from which protruded a wick that the miner lit. The miner filled and lit it each morning and worked until it became too feeble to give any more light. This lamp dripped a little with the miner’s movement, and by the end of the day, his skin glistened with a mix of coal dust and oil that required real devotion to remove.

It would be wrong to assume that the haulage ways were level and men could stand upright in them. When they were, a mule could haul the carts out; otherwise, the miners and day men pushed the carts out themselves. Nor did coal seams lie in accessible and continuous outlines. “The beds roll and pitch to such a degree that the average haulage ways in the mines resemble in plan and profile a roller coaster speedway,” observed one engineer.

One of the problems with coal from a consumer’s standpoint was dependable supply. Mines dried up; accidents closed them down; weather became uncooperative; markets
changed. At best mining did not keep everyone busy fifty-two weeks a year. While the coal and the conditions to mine it lasted, miners worked hard. The average mine lasted perhaps ten years, occasionally twenty, often much less, hence the necessity of “coal camps” that were built to service a particular seam while it lasted, perhaps as little as two to three years before the whole community picked up and moved to the next seam. On the other end of the production process, miners were frustrated by lack of railroad cars that came only two or three days a week to carry away the fruits of their labor. This slowed the work and decreased the wages.

Another problem was the ever-present danger of injury, collapse, even asphyxiation. Even going down and coming up the shaft presented dangers. At the beginning and end of the day, a conscientious mine operator would not carry two family members in the same elevator in case it capsized or the cable broke.

The danger of coal mining exceeded the occasional keelboat man’s drowning or being set upon by river pirates, or the wood hawker’s suffering accidents with ax or saw or falling timber. No figures were kept on the former’s activities and only scant records on coal miners as the new industry created systems and local and state governments took an interest in safety and order. Piece rates, quality control, supervision and safety were systematized over time while miners struck for better wages and fairer treatment from mine owners.

Danger, darkness, toil, uneven wages, primitive living conditions, but men would sooner mine coal than to start into manufacturing as an unskilled laborer or be a farmhand at half the wages. One miner turned poet wrote about the ways in which he had seen boys and men die in coal mines “All for Coal.” They were overcome by deadly gas, blown up by a delayed
fuse, dragged between the coal car and the rock wall, crushed by a rock fall, drowned in a
cave in, killed by fire. The poem ended with this:

Oh, now, my dear friends, please don’t think too hardly
Of those who toil down in the ground.
‘Midst hundreds of men, thro’ the years I have worked
A rich miner I never have found!
Facing death without fear, thro’ the years I have worked
A rich miner I never have found!
Facing death without fear, thro’ year after year
And still forty years from their goal.
Brave, gray-headed fathers have still got to dig
For coal, coal, coal!
CHAPTER 16

THE SYMBIOTIC RELATIONSHIP BETWEEN COAL AND ELECTRICITY

Is there a happier marriage between fuel and its offspring than between these two forces of fuel and energy? The great goal of illumination by some means other than oil or gas had been reached. Electric light did nothing less than achieve new heights for civilization, as some thought at the time, an idea that would become abundantly true in the years to come.

Give Us Light!

Electricity had not only been put to work for transportation, but also for lighting the night. The centuries-long process of understanding, refining and learning to control this magic medium had finally paid off. Factories could be lit at night and so could the streets. One enthusiastic mayor extolled the arrival of electricity as a panacea for everyone:

Give us the opportunity of attaining the highest civilization we can enjoy, give us sound and healthy bodies, give us no more darkness, but give us light! More light! Give us the electric light! It is the poor as well as the rich man’s light! It will light the suburbs, as well as the central portions of your city. It is in fact the light for all.  

In 1885 electric light was still a marvel, a bit of wizardry hanging from a pole and brightening the night. The eloquence of this speech suggests both the hyperbole of the nineteenth century and the esteem in which electricity was held as a solution to the dark, to ill health, even to class differences. The speech was titled “The Superiority of Electricity over other Illuminants for Public Lighting,” and was made at the newly formed National Electric Light Association at the first annual convention in Baltimore in 1885. The association was small, perhaps thirty to fifty men assembled from cities along the East Coast and as far west
as Kansas City, plus representatives of a few businesses providing their own lighting systems, but the conversation was enthusiastic, urgent and probing to understand the phenomenon these men were now responsible for delivering.\textsuperscript{32}

Electric lighting was new; the arc light had made its debut in 1879, but by 1885 every city of any size had arc lights blazing against the sky at night.\textsuperscript{33} City and industrial representatives in charge of establishing or growing electric lighting systems formed the association to exhort their fellows and to solve the challenges of electric lighting powered by coal. The membership gathered “electricians,” a new term with somewhat undefined connotations to discuss and educate each other on efficiencies and profitability.

Electricity had been made possible by the use of coal as fuel. The one thing that coal could do that wood simply did not do was to generate electric light. It may be that wood was occasionally thrown into a furnace in a stop-gap move to keep the boilers going, but coal gave light. The process with coal as fuel sounds like a child’s nursery tale: Coal heated metal that could be shaped into steam engines that burned coal that heated water that turned to steam that turned a dynamo that gave off electric current that caused the sparks to arc between two carbon rods that lit up the sky more than 150 times greater than the gas lamp then in use.\textsuperscript{34} This combination of electro-mechanical processes was not attainable with wood. Where once gaslight had lit homes, coal, through this process, now gave brilliant light at night.\textsuperscript{35}

Coal and electricity lit the cities of the world in a way that no amount of wood burning had ever done. Coal gave speed to ships, trains and steamboats; it gave power to standing steam engines to mass produce goods; it would power streetcars, but perhaps the most
exquisite service coal would perform in this era would be to create electric light.\textsuperscript{36} To compare a lump of coal to a burning electric light was to be confounded by the miraculous process of turning fuel into remote light. Nothing like it in the world had ever been seen. To eyes already accustomed to gaslight, electric light made by arc lights was thrilling, blinding, freeing to some, threatening to others. Mayor Hodges of Baltimore in a speech to the association noted: ‘Electric light is a nocturnal joy to an honest man, but a scarecrow to a thief.’\textsuperscript{37} Intense enough to be seen from a distance, night time skylines lit by electric arc lamps filled viewers’ hearts with wonder:

A Port Huron, Michigan, paper of December 31, 1884, said of Detroit:

This city by night has been for some months the amazement of travelers approaching by boat or cars. The steward of a lake steamer said to me the other day, ‘Whatever hour of the night, whenever we approach Detroit, I always call up the passengers to look at the electric lights, and they all considered the view a glorious one. Approaching on the railroad, the view is equally enchanting. It seems like a glimpse within the walls of Paradise to see the multitude of dazzling lights, flashing in the distance.’\textsuperscript{38}
Arc lights seemed like magic because they offered light a step removed from the burning fuel that created them. Instead of a torch or a gas flame for light, electricity allowed the coal furnace to hide in the background, heating the steam, making the belts whirl and generating light in the street. Coal would do the same for the electric trolley. Without flame present at the point of transportation, coal-driven engines via cable or overhead lines would soon pull the trolley along the street.

Arc lights glorified the night by 1879. They were a combination of the dynamo, acting as the generator, established by 1867, and the hard graphite carbon tips necessary to create the arc of electricity in the lamp itself. This technology emerged as two systems, one known as arc lighting and the other as incandescent lighting. The dynamo generated electricity and was often set up in a separate building dedicated to the dynamo and the coal that fed it. Wiring carried the current to the arc lamp. To create the light electric current ran between the two carbons when turned on at the dynamo, then, as soon as the current heated them, the points slightly separated. The air between the heated tips became a conductor and the electricity leaped in the form of an arc or curve between the tips creating the bright light.

Arc lights came in 500 to 3000 candlepower creating light too bright for interior use. If the current were diminished in any way, the mechanism that controlled the distance between the carbon tips, either a clockwork or a gravity-driven mechanism, adjusted the distance and the light burned steadily. The drawback to arc lights was that the carbon had to be changed daily. The carbon tips burned well for a few short hours and then died. The incandescent bulb that would replace it burned entirely without oxygen and would last several days.
Lighting with gaslight was well established before electric light appeared. By 1870 some three-hundred-ninety establishments produced manufactured gas from coal in the entire United States, employed over 8,700 workers with a total value of products at $32,048,850. Over $70 million dollars in capital supported the trade. Between 1850 and 1870 the industry had grown from 30 establishments in 1850 to 390 twenty years later. Gas lighting was at its height when electric lighting shouldered its way in during the 1880s.\textsuperscript{42}

Like most cities, Kansas City still functioned largely in the Wood Age in the 1870s. Fewer than 2,000 customers used gas lighting in a city of 55,000 and the “patient mule furnished the sole motive power for the few street railways connecting downtown districts.”\textsuperscript{43} At the end of that decade, power was confined to milling and packing houses that used steam engines. People still found mechanical power itself a wonderful thing. Electricity would be another of God’s gifts to His people. “Electricity is one of God’s motive powers that are given to us to handle for the good of God’s creatures,” said the mayor of Chicago in 1885.\textsuperscript{44}

By 1879 Thomas Edison had worked through the filament problem to create what we now call the electric light bulb and had developed a system to power it. The dynamo he invented was called a “Jumbo” because it dwarfed both size and stability of the previous models. Its efficiency was also superior. It could produce a kilowatt hour of electricity with as little as ten pounds of coal. Arc light dynamos of that era burned as much as 30 pounds of coal for the same production.\textsuperscript{45} Members at the second semi-annual meeting in Detroit, August 31st and September 1st of the National Electric Light Association in 1886 would be reminded that in that year of 1879 “there was not in existence in the whole world a central station for
electric lighting.”

Progress by the mid-1880s produced arc lighting in most cities and incandescent in a very few.

An amusing anecdote shows Edison, the creator, very much involved with his craft at a time when electricity was still a very local event. While attending the opening of the play “Iolanthe” in the Bijou Theater in Boston one evening in 1882, Edison was dismayed along with others in the audience to see the lights dim and flicker. But he could do something about it. Dressed in top hat and tails, Edison left the theater to help shovel coal “back at the powerhouse.” Whether in the back shed or a block away, the amount of coal burning in the furnace had a direct effect on the quality of light, and Edison did what he had to do. The show had to go on!

Gas lighting, now a customary form of indoor light by the 1880s, held danger for its users in a number of ways, asphyxiation, explosion, structural fires, and personal injury, but the century had been filled with experimental lighting and the public gave gaslight a respectful acceptance. City officials across the country had given gas lighting companies licenses to operate to provide indoor as well as street lighting for their citizens. Small improvements in burner design, gas pressure and composition of gas and lower prices encouraged loyalty by its city users, but gas lighting really stood little chance of survival as electric lighting became available on the market. Still, progress with electric lighting was slow.

By 1879 only three electric light and power systems showed up in the 1880 United States Census. In comparison by 1880, the gas companies had invested a $150 million in municipal lighting with more than five-hundred companies participating in furnishing both
street and indoor lighting. Arc lamps had taken about ten per cent of the outdoor lighting market by then; the incandescent light market threatened to take over the rest.\textsuperscript{50}

Tireless experimentation in electricity over the course of the nineteenth century had finally produced workable products. While gas lighting companies experimented with burner improvements, electric light enthusiasts experimented with the electromagnetic field and dynamos. Gas companies worked with end-use improvements typical of a mature commercially dominant industry while the other light source worked to refine the delivery of the electricity itself. The early commercial activity typical of emerging technology. Early manufactured-gas experimentation had taken place from 1816 onward when the first system was installed in Baltimore. Wooden pipes were replaced with cast iron by the 1820s. Better burners, fixtures and the development of meters improved delivery in the early decades of the utility. Decisions had already been made in terms of fuel, distillation processes, technology and distribution.\textsuperscript{51}

Looking back from a century and a quarter later it is difficult for us to imagine the meager beginnings of the electrical industries and the painstaking incremental improvements that made the entire industry blossom in the 1880s. In 1879 the telegraph held first place in this country as the premier electrical wonder, according to the 1880 census. Seventy-seven “establishments” or companies of telegraph works produced that wonder in the United States that year, employing almost 15,000 workers and bringing in $93,602,922 in revenue.\textsuperscript{52}

Telephone systems were more numerous with 148 different companies employing 3,338 workers and capitalized at $15,772,135. Even more numerous were 221 electroplating shops doing contract work, employing 1,441 workers and with capital of $865,890.
The production of telephone and telegraph apparatus kept forty shops busy and employed 893 with capital of $38,458. Production of other electrical apparatus and supplies kept thirty-six shops busy and employed 378 workers with capital of $873,300. Electrotyping and stereotyping outside of printing establishments kept 45 shops busy with capital of $536,000 thousand dollars and employed 642. These were encouraging signs of new industries birthing at the end of the nineteenth century.

At the very bottom of the list in 1879, three companies offered electric light and power systems--nationally, employed 229 workers and had capital of $425,000. The combined value of all the electrical products and services in 1879 amounted to $25,608,529. As robust as this effort sounds, these were national figures sprinkled across a nation struggling to embrace the power of the new fuel-driven technologies.

Electric light came of age in the 1880s. Other electric technology had already made their debut. Telegraphy had been well established since the late 1840s; electro-plating had been around since early chemical batteries in the 1830s. A series of improvements in arc lights and dynamos would create a viable industry by the early 1880s, hence the establishment of the National Electric Light Association by 1885. Enough cities then had electric light systems—between fifteen and twenty—to warrant an established professional discussion. Other electrical entrepreneurs were drawn to the prospect of working with the new medium. Since dynamos stood alone to generate electricity in the early years before Edison created his system with electric lights, a factory, for instance, could have its own lights managed on site. “Mill men,” as opposed to municipal lighting representatives, among other entrepreneurs, attended the conferences. Early on in the life of the association, members held a long
discussion about associate members. A man could join and become an associate member who might be generating light for a few hundred lights.\textsuperscript{55}

In other words, any one with a little capital, a dynamo, a coal supply and a willing customer could produce electric light.\textsuperscript{56} Before Edison’s system infiltrated city streets, store, hotel and mill owners installed their own systems for arc lighting on their own properties.\textsuperscript{57} The incentives to develop a new and better light source were enormous. Both entrepreneur and capitalist stood ready to reap the possible rewards of fame and financial remuneration.\textsuperscript{58}

In Kansas City in the 1880s, electric lights started within stores and other buildings before going outside, while gas companies monopolized the street lighting business.\textsuperscript{59} Nationally, the gas industry saw itself as the illumination system and defiantly hung on to that service while facing increasing threat from kerosene lighting and the incandescent electric light. Gas companies would eventually be forced to change their methods, market, technology and production, but not without a fight.

Arthur Bright, Jr., in his classic book, \textit{The Electric Lamp Industry: Technological Change and Economic Development from 1800 to 1947} (1949) summarizes the tactics the gaslight companies used that have remained common. The gaslight companies belittled the advantages of electric lighting. They played up the dangers of electricity and attempted to dissuade city councils against adopting it. The two franchises battled it out in newspapers and brochures while trying to influence standards in their favor established by the insurance companies.\textsuperscript{60}

In spite of such defensive measures nationwide, electric light came to Kansas City, March 23, 1881 with a three-hour display between 6th and 8th on Main. The event was highly
anticipated and crowds arrived to see it. The newspaper quoted one awe-struck bystander’s words: “You just pull a lever and there’s your light.” None of the business of making light by other means was required.

G. Y. Smith, operator of a hardware store at 712-16 Main Street, had financed this electrical demonstration with Edison’s arc lights, each of which had two-thousand candlepower. Two exterior lights hung over Main Street itself illuminating the crowd and the muddy ruts of the street. Smith illuminated his store that evening so that throngs of shoppers could buy by electric light. The arc lights had been designed by Edison with magneto and carbon tip. They produced about eight hours of constant light powered by a Brush dynamo located in a large building 22 x 32 feet one block to the west. The Kansas City Star the following day harshly described gas light by comparison: “…such gas lights as were to be seen, looked yellow, ghastly and ashamed of themselves.” The truth about arc lights was that they were white light, bright to the point of blinding and caste black shadows by the contrast of lighted to unlighted areas.

Shortly after this event, financiers contracted to begin electric lighting for the city. Kansas City became one of the first cities in the country to develop electric lighting with the organization of the Kawsmouth Electric Light Company in February of 1882. The company was licensed by the American Electric Light Company of Connecticut that held the patents of Elihu Thomson and Edwin Houston whose system it would use. The first powerhouse for the dynamos was built at Eighth and Santa Fe Streets in the West Bottoms. It soon supplied the Quality Hill residents, the old Union Station and the Union Avenue district with arc lights used indoors mostly for business houses. Edwin R. Weeks was made superintendent in
1882 and remained so, representing his company and city with dignity and expertise at national electric lighting conferences until his retirement in 1900.\textsuperscript{65}

**Going to Strangle Gas**

In the minds of electricians gaslight belonged to the same era as oil and candles and needed to be replaced as soon as practicable.\textsuperscript{66} From the 1870s onward different fuels, their dedicated technologies, their devoted supporters and eager publics vied for position. “Now incandescent lighting has reached that point of development where in many places, it has been able to compete with gas and with arc lighting,” said one representative at the semi-annual National Electric Light Association at the Union Square Hotel in New York in August of 1885. We have an infant seven years old, that, I think, is going to strangle gas with one hand and petroleum with the other. That infant is a robust one. He is today competing with a very well developed man. He is competing with arc lighting. He is also competing with gaslight, and is he to stop his growth in his seventh year?\textsuperscript{67} This rhetorical question could only hint at the growth to come. Meanwhile, Kerosene had already become a popular illuminant in the 1870s and a fall-back fuel for the vagaries of gas or electrical lighting. The lighting of Kansas City had become a many-splendored thing.
In Kansas City competition sometimes took on almost comical appearances. The means for transmission for telegraph, telephone, gaslight, arc lighting, incandescent lighting and trolley lines all collided in the streets of the growing city. Several electric companies (there were five altogether) and two gas companies further muddied the scene. The positioning of poles along the city streets posed a problem. The Kansas City Electric Company had received from the city permission to “enter upon any street, avenue, lane or alley of the city, erect poles or lay down pipes.” Were telegraph poles also to be added? What about the other companies? If every company were to install poles, what then? One Saturday night in 1891 the American Electric Light Company (AELC) put up a line of sixty-foot poles in the West Bottoms on one side of Santa Fe between 12th Street and the Union Pacific tracks working under cover of darkness to avoid a confrontation. This act compromised the lines of the Kansas City Electric Company (KCEL) creating dangerous

Figure 3-5. Light Pole with Complexity of Lines This photo shows the complexity of lines carried by the average light pole in the early years of electrical production. Notice the one line swooping down in the left foreground as a result of an ice storm. Missouri Valley Special Collections, Kansas City Public Library.
interference. The problem was solved when KCEL employees cut down the poles of the AELC on Monday morning!

Figure 3-6. Ad for Four Electric Companies Companies and their products in the Kansas City marketplace. Their different offerings indicate their level of development. *Greater Kansas City Official Year Book 1904-05*, Made in Kansas City, USA, the guaranty of Excellence.  

In 1896 a similar competitive moment between the United Electric Light Company and the Consolidated Electric Light and Power Company in Kansas clashed in the West Bottoms and each company cut down and removed the other’s poles during the night. Imagine the numbers of men required to cut down sixty-foot poles and remove them, probably by
kerosene lamps, without electrocuting anyone. The poles were loaded on horse-drawn wagons and pulled down rutted, muddy streets and unloaded somewhere else--nefarious deeds stealthily carried out for market share. These hijinks were committed more than once in Kansas City before the squabbling was settled between gas and electricity.

Rate wars and crossover marketing between gas and electricity worked well for customers but could be ruinous to the companies themselves. The two gas companies participated in a rate war in 1897 that dropped their price of artificial gas to fifty cents per thousand feet from an original $2.50. The electric companies reduced the rate on arc lights to one dollar per month per lamp. The gas companies also began to offer electric service as a means of joining the competition. Then, even some electric companies began to offer gas service before things were ultimately sorted out in the 1900s!70

Figure 3-7. Early Electric Substation This early substation shows the primitive technology then available. Wood sufficed as infrastructure until more sophisticated materials could evolve. Notice the horses in the lower right as an indicator of scale. Most remarkable in this picture is the absence of flame. The coal furnace turning dynamos to create electricity to send to the substation was far removed from sight. Missouri Valley Special Collection, Kansas City Public Library.
The gas companies also used the media to form negative impressions of the new electrical technology. A few small gas companies formed a syndicate and hire someone to represent them against the competition. “Whenever they see any little paragraph which is detrimental to the electric light, they have it printed and published in all of their local papers and paid for by the gas syndicate as an advertisement.” The speaker—again at the National Electric Light Association—went on to suggest that the electric industry ought to publish the many tragedies of explosions and asphyxiations caused by gas. “Why, we could make a Bibleful of these things; they are everyday occurrences.”

Figure 3-8. Kansas City Gas, Light and Coke Company Gas Holder. 1895. Note two people in left foreground to indicate the scale of the installation as natural gas arrived in quantity to the city by 1907. Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Missouri.
The national companies also fought for position. Mergers and acquisitions were a way to beat the competition. The Electro-Mechanic editor in the Kansas City-based publication complained in 1889 about the state of industrial mergers: “At this rate, between the two great cannibals Westinghouse and Thomson-Houston, not to speak of the more fastidious but still capacious-mawed Edison, there won’t be many independent manufacturing electric light companies left by next Christmas.”  

By 1885 in spite of early growing pains, the original Kawsmouth Electric Company in Kansas City increased its customer base to serve businesses and residences along Union Avenue, Main, Walnut and Grand Streets from Third to Fifteenth Street. Even at the time of the cable car’s origin (1885) Kansas Citian John C. Henry started his experiments with an overhead electric trolley that would in the next few years become the dominant form of local transportation. It also required its own dynamo station.  

The Kawsmouth Electric Light Company incorporated in Kansas in 1881 and by 1882 the company had been reorganized as the Kansas City Electric Light Company with capital of $20,000. The plant had four small dynamos with a capacity of ten lamps each and an improvement that allowed lights to be turned on and off on the circuit without hand adjustment at the plant each time, a considerable improvement. By 1883 the capitalization had increased to $100,000 and Edwin Weeks oversaw every improvement. Larger dynamos and Corliss engines increased the station capacity to three hundred arc lamps, all used for business houses and stores.
We Must Watch Our Coal Pile

The ratio of coal to candlepower began to be explored as electricity expanded its reach. Greater quantities required greater savings. Edwin Weeks, Kansas City’s pioneer electrician, was a fastidious manager and particularly adept at watching the ratio of coal to output. “In regard to the cost of coal, and the steam part of the plant, I think that is a matter of great importance. It comes right home to every one of us. That is where the solution must be made in regard to the commercial success of electric lighting. We must watch our coal pile.” Weeks went on to detail the intricacies of setting boilers, keeping records, lighting lamps and keeping them going. This was an industry in its infancy.76

At another point at the same meeting Weeks urged the members not to work their engineers and firemen on “too long a watch.” They needed to be vigilant in their attention to the coal fire: “Basing our calculations upon a good mixture of slack and nut coal for a 200 arc plant, at an average distance from the fuel supply, the cost of the power department should not be far from 32 percent of the whole operating expense.”77 Over time, best practices would become standard in the trade, but in the early years, individual watchfulness provided the data.

In New York in August of 1885, at the meeting of the Electric Light Association, Weeks again approached the coal question educating his cohorts on the distance between grate and fire and the amount of coal to be burned on the grate surface “depends on the amount of grate and draft.” He noted that companies “in no less enlightened a portion of the country than New England” operated by “very intelligent men” were burning six pounds of coal every hour. That he found to be “simply ridiculous.” Boilers and pipes also had to be considered.
The Westinghouse engine “takes more steam than any other engine in Christendom,” Weeks announced and the boilers in question were set 20 inches from the bars. “I think if he (the questioner) will raise his boilers about a foot and a half or very near that,” he offered, “that he will find that he will make a great saving in coal.”78

Another observation of Weeks was the pipefittings. “In regard to size of pipe, many put in too small steam pipes and insufficient heaters to create heat. Proper size steam pipes, setting of the boiler, settings of the grate, the draft, size, kind, and price of coal, and many other details had to be worked out during this period.”79

One of the disadvantages of gaslight for street lighting was the manual turning on and off of each light every night and morning. Men were hired to do that city block by city block twice a day. The refrain from the song “The Old Lamp Lighter” gives the picture:

Now if you look up in the sky,  
You'll understand the reason why    
The little stars at night are all aglow,  
He turns them on when night is here,  
He turns them off when dawn is near,  
The little man we loved so long ago.

One of the electric-light practitioners at the association conference in Baltimore in 1885 compared that practice to electricity: “Today a hundred men are required to light and extinguish the gas burners in the city of Chicago, at a great expense. The entire city of Elgin is illuminated in an instant, by simply turning a switch at no expense or loss of time, and Chicago, with its 600,000 citizens might be lighted in the same manner.”80

Gas companies and electric companies rankled each other with petty arguments until December 1885, when the gas works exploded in Kansas City and inhabitants were plunged into darkness except for those portions lighted by electricity.81 Mr. Weeks was quick to
suggest the benefits of electricity while the gas company built a new fire-proof building for itself. The Kansas City Electric Light Company, of which Weeks was manager, installed a twenty-five lamp circuit for outdoor use, the first time electric light was used for public lighting in the city. The city population at the time was around 125,000, having grown from 55,000 five years before.

By 1886 two incandescent light plants were put into service. They had 150-light capacity of sixteen-candle-power lights and required no hand regulation at the plant when individual lights were turned on and off. The company soon realized, however, that without meters they were losing about a third of their output. The company adopted the Edison meter the following year increasing revenue by twenty-five per cent. Company officials soon realized that the Edison system was superior and formed still another company, the Edison Electric Light and Power Company in 1886 with capital of $100,000 with Edwin R. Weeks again as general manager. This plant had continuous current of 220 volts (110 on each side) using the Edison three-wire system. It served a district about a half-mile square with an initial load of about 2,600 incandescent lamps, all at sixteen candlepower.

The gas interests realized by 1890 that electricity was a serious threat to the gas lighting business. They built a new electric powerhouse with the Brush system of arc lighting using Corliss engines and “all improvements known to science.” The company was soon bought up and consolidated with other small electric companies into the Kansas City Electric Light Company. Inducements to light with gas and cook with gas were offered customers including fixtures and gas stoves. Despite the financial panic of 1893, the twin industries grew. They
extended their lines five miles into the suburbs, introduced alternating current, powered a scattering of elevators and introduced incandescent lighting to several residential districts.\textsuperscript{85}

Nationally, the brilliant, mesmerizing arc light hit its highest peak of use between 1880 and 1893.\textsuperscript{86} Ten companies produced arc-lighting fixtures across the country. Edison’s first company to produce fixtures, the Edison Lamp Company, established production in 1880, followed by such companies as the United States Electric Lighting Company, the Consolidated Electric Light Company and the Swan Lamp Manufacturing Company, all established between 1881 and 1883.\textsuperscript{87} They produced arc lamps, switches, wiring and dynamo systems. They sold the ability to make light. Once installed in cities, the owners of these systems contracted through franchise with the city for street lights to be turned on at sunset and turned off at eleven or twelve p.m. or at sunrise. “Calendar lighting” allowed them to avoid moonlit nights and to supply lighting on cloudy and overcast nights.\textsuperscript{88}

Edison’s followers formed an associations in 1880 as the incandescent light begin to flourish and met for their ninth convention in Kansas City at the Coates House on February 15, 1889. John Peak, a city official, welcomed the visitors, “Gentlemen, we may not welcome you to a city filled with beautiful parks and handsome thoroughfares, but we point to our network of electric wires, our great cable system, to the marvelous growth of the city as an example of western energy.” In nineteenth-century style he continued, “Edison is not unknown here, and if he lives for fifty years more and keeps on inventing, we may expect to see aerial ships sailing through the air to Mars and other planets, and the moon used, like the Samoan Islands, as a coaling station, upon the heavenly voyage.”\textsuperscript{89} His was evidently a coal-fired vision.
A further treat for the convention attendees was to visit Edmund Weeks’ residence to inspect the model electric light plant with which he lit his home. The Electro-Mechanic magazine reported that he used a “2016 c. p. light, Thomson dynamo run by Baxter motor by current taken from the arc circuit (from the street, a now illegal practice). All present expressed themselves as much pleased with their visit.” The magazine also reported on one final touch of modernity during the event: The Missouri and Kansas Telephone Company put up a phone at the door of the convention room in the Coates House for the use of the members.  

The fears of the gas industry in the end were unfounded. So great was the demand for both light and power that the gas market grew from fewer than 2,000 customers in Kansas City to over 20,000 users. “It is a fact growing into general recognition,” wrote one author, “that, while gas is losing its position as the leading illuminant, it will be the fuel of the future.” The future of electricity certainly seemed assured; the Kansas City Electric Light Company paid its shareholders dividends amounting to more than 200%.

By January 1, 1900, Kansas City generated enough current in isolated plants to operate no less than 1,000 incandescent lamps, 3,000 arc lamps, and 4300 horse power in motors, exclusive of street railways which were rapidly converting to all-electric systems. General manager Edwin Weeks had presided over that growth. He retired from it in 1900 when the company was purchased by Armour & Company of Chicago. “One of these days,” he said, “the best electric light is going to be formed by taking the best in all the systems and putting them together as one system. That time is coming.”
By 1901 the wages for electric light employees in Kansas City looked good: for a lineman they were $2.25 per day; trimmers of the lamps, which had to be done daily in the case of arc lamps, received $56.50 per month; dynamo men the same per month, assistant foremen $60 per month, the foreman $65 per month, and the line superintendent $75 per month. Mr. Weeks earned $175 per month by 1896. The men worked ten hours a day six days a week. They also received double time for Sundays and holidays and time and a half for overtime. A union had been organized in 1891 and helped to create standard wages and hours. Kansas City by then had a national reputation, due largely to Mr. Weeks’ participation in various organizations that gave him one-on-one communication with representatives from other cities. The city was considered to have “the best electrical facilities of any city of its size in the country” in the late 1890s, according to the Kansas City Star in 1898. By 1900 the city enjoyed 100,000 incandescent lights, all at sixteen candle power, 3,000 arc lamps for outdoor and factory lighting, and 4,300 horsepower motors beyond those that operated the street railway. The city was definitely on its way.
CHAPTER 17

THE HORSE LEAVES THE CARRIAGE:
REPLACING ANIMALS WITH MOTIVE POWER

It was inevitable that the horse would leave the carriage and only a matter of time now that mechanization had entered the lives of city folk. The horse in the city became a foreign object, a shard of a retreating energy suite, one of the first to be realized but one of the last to go.

A Substitute for Human or Brute Labor

As with every other task in the nineteenth century, mechanization arrived to assist the miner in his trade. By the turn of the century a certain transformation had taken place below ground: “There is hardly a country in the world and hardly any department of mining in which electrical appliances are not employed, and in many instances the installation and equipment are of a most extensive character,” wrote Thomas Commerford Martin, in “Electricity in Mining” in the special report, *Mining and Quarries* for the 1902 Census.97

The work would always be arduous and dangerous, but the new power of electricity, itself fed by coal, supported reaping its own fuel. The symbiotic relationship between coal and electricity found its way to the very mouth of the mine. In 1900 electricity still alternated between direct and alternating current. Water generated electricity for the first time and wires from waterfalls could span a distance of twenty five miles to light a mine. “A great many mines and mining camps in regions where fuel was either very costly or difficult to obtain have been brought within the range of profitable working through the use of some distant waterpower.”98
In the early stages of electricity, lighting was applied to mine work. Who needed light more than those who worked under ground and mined the coal that lit the homes of the nation? They, too, should benefit from their own labors. The lights that lit the corridors of the mines at 24 watts each were feeble by today’s standards, but they were steady. Because of the intricacies of the mining landscape underground the cost of wiring all the hallways and rooms for electric light was prohibitive. Instead only the main corridors were wired for electric light leaving the rest of the minescape in the gloom of oil lamps or eventually lights operated by portable batteries. The average coal mine at the turn of the century worked with 227 horsepower for lights, motors and other uses.\(^9^9\)

Beyond lights the next improvement allowed electric motors to replace horses, mules and humans as traction in the mines. Rails had been laid in the mines in America during the nineteenth century; at the beginning of the twentieth century electric motors would do the work formerly done by “brute force.” The haulage in the mines was originally by rope driving and by mules, a system nearly two miles long. With electricity a system of 5,600 volts of alternating current at the mine mouth generated current to a substation in the mine itself near the actual mining operation and about nine thousand feet from the power house.

Static transformers and a rotary converter generated 275 volts of direct current to the haulage circuits. The two-mile system with mules grew to a five-mile system with electricity.\(^1^0^0\) The electric mine locomotive weighed about five tons with thirty-two-horsepower electric motors. The motor turned the driving wheels by a chain and cog or sprocket connection and hauled up to fifteen cars, each of which weighed one ton when empty and carried 2.35 tons of coal. The current was supplied by a trolley arm and the track
rails were used as the return circuit. This motor was operated by a man seated on the machine. The cost of haulage by mule power was estimated at six-and-a-half cents per ton while the cost of electric haulage was at two-and-a-half cents, a savings that was eagerly accepted.¹⁰¹

Electricity provided another great improvement to mining--the cutting of the coal face itself. Instead of a pick, miners now used electric cutting machines, one of the largest classes of mining machinery employing electric current. A recent development, the number of coal mining machines in use in the United States in 1898 was 2,622, but by 1902 it had increased to 5,418. All of these were employed in bituminous mines.

In 1891 mining machines produced slightly less than seven per cent of the total production of bituminous coal. In 1902 they produced somewhat over twenty per cent. The first machines were powered by compressed air operating like a jack hammer, but improvements created a chain form driven by electricity like a chain saw. In 1902, almost 60% of machines ran on compressed air while the other forty-two per cent were electric or chain machines.¹⁰²

A machine could cut fifty tons of coal in an eight-hour shift. Since most of these machines were operated by two shifts of workers, the output of a machine working in a “thin vein” of perhaps twenty-eight to thirty inches could cut up to a hundred tons per day! The machines were about one hundred horse power, which allowed for simultaneous operation of power for lights, pumping, ventilation, drilling and shot firing.

The cost of pick mining in rooms was ninety cents per ton, while the cost of machine mining in rooms was eleven cents with a cost of fifty-two-and-a-half cents for loading the coal after the machines left the room. This is a savings of twenty-six-and-a-half cents per ton of machine over pick miner, an appealing increase. Of course, operation and depreciation
would leave a net savings of thirteen cents per ton, but four machines could produce at least 75,000 tons per year.\textsuperscript{103} The cost of operating such a machine ranged from one tenth of one per cent up to two cents per ton depending on the hardness or softness of the coal and the skill of the operators.\textsuperscript{104}

Other benefits of the machines included the very small amount of slack coal falling out of the cutting process, decreasing the loading and cleanup time. The speed at which the chain machine could cut the coal decreased from hours to minutes: Once the machine had been placed in position, it could make an undercut 44 inches wide, four-and-a-half-to-five inches high and six feet deep in five minutes. The cutting machine weighed about 3,000 pounds,

Figure 3-10. Electric Coal Cutter This turn-of-the-century coal cutter, though very primitive, markedly increased energy to increase production. "Electricity in Mining," Thomas Commerford Martin, Mines and Quarries, Twelfth Census, 150.
was about eighteen inches high and was operated by two men.

To set up the machine and make a cut that size took less than ten minutes. One machine team cut seventeen hundred square feet in nine and a half hours, a record beyond a pick miner’s wildest dreams. Many, many mines, of course, never used such undercutting machines and pick mining was the norm for decades to come, but the machines came into use soon after electricity became a force in the workplace. Most of the original machine mining took place in Pennsylvania and West Virginia at the turn of the century and worked their way west to Illinois and beyond.¹⁰⁵

The power-generating plant was located at the mouth of the mine and coal from the mine kept the electricity going. At some mines, all of the machinery from tipple to mine opening was driven by electric motors, a trolley line with electric locomotives bringing the pit cars from the main entry to the tipple. Electric augers and shot firing completed the ensemble of coal mining supported by electricity. At this early stage with the mixed use of direct current and alternating current and distances from the power source making it remote, electricity was a miracle worker that needed to be handled with great respect.¹⁰⁶

Competence in handling electricity in mine settings became just one more of many skill sets needed to operate a coal mine. Miners doing everything by pick and oil lamp could only be astonished by the arrival of the machinery and its electrical motive power. The miner’s skills changed as he worked in concert with machines to greatly increase the coal production of the nation.
Demise of the Equine

Perhaps no transition shows the shift from wood to coal better than the phasing out of the horse from city streets. Through the many iterations of change from horse-drawn to motorized vehicles, city populations struggled to adapt, invent, expand and replace transportation systems to serve their fast-growing populations. By the 1870s the “urban horse” was differentiated in the census from the other horses in the country. Their numbers increased with the need for city transportation. As city populations became dense, as factories gathered in the midst of population centers and increased the need for a way to handle numbers of people and piles of goods, something in the way of mass transportation became necessary.

Both transportation by steam engine and transportation by horse grew at the same time. Though steam propelled both steamboat and railroad engine, the technology had not yet been applied to vehicles that could move beyond river or rail. All other engines stood stationary in support of industrial processes. Until the point at which the changeover was complete and the horse had been replaced by engine-driven transport, the horse would supply muscle as a vital link from Wood Age to Coal Age. It would then give way to the horseless cable car that would shortly be replaced by the electric car, two products of the Coal Age.

As an agrarian animal, horses and their required services had always been built into the fabric of the farmer’s life. He watered and fed the horse from materials close at hand; the manure he shoveled into a pile to be plowed into cropland. The city dweller of means kept a stables and hired stablemen to look after the horses. The poorer classes walked or hired
“hacks.” In the city, as horses began to be used in areas of concentrated population, their needs became somewhat problematic.

Horses were a product of natural ecosystems long since adapted to human use as a Wood-Age energy force. In their final years as bearers of burdens and pullers of wagons, horses inhabited an increasingly mechanized, man-made environment that had less and less tolerance for their needs. Horses had to eat and drink as much as five times a day to keep up their strength. They each required from 16 to 47 pounds of hay and oats daily. Like the wagon-train drivers to Santa Fe before them, city drivers had to provide oats along the way for their horses.

The 1870s city offered numerous places at which a driver could stop to purchase a meal or two for his horses, though to stop meant the driver expended both time and money. Horses worked best with an ample supply of oats, their best fuel. Their droppings and urine were the resulting pollution. Horses defecated freely, roughly 16 pounds of manure to a thousand pounds of horse. Add several gallons of urine to each horse’s waste, and a city already operating on rudimentary services for its human population has a sanitation problem of sizable proportions. On the Santa Fe Trail horse waste posed no problem, but in the city, those who used horses as labor force were responsible for cleaning up after an urban horse population.

Manure was known as a profit center in some cities as farmers in the surrounding countryside adjacent to cities hauled in for hay and grains daily use, and hauled out manure. This exchange set up a long series of efficiencies in hay growing, standardization of crops of hay, oats and other feed, baling, pricing and transportation to accommodate the growing
urban horse population. The farmers frequently bred horses for the urban horse trade as well. They often contracted for the manure from stables and streets for their fields to grow more hay. Water for horses presented a need for water troughs or fountains though some teamsters carried water with them.

As a facility for horses, water troughs did not last long. First instigated after the Civil War, they were removed for public health reasons by 1910, leaving the remaining horses to be watered by carrying their own water or by the driver arranging for private service. A horse could feed from an oat bag or on hay thrown on the street, but the driver did not always address the task of manure removal. He had promises to keep and moved on, hence the cycle in which the farmer grew hay and oats to feed the horse and then picked up the subsequent byproduct to plow into the fields to produce more.110

In the first decades after the Civil War the 1860s and ‘70s mixed coal and wood, animal and machine in whatever form and quantities could be found. Business went on; the Coal Age encroached from the East while the Wood Age stretched out from the riverfront community all the way West. Kansas City was a city in both a fuel and an energy transition.

The wave of mechanization rising from the East reached St. Louis and then subsided by the time it reached Kansas City. The Santa Fe Trail trade, for instance, continued as it had before. In 1867, two years before the Hannibal Bridge open to railroad traffic, W. H. Chick & Company, one of the original “town company” owners and a substantial businessman of long standing in the community, loaded 1,420 wagons for Mexico, the value of which was $2,200,000.
Two other firms put together smaller but profitable ventures at $300,000 to $500,000 each with fleets of horses, oxen and mules to provide the energy along the way. The trail to Mexico still invigorated trade in the city and demanded servicing by large amounts of animal energy. Kansas City businessmen continued to lace together the markets they serviced with the goods their customers could depend on from what arrived at the steamboat landing.

**One Horse Did All the Drawing**

As early as 1860 the first commercial horse car transportation was organized as the Kansas City Railroad Company. Poorly financed, it faded in a short time. No further efforts were made until after the war. As the emigrants flowed back into the city after the war, however, entrepreneurial opportunities once again abounded. In 1868 a freight company, marking the revival of business in town at the levee, began business with one horse and one wagon and two men to haul goods around the city.

By 1870, as the population had increased tenfold to 32,260 from post-war figures, twelve horses, six wagons and twelve men actively engaged in delivery for this one company. “Some idea of the increase in the express business may be formed,” boasted the city directory author, “when it is remembered that in 1866 one horse did all the drawing, and now fourteen horses are kept continually busy.” Kansas City had moved from a “one-horse town,” literally, to a metropolis in three years.

Commercial transport of pedestrians began when one enterprising citizen, Nehemiah Holmes, started the first street railway in 1869 between Kansas City and Westport, a distance of about four miles. The Kansas City and Westport Horse Railroad Company completed the
four-mile run by 1871. Holmes “was the leading spirit of the enterprise, and but for him it would doubtless have failed.” The company’s office and stables were at 16th and Grand Ave, about equi-distance between the two towns. 115

Coal furnaces in Pittsburgh or St. Louis had produced the first inter-urban rails for the two separate populations of Kansas City and Westport whose citizens rejoiced that they were now “linked together by indissoluble iron bands.” Like the railroad itself that had just arrived to link the city across the state and the nation, Kansas City had suddenly entered the age of iron rails.

By 1873 the Kansas City population had grown to 40,740, a jump of 8,000 in three years. Clearly, public transportation needed to grow along with the city. Holmes’s railroad did not pay, however, and upon his untimely death in 1874, the company was sold and reorganized as the Westport and Kansas City Railroad Company. It would not become profitable until 1880. Meanwhile, the Jackson County Horse Railroad Company was organized to run from the corner of Fourth and Main at the levee along Fourth to Wyandotte, on to Fifth Street to Bluff street and Union Avenue to Mulberry Street, on to Ninth and on to the State Line to connect to a new company organized in Wyandotte. 116 The “horse” in the name of the railroad would indicate it as the hybrid of its day. Part horse, part mechanical, it bridged the old and the new.

The city grew and changed along with its transportation and reflected the changes in both regional and national events. Competition for the Kansas City and Westport Railroad started up in the form of the Jackson County Horse Railroad Company, which established offices and stables at 4th and Walnut on the levee.
As far out as 20th and Cherry, a hospital was listed for the second time in a city directory, clearly not yet served by public transportation. “Barar, C & Son, Car-builders—street” had a factory between 19th and 20th at Grand Ave, becoming part of the growing industrial section of the city. Brick works were now “steam-pressed,” and “hoisting machines” steam and hand-powered were available by local agents. 117 The levee along Delaware Street, “the great wholesale mart of the valley of the Missouri is teeming with an activity never before witnessed, and we are positively assured that its trade alone will reach forty per cent in excess of any preceding year in its history.” 118

The city was taking on the characteristics it would retain to the present time—wholesale district at the levee where the great storehouses of furs were once held by the Chouteaus, then the real downtown of banking and retail, and then to the industrial section beginning around 16th street and running to the outskirts of Westport at 37th streets.

**The Future of This System is Filled with Possibilities**

Not surprisingly, New York and Boston started their horse railroads around 1838, thirty years earlier than the frontier of Kansas City, though until 1850 only one road carried small horse-drawn cars in New York City. By 1870 twenty lines of passenger railroads prospered in New York City, employing nearly eight thousand horses. Their gross earnings equaled about $1,000 per horse or $8 million for the company per annum. Brooklyn, Boston, Philadelphia, Cincinnati and Chicago had nearly as large fleets; all other cities of twenty-thousand inhabitants or more had lines of similar but smaller dimensions.
Collectively, the roads in American cities extended almost 2,000 miles and carried more than 300 million passengers per year. Horses still supplied the energy, not with wooden wagons, but with metal streetcars instead. Coal as coke had created the ability to produce metal in large pieces to create such a thing as a street car, though in the beginning the urban horsecar was also built with wood and covered with a metal covering.

Innovation began in Europe first and then crossed the Atlantic. In 1881 the first electric railway was built in Germany, but struggled with technology. The Germans had already moved beyond steam for railway purposes and had invested in electricity in the form of battery-powered street cars. “The machinery for converting coal into the power, or rather extracting power from coal, is not portable, but stationary and can be placed in the most convenient spot.” The mechanism they used was a central rail though it sometimes became encrusted with dirt and could not “communicate” with the battery itself.

This problem also crossed the Atlantic and became a matter of concern at the next electricity conference. The Second Annual Proceedings of the Electric Light Association, electric pioneers, discussed the significance of this in Baltimore, Maryland, February 10, 1886 with prescient forecast. At the same time this discussion gives a snapshot of the cautious understanding and progress being made in electricity. One delegate explored the subject:

From all I can gain on this subject, it is my opinion that the most practical way will be to use wires and poles. The poles can also be made available for stringing electric wires for both incandescent and arc lighting. The future of this system is filled with possibilities. It will eventually become the motive power of all the present horse railways.
Members of the Association of Electric Light agreed that the “present system of making steam in locomotive-boilers is expensive as well as wasteful.” The ratio of evaporation of pounds of water to each pound of coal consumed to make steam in locomotive boilers was the key to profit. The then-current ratio of making steam in locomotive boilers of three-and-a-half pounds of water to a pound of coal using the best grades of bituminous coal was too costly. At the same time the stationary boilers, set to burn coal screenings (a lesser grade of coal) for fuel evaporated nine pounds of water to one pound of fuel, reducing the cost of fuel from one third to one half.\textsuperscript{122}

The discussion continued on to forecast the next step in augmenting electricity and phasing out the horse:

It is only a question of time when all the different electric lighting stations in this country will use their engines in the daytime to make power to be sold for manufacturing purposes, the same as they sell power in the form of electric lights now. They can also furnish power to run electrical railways, elevated or surface. The economy of this system over the cost of running horses, as used now, will be over fifty per cent.\textsuperscript{123}
Daytime use of electricity was an idea then in formation. Lighting was seen first as the real reason for pursuing electricity, its use beginning in the evening. But with the advent of
electric railways and electric coal cutters and other mechanical uses of electricity, the daytime hours began to be productive as well.

In April of 1882, as part of the mix of horse and machine in Kansas City, the city council approved a franchise for another horsecar railway to operate along part of Eighth Street to part of Main Street, to part of Ninth Street to part of Jefferson Street, a small line but one that serviced a business district growing in density and importance. Then along came a new combination of energy and technology, the cable car.

Along with the horsecar endeavor, Kansas City could boast of being one of the first in the cable car business. According to local historian and eye-witness Colonel Theodore Case, Kansas City was third in cities just behind Chicago and San Francisco in that order. In 1880 the nation as a whole had only sixteen miles of cables in operation. By 1884 the total had increased to thirty-four; by 1888 the list of cities using cable cars included New York, Philadelphia, Cincinnati, St. Louis, St. Paul, Omaha, Oakland and Los Angeles. Beyond American shores London, Melbourne, Sydney and Auckland, New Zealand each had started their own lines. The systems were often powered by two 500-horse-powered Corliss steam engines turning a wheel with cables running under the surface of the street (see fig. 3-8). The original power house in Kansas City was located at Ninth and Washington but expanded to a new powerhouse at Eighth and Woodland in 1887 with two Corliss engines of 750 horsepower each and became, at the time, the largest institution of its kind in the world with 130 cars, 210 employees and car designs “of the latest and best patterns.”
The effect of the cable car on the city was intoxicating. The stock of the KC Cable Company appreciated more than a hundred percent to $255 a share. Real estate prices along the routes shot up as people envisioned the cars penetrating to the farthest reaches of the suburbs. While the horse railway was viewed as a great improvement over carriages, the cable car appeared to be an invention unique in its ability to elevate the expectation of the city toward modernity. Theodore Case noted the following about the growing interest in all things mechanical.
“Real estate men saw their opportunity, and with the sagacity peculiar to their class, seized upon it. They saw that ultimately cable lines, annihilating distance and removing time, would penetrate to the exteriors of the city and additions were laid out as fast as they could be surveyed and the plats filed. The problem of rapid transit through the city, across the ravines and over the elevations was solved.”

**Carried the People as They Had Never Been Carried Before**

The city transportation discussion continued worldwide on the merits of horse vs. cable vs. electric as the energy transition took place in small increments. The horse was clearly on its way out with two new systems to choose from, though each had its problems. The cable car system worked “where the traffic is exceptionally large, but its cost prevents its adoption except in places where the transportation is extraordinarily large.” The storage battery system was “destined to failure.”

The conversation ranged from storage batteries to trolleys electrified by rail or pole. A visit to Richmond, Virginia, reported in the pages of the *Electro-Magnetic Journal* published in Kansas City showed the very latest in electric trolleys:

We started for Richmond. What we found there was perfectly surprising and amazing to all of us. There in the city of Richmond, a city of 90,000 inhabitants, was a road twelve miles long over grades and around curves. It is operated by a system of overhead wires, which is positively unobjectional; the cars ascend grades of nine per cent at the rate of six miles per hour, and are under the most perfect control.

Perfect control, however, did not mean perfect success. The theme of “communication” between car and surface again came under discussion. The track itself was in “exceedingly bad order.” It was laid without any paving at the sides, “laid in Virginia mud; the cars would
get off the track continually, and one thing and another would happen.” But the inspection team left satisfied that they had seen the future and that it included an “electric road.” The Richmond road was “carrying the people of Richmond as they have never been carried before, and with entire

Figure 3-13. 1873 Map This 1873 map shows the original railroad bridge crossing the Missouri River at the top and immediately turning west because of the cliffs close to the river. The railroad makes its way to the West Bottoms where the state lines come together and share the cost for the railroad bounded by the Kansas River on the west and Turkey Creek on the south. The “original town” plat in pink is immediately to the east of the Hannibal Bridge. Missouri Valley Special Collections, Kansas City Public Library.
satisfaction to everybody.” It would soon have from seventy five to a hundred cars running on the streets of their town.\textsuperscript{130}

The Kansas City cable car line, meanwhile, in spite of its success would soon be overtaken by the electric streetcar. The Corrigan system, named for its owner Thomas Corrigan, powered by batteries was also changed to cable, followed by the construction of the 10th Street cable road, which paralleled the lines of the Kansas City Cable Railway Company, a competitor line, and this was followed by the construction of the 10th Street cable road, which paralleled the lines of the Kansas City Cable Railway Company, and “proved immediately on its completion and operation that cable roads in Kansas City had been overdone.”\textsuperscript{131}

While the cable dominated the scene, however, it offered a certain cache to the city and adventure to its riders. After numerous delays and tribulations a start was effected, and only one trip made over the road. Such an experience has rarely if ever been equaled. The rollers in the grip jaws made a noise like a threshing machine, and when they did succeed in gripping the cable, the car shot forward with a jerk sufficient to throw one off his feet. In fact the entire trip was a series of jerks and jumps, the rollers slipping from one end of the jaws to the other. On the completion of that trial trip every creditor made a rush for his money. Liens were filled and suits instituted to such an extent that for years that road stood as a monument to the folly of the enterprise.\textsuperscript{132}

This scene, amusing now, had a hair-raising quality to it, that made new-found technology less friend than frightener. The Ninth-Street Incline was an ebullient testimony to cable car
riding that both terrorized and inspired riders as it moved between railway station in the West Bottoms and the growing town on the cliffs above.

The Decision as to Electricity vs. Horses

The comparative cost, not to mention the pollution of horses, became a decades-long part of the conversation. Each was calibrated to equate with the other. The article in the *Electro-Mechanic Journal* published in Kansas City in January 15, 1889, observed, “The life of a good battery should be about the same as that of an ordinary tramway horse; if both are used with care they should last for about four years.”

This remark was followed by a discussion of battery-powered tramcars as part of the mix among horse, cable and electric rails. “For one car, two sets of batteries would be necessary, and supposing that each set weighed one-and-a-half tons, there is a total weight per car of three tons. One set is sufficient to carry an ordinary tramcar for about thirty to forty miles on average roads, that is half a day’s journey. Two sets therefore will be enough for each car per day; and the batteries will only need changing once.”

Across the Atlantic, the Germans had been hard at work on the same problem. German observer, Herr Zacharias, gave a comparison between horse and electricity in stables in Berlin to settle “the decision as to electricity vs horses”

He estimated that less than half the annual expenses were needed to work with batteries rather than horses. Herr Zacharias stated that the figures given were derived from actual working on the Berlin tramway lines and may therefore be given credibility. The *Journal* editor commented that the cost of working the horse cars may have been overestimated; ten
to fifteen per cent depreciation were sufficient for “properly worked and well supervised batteries.”

By February of 1889, the question the Kansas City-published *Electro-Mechanic* posed was about the weather. Could the electric car handle snow and ice? What would be the effect of low temperatures on the batteries? The news from Davenport, Iowa, proved heartening:

Though the tracks were covered with ice and snow and snowplows and scrapers had left hard ice on the track, the electric cars brushed away such obstacles with steel brushes. “The electric cars moved along without a break with almost the usual speed, and with much less difficulty than motive power on horse car lines encountered.” Two horse cars did their best with the weather. They had two mules on one and two horses on another but each electric car had 15 horsepower. The electric car even did better than the Chicago, Rock Island & Pacific freight train that “did not move for half an hour.”

The electric car moved “a very heavy load” up the hill on the icy track in less than six minutes. “Two teams of horses could not have done the same under similar circumstances in less than fifteen or twenty minutes.” The satisfying results of this scene emboldened the writer to announce that the “electric system will be adopted in both Sioux City and Aberdeen” in the near future. In this manner each city found its way to the new technology and chose what worked best for its population, but all agreed to leave the horse behind.

**Twelve Miles for a Nickel**

By August 1, of 1889, the *Electro-Magnetic Journal* proudly announced that electric tramways had arrived in Kansas City:
The city now has the finest system of street railways in the world, and the new line will compel all rivals to admit the fact. A person will be able to board an electric car in the extreme northeastern part of the city and travel to the extreme southwest and over into Kansas City, Kansas, over the electric and cable roads at a speed of not less than eight miles an hour. Or he can travel in the same manner from the southeast to the northwest. On the Metropolitan Company’s lines alone he can travel from the western limits of Kansas City to the eastern and southeastern limits of Kansas City, Missouri, a distance of from ten to twelve miles, for a nickel. No other city in the world can show such a system of interior transportation.\textsuperscript{136}

By January 1, 1896, the \textit{Journal} newspaper reported that their Metropolitan Street Railway Company ranked among the greatest of the street transportation companies of the country. It owned 135 miles of cable, electric and horse railway, penetrating the two Kansas Citys in every direction like a network and extending to Independence, Westport, Rosedale, Sheffield and other suburban towns within a radius of ten or twelve miles. The capital stock of the company was $5,600,000. The company owned 147 grip or cable cars, 249 cable trailers, 109 cable cars, 54 electric motors, fifteen electric trailers and 47 horsecars. The company furnished the power to this impressive system with an engine and boiler capacity of over 6,000 horsepower, distributed through eight power houses around the city.\textsuperscript{137}

By 1900 the exchange between horse and machine had largely been completed. The above mix of batteries and horses, cables and power houses typified the necessary exchange of one technology for another along the line of the transition itself. The next exchange would be from the remaining individual horse carriages, necessarily remaining, to the automobile that would encroach on the crowded streets of Kansas City in the early years of the twentieth century.
A broader view of the exchange of horse for electricity was voiced by author James P. Boyd in his 1899 *Triumphs and Wonders of the 19th Century*. In speaking of the passing of the horse-car and its substitution by the trolley, a distinguished writer indulged in the extravagant expression of the period to capture the awe and enthusiasm that electricity brought to the public. Nothing like it had ever been seen in the life of man, and the ability to actually use it as a matter of choice and convenience excited everyone.

To use it to replace the plodding, obedient, and often misused and abused horse came as a relief to many. The Society for the Prevention of Cruelty to Animals was created in 1866 to protect the horse from its grueling life. People sensitive to the abuse of the horse must have been pleased to find an alternative land transportation they could embrace, not only for its amazing powers of self-propulsion, but for not having to sit behind the haunches of a horse straining in its traces.

Humanity in an electric-car differs widely from that in the horse-car, propelled at the expense of animal life. It is more cheerful, more confident, more awake to the energy at command, more imbued with the subtlety and majesty of the propelling force . . . . There is no dragging down and subjugation of a physical force. There is only a going out, or up, of genius to meet and to grasp it. Its universal application means the raising of mankind to its plane. If electricity be the principle of life, as some suppose, what wonder that we all feel better in an electric-car than any other. The motor becomes a sublime motive. God himself is tugging at the wheels, and we are riding with the Infinite.

Transportation used electricity soon after lighting found its magic. Small appliances would come in the twentieth century, but the problem of getting around, the challenge, the smell of horses and their deposits would soon be at an end. Yes, animals would still work, problematic and expensive as they were, while electricity seemed like “God himself tugging at the wheels.”
CHAPTER 18

FROM RIVER TO RAILROAD

A less obvious energy transition but a signal of the influence of coal was the change of focus from the riverfront to the railroad yard. Even though the railroad would eventually take over the burdens of the river traffic, steamers still discharged 28 million pounds of freight as late as 1888.140

The Hannibal Bridge of 1869 made the Kansas City area not only the crossroads of railroading to the West, but the nexus of more and more railroad connections to all points of the compass. With the railroads arriving from the West and from the East, the obvious place to put the connecting points was in the West Bottoms on the state line between Kansas and Missouri. That spot that had been a dense forest for the French, a hunting ground thick with deer for the settlers, the firewood and lumber yard for the growing city, had by the 1880s been cleared the land to provide the site for the Union Depot and numbers of railroad switches. It may be that remaining woods were swiftly cleared out and used for fuel for the first trains arriving since coal supplies would be tenuous.

This made the West Bottoms the most important area of the city. The city council appropriated $60,000 for street improvements that led to the opening of Third, Fifth and Twelfth streets. Both the Missouri Pacific and the Union Pacific terminated there and demands for passenger accommodation through hotels, restaurants, saloons and local transportation were soon supplied. “It now became evident that the business base of the city would be transferred from the levee where it had always been . . . and that Kansas City was destined to become a railroad center, rather than a steamboat town.”141
The river could not, in fact, handle the traffic that deluged the town and of which Kansas City was justifiably proud. In 1893 the Commercial Club of Kansas City, a group of professional businessmen who also promoted the city issued this report: During 1892 Union Depot handled 970,000 pieces of luggage, an increase of 50,000 pieces in one year. The baggage department handled 33,823,750 pieces of United States mail and 3,408,000 letters and packages for railroad departments. At least 134 trains arrived and departed on a daily basis, including specials and extras that themselves made a total of 120 per day! The riverfront landing was simply unable to handle that kind of traffic. The embodied energy of passengers, freight, and letters going in multiple destinations beyond the river itself impacted the Kansas City area to eclipse river traffic for its earlier purposes. The simple days of linear river boating and delivery were over.

By 1893 Kansas City had nine passenger depots and 36 railroad warehouses and freight depots mostly in the West Bottoms. “Unequaled switch facilities” provided access to 450 commercial houses, which loaded and unloaded goods there. The railway facilities were “unsurpassed by any city in the world.” Kansas City had as many railroad lines as Chicago (26), which was more than St. Louis (19), more than New York City (17), more than Cincinnati (15), Buffalo, St. Paul, Omaha (11 each), Philadelphia (9), Indianapolis (8), New Orleans (8), Pittsburgh (8), Boston (6), Denver (6) or San Francisco (5).142

Even though 1892 had been a year of economic depression, the city had handled over a $100,000,000 worth of merchandise that did not include their mammoth market for livestock and grain. The yards had shipped 38 million bushels of grain, had processed in the local slaughter houses 1,358,588 cattle, 2,654,700 hogs and 484,000 sheep. To carry the stock and
grain required 158,000 railroad cars. With a population of 134,000 in the city proper, and another 90,000 in Kansas City, Kansas, across the Kaw River, “which is, in fact, nothing but Commercial Kansas City,” the metro had 225,000 thousand “bona fide” population. The little village beside the limestone pier had vanished into a railroad destination of world-class proportions.

Figure 3-14. Regional Railroad Map 1873 Railroads serving Kansas City in 1873 overlays the land that once knew only the curves of Indian territories. William D. Kelley, History of Kansas City, MO: Her Business, Population Natural Resources: The Manufacturing. Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Missouri.
CHAPTER 19

THE CHANGING ROLE OF WOOD FROM ONE ENERGY SUITE TO ANOTHER

The role of wood in civilization took a turn from local building material to supplies of industrial proportion from locations distant and unknown. Wood, by virtue of the quantity cut and the remote location of the forests, created its place in the new energy suite with coal as fuel. In its demise as fuel, wood was reborn as building material delivered by railroad.

Mammoth Interests of Both Lumber and Coal

In the 1870s wood reached its height as both passive fuel for home heating and active heat for steamboats and locomotives. Consumption of fuel wood burned in 1870 was 138 million cords, the zenith in quantity of fuel wood use at seventy-three per cent. By that same year coal had increased in use to over 40 million tons and had become over twenty-six per cent of the fuel picture. Because of the weight and the difficulty of hauling wood by team and wagon, it had always been a local fuel and building material until steamboats made it possible to bring both fuel and lumber great distances. Now railroads would burn fuel and carry lumber as well. Though wood had been used as both fuel and building material from the beginning of time, the supplies needed for burgeoning cities like Kansas City required a railroad for transportation to keep up with demand.

Wood was still a very relevant material in the last quarter of the nineteenth century. Wood from species no longer known to the average consumer today were in demand for building. This quote suggests the irony of importing wood from forests far away from the standing
timber in the state, such exchanges made possible by the railroad’s ability to crisscross the states with raw materials formerly carried as short a distance as possible by horse and wagon:

There are many excellent varieties of timber for fencing, agriculture and mechanical implements, for cabinet work and for carriages. These varieties comprise twelve species of Oak, four of Hickory, two of Walnut, two of Maple, two of Elm, three of Ash, two of Locust, two of Cottonwood, two of Hackberry, besides Box Elder, Cedar, Cherry, Coffee Bean, Mulberry, Sycamore, Birch and Willow. The introduction of machinery will give us more of these fine hard woods in our houses, and thus save the expense of poor imitations in paint. Were it not so common, it would be a matter of surprise, that we finish our houses and churches in pine from Wisconsin, that we may cover it with paint in imitation of the oak, walnut and cherry, which grow so abundant in our forests. Boone County burns up much of her best lumber, and pays Ohio and Illinois many thousands for the same kinds manufactured into implements, vehicles and furniture.\textsuperscript{146}

Since coal also required railroad transportation from mine to market, the two resources often intertwined in the same business. Railroad spurs were specifically built to reach remote coal mines and timber lands making them accessible in large quantities delivered in an efficient style. One such local company controlled “mammoth interests of both lumber and coal.”

Beginning with a capital sum of forty-four dollars, Richard H. Keith, a repatriated Confederate soldier, established a small coal yard on Bluff Street in 1871 “when Kansas City had very little industrial or commercial importance and handled not more than thirty or forty carloads of coal per day.” (A carload measured ten to twelve tons at that time.)\textsuperscript{147} The city
proved a profitable marketplace and by 1893 Keith had reorganized the Keith and Perry Coal Company into the Central Coal and Coke Company.

He opened one mine after another in Missouri, Kansas and Arkansas. Starting with two or three men at the original coal yard on Bluff Street, the company grew to employ about 10,000 men with an output of 120,000 cars (probably of greater capacity than twelve tons since they grew by the turn of the century to hold from 30 to 90 tons) from mines in Kansas, Missouri, Indian Territory, Arkansas and Wyoming.

The company established 25 stores and coal yards and offices in Wichita, Kansas, St. Joseph, Missouri, Omaha, Nebraska, and Salt Lake City, Utah, and became the leading coal company in the Southwest. One of Kansas City’s downtown office buildings was called the Keith and Perry Building at 9th and Walnut.

With the help of the railroad the lumber enterprise grew rapidly. Keith purchased a small lumber company in Texarkana, Texas, along with twenty-five acres of forest within the city limit. He modernized the small plant and within eight years had cut into lumber the entire marketable timber from the Texarkana property, and then moved the operation to Carson, Louisiana to start anew, “owing to the exhaustion of the timber supply of the company at the former place.”

The Carson mill cut about five million feet of lumber per month and shipped them via the Missouri & Louisiana Railroad, virtually owned by the Central Coal and Coke Company. Then Keith formed a new corporation, the Louisiana and Texas Lumber Company, for the purpose of harvesting 165,000 acres of pinelands in Houston County, Texas. The lumber was
Another leading lumber and coal business, the Dierks Lumber & Coal Company ranked as one of the foremost local yards at 16th and McGee streets in Kansas City covering fully half a city block, including a large, two-story office and store house. The company started up around 1875 and by 1900 had a daily capacity of about 200,000 feet of lumber, “principally, yellow pine lumber as well as fine fuel coal, the local house supplying most of our builders, manufacturers and also doing a large family trade.”

Another businessman, Alfred Toll moved to Kansas City from Hannibal, on the other side of the state, after having successfully run a lumber business there in 1866. By 1873 he had enlarged this organization as the Badger State Lumber Company with mills in Wisconsin and in 1886 moved to Kansas City to make his headquarters there. This business having prospered, he also organized the Fort Smith Lumber Company of Fort Smith, Arkansas where four mills operated. He owned 94,000 acres of timber land in that area and used much of that lumber to build the Central Railroad of Arkansas. By 1900 he was president of the Badger Lumber Company, the Fort Smith Lumber Company, the Central Railroad of Arkansas and the Choctaw Investment Company, a series of businesses that complimented and supported each other in the marketplace.

Well-known lumberman and pioneer conservationist John Barber White (1847-1923) also combined lumber and mining. He helped to organize the Missouri Lumber and Mining Company in 1879. As a conservationist he came to the notice of the White House, and
President Theodore Roosevelt appointed him to the National Commission on the Conservation of Natural Resources in 1908.

During his administration the President put under government protection two-hundred-and-thirty million acres, including five national parks, eighteen national monuments and twenty-four reclamation projects. He was in touch with naturalist John Burroughs on the East Coast and John Muir, founder of the Sierra Club, on the West Coast. Roosevelt also pioneered the idea of selective cutting in which mature trees are carefully removed to avoid damaging new growth.

As the nation’s forests yielded to massive cutting and the outcry for conservation could be heard throughout the nation, it was coal mining and the fruits of those who labored in the dark that took over the national economy. Both lumber and coal thrived on organization and mass production. Systems of organization augmented by steam engines and rail multiplied the processing of the nation’s resources.

As business history author Alfred Chandler noted, “Coal mining brought the pattern of modern enterprise with it—a need for organization, managers, coordination of transportation and output.” Jay Gould saw this need and systematized transportation and coal production on a large scale. The Kansas City coal and lumber companies did the same on regional scales, far beyond the confines of the city or county, into states in the South and Southwest. These coal and lumber companies exemplified the changing nature of the raw resources industry. No longer a farmer’s supplementary effort with either wood or coal or a small-time coal mine or woodyard with a half-dozen hands, coal mining had gained a whole new level of exploitation and organization.
The role of wood began to grow in all directions after the Civil War. In the 1870s Missouri ranked eighth among states in quantities of timber cut at twenty-nine million board feet, compared to Michigan as number one at 2,251,000,000 board feet. Kansas did not qualify with a ranking its numbers were so low: 750,000 board feet. These were reports of sawmills cutting lumber, not wood chopped for home heating and cooking.\textsuperscript{153}

The Kansas City \textit{City Directory of 1870} proudly lists the lumber yards in the growing town: Corner of Fifth and Delaware and Santa Fe Street, Latshaw, Quade & Co., sold during the year ending 31st August, 1869, 5,480,699 feet of lumber; shingles, 3,881,000; and lathes 1,808,840, amounting to $240,000. Other lumber yards lined the streets: 1) corner Walnut and Twelfth, 2) Walnut Street from 11th to 12th, 3) corner Main and Eleventh, 4) west side Main between Court and Eighth Street, 5) between 18th and 19th streets, and 6) Grand Avenue, McGee’s addition, corner Grand Avenue and 18th. Clearly the building boom marched forward with ample supply.\textsuperscript{154}

The age-old product of wood had expanded to furnish a superstructure that included in its arc the use of wood as fuel, the supply for steamboats and then for railroads and then clear-cutting of forests to build dwellings and shops in cities. While the nation’s forests filled the building needs of an influx of population in the final decades of the nineteenth century, coal picked up the fuel needs. The commercial dominance of wood as fuel in 1870 was three-quarters wood to one-third coal. By 1900 the reverse was true.\textsuperscript{155}

The “abundance of the raw material” of coal required more than horses and wagons for transportation. It required furnaces, grates, processing into coke and railroads to carry it. The qualities of coal itself at BTUs higher than wood along with the process of turning coal into
coke for metal smelting made greater production of iron possible than the charcoal plants tied to nearby forests. The final cost of charcoal as fuel remained steady at $20 a ton as far back as 1845 versus coal as fuel at $3.25.\textsuperscript{156}

Coal and railroads formed a symbiotic relationship, the one being the fuel for the carrier, the other the carrier for the fuel, while iron to make the carrier was made accessible with anthracite coal--all to serve the rising field of enterprise. Coal, iron and transportation in the form of the “iron horse” created an unbeatable combination. Other business partnerships and evolving systems from merchants to bankers had formed on the Kansas City waterfront in the antebellum years to serve the emigrants, but only the arrival of coal as fuel unlocked the potential of capitalism on so grand a scale.
CHAPTER 20
THE STRUCTURAL EXPRESSION OF COAL: STEEL

Wood and stone for building material would now be replaced with steel in quantity made possible by the Bessemer process of making steel. While steel had been available historically, each piece had been beaten out by a blacksmith on a forge in small quantities, an inefficient method that kept steel expensive. Now all that would change as a new process would make cheap steel available in large quantities.

Bessemer: Eight-Hundred Pounds of Metal in Thirty Minutes!

One of the great bottlenecks in nineteenth-century industrial development was the inability to make quantities of steel at a rapid rate and a reasonable price. Although the hot blast furnace developed in the 1830s and 1840s and the growing exchange of coke from coal as fuel was replacing charcoal from wood, steel was “still a luxury product.” To make it commonplace was the goal of English inventor Henry Bessemer (1813-1898) who patented a process rather than a formula. In one of the early recycling efforts of the Coal Age, he used the waste heat from the blast furnaces to heat the blast air. With this simple closed circuit, Bessemer reduced his fuel consumption by forty per cent. His process, like that of his fellow Englishman Abraham Darby a century earlier and his exchange of charcoal for coke, was slow to be adopted.

In 1856 Bessemer presented his paper called “The Manufacture of Iron Without Fuel” in England. He claimed to be able to “do” 800 pounds of metal in 30 minutes against the puddling furnace's output of 500 pounds in two hours. Early licenses to use the process,
however, left other iron makers unenthusiastic, and Bessemer was forced to experiment on his own without benefit of income from licenses until he proved the worth of his process by providing steel at $20 less a ton than his competitors. By 1859 he was making steel with his “pneumatic” or forced-air process. American ironmakers first adopted it in 1865, while experimentation went on in this country on various ways of decarbonizing steel, dealing with chemical combinations of pig iron, fuel and blast, conflicting patents by other early experimenters and financial constraints. Steel on a mass scale evolved in a complicated fashion.159

One of the first uses of steel was to replace iron rails for the railroads. Steelmakers were not able to guarantee quality, however, which kept the iron-rail makers in business for another twenty years.160 To assure greater control over the rail-making process, the Reading Railroad built its own steel mill in 1868. Steelmakers also began building integrated works where they could combine iron smelting as an “adjunct to steelmaking.” This combination of processes to support the creation of a final product from start to finish would become more common. While doing so would increase speed and quantity through mechanization and greater scientific understanding of what made good steel, at the same time the combined factory processes reduced individual workmanship from artisan to employee.

“The knowledge of materials and how they could be expected to behave was inexact, and the tools for measuring the chemical content of materials were imperfect. People tested their materials in somewhat impressionistic ways, both for physical and for chemical properties, and tried to build their findings into a unified description of the phenomena observed.”161
The Bessemer process produced at least 50 per cent of the steel in this country until the
beginning of the twentieth century when a much-evolved puddling process took over.\textsuperscript{162}

What once had been an art of reading the molten iron, the rising vapors with careful,
individual attention to small batches of metal became an assembly of interacting parts on a
grand scale. “Union and business leaders, in their quest for political and economic power,
lost interest in the intellectual content of work and were willing to connive artisans’ creativity
with rigid work rules and bureaucratic control of the shop floor. As they did these things,
they put in place the forces that would later bring about the demise of the great American
steelworks.”\textsuperscript{163}
CHAPTER 21
IS PETROLEUM A NECESSITY?

Though it took coal more than eighty years from first recorded shipment (1758) to reach a production milestone of a million tons, oil reached the equivalent of that in ten years. Fledgling wells pumped 500,000 barrels in 1860 and a strongly organized industry increased that to nearly 5,000,000 in 1870. In 1873 the Titusville, Pennsylvania, Morning Herald asked the editorial question, “Is petroleum a necessity?” and went on to suggest that it had already been proven to be of “such commercial and social importance to the world that if it were suddenly to cease no other known substance could supply its place, and such an event could not be looked upon in any other light than of a widespread calamity.” This praise was based on illumination and lubrication, not on internal combustion, an idea whose time had not yet come. Coal, however, had received no such prophetic welcoming. It did not bring to mind that kind of proclamation though it had and would provide the stepping stones for oil’s success as wood had done for coal.

Using the distilling infrastructure of coal oil (that had borrowed whale-oil distilling practices, a light-source coal oil was replacing in the 1850s), producers and distillers quickly adapted the process to refining oil, separating products and marketing them. The first decade had also seen the bumbling attempts to contain a liquid fuel get organized to solve those problems with barrels and tankage.

The transportation industry had taken on the task of moving liquid in quantity and evolved in short order from horse team and riverboat to railroad transportation and pipeline. The lightning progress not only could be attributed to the infrastructure already available that coal
built, but “partly it was because innovation was in the air—because the mid-19th century, especially in the United States, resembled a great laboratory both for the debut of intellectual invention and for the nurture of the alchemy needed to translate it into revolutionary applications to the physical world . . . The oil and gas industry was one of the earliest of a bevy of American businesses that would combine ‘future shock’ changes in science and in economic theory and management methods.”

Perhaps no greater example exists than the new and ever-expanding oil industry. The remaining thirty years of the nineteenth century would witness the rise of the Standard Oil Company, incorporated in 1870, as an organizing and threatening force in the marketplace, the expansion of prospecting from “the Region” in one state to many regions both in and beyond Pennsylvania and the world, the building of large refineries, the “vertical” organization of the activities of the oil business into fewer and stronger companies and the competition with foreign markets. The new fuel was irresistible as a light source, and as soon as practical problems were overcome at the production end, it was universally accepted by consumers.

Who could not welcome a cheap and brilliant light that once poured into the new glass lamps lit the room better than any previous fuel ever used? By the early 1870s eight-nine per cent of foreign kerosene shipments went to Europe, almost three per cent to China, and about two per cent each to North and South America. Over the course of the next ten years, Europe would import less and Asia more as each market responded to the new fuel either by increasing tariffs to encourage exploitation of their own oil deposits as in the case of France and Spain, or in replacing glass lamps with tin, and bean oil with petroleum as in the case of China.
Cost and availability of the lamp at about $3 each prohibited many from using it in the beginning, but over time costs of both fuel and containers came down. For the first time the modest homes of the low and middle-income workers around the world could be lit against the night. The “trading class” in China found a kerosene lamp on at desk or passageway a boon to extending hours in retail and wholesale business.\textsuperscript{167}

The business in oil products consisted primarily of axle grease, kerosene or other lantern fuel, naphtha, benzine and gasoline used as cleaning fluids, and paraffin for a wide variety of uses including sealing jars of canned goods. Though nine other countries by then produced oil, borrowing technology and process from Drake’s approach, still Pennsylvania produced over ninety per cent of the world market.\textsuperscript{168}

The Standard Oil Company approach was first to buy up small refineries and reorganize them under the Standard banner to increase their yield. The next step was to take over transportation, first railroads and then pipelines. A third step and coinciding with the first two was to go beyond the boundaries of the state of Ohio where the company had been incorporated to other states via the legal mechanism of the trust held by officers of the original company, the trustees.

The trustee idea eventually became a holding company of businesses bought in other states whose shares and profits were passed on to Standard Oil shareholders.\textsuperscript{169} In 1877 Standard Oil of California was formed by local businessmen in Ventura to spur oil drilling there and bought by Standard. In Maryland that same year the United Oil Company, formed of many smaller firms, joined Standard. In 1878 Waters-Pierce Oil Company of Cincinnati joined the Trust.
In 1879 Standard Oil of Ohio marketed to Ohio, Indiana, Illinois, Wisconsin, Michigan, the Rocky Mountain States, and California. They also acquired Standard Oil of California by way of their Pacific Coast Oil Company. In 1880 the company founded Imperial Oil of Canada. They added the Vacuum Oil Company that year from the Rochester, New York, a company that manufactured lubricating oils by vacuum steam distillation, and the Chesebrough Company that made the already famous “Vaseline” petroleum jelly in 1881.

That same year the company moved into pipeline installation and operation by way of their National Transit Company. New Jersey laws allowed corporations to own stock in other corporations so the Standard Oil Company of New Jersey was formed to provide administrative coordination to the Trust in 1882. Standard Oil Company of New York also formed that year and oversaw most of the foreign territories.
Another company, the West India Oil Company formed to handle refining plants in Cuba and the Caribbean. Needing transportation for the West, Continental Oil was acquired to distribute Standard products to Colorado, Montana, Utah, Wyoming, and New Mexico. Regional company Gilbert and Barker were acquired by the Trust. In the Midwest in 1885 the Standard Oil Company of Iowa was given responsibility for marketing along the Pacific Coast. The Buckeye Pipe Line, still listed on the New York Stock Exchange in 2008, was formed in 1885, along with the Solar Refining Company while Standard’s Vacuum Oil Company sailed across the Atlantic and opened offices in Liverpool, England.

By 1886 the Trust had taken up residence in Kentucky, establishing the Standard Oil Company of Kentucky and absorbing companies there. The same was true in the North Central states where standard Oil Company of Minnesota absorbed another regional company in Wisconsin, Minnesota, North and South Dakota. In 1889, skipping over some lesser acquisitions in other states, Standard Oil of Indiana built a refinery in Whiting, Indiana, the “production end of the business” being its only task. That same year South Penn Oil Company was formed to further explore Pennsylvania and West Virginia to produce more oil. Standard Oil Company of Illinois was then forming in 1890 and absorbed the assets of P. C. Hanford Company.\textsuperscript{171}

In other words, though many independent producers, pipeline companies, refineries and transportation companies still existed, they all felt the pressure and threat of the mighty Standard Oil. In 1892 due to court action in Ohio where the original company still operated, the Standard Oil Trust officially dissolved and gave the responsibility to the New Jersey standard Oil Company to become the controlling organization for the Standard brand.
Over the next decade this pattern of acquisition continued throughout the United States and throughout the world. Offices were opened in China, Japan and Germany. At home, Standard of Kentucky sold to Indiana Standard to Iowa, Nebraska, Kansas and Missouri. Two new companies, bowing to anti-Standard sentiment, formed Standard Oil of Kansas and Standard Oil of Missouri. Kansas was particularly upset; Standard operated only one large refinery in Neodesha in that state.\textsuperscript{172}

Standard Oil arrived in Kansas City in 1880. In spite of the hue and cry against Standard, the law suits and the vituperation, the following quote written from a distance of twenty years later describes in very positive terms the influence of the company on the local scene:

The great Standard Oil Company practically controls the coal oil trade of the world. And yet it has been through the very operations of that company's vast aggregation of capital, resources and facilities which enabled them to produce more oil, to handle more oil and handle it at far less expense than a widely scattered and large number of small operators working under primitive methods and with deficient equipment. The local yards of the company cover not less than four acres of ground upon which are located 30 extensive tanks and other necessary belongings of the oil business, including a handsome new office building covering 5,000 square feet. This business was established here in 1880 and has been under the management of Mr. George W. Mayer for many years.\textsuperscript{173}

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covering 5,000 square feet. This business was established here in 1880 and has been under the management of Mr. George W. Mayer for many years.  

Clearly, Standard Oil epitomized the corporation of the late nineteenth century. First, it had capital. Without that, all the other companies were destined to local and regional strength at best. Because of that, and the way oil required various steps of organization from prospecting to drilling to production to storage to transport to refining to more transport and marketing, Standard was able to integrate those many parts of the process that may have remained separate industries without their leadership.  

Through their financial strength and managerial talent they assumed the risks of the new industry and moved quickly west as fields in Pennsylvania began to die out. In Ohio they learned to refine high-sulphur crude that would prepare them for the Texas crude to come. In becoming national they stood ready to move from illuminant to fuel oil. But John D. Rockefeller, “who took a dim view of using crude for fuel purposes,” wrote this comment to the Whiting, Indiana, plant managers when he learned that it was producing just 60 barrels a day of paraffin, one of the most profitable by-products:

With wax at say fifteen dollars a barrel and fuel oil between fifty and sixty cents, it seems we ought not let our valuable paraffine (sic) plant be idle in order to supply fuel oil . . . . My view is we should distill all the production of Lima oil, run our paraffine plant to full capacity and supply tar and benzine, if necessary, for fuel.  

This short quote says much about Rockefeller’s approach to business. He was legendary in watching his pennies, though at the same time, he seems to be unaware of the fortune to come in fuel oil. Whether Rockefeller liked it or not, fuel oil would soon be the order of the
day. The empire he had built on illuminants and lubricants was but a prelude to the twentieth century.
PART III CONCLUSION

The Great Fuel Exchange, the first of its kind in human history, occurred with some kind of mathematical precision in 1885 as the abundance and higher energy content of coal crossed over wood. In a mirror reflection the two fuels proceeded toward their destinations, coal as the new dominant fuel and wood toward its demise. Had it been a sporting event, it could be said that “coal trounced wood,” or “wood’s defense was weak,” or that “wood was unprepared for the contest,” but little of that observation was ever made.

The crossover was probably unnoticed at the time since “innovation was in the air,” but the results of it were certainly noticeable, and citizens of Kansas City were kept exceedingly busy responding to wave upon wave of energy in the form of people, trains, building efforts, cable cars and the other inventions and artifacts that fairly flooded their lives. Compared to the pioneer days before the Civil War, this thirty-year period had to be a cornucopia of increased materialism.

“The pattern of modern enterprise,” as historian Alfred Chandler noted, required “organization, managers, coordination of transportation and output.” A clarity to effort must have emerged from the melee of events occurring in this outpost turned steamboat town turned railroad town. The sheer numbers of people and things and trains drove organization and coordination. The careful steps of organizing the electric light industry is such a view into a fledgling industry whose most ardent fans could not have imagined the foundations they were laying would support the structures to come.

Fuel, meanwhile, was becoming a more distant commodity. Though the city had a few coal mines, most of the coal supply would come from neighboring counties and from even
farther away. Fuel gathering was no longer a local affair; still regional but by and large beyond the sight of town citizens whose coal came delivered much like the kindling man—the disguised Governor Reeder—might have done, a coal bucket at a time. Or citizens would have bought from the local coal yard, an accompaniment and replacement for the local wood yard—beginning down by the river, but increasingly moving southward.\textsuperscript{177}

The advantage that wood had as a fuel source was that it was visible and cut in daylight. The light of day never reached to the depths of the mines. The miners worked by the thinnest of light sources, problematic and dangerous deep underground. The outcome of their efforts, however, were visible everywhere one looked around the growing city. Whether the citizens actually connected the huge city activity to the labors of men in the dark mines is unclear, but they certainly enjoyed the fruits of the miner’s labors.

Nothing so wonderful from those labors appeared better than electricity for it truly changed the way mankind lives. The early beginnings seem quaint and amusing now, but electricity had the feel of magic to it and was gingerly handled even by the 1880s as seen by the speeches made by the men at the Electric Light Proceedings in cities along the East Coast. Both creators and users of the new light source lived in wonder at its feeble light. To do away with candle, gas light and kerosene was to put an amazing distance, once again, between the user and the fuel source itself.

Now that gritty transformation occurred “out back” or “down the street,” not far at this point since direct current had a short tether, but the raw flame of lighting could disappear with electric light. It did not replace any of those flammable fuels by any means, and in
another overlap between fuel and energy sources, appeared side by side for some years before the fuel and energy picture settled into its current profile.

Distancing from the source is a theme of this part of the fuel story. That distancing included the long farewell to the horse. It was much more complicated than uncoupling the animal from the wagon and turning it out to pasture. Legions of coal miners had to produce the coal underground to replace it. Coal had to be shipped to any number of factories for making cable cars, steel rails, steel cable and for every piece, part and connector of the new mechanical world that would replace the horse.

The horse could not be replaced by an equivalent element packaged in a single unit in a quid pro quo, but must be replaced by the many inventions great and small that would create a cable car system or a street car system or a rail system. A single horse could carry a rider to a destination, but a single cable car without its cable, its rails, its personnel, was useless. For this reason the horse faded slowly as whole systems evolved to replace it. A horseless society took another fifty years to create since even World War II armies had cavalry units still going into battle. Like the Wood Age itself, of which the horse was a key part, the animal as energy unit declined but found its niche in pleasure riding and horse racing as wood found its use in fireplaces and bonfires. The arrival of new kinds of fuel and energy provided the much welcomed retirement for the horse that had served mankind for some four thousand years.

Thus the Stage III: Expansion and Defense worked its way through the energy components and slowly exchanged one element, one component for another across the decades of the 1870s, ‘80s,’90s and on into the twentieth century. No energy component could retire until all its parts had been replaced by a new fuel and its systems. Meanwhile,
competitors of new technologies slugged out market share and jostled to find their places. The expansion of any one of the new fuels met with retaliation and undermining of the others.

Though this part of the story is undeniably about coal and wood, in the background oil moved along at a swift pace organizing and refining its product as much as its fuel system. The fact that it could do all its basic work in 10 years is a testament to the groundwork already laid and many lessons learned from whale oil and coal oil.

The industrialization of lumber—the transformation of local wood into a new commodity of national lumber sales made possible by coal and railroads—and the arrival of steel in quantity changed the way building industry did its work. Steel allowed buildings to be erected beyond the four or five floors to which they had been limited, not just in structural measures but because architecture had to adjust to building tall structures. Structural steel interior walls had to be designed to take the load formerly supported by outer walls. In this way and in countless others, the effect of fuel as coal and oil as light source impacted daily life and changed it forever to become a society of large proportions.
PART IV

THE GREAT SYNERGY OF MULTIPLE FUELS, 1900-1920

The rapid development of all material resources during the closing years of the nineteenth century and the opening years of the twentieth has brought business enterprises up from the day of small things to gigantic proportions, where millions of dollars take the place of hundreds and where men are required to handle thousands as carefully and as successfully as their grandfathers handled hundreds.

--Robert Alexander Long, Kansas City Lumber Baron, 1850-1934

This chapter explores coal’s expansion as wood fuel fell into decline and heavily used as building material. Coal worked to maintain its position in the marketplace at seventy-two per cent of the fuel consumed in this country. Meanwhile, oil continued on its systems-organization path as it reshaped itself into a fuel that burned in engines rather than in lamps. At the same time due to geographic patterns of geologic deposits, oil became a national fuel available from coast to coast, something that coal was not able to do. Coal was an eastern fuel; natural gas became the western fuel for cities like Phoenix and San Francisco.

Figure 4-1. The Fuel Basket  The fuel basket now contains a mix that allows each fuel to find its niche. The multiple fuels attracted new technology and new industries. The oil derivatives of kerosene, diesel, propane, heating oil and aviation fuel opened a bright future.
Coal’s period of commercial dominance from 1885-1920 contained the trauma of World War I with its fuel shortages and shortcomings as a fuel—pollution, labor strikes, huge industrial demands, and an up-and-coming rival, the aggressive oil market. Its power as a fuel destroyed individual artisanship in iron and steelmaking and created instead employees of endless furnaces, intense heat, declining wages, and avaricious and unfeeling overlords.\(^2\)

Coal had a heavy footprint very distinct from wood and oil. The Coal Age was Herculean in its might, whose support of human activity provoked such descriptions as “city of the big shoulders” that poet Robert Frost saw in the city of Chicago. From 1885 to the 1920s coal abundance, shortfalls, delivery problems, pollution—its personality as a fuel--dominated people’s lives from electric-powered streetcars to increasing number of small appliances to the shopping experience itself. At the consumer level the increased cultural artifacts available from Montgomery Ward’s and Sear’s catalogues in the last decades of the nineteenth century came from coal that fired the furnaces that created mass production. Cities became chaotic messes because of the need for workers concentrated in urban areas. Coal supported factories en masse.

Skyscrapers came from men conquering the metallurgical process on a grand scale through coal. Railroads epitomized coal’s strength as both medium and message. Coal introduced electricity that began to erode the efforts of human- and animal-muscle for mechanical output. Mining and forging iron and steel with coal provided a backdrop for labor rights to evolve. It would retire animals from the picture slowly but surely. It made fortunes for men like Carnegie, Frick, Gould and Vanderbilt, while laying the groundwork for the Rockefellers and the Morgans. Coal gave America, not just the city but the nation, big
shoulders. More than any other force, it unleashed the human acquisitiveness on the American continent to harvest the resources of a deeply rich and varied land. It also bridged the chasm between the Wood Age and the Oil Age. The latter could not have achieved its meteoric rise had it not stood on those shoulders to begin its own work.

Chapter 22: The Multiplication of Small Things to Gigantic Proportions identifies the multiplication of systems, processes as a phenomenon in creating a complex society with four or five kinds of fuel being used at once.

Chapter 23: The Osage in the Oil Age reveals the fast-paced, unsteady and sometimes harsh path of modernization the Osage nation took to become twentieth-century citizens of America.

Chapter 24: Wood Organizes as Industrial Lumber compares the industrialization of lumber on a national scale by way of railroads and improved logging methods vs. the local hewing down of timber to clear fields for planting and building as shown in Part I.

Chapter 25: King Coal gives a glimpse of “Peak Coal,” the period during which this fuel flexes its muscles as the dominant fuel in amounts excavated by the underground army of miners who did their best to meet national demands.

Chapter 26: Oil Expands Against Coal shows the growing rivalry between the two fuels that would carry us throughout the twentieth century.

Chapter 27: World War I Strains Coal Delivery Systems describes the difficulties of that the coal industry endured as their fragile delivery system fell apart during the cold winters of 1917-1918 as the war raged in Europe. A war of a different kind waged at home among the railroads as delivery system, the coal industry and the public who needed fuel.
Chapter 28: Wood to the Rescue illustrates the long-term worth of wood as a standby fuel in emergencies.

To capture a little of this panorama Part IV changes the order of presentation of these three fuels in order to bring their stories to an orderly climax in 1920. We first continue with the ascent of oil in its Stage II, systems organization path, as it morphs into fuel oil, and then tell the story of coal’s tumultuous supremacy and finally the recall of wood to avert human tragedy. If this sounds a bit like a soap opera, it is. Seeing the history of this period through the lens of these fuels changes the observer from political or social sympathizer to fuel admirer. As the story unfolds, the fuels’ “personalities” as it were, insinuate themselves as forces of intrinsic qualities and demands. This is not an attempt at personification, but the point of view of the reality of life fueled by wood, a life fueled by coal or one fueled by oil in combination with other fuels. This angle is unfamiliar and challenging but also revealing of fuel as main character instead of invisible support to human drama. It is, of course, a human drama since fuel is a man-made thing, but the interaction between the humans and their fuel is wonderfully complex and compelling.

In this period fuel use increased exponentially as technology developed to take advantage of it. In 1900 the Btu value of oil as percentage of the total consumption of mineral fuels was 3.1 per cent with coal at 93.4 per cent. By 1910 oil had grown to 7.1 per cent and coal had shrunk to 89.2 per cent. By 1920 oil had grown to 13.9 per cent and coal had fallen to 81.6 per cent.\(^3\)

Oil had made a sizable gain, though undoubtedly coal still had the upper hand. Consumption rates followed similar lines (see graph at left). Nevertheless, coal had been the
primary fuel since the 1880s (it had crossed over and changed places with wood as leading fuel in 1885), was referred to as “King Coal,” and would gain its “Peak Coal” height in this period with 72 per cent consumption. In the first decade of the twentieth century alone, mineral fuels and hydropower, excluding wood, increased their consumption by 95 per cent. By 1920 they had increased another 33 per cent.

The National Oil Reporter offered a cartoon in 1902 that showed a decadent king with crown and ermine-trimmed robe on his throne surrounded by smog, ashes and the general mess of coal. This part of the cartoon was labeled “The Past,” while a bosomy young woman in graceful gown and headdress pointed her wand at King Coal and commanded “Abdicate! Your reign is o’er!” Behind her is an oil derrick and barrels of “oil fuel.” What other fuel of the dimensions and quantity of coal the growing country would use instead is unclear.

The coal industry scoffed at that idea of being replaced. Even though oil increased to only 12.3 per cent by 1920, it may have been the ease of handling that the Navy discovered, or the much lower prices than coal, or the promise of less air pollution or the magic and wonder of automobiles and flying machines, or just that it was the new, untried fuel and therefore, had none of the problems of the old. Psychologically, these facets of oil’s personality gave it a boost, though the quantity used did not bear out the supremacy often claimed.
CHAPTER 22

THE MULTIPLICATION OF SMALL THINGS TO GIGANTIC PROPORTIONS

The multiplication of fuels was bound to expand “small things to gigantic proportions” by the twentieth century. John D. Rockefeller alone created that kind of mathematics. Not content with one refinery, one pipeline, one railroad siding, or even a few, he replicated like functions into a system of prodigious production. The small amount of oil used as illuminant, lubricant, cleaners, and waxes—less than three per cent of the fuel picture for the country by 1900, nevertheless generated an enormous amount of human energy and enthusiasm. This energy rippled across the nation in the form of more refineries, railroads, terminals, pipelines, labor, dollars and other services, not to mention the fever of speculation, and, in turn, helped to infuse Main Streets across the country with expansive activity. One such refinery was built between Kansas City and Independence in 1904, founding a small town called Sugar Creek and helping both of the larger towns to grow.

Kansas Oil: Mining in Its Liquid Phase with a Wheat Field Lid

Prospectors discovered oil in the states of Kansas, Oklahoma and the Indian Territory before the end of the century and the state of Kansas eventually became the last of top seven producers in the country at the turn of the century with production of 75,000 barrels of oil from 103 wells. The center of crude oil production had moved west from Pennsylvania to Ohio, Indiana, Illinois and on to the Midwestern Prairie. Standard Oil moved into what became known as the “Mid-continent field” before 1900 and made its presence known by leasing several hundred thousand acres of land with likely deposits of oil.
By then the technology of refinery and pipeline served four large, “integrated” companies, among the hundreds of startups: Gulf Oil, the Texas Company, Sun Oil and the Security Oil Company, a subsidiary of Standard of New Jersey. These companies soon overpowered the smaller ones and dominated the market. Standard built a refinery in 1897 with a capacity of about a thousand barrels a day at Neodesha, Kansas, (pronounced NeOdeshay) about 150 miles southwest of Kansas City. The refinery produced 3-5,000 barrels a day by 1904.

Victor Murdock of the Wichita Eagle drove in 1936 with C. Q. Chandler of Wichita's First National Bank to view the oil and gas developments on the western KS prairie. Though thirty or more years had passed since the first such scene, the combinations and the contrasts were what struck him: "Here is found," he wrote, "a mixture of mining in its liquid phase with agriculture in its agronomical phase, a mixture which immediately arrests the imagination. Perhaps its most appealing manifestation in central terms is the way the derrick has jostled with the windmill on the skyline of the prairie landscape . . . There is no statute against any victim of the oil contagion sharing the general thrill which invariably quickens the closer you get to its source . . . [The oil and gas] under its wheat field lid is an enormous volume and it crouches there like a lion."9

Standard then built a second plant in 1904 between Kansas City and Independence on the bluffs overlooking the Missouri River. This latest addition to Standard’s Mid-continent holdings opened with a capacity of seventy-five hundred barrels a day, mostly of kerosene production. The region was producing some thirty thousand barrels, however, and an extension pipeline to Whiting, Indiana, would have to be laid along with a tank farm for storage to handle the overflow.
Workers from the Whiting refinery had been brought in to build and operate the intricate equipment of the Sugar Creek refinery since local labor pools had little experience in this type of work. At both refineries Standard hired as much local talent as it could find and paid them the same wages as their counterparts in the East. “Indeed,” one author concluded, “Standard attained the image of the hero-employer during the early years of the first decade of the 1900s.”

In spite of such largesse, the skirmishes between Standard Oil and the independent Kansas producers created long-term friction that provoked anger and panic on the part of Kansas citizens and aloof entrenchment on the part of Standard until somewhat more equitable terms for refineries and pipes were worked out over the objections of the state’s “anti-pipers” who objected to their lack of access to pipelines. The oil was destined for Kansas City through miles of pipeline to be refined at Sugar Creek, so named for the sugar maples growing along the banks of the Missouri River. The boat landing area along the Missouri River that is today part of Sugar Creek, Missouri (officially incorporated in 1920), was once known as Wayne City Landing originally Duker’s Landing) by about 1845 when steamboat landing itself was new. No one there could have imagined such a thing as an oil refinery growing on the spot where early pioneers left the river and headed west on foot.

A railroad line between Kansas City and Chicago had been laid through Sugar Creek in November of 1887. By the following spring passengers could travel by train between the two cities though no stop was made at Sugar Creek until the refinery opened in 1904. The refinery held great hope for the nearby Kansas oil producers and their expected access to the Sugar Creek pipeline. The refinery plus its new tank farm would be connected by what would
become one of the world’s largest trunk-line systems, to the Whiting, Indiana, plant, which, in turn, would be connected to points east.\textsuperscript{14} Local residents were proud of their trans-continental oil system. In 1904 the \textit{Kansas Derrick}, a local oil-industry periodical, wrote: “Probably eighty per cent of the refined products of crude petroleum used in home consumption find a market east of the Mississippi. The economy of the pipeline system will thus effect a great savings of the cost of transportation, and at the same time it will permit the Kansas product to participate in the economies of manufacturing.”\textsuperscript{15}

![Image of Sugar Creek Oil Refinery](image)

Figure 4-2. \textit{Sugar Creek Oil Refinery} The refinery was constructed along the Missouri River east of Kansas City in 1904, first to produce kerosene and then to refine other products. Missouri Valley Special Collections, Kansas City Public Library, Kansas City Missouri.

Connections from Kansas to Sugar Creek, Missouri, to Whiting, Indiana, formed part of a Standard Oil strategy to satisfy the producers and their demands to access to refineries on the one hand and to restrain competition from other companies by buying all the oil available. The strategy failed to work, however, because sufficient local markets had not yet been developed for the kerosene and byproducts produced.\textsuperscript{16} Standard also needed to develop
pipelines from Kansas to the Gulf of Mexico, but those were still on the drawing board. Abundance and scarcity on a grand but regional scale stalled Standard Oil in the Midwest. Rivals that sprang up around the Texas oil field—Gulf, Texas Company, Sun Oil, Royal Dutch Shell, Sinclair and Cities Service, soon bit into Standard’s territory, and from its original ninety per cent share of refining in 1900, it was reduced to sixty-four per cent of national production by 1911. The Standard Oil Company Trust was broken up in that year by federal action that also caused it to lose market share.\(^\text{17}\)

Standard had been on the field first and had devoted itself, not to production but to refining and transportation. It had used predatory pricing to control independent producers to buckle, to be bought out, or to be left using railroads and their predatory pricing rather than pipelines, a cheaper and more efficient transportation technology. Advantages of scale had given the company capital for both vertical efficiency and technological advantages. Pipeline access had been wielded like a blunt instrument against small producers but also against the railroads that lost their loads to a new technology. The prelude to the eventual breakup were a series of reports by the Bureau of Corporations confirming predatory pricing, railroad rebates and non-competitive market conduct.

The federal government followed that with passage of the Hepburn Act of 1906 to make regulation of oil pipelines a federal matter under the control of the Interstate Commerce Commission. This same commission would step in again during World War I to regulate the delivery of coal during the nation’s fuel crisis.\(^\text{18}\)\(^\text{18}\) “By the early twentieth century, pipelines were the key element in the expansion of the industry. In 1910, 20,000 miles of trunk line and 24,000 miles of gathering line were operating; by 1920, 70,000 miles of all pipeline were
in place.” Not that Standard was dead by any means, only forced to reorganize for the second oil revolution—fuel.¹⁹

At the same time the opening of the mid-continent fields and those in the “Sunbelt,” California, the Gulf, vastly increased oil output and influenced the oil industry to build more pipelines and refineries.

Domestic crude production by major fields 1900-1919 (millions of barrels)

<table>
<thead>
<tr>
<th>Year</th>
<th>Appalachian</th>
<th>Lima, IN</th>
<th>Illinois</th>
<th>Midcontinent</th>
<th>Gulf</th>
<th>California</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>36.3</td>
<td>21.8</td>
<td></td>
<td>0.9</td>
<td>3.7</td>
<td>4.3</td>
</tr>
<tr>
<td>1910</td>
<td>26.9</td>
<td>7.3</td>
<td>33.1</td>
<td>59.2</td>
<td>9.7</td>
<td>73.0</td>
</tr>
<tr>
<td>1919</td>
<td>31.8</td>
<td>2.8</td>
<td>12.6</td>
<td>193.1</td>
<td>23.4</td>
<td>101.2</td>
</tr>
</tbody>
</table>


The Sunbelt oil discoveries meant the populations there jumped right over the Coal Age and into the Oil Age. Very little coal had made it to those areas so their growth was dependent on oil and natural gas. This fuel discovery and production promoted rapid industrialization and made clear, as the new fuel was used ubiquitously, the advantages of oil over coal. The railroads in the Sunbelt were among the first to appreciate fuel oil. The Southern Pacific Railroad’s use in El Paso rose from 100,000 barrels in 1900s to more than 5,000,000 in 1905. Coal use fell in proportions to oil’s rise. Railroads across the Sunbelt followed suit. By the 1920s railroads became the major market for fuel oil across the area from Texas to California.²⁰

It may not be too much of an overstatement to say that the intersection of easily refined oil in quantity, some derivative of that fuel for internal combustion, grease for bearings, the internal combustion engine itself, railroads for transportation of fuel, metal produced in
sufficient quantities by coal use to provide car bodies, paved streets, demand for goods oustripping current infrastructure, and eager users created one of the great harmonic convergences of human history. The idea of self-propulsion had arrived.

Perhaps nothing else since the domestication of the horse between 4500 and 2500 BCE has quite hooked the human consciousness the same way as auto-mobility. While each of the aforementioned streams of material and technology evolved separately or in concert with each other throughout the latter part of the nineteenth century, nothing combined them better with greater long-term impact than the automobile. To leave the horse behind, to no longer be behind a horse for locomotion on an individual basis was a dream beyond comparison. It would take another three to four decades to phase out the horse entirely after its estimated three-to-five-thousand-year service to humanity, but that was done as expeditiously as manufacture and technological alchemy could support the switch.

Could the convergence of such materials NOT have produced the automobile? Human values dictate such choices, and those values indicated at the top of the list of wish fulfillment that transportation sans horse be possible and then imminent. To think of transportation without horses was a revolutionary idea that slowly filtered into the public psyche as technology replaced animal power. The idea was not a goal as much as a byproduct of flow of energy from new sources that shunted aside the horse in its forceful takeover of the daily scene.

New sources of energy, new ways to apply them, new mechanical processes, faster and easier and non-horse, non-animal appeared in a steady stream and the choice became inevitable. The old power of the animal—horse, mule, oxen--was replaced by the then new
power of steam engine, then *that* to be replaced by an engine that burned an oil derivative, and the footprint of the Wood Age shrank in the early decades of the twentieth century along with the use of its most steadfast servant.

**Horseless Carriages Conquer**

The horse shared the street scene in Kansas City with electric streetcars at the turn of the twentieth century, but a newcomer encroached. “The horseless carriage,” the next step in the long evolution in individual and collective mobility took to the streets in Kansas City *successfully* in the summer of 1901, according to the article “Horseless Carriages Conquer. Kansas City’s hills after many trials have been overcome by the Locomobile,” in the magazine *The Kansas City Manufacturer*.

![Figure 4-3. The Locomobile](https://example.com/fig43.jpg)

This Locomobile, a steamer, was tried on the up and down streets of Kansas City and found to be “peppy” enough to handle itself. Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Missouri.

...At the present rate, it will only be a short time that all business and pleasure vehicles will be propelled by steam on the hills of Kansas City. The only successful carriage, so far, has been the Locomobile, as shown by past experience, and to it is due much credit for
making Kansas City up-to-date with Eastern towns, and showing that the hills here are no obstacle to automobiling, if the Locomobile is used.  

Indicative of the mixed fuel scene of the era, different engines had been tried, a gasoline engine and two different “steam carriages.” This particular news story announced a peppy little carriage that was indeed “horseless,” with a small steam engine attached under the two-passenger seat. (See Figure 4-3)

The steam engine had served Kansas City well since its introduction by steamboat in the 1820s. Now it was time for it to leave the water, leave its stationary stance in the coal shed as a provider of electricity and take to the roads of the city. The future seemed rosy for cars using a small steam engine. The little Locomobile fanned the desire of people to be self-propelled—without a horse. They had done it collectively with the streetcar, now they wanted true automobility—to go wherever and whenever they wished to go individually.

Experimentation continued. In 1905 the Sunday Journal advertised an electric car, the Columbus Electric, as the “only successful (sic) Electric Auto on the market. It will run all of the time, 75 miles on one charge. Speed 20 miles an hour. It will climb any hill in Kansas City. NOISELESS! Isn’t that comfort for you? And any lady can operate it too. In details it is perfect. Has graceful lines and trimmed in the latest style.” The Columbus Buggy Company would sell the electric car at 922 Walnut at a price of $1,600.

The auto industry in 1907 offered “the 14 horsepower wonder,” the Maxwell, that had “the marvelous simplicity that eliminates the necessity of a chauffeur and makes it the ideal car for the untrained owner.” (One can read between the lines here on the cautious approach to horseless carriages and their ease of handling.) The Maxwell sold for $825 and had 9,278 owners to “proclaim its superiority.” Whether that number was local or national is unclear.
The Auto Dealers Association of Kansas City held its first annual automobile show in 1907 in the convention center. Lighted lamp posts, lavish use of potted palms and patriotic bunting announced the serious role cars were taking in Kansas City.

At least 35 cars were on display. The President of the Buick Automobile Company wrote an article in the 1907 Annual saying that Kansas City was an “automobile market.” The city welcomed “both American and foreign cars from the most luxurious and finest appointed gasoline, steam or electric cars to the popular priced Runabouts.” Along with the 60-horsepower Thomas Car, “America’s Champion,” evidently uniforms for drivers and chauffeurs were sold at Central Automobile and Livery Company, R. C. Greenlease, proprietor, at 1316-18-20 East 15th. Further evidence of the flux in energy choices and the energy transition from horse to car was the ad on the opposite page that promoted “The Regent Leather Tire,” that was built with a rubber shoe, a fabric liner, a steel rim and leather tread with steel rivets. This is a great example of the energy transition in motion!

The Studebaker, (“[T]he entire line of self-propelled vehicles from the dainty electric to five-ton truck”), the Packard (“enclosed body cars our specialty”), the Stevens-Duryea, (“this line based on seven years’ of experience in the business”) the Woods Electric, the Jackson, (“No Sand too Deep,” “No Hill too Steep”) the Buick, the Pierce Arrow, the Moline, the Maxwell and the Mitchell (“Not only the most economical car to buy but to keep”) all advertised for sale in 1907. The Buick Automobile Company built an impressive three-story building at the northwest corner of Admiral Boulevard and McGee Street. Ads that did not mention either electric or steam must presume to be an internal combustion engine of some kind.
By 1908 the 30-horsepower White Steamer sold in Kansas City, the “incomparable White, the car for service.” This advance in technology assured prospective buyers that “the steam pressure remains constant under all conditions. The persons driving one of the new models for the first time will get the same results as the most experienced operator,” along with such welcomed features as “absolute silence, freedom from vibration (the absence of all delicate parts, genuine flexibility (all speeds from zero to maximum by throttle control alone), and supreme reliability.” Owners were assured that the car would run “at least 150 miles on one filling of the gasoline and water tanks.” Missouri Valley Automobile Company sold the White at 1112-1114 East 15th Street.

Clearly, machines of power and personality took to the roads in droves in the first decade of the twentieth century. No one yet knew which fuel would rise to the challenge and bring uniformity to the fleets of cars.

**Keep Your Bearings Cool**

A look through the pages of “The Kansas City Manufacturer” of the summer of 1901 gives a picture of the varieties of fuels, technologies and uses to which the new fuels have been put. Lubricants in an engine were still a topic of conversation as suggested by this ad:

“Reduce your oil bill 75 per cent and keep your bearings cool by using Finch Oil Cups, Crampton-Farley Brass Company, 221 Main Street, Kansas City, MO.” An oil cup contains a wick of wool or cotton that drips oil onto the bearings to keep them from overheating, an important part of making a steam engine last.
Figure 4-4 Early 20th Century Kansas City This bustling view of the Kansas City waterfront combines all energy systems at once, the steamboat, the barge, the railroad bridge, the factories. Skyscrapers rise in the background in this scene from the Kansas City Star, August 2, 1913. The “eye of prophecy” refers to Thomas Hart Benton’s 1853 famous quote about a great city rising from this site. By the twentieth century the original Westport Landing from the Wood Age from which Benton made the speech had disappeared.29

Another ad for “King Bee Oils” shows they are made in “Kansas City, U.S.A. Cylinder, Engine Dynamo, Roller, Harvester, Harness and Castor. Pure, and will lend life to machinery.” These oils were “manufactured by Interstate Oil Company, Kansas City, Kas.” What kind of oil, unfortunately, is not stated though the company was the “only refiners of
lubricating oils in the two Kansas Citys, and whose products deserve and receive general recognition from users of machinery.”

Gasoline was being used in a variety of ways such as in “gasoline stove ovens,” manufactured by Gille Manufacturing Company at 1053-1059 St. Louis Avenue in Kansas City, Missouri. Since gasoline has a high volatility, the idea of using it to heat an oven seems chancy. This manufacturer also made gasoline and oil tanks in “tin plate, galvanized iron, sheet steel and tinner’s supplies, granite, galvanized, stamped and Japanned ware and stove hollow ware,” all of which meant benefits to the buyer who understood these advantages in 1901. Witte gasoline engines were advertised as “Kansas City’s Best,” with electric ignition.

They promised steady regulation, economical fuel consumption and were guaranteed for five years. Witte offered models in two and three horse-power and recommended them for “printing offices, blacksmith and bicycle shops, small pumping outfits and all places where small and steady power” would be required. This little engine would be replaced by electricity later, but for now a small gasoline engine in the shop would take the place of handwork. Over a thousand of these engines were in operation in July of 1901 made by the Witte Iron Works Company at 51 West 5th street in Kansas City, Missouri.

The editors of the Kansas City Manufacturer described each entry at The Homes Products Exhibition opening May 27, 1901 in glowing terms. Their comments will remind some readers today of business icons that have come and gone or lent their names to streets in the city. William Volker, manufacture of picture frames and window shades was mentioned along with Woolf Bros. Manufacturing Company that would show “the latest fancies” in the essentials of shirts and “gents’ furnishing goods.”
Fred Wolferman, “who has the most complete establishment of retail groceries in Kansas City will have an attractive display of the goods he carries that are made in Kansas City, U. S. A.” (The use of the phrase “Kansas City, U.S.A.” seemed to be an editorial decision to position the city as an internationally known entity, suggests an early attempt at what we now call “globalization.”) In another part of the exhibit “a concord of sweet sounds will emanate” from the booth of J. W. Jenkins’ Sons manufacturer of a line of musical instruments “which are known throughout the world,” including the “famous Harwood guitars and mandolins.”

The news of the building of the “largest retail structure” in the city, the Jones Dry Goods Company at Twelfth and Main Streets was announced. Small stores at the site were “being wrecked” to make room for the retail giant, eight stories high, of white enameled brick, glass and iron. “The Christmas trade,” the ad said, “will be accommodated in the new house.” The highly lauded Day Locomobile would be represented in the hall in a “very attractive manufacturing exhibit, and as the Locomobile will be new to many visitors this exhibit will attract attention from all.”

The automobile had arrived in Kansas City and meant to stay. It required more paved streets, more navigable roads, garages, ultimately gasoline stations. The infrastructure of the auto would replace the infrastructure of the horse. Watering troughs would be replaced by service stations. Parking spaces for cars would replace the stables. Another feature of the Wood Age would give way to modernity powered by the Oil Age.

These early autos were a harbinger of growth to come in all sectors. The city itself boomed with activity and experienced a real estate bubble from which the developers learned hard lessons.
The Lesson Was Severe

By 1900 the city and its environs had grown to a population of 210,000, an amazing increase of growth considering its enfeebled condition and resurrection from the Civil War when in 1865 it had about 4,000 residents hanging on.

From then onward, miles of railroad tracks along with acre upon acre of building and growth marked the city as it accommodated the emigrants going west and the wheat and cattle that would fill the railroad cars going east. As with all building booms, this one required thousands of feet of lumber and every kind of attendant business to support rapid expansion. Then the boom collapsed in the 1890s, until the city once again resurrected its building plans after losing “a number of valuable business enterprises, due solely to there being no suitable building and location to accommodate them.” 35

A full-page article reported on the lumber business: “Shipments are exceeding the cutting and there is a visible depletion in the supply of stocks. Very few, if any, of the southern mills have been able to keep even with the pace set by the call for lumber and stocks are badly broken. . . . The demand has continued to steadily increase and prices are stiff.” 36 Perhaps this shortage helped to lead to the use of steel for building material.

The year 1901 was hailed as “the greatest building year and will lead all records in number and substantial buildings.” Kansas City had suffered its own inflated building drama in the recent past reminiscent of the housing problems of 2008: “During the boom of unhallowed memory the city went building mad and structures of all kinds were erected in such number as to preclude even the earning of a fair interest in the investment. The lesson was severe and costly and capital has fought shy of a repetition.”
The report went on to describe the building of warehousing along Southwest Boulevard, the erection of the “largest elevator and warehouse in the West,” more warehouse building at Eighth and Broadway “going up so rapidly that while the men are blasting out the rock in one end of the lot the piers are up and the superstructure is begun in the other end.” The Savoy Hotel was expanding on Ninth, and the New Century building for stores and offices was rising on Grand Avenue. “The lumber is arriving for this and work is going on there every day. It will be finished this fall and will be six stories high.” The aforementioned retail giant, the Jones Store, was part of this list that ended with the description of the Willis Wood opera house being built at Eleventh and Baltimore at a cost of $350,000. It would be “the finest in the West.” “The steel is here” for this building, the story said, and suggests it had arrived from somewhere farther east, and that steel-built buildings would slowly take the place of wood-built infrastructures.\(^{37}\)

The home and kitchen at the Homes Exhibition received its fair share of the spotlight with the Herrick tile-lined “Refrigerator,” though still an ice box, the technology had advanced to include “circulation of pure cold air, absolutely dry, never sweats, therefore is perfectly hygienic, iced from outside the house. Unequalled for economy of ice.”\(^{38}\)
It is the same of economy and you can learn to operate it in twenty minutes. ₺ Natural gas is now knocking at your door. Receive it as it should be with a GOOD LUCK RANGE. ₳ Come down and let us show you as superb a line of gas ranges as ever entered the gates of Kansas City. They're here at from $10.00 to $30.00 with everything else that goes to make a home attractive and comfortable. ₳ Two steps from the center of high prices and extravagance to this, the home of economy, and every step you take in this direction saves you from a dime to a dollar on your purchase. ₳ Our easy payment plan is the most liberal yet devised. Come, we'll be glad to see you and show you through this home of low prices.

Western Furniture and Stove Co.
1303 Grand Avenue
A step from the center of high prices — A block from extravagance too.

Figure 4-5. Good Luck Range A 1907 Ad shows the “Good Luck Range,” a natural gas range showing that fuel was finding its new niche in home heating and giving up the lighting sector. As advanced as it was, it took only “twenty minutes” to learn to operate, suggesting lighting a gas range was still a tricky and potentially dangerous process. It was probably called “good luck” because the range provided ease of lighting and performed better than others. From 1907 Yearbook, 22.

The Kansas City Steel Range manufacturer showed a new cook stove, a definite cut above the cast-iron range, and the Kansas City Milling company had “one of the most striking exhibits in the hall” especially interesting “to lady visitors” who used Imperial Flour.
Coal needed to be encased in a furnace, an idea barely entertained even a hundred years earlier. Within the confines of the furnace a coal fire could become as large and as intense as necessary to do the work of industry vs. the work of hand laborers. This furnace on the left is a small version for home heating with pipes leading to individual rooms. The furnace on the right is industrial scale with its own infrastructure. 1907 Yearbook, and Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Missouri.

The furnace for the home had arrived in Kansas City. The Prest Heating Company, manufacturers of the Prest Furnace, of which there are “more in use in the best homes in Kansas City than any other kind, will show the superiority and general excellence . . . over those of any other kind in the market.” The fuel is not stated, but the furnace could have burned either wood or coal and perhaps both. The engraving here is not a Prest Furnace, but the formidable structure shows how far home heating had come from the open fireplace. Coal required an enclosed housing to make the best use of its qualities as well as to remove as much smoke as possible. The multiple pipes indicate room-by-room heating outlets and the
size of the furnace itself a testimony to the breakthrough in working with metals made available through the use of coal in the last decades of the nineteenth century. Technology had caught up with the coal stream.

Two thousand “editors of country dailies” would attend the exposition and would carry back to their small towns the wonder of a multi-fueled, energy-rich Kansas City at the turn of the century. Among other wonders they would see was the manufacturing of wind mills their readers no doubt used on their farms. The American Wind Mill Manufacturing Company, a newcomer to Kansas City, was the only manufacturer of wind mills in the area.

Armour Packing Company had an elaborate display of canned meats and “products and by-products which are produced by a first-class packing house. Their exhibit was in the nature of a revelation.” Nearby would be the American Can Company with an “artistic line of their goods, which practically covers all lines of products in tin cans, from the ordinary fruit can to the highest grade of art lithograph tin packages.” The Novelty Manufacturing Company displayed “scores of useful and labor saving novelties for workshops and household and many other uses,” indicating the phrase was a come-on for the curious and hopeful.

Though the city had achieved some control over its water quality by installing a waterworks in 1875, the Standard Filter Company, manufacturers of Standard and Climax filters for the home and factory would demonstrate “how the non-pellucid Kaw and the sometimes turbid Missouri River water can be made as clear as crystal,” a welcomed relief to those drinking the water and trying to wash clothes with it.
In spite of the obvious advantages of the horseless carriage, the Kansas City Buggy Company is pictured on the front of the July issue of *The Manufacturer*, a huge factory that would burn down shortly thereafter. Little did people know in the early years of the twentieth century how quickly buggies would become obsolete. The size of the buggy company factory suggests a strong market for their product, but around the corner a little Locomobile chugged up a hill toward commercial dominance.

One of the city’s other firms was described as “the line of rapidly developing businesses in the production of buggy tops in Kansas City. The largest single plant devoted to this line is operated by the Gille Hardware and Iron Company. Improvements in the machinery, equipment and additions to the capacity were made “as fast as a rapidly growing demand enforced it. The result has been a factory modern in every feature and producing a complete line of goods varying from the medium rubber top to the highest grades of hand buffed leather.” In addition to buggy tops, cushions, lazybacks and aprons were also made. This merchandise was distributed to all parts of the West and Southwest, and “an ever increasing trade offers good evidence that the goods are right in quality style and price.”43 This product is not quite akin to the buggy whip rushing to extinction, since the buggy tops were probably used on little Locomobiles, but they certainly were of the old paradigm and no one is seemingly aware that the multi-fuel picture and horseless runabouts had already numbered their days.

One of the most interesting ads in this edition is the “Sedalia and California Oil Company” offering 250,000 shares of stock in an oil well in California brokered by a local realty company. This ad shows the level of financing for the oil fields at the time. This Missouri
company, straddling half the continent between Sedalia, Missouri, and Kern County, California, had local backers and California equipment to bring in a sure investment, not the “probability of striking oil” but one already producing.44

The next chapter in Kansas City’s oil history combines the very old occupation of the Osage Indians with the very new arrival of oil as motive power.

Figure 4-7. Sedalia and California Coal Company The “California Connection” to oil drilling being sold in shares by a realty company in Kansas City. Donohue, James, ed. Secretary Manufacturers and Merchants Association, Greater Kansas City Official Year Book 1904-5 Made in Kansas City, USA, the Guaranty of Excellence.
CHAPTER 23
THE OSAGE IN THE OIL AGE

At this point in its fuel history Kansas City has one of its most ironic twists. The original inhabitants, the Osage Indians and other neighboring tribes, were removed in 1825 and suffered a century of humiliation, disease, mistreatment and thievery in many forms during the following decades. Their revenge was to enjoy the fruits of their newly acquired lands in Indian Territory, Osage County, Oklahoma, that would become the largest county in the state when statehood was conferred in 1907.

Oil was discovered there at the turn of the twentieth century and made them “the richest tribe in the world.” As if that were not an ironic enough twist, natural gas and oil found on their reservation was piped back to their former homeland to Kansas City in the form of money and dividends in the early 1900s. According to the Greater Kansas City Annual of 1904-05 “gas exists in a great many places in the Indian Territory on both sides of the line separating the Cherokees from the Osages.”

In an article entitled “Heart of Oil and Gas Belt, Great Productive Territory at Kansas City’s Doors Assures the Cheapest Fuel,” the author writes that “for many reasons the large supply of petroleum and natural gas in Kansas and the Indian Territory has an important bearing on the future development of Kansas City.” In a telling judgment of the future he writes, “The great development of this product is having an unusual influence on the material development throughout the areas producing them, and as the productive territory is tributary to Kansas City this alone would yield no small increase to her commercial and banking
accounts.”45 In so many words, the author connects the oil and gas fields of the Indian Territory with the “material development” being enjoyed in Kansas City.

Once again the white settlers of Kansas City drew on the natural wealth of the Osage, first profiting from taking their land in Missouri, then from taking the oil from under their land in Oklahoma. What the arrival of oil did for the Osage was another matter.

We began this story with the long-suffering Osage Indians after their first removal from Missouri in 1825 to becoming the “richest tribe in the world” through oil discoveries on their reservation. Their nineteenth-century experience at the hands of the higher energy suite and its presumption of civilizing the Indian into “citizen’s clothes” to at least “resemble white men” is a cautionary tale with that double ironic twist at the end.46 First feared, then disdained, then enriched and envied, the Osage felt the full force of the influence of both energy and fuel over the span of a century from 1825 to 1925.

The white settlers matured with the incremental changes of moving from one fuel to another over time, while the Osage had to telescope a longer adjustment of understanding and accepting Euro-American materiality as well as changing fuels. This collapsing time frame forced them to relinquish time-honored ways with sudden loss and to acquire modern ways with forced acceptance.

**Walking the Narrowing Path of Accommodation**

The Osage, originally residents of lands south of the Missouri River and down into the Ozarks and Arkansas, were forced to give up those lands once Missouri became a state. They moved along with numbers of other tribes onto the plains of Kansas in 1825. Having been
both plains and woodland Indians, this arrangement removed them from their woodlands cover and made them exclusively Plains Indians. Lost were the rushes to weave into walls for their dwellings. Lost to them was the forest and its abundance of sounds and whispers that told them that the bear, the deer, the turkey, the badger had gathered there for cover as had the Indians themselves. Lost to them were the stalwart trees, sentinels to the Indians’ comings and goings among them.

The Osage had originally had the good fortune of being located in a geographically powerful position and became “a perfect buffer” between the competitive French and Spanish in the seventeenth and eighteenth centuries. In that position the Osage had spread their borders and increased their territory through raids, fighting, and bluff warfare with other tribes on their periphery. Fierce warriors with a tremendous pride of battle and bravery, they were feared by the other tribes as well as by the Europeans who felt they could do little with this nation of tall warriors “until the time when they could overwhelm them.”

Eventually that time came for the Indian removal. What the Osage gained by living on the plains was proximity to the seasonal movements of the buffalo and grasses for their horses year around. They gained antelope and prairie dogs. They also gained from the United States government farm implements, a mill, blacksmithing tools, a log cabin for the chief and other material goods typical of nineteenth-century Euro-American farmers. And, they gained annuity payments for their lands. This seemed like an equitable if undesired tradeoff for having given up their homeland.

The Osage lived in reasonable harmony with their neighboring tribes, given the dislocation all of them had experienced, until 1868 when treaty negotiations began again.
Once more the United States government asked the Osage to give up their lands and move. When Kansas became a state in 1861, only the Civil War slowed the land rush that brought increasing pressure from white settlers for the Indian lands, and the tribes were again forced to relinquish the place they had made home.\(^{48}\)

The first land confiscation after the war came from having been associated with the losing side. An unknown number of Osage men served the Confederate Army, while nearly 400 served with the Union army. At the close of the conflict the North had won, federal authorities, taking a dim view of confederate service, forced the Osage to give up nearly half of their Kansas lands in retribution.

In an 1865 treaty the federal government also allowed non-tribal members to settle on the remaining land the Osage still possessed. Post-war conflicts found the Osage beleaguered from both East and West forces. They had been unable to complete their fall buffalo hunt by the “allied” tribes of Arapahos, Cheyenne and Sioux who had united to harass the oncoming flow of emigrants and to stop the intercontinental railroad from being built. Not only had the Osage come home without their buffalo meat but they had lost over 325 horses to the allied tribes as well. Meanwhile, settlers encroached on their land, and the Missouri, Fort Scott and Santa Fe Railroad Company asked to buy a third of the remaining Osage reservation for right of way. The white man had all the power at this point. The tribe was “very destitute,” reported Indian agent G. C. Snow in Kansas. “Something must be done for these people at once.” They were starving.\(^{49}\)

During negotiations the tribe leaders were told their game was disappearing and that they could move to the Indian Territory where “the white man would bother them no more.” The
Great Father, they were told, “would be sad,” if they refused to sign the treaty, he would believe, then, that the Osage “could get along without him.” Without supplies from the government, the Osage would have to stand alone against the Plains Indians to try to hunt buffalo while the settlers gathered on their land wanting to plow and build. The Osages eventually “touched the feather,” signing the new treaty.

After 1870 the Osage relinquished all of their remaining land in Kansas for which they were paid and that money held to buy land in Indian Territory, what would become Oklahoma. They had $8,500,000 from the sale of their land earning five per cent in the United States Treasury. Since 1825 the Heavy Eyebrows had steadily infiltrated their numbers to marry the Osage women, especially when the Osage were then seen as people of property. This dilution of the pure Osage blood would eventually lead to the mixed bloods outnumbering the full bloods and would add to the general disintegration of the old bonds and ancient traditions.

By 1874 they had moved atop one of the as-yet-undiscovered major oil fields in Oklahoma and the United States. The reservation measured 2,350 square miles, 57 miles long north to south and 60 miles across east to west. It bordered the Cherokee Nation on the east at the 96th meridian, the Creeks Indians on the south, the Kaw Indians and the Arkansas River on the west. The northern border is the Kansas-Oklahoma state line. The Indian agent reported with both hope and despair that some of the tribes “were civilizing,” but that “the Osage as yet are most of them wild, blanket, scalping Indians, far from civilized, many of them hardly ready to give up the war dance and the scalping knife.”
The Osage arrived at their new reservation 3,956 strong, with twelve thousand horses.\textsuperscript{57} The 1870s proved to be a rocky decade for the tribe. In 1874 they hunted buffalo and came back with “great loads of meat and tallow and 10,800 buffalo robes,” but in 1876 they hunted buffalo for the last time.\textsuperscript{58} The white hunters had reduced the buffalo herds to negligible numbers. Their Indian agent urged them to become farmers in the Euro-American fashion with men at the plow. The Osage men, however, saw themselves as warriors and farming as tending “squaw patches.” They attempted it half-heartedly, but readily gave in to the grasshopper plagues and the drought of that decade.\textsuperscript{59} In 1877 half of their tribe died from disease: small pox, tuberculosis and cholera.\textsuperscript{60}

Figure 4-8. Osage Indian, Ma-chet-seh This Indian man has adopted modern clothing while keeping his signature hair style to show his tribal affiliation. n.d. Research Division of the Oklahoma Historical Society.
The United States Congress under President Grant supported congressional legislation “for the purpose of inducing Indians to labor and become self-supporting.” Indian agents were to see that all able-bodied men from ages eighteen to forty-five were to “perform manual labor” in exchange for the annuities they had been receiving. The Indians protested working for what the government already owed them by treaty for land cessions. They understood quid pro quo.

In the view of their oppressors/conquerors, their lack of “acculturation” even as late as the 1880s indicated how far removed they still were from becoming “progressive.” They had neither understanding nor even comparisons in their experience for the white man’s ways and mechanisms. They did not understand the concept of a brake on a wagon, for instance, and routinely ran down a hill throwing out passengers and goods as the team ran full tilt for a cliff or a wreck.

Their children at school climbed the stairs on their hands and knees and came downstairs scooting from one step to the next on their bottoms. A group of grown Osage men who had slept inside a white man’s house one frigid night, did not understand the idea of a door knob when smoke began to fill the room and they badly wanted out. Their children continually tried to escape the boarding school and were hunted down by white men on horseback and roped and tied in a wagon or dragged back through the dirt. Keenly self-educated in the intricacies of thriving in the open forest and prairie, their frame of reference had no room for the built environment and mores of the white man.

In tandem with these negative events, the tribes merged the Great Osage and Little Osage to become “the Osage Nation.” They created a constitution in 1881 that divided the nation
into five districts, with a national council made up of three members of each of the five districts. The council could “tax, make treaties and impeach officials.” This change in power/political structure meant they walked the “ever narrowing path” the white man wanted, diminishing the powers of the council of elders, tribal identities and clan lodges.

**Nation with a Capital “N”**

Pressure from the outside had succeeded in forcing them to take up ways by which the white man could understand and deal with them. While sublimating their tribal distinctions, they melded into a single tribe, the easier for the white man to address. In losing their identities they became a nation with a capital “N,” strong enough together to stand against the white intruders. To the Great Father who lived far away in the East, however, they were a nation with a small “n.” In the eyes of the United States government, the tribes were “domestic dependent nations . . . . in a state of pupilage . . . whose relationship “resembles that of a ward to his guardian.” This paternalistic approach gave the United States government the attitude of “doing what is good for them,” in a way that was good for the government.

On the reservation, these once-mighty warriors and hunters were daily demeaned and corralled by their white plunderers. Horse stealing, whiskey peddling, wife hunting and those bribing their way onto the tribal rolls kept the Indians in a defensive position. The local lawmen arrested “thousands” of Indians for possessing whiskey but not the white man for selling it. Alcoholism was a common problem as the Indians attempted to numb themselves
from the confusion of oil derricks, railroad tracks, leases, dubious schemes proposed by white men, and constant negotiation over sovereignty that appeared in ink but nowhere else. “They were afflicted with a nagging certainty that they were not active participants in the capitalistic bustle of the surrounding and pervasive majority culture.” In their long struggle for sovereignty to become an independent nation, the Osage were pummeled and pelted with the white man’s values and his high-energy system.

In 1897, large amounts of oil were discovered under the reservation. Because the Osage had chosen to share their wealth communally by “headright,” each full blood or half blood on the rolls of the tribe, they fared better than other tribes. The Cherokees, Creeks and others had chosen allotments of acreage and only those under whose land oil was found grew rich. Because of the Osage decision the whole tribe became “the richest tribe in the world.” Then schemers descended on them en masse to swindle, cheat, rob and even murder them for their
wealth in a period known as the “Reign of Terror” that finally ended in 1932 with the falling oil prices of the Depression.\textsuperscript{70}

**Trading Horses for Horsepower**

By 1904 high-grade petroleum was being pumped from 155 producing oil wells on the reservation. Eighteen gas wells also produced a steady stream. With that kind of production their Kansas City connection came into play. In 1904 the entire Kansas-Indian Territory produced 5,602,963 barrels. The Prairie Oil and Gas Company that developed the field increased their production to about 15,000,000 per annum. This production represents a good deal of both oil and money for the day and fueled a metro of over 220,000 with buying power.\textsuperscript{71} While it is easy to imagine what the city was doing with such fuel—increases in manufacturing, material goods, conveniences, everything an upwardly mobile city population yearned for, it is also easy to imagine the bustle, noise and pollution that accompanied its production on the Osage reservation. They daily witnessed the disintegration of the remnants of their former world.

Between 1906-1916, a blanket lease for oil production covered 68,000 acres and over a thousand producing wells.\textsuperscript{72} In 1907 the Osage nation became part of the state of Oklahoma and the reservation became Osage County. This period of overnight oil wealth for the Osage was called “the Frenzy.” White man’s wealth pushed the Osage into bizarre behaviors of buying cars they did not know how to drive, hiring chauffeurs to drive them two blocks on the reservation, taking lavish vacations and inviting less fortunate tribes in for days of dancing at which they would give away extravagant gifts. At one point it was said more
Pierce Arrow touring cars could be found on the reservation than any other county in the country. They had traded in their once-prized horses for horsepower.

By 1917 the Osage Nation’s royalties amounted to $2,719 per person. For a family of five or six “headrights,” that became a fortune. Many of the Osage left the reservation for extended vacations in Colorado, Texas and California.

The Kansas City economy felt the wave of money from the oil fields, and, indeed, helped to supply the capital. The *Kansas City Star*, March 11, 1917, corroborated the connection to the Osage oil fields in Oklahoma:

Already the golden backwash is beating closer and closer to Kansas City. The actual, tangible wealth from the Kansas and Oklahoma fields is affecting the financial life of the city. Kansas City capital goes out and oil field capital comes in. The tide swings back and forth, but each day the waves lap nearer. Being in the midst of it, or on the edge rather, it is difficult to realize that something is happening nearby that is as romantic as the days of ’49, the Cripple Creek madness or the rush to the Klondike. Yet some day there will surely arise a Bret Harte or a Rex Beach to set it all down that the world may know. Today he may be a driller or a tankie.

-- *Kansas City Star*, March 11, 1917

In keeping with their warrior tradition, a number of the young Indians volunteered for service in World War I. Against the wishes of the Indian agent, all the young tribal men joined one company in the Army known as the “millionaire company” comprised of wealthy Creeks, Choctaws and Osage. The agent felt the young Indian men would not be trainable since they had no discipline and did no work, but when they came home on leave their demeanor had changed. They were able to pass the training and serve in the Oklahoma National Guard. In spite of this exposure to the outside world, the tribe’s naïveté invited more big-and small-time swindlers, oil companies that did not pay their royalties, cattlemen
who leased pasture and got away without paying for it. One writer said, “Oil merely gave the Osages more money for white men to grab.”

By 1925 the Osage reached their peak of $13,200 per headright, an envious amount of money even in the gay ‘20s. The Osage had come a long way from the pedestrian tribe frightened by the “elk dog” and being king of their Midwestern domain. Some critics compared them to the Germans that the Roman emperor Tacitus described in the second century A.D. in their “incredulous inaptitude of being face to face with the simplest of mechanisms.” Journalists enjoyed writing about the “Neolithic tribe” who had become bizarrely rich.

With the original steel knife European traders had opened the Osage world to one of material possession from knives to land. For two centuries the Osage had modified their behaviors to include knives, blankets, guns and horses. They obediently moved from one assigned piece of land to another. They sipped from the cup of the white man but did not dine at his table. Yet after two centuries of association amazingly little of the white man’s world rubbed off on them until their food source—their energy source—disappeared. With the loss of the buffalo came the loss of their identity. That great, grand creature defined who they were and how they lived. Wood may have been their fuel source, but the buffalo supplied their energy.

As white farmers organized around the field and the mill, the Osage organized themselves around the buffalo. No longer warriors and hunters, the men disdained farm work. The women no longer had buffalo robes to process and garden plots to plant in the forest. They wept for more than the graves of their family members left behind; they wept for their lost
traditions. The children reacted with terror at the white man’s ways. By the end of the nineteenth century, the Osage no longer sipped from the cup of the other world, they drowned in it.

The twentieth century would find the Osage rich by white man’s standards and in poverty by their own. In their original belief system those warriors who died in battle lived on in a lush village with plenty of game and horses. Those who died from other causes struggled endlessly in a poor village. Unfortunately, the reality of the white man’s definition of riches did not fulfill their dream, but instead fed their nightmare. The Osage populations hunting and living in Missouri and Arkansas before the white man came had no yearnings for the white man’s things, nor did his grandchildren in Oklahoma conjure up California vacations or touring cars. Those were not in their lexicon, their experience, or on their wish list. Stripped of their energy source and the whole belief system that supported it, the next generation had to find new religion, new food and new ways of being in the white man’s world.
CHAPTER 24
WOOD ORGANIZES AS INDUSTRIAL LUMBER

In one span of a hundred years, nineteenth-century wood on Missouri’s western frontier moved from primeval forest to timber to construct the first cabin heated by wood to lumber for building cityscapes. The age-old resource of wood, the pillars of the Osage’s forested world, became a huge commodity for the sons of the white settlers to use for suburban dwellings. Gone were the days of the woodhawk hefting his ax at riverside and the woodman selling kindling door to door. Most people by the twentieth century now burned coal or fuel oil, many read by electric light; others used kerosene lamps. Though the fuel picture changed completely by 1920, taking wood out of the fuel basket would not be safe. Instead of the settler’s ax it now yielded to the lumber industry’s saw mills. Cut into lumber and hoisted aboard railroad cars, wood once again surrendered to the demands of the growing nation.

One Hundred and Fifty Thousand Cars of Lumber

In the burgeoning Kansas City landscape yellow pine lumber did its work. Yellow pine stood for progress. It served as the core of the city building program and came by the millions of board feet. In 1907, Charles S. Keith, vice president and general manager of Central Coal and Coke Company, wrote in the 1907 Annual for Kansas City that the city “is the greatest yellow pine distributing point in the United States.” Charles, the son of Richard H. Keith, the Confederate ex-patriot who started the company after the Civil War with $40, now inherited and expanded the extensive works his father had organized. (The company reincorporated with a new name in 1893.)
Speaking for the industry itself, he wrote that sixty mills run by a total of forty companies produced two billion feet of yellow pine lumber each year, which amounted to twenty-five per cent of the total yellow pine lumber “to come out of the entire South.” (In other words, the South yielded eight billion board feet of lumber per year.) The total land controlled by these companies amounted to over 1,600,000 acres, an amount capitalized at $115,200,000. The annual lumber sales of these companies amounted to $44,000,000 with additional merchandise sales of $6,000,000. The industry employed 11,000 men operating the mills that sent 150,000 cars of lumber through Kansas City per year, a staggering number of cars of just lumber rumbling through the once squirrel- and deer-infested West Bottoms.\(^80\)

Steel studs began to take the place of wood in the early 1900s, not just because of price, but because of strength and fire safety.\(^81\) “The steel is here,” an announcement mentioned earlier, was not just an acknowledgement of its arrival for that building’s construction, but for a shift in the industry of building multi-storied office and warehouse buildings. Wood as building core for those kinds of buildings was being left behind.

**The Demise of Fuel Wood and the Rise of Lumber**

In 1910 ninety-one million cords of wood were cut for fuel wood. By then it is safe to say that railroads, except for those engines on local spurs in the heart of timber country, burned coal. In 1909 over 44 billion feet of lumber were cut for lumber. In 1920, only 83 million cords of wood were cut for fuel wood, while over 34 billion feet were cut for lumber. The high point for fuel wood came in 1870, while the high point for lumber from 1869 to 1919 came in 1909, the last year before the 1910 census was published.
Young Charles Keith said about the yellow pine industry that his Kansas City company handled only a quarter of the wood cut in the South. The 1920 census gives a detailed view over a fifty-year period of lumber cutting in the United States. As wood fires died out to be replaced by coal furnaces, the raw resource of timber became a highly sought after building material. In this example of commercial redirection, timber transformed from fuel wood that was collected and sold on a very informal basis to a highly competitive and lucrative industry of lumber. Table 4-2 shows 50 years of wood use:

<table>
<thead>
<tr>
<th>Year*</th>
<th>Fuel Wood/cords</th>
<th>Lumber/M ft b. m.</th>
<th>Lumber Yards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1869</td>
<td>138,000,000</td>
<td>12,755,543</td>
<td>NA</td>
</tr>
<tr>
<td>1879</td>
<td>136,000,000</td>
<td>18,001,356</td>
<td>28,851</td>
</tr>
<tr>
<td>1890</td>
<td>100,000,000</td>
<td>35,077,505</td>
<td>28,133</td>
</tr>
<tr>
<td>1909</td>
<td>91,000,000</td>
<td>44,509,761</td>
<td>40,671</td>
</tr>
<tr>
<td>1919</td>
<td>83,000,000</td>
<td>34,552,076</td>
<td>32,568</td>
</tr>
</tbody>
</table>

Table 4-2. Lumber Yard and Total Lumber Cut figures from “The Lumber Industry,” 14th Census (Washington, D. C.: General Printing Office, 1920) 422, 436. Total fuel wood figures from Schurr and Netschert, 508.52

Timber became lumber in a reversal of fortunes that eclipsed one use and generated another. Wood fell into a niche fuel over the next few years to be reborn as luxury fuel for genteel fireplaces in middle class homes. Gone was the ping of the ax against the trunk and the thud of the falling tree, to be replaced by the screech of tires and the clang of trolley cars. The passing of wood as fuel can be mourned or celebrated according to one’s level of nostalgia or urgency for a certain progress, but it will always be there when oil or electricity has the hiccups, and is instantly yanked into the modern world to fulfill its age-old role as first fuel.
CHAPTER 25
A GLIMPSE OF PEAK COAL

Coal mining had come a long way since women and children dragged out baskets of coal on their hands and knees while husband and father hewed the coal face with an ax in a small space lit only by a candle. By 1900, coal had exchanged with wood the supremacy of fuel dominance. Peak Coal was in full throttle from 1900 to 1920 at 72 per cent of fuel consumption. What that meant to the industry, to its competitors, and to the consumer is a complex tale of chaos and growing maturity. Peak Coal included the use of animals and timber from the Wood Age that would slowly be eased out of the picture by mechanical equipment and steel beams. It included greater management efficiency, in fact, “the science of management” was promoted in the Coal Age weekly, a publication started in 1911 that became the organ for the coal industry.

This period for coal is Stage III: Expansion and Defense for this fuel. The two terms could not be better chosen to describe these years. As it assumed commercial dominance, the coal industry stretched to meet the demands of the position. Local and regional shortages became national shortages during these two decades, when one bottleneck after another choked production, transportation, delivery and markets. The rewards for the coal industry for being dominant were great, but the pain was also enormous. The reputation of being part of “King Coal” had certain psychic satisfaction to those involved, but to others it was a power to be dethroned as quickly as possible.

The Coal Age weekly magazine was started to give the industry a professional face to its readers and to the public. It added power of voice and solidarity of practice, promoted
efficiency and educated miners to both mining production techniques and to the morals of leadership, patriotism and alcohol-free mining. Its pages are a treasure trove of insights into the mining industry. The following threads show the state of the coal mining industry during this time. The first is the use of animals in large-scale production.

**Goodbye, Old Mule!**

Animals still played a part in coal mining as the Wood Age and its animal complement hung on in the Coal Age itself as well as in the pages of *Coal Age*. Evidently a consciousness of cruelty to animals as a negative practice had lodged itself in the coal industry since the industry organ consistently printed material instructing handlers how to treat their mules. On the 4th of July, 1913, as reported on the “Sociological Department page, the United States Coal and Coke Company “used the occasion . . . . to promote a kindly interest of drivers for their mules and to enliven the dull routine of a line of mining camps which are shut in closely in narrow valleys between forbidding hills.”

Twenty-eight mules ridden by their drivers “dressed in comic costumes representing the nationality of each, the marshal of the cavalcade being the stable boss. The mules were caparisoned in muslin with ‘First aid’ in gold letters.” Following that came the sawmill department with a large log float twelve feet long and four feet thick, drawn by eight large mules decorated with bunting. Woodsmen marched in the rear. (These would have been the men charged with finding and cutting mine timbers.)

Another float was led by a horseless carriage pushed by a mule draped in all the colors of the rainbow and marked as generating 100,000 mule power. This entry took first prize as
being the cleverest by far of entries from a parade that lasted over an hour.\textsuperscript{84} A model miner’s house, the “sanitation machine,” and a float with Sunday-school children and 12 mules in working harness followed. All the workers from mines no. 4 and 5 of the United Supply Company, a nearby plant, walked with their wives and 22 mules gaily draped. First aid figured large in these gatherings and a float of members of the first-aid corps followed with a patient in bed “swathed in bandages, and thirty-five decorated mules and their drivers making a striking cavalcade.”

The entrant who expected to carry away the prize “as always before” showed off “thirty lively mules tricked up in bunting and mounted by as many drivers,” admittedly a striking and expensive entry; but as a sign of things to come, it had been trumped by one mule-pulled horseless carriage! This entry was followed by a Hungarian band of 16 pieces, another float of Sunday-school children and twenty-five “fine mine mules without a scratch on any of them, and all dressed in comic costumes.” Another float filled with miners carrying flags followed thirty-nine mine mules “gaily decorated,” and so on flowed the parade as an example of what we might now call “community relations.” Whatever the purpose, mules figured largely in numbers, in examples of good health and in more than pulling wagons. They starred in the show above ground as they provided important services below and were a vital part of the mining community.\textsuperscript{85}

The magazine featured other articles and ads reminding readers in subtle ways that the Wood Age hung on in their workaday world. One editorial observed that “the use of animals for haulage purposes underground is generally unprofitable if the distance to be covered exceeds two-thousand feet.\textsuperscript{86} Wire-grid eye guards for “horses underground,” looking
something like a hockey-player’s mask only smaller, were advertised in a 1912 edition of *Coal Age* with the copy that this would save their eyes from being scratched by passing walls or to keep falling coal away from their eyes. A 1913 ad for a Whitcomb Engine advertised that a motor using only fifteen gallons of gasoline “discarded 22 mules for gasoline engine” power. Interesting is the word “discarded” rather than “replaced,” a choice of words that has a subtle lack of feeling to it, as if many mules had already been discarded before for failing to qualify as adequate mule power.

In search of a means of testing the air for toxic gases, canaries and mice had both been used, but miners complained that these animals were too small and sensitive and their alarms sounded too early. The men could have worked longer after these small animals keeled over. What they wanted was an animal that was just slightly more sensitive than humans so that the miners could work longer before leaving a dangerous situation. To that end, miners in India tried using chickens. Two miners took a chicken to the pit bottom where a fire had raged and was being put out. Both men “fell to the ground in a collapsed state,” but the chicken was fine. Another group of miners tried a chicken in a similar circumstance in another mine. The men “were knocked over” but the chickens “were quite unaffected.” A bit of trivia for the reputation of chickens, perhaps, but not a reliable means for detecting toxic fumes.

By 1917 the carbide lamp test for air quality had given some solution to the problem of depleted oxygen in mines. A miner’s life is not endangered until the oxygen content falls below ten per cent. The carbide lamp now preferred required twelve-and-one-half per cent oxygen at its lowest point. The color changed in the flame when the oxygen content reaches seventeen-and-a-half per cent and allowed a miner some ways from an exit to return before
the oxygen level dropped to a lethal level. The acetylene lamp “certainly presents more positive warning than anything else of a practical nature that has yet been devised (including chicken, mice and canaries). Irrespective of whatever else may be said of a carbide lamp, this point alone is a strong recommendation for its use.”

Years went by and still mule care was a concern in the pages of Coal Age. A series of instructions was offered in 1917 as a definitive look at mule treatment. ”Humane Treatment for the Mule” leaves no harness unexamined. (See Appendix). These mules were animate units of energy employed to do the work that men could or would prefer not to do with greater efficiency. It is difficult to think of mules in an industrial setting, but the roots of the Coal Age grew from the Wood Age and carried forward with it certain components of that era until ultimately replaced by inanimate labor.

A mule lasted from five to ten years in a mine, “some mines use them up faster than this because of specially hard and adverse working conditions.” The mule, better than the horse, was well suited to this work and displayed “an almost human sagacity in getting about the mine and avoiding the many dangers incident to his precarious life, such as being run down by trips of loaded cars, etc.” They responded well to kind treatment, as the article above suggests, but could sulk and become vicious when abused.

Mules worked in dark passageways, did dangerous work, breathed air filled with all manner of dust and odors and got minimal sympathy and only fair care. Whatever problems machines challenged workers, the difference between animate and inanimate power was enormous. Just as electric cutters saved the miner’s back, carts powered by electricity saved
the mules. The coal industry embraced mechanical devices to compete in the marketplace increasingly powered by them.

In 1920, an article on “Mine Electric Lighting,” recommended 25-watt lights spaced at 300-foot intervals for safety purposes, a very dim lighting system by today’s standards, and instructed readers on lighting the mule stables. “Underground rooms, mule stables, and the like may be illuminated with 40-watt lamps equipped with angle reflectors mounted on the wall as high as possible. One unit can be used for each two stalls.” Frequent whitewashing of the walls of the stables would increase materially the illumination of this part of the mine. Mules spent years in the mines sometimes being hoisted out for pasturage during the low-producing summer months.

At what point mules were finally replaced forever by mechanized equipment is hard to say. Animal power increased until about 1910, but by 1920 the work output of animals had dropped to about six per cent. In 1910 animals provided 18 per cent compared to machines offering 142 per cent. Animal power dropped slightly in 1920 to 15 per cent while inanimate or mechanical power increased to 268 per cent. By 1920, then, animals still held a portion of the work force while machines quadrupled their output. As for mules and horses in mining, they were still used in some mines as late as the 1940s, when, at last, it was “goodbye, old mule!”

All this is to say that while coal held its place as provider of 72 per cent of fuel consumption for the nation, it did so with uncounted animal power still laboring in an industrial setting. This overlap between the Wood Age and the Coal Age shows a remarkably long and well-used bridge between the two as industry built replacement units of machines powered by coal, natural gas and electricity to take the place of animal power.
The 1910 census indicates a huge output of coal using such combination of methods (it does not count mines producing less than a thousand tons a day nor does it mention mules. These two may be in combination with each other. Mines operated without mechanical power fall into this category. Missouri had 78 mines without power out of a total of 220, and Kansas had 48 out of a total of 202 mines.\textsuperscript{94} Of the more than 6,000 mines operating in the United States, a third of them operated without power, and these produced more than a thousand tons per day.

Mechanical power was still small. Steam engines and electric power together made up 1,227,400 horsepower with an increase of 148.9 per cent over the decade. The average increase of steam engines was 80.2 per cent in number and 145.5 per cent in total horsepower. The average horsepower per engine increased from 75 to 102 horsepower or 36 per cent. Electric motors run by current generated by the mine increased 635 per cent in number and 400 per cent in total horsepower. The total output of coal increased 45 per cent and the total horsepower increased 150 per cent.\textsuperscript{95}

Not surprisingly the greatest percentages of increase in mechanical horsepower appeared in the stages producing the largest amount of coal, Kentucky, West Virginia, Texas, Tennessee, Pennsylvania and Alabama with an average increase of 221 per cent. (The states are listed here in order of increase with Kentucky at 267.1 per cent and Alabama 194.7 per cent.) Their coal production increase averaged 63 per cent. Those states with the lowest increase in horsepower included Missouri and Kansas with an increase in mechanical horsepower of about 50 per cent. Missouri showed 238 steam engines with a total of 11,619
horsepower and 78 electric motors with horsepower of 2,042 which amounted to over a thousand per cent increase in electricity use and a 25 per cent increase in steam power.\textsuperscript{96}

Production of coal for the state of Missouri was 293,000 in 1909. Kansas sold locally 679,500 tons and shipped out almost seven million tons. Missouri shipped out three-and-a-half -million tons.\textsuperscript{97} In 1909 the United States produced 460,049,000 tons of coal (17.6 per cent anthracite and 82.4 per cent bituminous) valued at $552,895,000. The coal industry controlled 8,182,749 acres of land throughout the producing states.\textsuperscript{98}

**Growing Scarcity of Mine Timber**

Another thread in the *Coal Age* pages is the need for ready supplies of timber to shore up the roofs of the rooms where miners work. A series of articles addressing this problem appeared over the two decades from 1900 to 1920. Some quite profitable mines left wood behind and went for metal posts that were proposed as early as 1913. These particular ones were imported from Belgium. Each post had a metal sleeve of 4.8 inches in diameter that is closed at the bottom with a wooden plug. The sleeve is split lengthwise and fastened by three collars making it a telescopic kind of tube. It is then filled with coal dust, broken stone, cinder or other filling to give it strength. This becomes the pillar part of a three-piece set that forms an arch for holding up the roof of a chamber.\textsuperscript{99}

Costs and difficulty in handling argued against its use. Timber supports cost $1.78 vs. $12.75 for the metal post. The metal post weighed over a hundred pounds and was difficult to handle. The crossrail weighed about 158 pounds. Plus, filling the tube with some kind of
filling required time, material and skill. Still the article thought the metal mine posts were worth the cost. Other articles suggested cement supports with similar arguments.\textsuperscript{100}

The reverse in cost proved true for a steel derrick and drilling rig advertised in the \textit{Gas and Oil Journal}, a rival publication, in 1911. Offered by the Carnegie Steel Company, it extolled the virtues of steel against the growing scarcity and rising cost of wood. “While wood is still plentiful in many districts our steel derricks are fast crowding out the wooden rigs. The first cost may be slightly higher but consider the ultimate saving when you can use the same rig over ten wells; the immunity against fire, lightning and decay; the lower steam pressure required for operation, as the rigidity of the steel does away with lost motion. You can erect the derrick, take it down, move it to a new location and set it up again at less expense than when using wood.”\textsuperscript{101} This is another overlap between the Wood Age and the Oil Age with coal as the fuel that bridges the gap between the two. Soon enough, coal
producers would move to steel derricks for the reasons above and another component of the
Wood Age would fall by the wayside.

Other mines stayed with timber and crews of saw men. A timber would last four or five
years, the length of most mines’ service, if they were treated with creosote. Like the green
mule, a green timber should never be taken into the mine and used as a prop. It would be
unreliable, prone to dry rot and disease and would soon have to be replaced.¹⁰²

Another aspect of mine timbering was the source of the wood. Timber preserves were
proposed in this article, citing the use of unvalued timber. The attitude was toward cultivating
timber tracts beyond the government’s role in this. Mine timber needs about 10 to 20 years to
grow to the appropriate size and can be grown on hilly regions nearby the coal fields, which
“would seem a practical solution of the problem of the impending scarcity of timber.”¹⁰³

Timber scarcity is often associated with agriculture since tillable fields were the
motivating force for forest clearing when agriculture began. It is less known that both coal
and oil production destroyed whole countrysides that needed to be replanted. That replanting
has often been a slow and begrudging process, but the roots of restoration around coal mines
started early in the twentieth century.¹⁰⁴
CHAPTER 26

OIL EXPANDS AGAINST COAL

We now live so far removed from handling chunks of coal that only the older generation can remember its personality. A list of instructions from “Hints on the Storage of Coal” from Coal Age suggests that both producers and customers used to know a great deal more about coal than any of us can now imagine. (See Appendix for a complete list of instructions.) Coal could ignite spontaneously in large piles, needed to be handled carefully to reduce coal dust and breakdown of the chunks, and oxidation more common in freshly mined coal.

Such was coal’s individual characteristics that underlay the industrial use of coal. Industrial coal users had known these factors for centuries, had learned which coal to use for which task, if a choice was available, and how to get the most out of it. In the Wood Age people knew the kinds of wood that worked best in each kind of use. It is reasonable to assume that as the many coal types became known that their use would also be distinctive and a subject of trial and error. A similar lesson came with oil that flowed from the ground in various qualities from sweet crude to sludge.

Petroleum as Fuel for Steamers is Hopeless

During the first two decades of the twentieth century, the baton passed from coal to oil on the high seas as fuel for shipping. In the 1860s oil had been burned in steamships, had proven that it could work, and that ships did not have to refuel nearly as often as with coal. But crude oil had its drawbacks. The level of refinement at that time left the fuel with a bad odor, and the intensity of heat generated by the boilers was more than the crew could endure. A fear of
instant explosion should the ship be hit by a torpedo or have an accident discouraged the
shipping industry from taking it on. The Secretary of the Navy concluded: “It appears that the
use of petroleum as fuel for steamers is hopeless; convenience is against it, and safety is
against it. Opposed to these the advantages of the probably very important reduction in bulk
and weight, with their attending economies, cannot prevail.”

It would be another forty years before the Navy seriously considered using oil again. In
the meantime the illuminant period had passed for oil. That role had been taken over by
electricity, and fuel oil had become the dominant motive power in the West where both
railroads and shipping ran on California crude. Anywhere from half to four-fifths of crude
was refined for fuel oil. Railroads were using 20,000,000 barrels, about 25 per cent of the
fuel oil produced in 1909, and nearly that much was used by industry. By then the Navy had
changed its mind:

The introduction of fuel oil into the United States Navy has been quite rapid and with fully
as good results as were anticipated . . . . The engineering and military advantages of the use
of fuel oil are clearly recognized by the Navy Department, as a result of experiment and
experience. In the new construction fuel oil is being more and more extensively used.

The *Oil and Gas Journal* in 1911 concurred.

The uniformly good results obtained whenever oil fuel has been given a properly arranged
test on an ocean-going steamship have made it certain that some day, and not so very far in
the future, oil will take the place of coal as the fuel of the great trans-Atlantic steamships.
One remarkable fact in favor of the oil fuel is that in spite of the unusual number of
advantages to be derived from the change, there is practically no serious disadvantage.

The United States Navy had been coaling at sea since 1899 and knew the danger involved
in the process. The coaling of ships was a challenge even in port though refueling was easiest
between dock and moored ship. Winches were set upon the warships to haul bags of coal on
board. Crew members moved the bags on small carts to the coal chutes that went from the upper deck to the bunkers below. Recoaling at sea from ship to ship, i.e., collier (coal carrier) to warship, depended on the weather and the height of the waves. Swells that caused the ships to roll more than three or four degrees made the transfer prohibitive. Colliers carrying a full load of coal were equipped with bumpers made of cotton bales to keep the two ships from touching metal to metal. Some transfers happened quickly with about half the crew participating filling bags of coal of 100 kilograms or 222 pounds each. With enough manpower as much as 57 tons per hour could be transferred. The bags were transferred by way of a wire between the two ships, full ones dumped, empties returned. It took about twenty seconds for a bag to make it from one ship to another.\textsuperscript{108}

In 1899 the United States Navy carried out their first under-way coaling. The USS Massachusetts towed the collier 300-400 feet astern while the tramway shuttled the bags of coal from one to the other. By 1903 the USS Alabama lashed the collier alongside while coaling. The seas were high enough that one sailor said it was “about the roughest proposition I ever stood up to. At one time the collier rolled so heavily that I was afraid she would stave in against our armor belt and she literally raised right up into the air on each swell and looked as though she would come down on our decks.” In over twelve hours the ship took in
Figure 4-11. **Loading Coal on Ships** Before the naval fleet adopted oil, the ships took on coal by this process at the New York Navy Yard, Brooklyn, New York circa 1909. Bags of coal are being hoisted from the collier, the coal barge, to the hold of the *New Hampshire*. Crew members shovel coal into the bags from the coal pile while sailors on the receiving end wait. This process was very difficult on the high seas. Oil in barrels soon proved to be a much more efficient process. United States Naval Historical Center.

seven hundred tons using this form of transfer. Further evolutionary steps increased to a ton of coal per minute using better methods. Bag size increased to eight hundred pounds by 1914. In spite of these improvements, oil would take over the shipping lanes by the end of World War I. \(^{109}\)
CHAPTER 27

WORLD WAR I STRAINS COAL DELIVERY SYSTEMS

The Wood Age had endured because it was the basis for life. The suite of landscape and ecosystem in which human beings learned to live and prosper was primary resource to them. Only in the nineteenth century did people move past that context through increased fuel use and technology to give up wood and domesticated animals and move on to other sources of heat and man-made power. No sooner had they done so, in fact, were in the process of doing so, than the new systems failed them and they were forced to return willy-nilly to the Wood Age for fuel. A confluence of weather, politics and economics created a bottleneck of enormous proportions in coal delivery in the winters of 1917 and 1918.

A Problem That Was Literally Staggering

World War I had begun in 1914 in Europe with a pledge by the American government to remain neutral. Over the course of the next three years, however, the German submarines began to attack American shipping. These U-boats, unterseeboots or “undersea boats,” sank a number of American merchant ships as well as the famous British luxury liner Lusitania off the Irish coast in 1915. Besides passengers that ship had also carried munitions to which the Germans objected. Over twelve hundred passengers lost their lives, including 128 Americans.

Negotiations for reparations and for security of non-military ships, which had some effect on protecting shipping lanes, occupied the governments for the next two years. But in February of 1917, Germany changed its tactics and sank 500 ships of various nationalities in
the first two months, including the American liner U. S. S. *Housatonic*. A month later, Germany sank four more American merchant ships. Though poorly prepared to field an army, President Woodrow Wilson declared war against Germany and Austria-Hungary.\(^\text{110}\) “It was apparent to all that we were confronted with a tremendous task,” observed one local fuel administrator later, ”that we must not only furnish men with munitions, and everything that is necessary for conducting the war, but there was the still greater necessity that they should be delivered with the greatest possible speed.”\(^\text{111}\)

The weather had already been uncooperative during the winter of 1916-17 causing hardship among the citizens, but more so in Europe where the war broke down food delivery. Germans called it “the turnip winter,” since the interruption in shipping left them without foodstuffs and they were forced to turn to turnips to survive. Over 750,000 Germans died of malnutrition that winter.\(^\text{112}\) In the United States, communities suffered fuel shortages. Some in the northern states were forced to buy coal only in 500-pound lots, a price beyond the reach of low-income residents.\(^\text{113}\)

A country gone to war, high demand for coal, a severe winter, and a shortage of coal cars required national management. The newly created Federal Fuel Administration (FFA) faced such challenges as increased demand for coal for manufacture of war materials for the Allied powers of Britain, France, Italy, Russia and the United States while American citizens suffered fuel shortages.

The Federal Fuel Administration was face to face “with a problem that was literally staggering.” The draft for the Army took their quota from the mine rolls so that the mines were immediately shorthanded in the face of the heaviest demand for fuel during a time of
frigid weather. The “old-fashioned winter” of 1917-1918 was one of the most severe on record. In the autumn, the unripe corn froze on the stalk and the severe cold stunted winter wheat. Field hands picking cotton found it too cold to work; truck crops of fruits and vegetables were damaged. Railroad tracks were blocked by snow, or their steam engines were barely able to make steam in sub-zero winds. Rivers and harbors were locked in ice. A bridge of ice connected Nantucket Island to the mainland.

In Kansas City, January 16, 1918, the city sent a telegram to Coal Age reporting that twelve of the local companies were short 225 cars of coal that day. That was a 7,550-ton loss. “Thirteen mines are idle all day, four idle part of the day. This shortage situation is not improving,” the Coal Age reporter added. At the first of the week, he continued, “wealthy people were going around with buckets and wheelbarrows to get a few pounds of coal. It wasn’t a question of tons in Detroit; it had got down to pounds.”

The reporter said the Fuel Administration had done all it could do—eleven days before Garfield gave the close-down order on January 16th. The country would experience a coal shortage when in reality they were experiencing a coal car shortage. Coal could not be had even if people lived within a few miles of a mine with an abundance of coal. Railroad officials had a habit of assigning cars to all other customers before assigning to the mine to move coal and now the mines had coal but no cars. The railroads received the blame.

In a March edition of Coal Age a letter to the editor suggested the “small wagon mine is a blessing to the country and should be encouraged. The product of these mines is generally consumed in the neighboring locality with the result that freight charges and profits of the middleman are eliminated, and the farmer and local consumer pay less for their fuel
supplied.”118 Where railroads could not do the job, teams of horses and teamsters have the advantage. The Wood Age energy component stood in reserve to trump the Coal Age when necessary.

Figure 4-12. Desperate Measures A woman climbs the side of a coal car to join others in gathering enough to take home in the severe winter of 1917-18. This mob scene was not uncommon throughout the nation as the bitter cold exceeded the nation’s ability to keep warm. Coal Age, February 9, 1918, 291.

The Most Cold-blooded and Heartless Bunch that Ever Went Unsung

With coal at a premium, price gouging became epidemic on all sides. In August 1917 the Food and Fuel Act gave President Wilson the authority to set coal prices nationally. Two national coal organizations were born out of the need and desire to defend the coal-mining
industry, the National Retail Coal Merchant’s Association (NRCMA) and the National Coal Association (NCA), a group of producers. Their approach was a balancing act between patriotism and defense against “foolish federal intervention.”

The public complained bitterly about coal prices rising to more than $2 more than they had paid in 1916. One woman from Kansas City wrote she felt as though she were being “held up,” as if the coal industry acted like thieves, while another resident wrote that the “coal dealers were the most cold blooded and heartless bunch of speculative sharks that ever went unhung.”

It was not for lack of coal at the mines that caused the problem, however, but the lack of coal cars to carry the fuel to its destination, a messy and inefficient distribution of coal that could hardly be called a system, and chicanery on the part of railroads to violate contracts with customers and either keep the coal for themselves or to sell it to whom they wished at the moment. Comments like these that made their way into public debate fed the federal government’s need to control the coal market.

The symbiotic relationship of coal to railroad meant that railroads favored coal mines and vice versa. Railroads rated mines according to the mine’s daily capacity and assigned cars to new mines that were likely to have a good yield before servicing other customers. In May 1917 coal prices rose even though the off-season approached. Citizens wrote to their congressional representatives, to the newspapers and to the Federal Trade Commission threatening and predicting riots when they began to suffer from the cold the following winter. Some called for government possessions of mines.
Soldiers in training camps were freezing from lack of fuel and one official called for the coal operators not to “coin the blood of soldiers into dollars” by extorting high prices. Eventually a price of $3 per ton was agreed on though the Wilson administration thought it high. By August an agreed price of $2.40 was set though the coal associations said that price would discourage production and further complicate the war effort. By October 1917, the FFA issued its first price schedule, an average of 30 to 50 cents per ton above the $2.40 set by President Wilson. In 1916 coal profits were at eight per cent, but in 1917 they had risen to 29 per cent, in spite of the government’s best efforts. Profits declined in 1918 to 18 per cent.122

Even though industries bought coal on contract, the railroads frequently let these plants get down to a supply of a day or two. Such impending shortages forced the factories to buy coal from the open market at higher prices. Investigations showed the railroads took care of their own by reassigning coal cars in violation of contracts already held. One railroad had confiscated 1,782 loaded coal cars for preferred customers over a six-month period in the winter of 1916-17.

During that same winter, coal prices in Kansas City rose to $6.50 and $7.00 a ton. Those who bought in the largest quantities paid the least of the inflated prices, while those who could afford it the least and bought it by the bucket or 100-pound bag paid a 100 per cent more than the previous year. The arguments over the coal shortage spiraled along with prices. Was it the railroad’s fault they had insufficient cars or was it the coal producers who were inefficient in loading and distributing? Nervous and frightened publics blamed the government for its lack of power over the problem.123
In spite of the government’s best efforts loaded coal cars sat on sidings with “coal frozen solid in the gondolas.” After considerable pressure from officials, President Wilson nationalized the railroads by establishing the United States Railroad Administration (USRA) at the end of 1917. Their purpose was to move the 145,000 loaded cars west of Chicago and increased efficiency in meeting demands.\textsuperscript{124}

**Heatless, Meatless and Wheatless . . . and Then Lightless, Too!**

The coal shortage became acute in the winter of 1917-18. By January The FFA mandated a five–day shutdown called “The Closing Order” of industries east of the Mississippi River from Friday, January 18, through Tuesday, January 22nd. Those industries necessary to the war effort such as railroads and public utilities were exempted. This move would conserve coal and give mines and railroads an opportunity to build domestic coal supplies. To bolster this slowdown, the administration proclaimed that the next ten Mondays would be heatless from January 21 through March 25, 1918. Stores, schools, saloons, theaters and office buildings would be closed. Newspapers and street car lines were to adopt a “Sunday schedule.”

The calendar swelled with sacrifice. Tuesday would be “Meatless Day,” and Wednesdays would be “Wheatless.” One meal of the other days should be meatless and wheatless. Saturday would be a “Porkless Day” for good measure. *The New York Times* called heatless Mondays “workless” Mondays, since many establishments were too cold to tolerate. The public was outraged since their wages were cut accordingly and some could not suffer the loss of even a few days’ wages. At the same time merchants suffered the loss of income.\textsuperscript{125}
These rules were made to reduce traffic on the railroad and save coal at the same time. They were cancelled after four weeks.\textsuperscript{126}

The Kansas City \textit{Journal} on January 18, 1918, announced to its public the agenda for the city: Until the nationwide coal shortage could be relieved the following closings would save an estimated 1,500 tons of coal each day by closing the saloons, theaters, dance halls, pool and billiard halls, bowling alleys, restaurants and amusement centers early. Coal dealers estimated that theaters burned as much as two tons of coal each daily. All these places must close on Mondays and Thursdays and must close at 10:00 each night on days they were opened.\textsuperscript{127}

In addition, all electricity for advertising purposes and street lights not needed for public protection would be turned off permanently until the ban was lifted. The coal orders to be filled were household consumers first, public utilities second, factories filling government war contracts third and manufacturing plants producing foodstuffs for immediate consumption came last. Violators of these orders were threatened with immediate action: “Persistent violation will lead to cutting all feed wires to the establishment.”\textsuperscript{128}

A “Lightless Night” order was added in July of 1918 and was expected to save even more coal. Every effort would be made to reduce the fuel consumption in office buildings, apartment houses and hotels. It was expected to save a considerable amount of fuel. Along with lightless nights, only 50 per cent of coal was to be furnished to breweries during the next year, the average to be based on the last three years’ deliveries.\textsuperscript{129}
I Have a Boy in France

In January of 1918 at the height of this miserable time the editor of the *Coal Age*, Floyd W. Parsons, traveled to Washington, D. C. to visit with the Fuel Administrator, Dr. Harry A. Garfield, to discuss closing down the Nation’s industries to relieve the critical fuel situation. Full of belief that alternatives actions were the better solution, he left Doctor Garfield believing that “he took the wisest course possible.”

Garfield explained his reasons: The main purpose was to break the snarl on the nation’s railroad tracks and to allow the multitudes of cars—up to 50 per cent of the cars were loaded with coal—to get to their destinations even before food and other vitals could be delivered. He also shut down mills and factories operated by waterpower to avoid a pile up of manufactured products and create more congestion. He closed munitions plants that had produced “more war material than transportation could handle.” He did not consider the economic effect on the nation. “It simply had to be—there was no other way.” Why couldn’t industry continue on as it had been, doubling its energies in transportation? A shortage of locomotives made that impossible. Dr. Garfield responded with these statistics:

At least 5,000 new locomotives were needed each year by the railroads of the United States but they were receiving roughly half that number. Though the American manufacturing produced that many, more than half were shipped to France forcing the American railroad system into a crippling shortage of coal deliveries. Different gauges of rails and heights of engines further made exchanges of engines problematic.
Any lengthy warning of the closing rule would have pushed manufacturers into greater production and congestion as they tried to get their goods out before the deadline. “The railroads would have been swamped with freight” and chaos would have followed. Further plans were to create municipal storage yards of coal, government control of important coal-loading piers, better use of water-ways and the long talked of zoning system to eliminate cross-hauling. “I have a boy in France and another here in the army. Thousands of other parents are in the same situation. If we, as a people are not big enough to do this most necessary thing, then indeed we are a sorry lot,” said Dr. Garfield, in referring to his now famous closing-down order.\textsuperscript{132}

The next step of the government’s supervisory role was the zoning program that reorganized railroad distribution of coal and cut long shipments of anthracite to western cities besides depending on the Midwest for greater self-sufficiency. After the war was over, one politician quipped “the inefficiency of the American railroads was the greatest ally of the imperial German Government.”\textsuperscript{133} The system eliminated cross hauls by encouraging users to
purchase from nearby sources rather than from across the country. Kansas City and Missouri were in Coal Zone A, one of the 13 bituminous zones, with Iowa, Kansas, Arkansas and Oklahoma. This massive reorganization solved the problems of the eastern industries for which their supply had been the object, but others west of the Mississippi came up short of fuel or had to create alternative plans for development.¹³⁴

One casualty of progress in Kansas City was that of the Kansas City Power and Light Company.¹³⁵ On April 8, 1918, the Kansas City Star announced that the steam turbines for the $5 million dollar power plant would not arrive any time soon. The explanation was “due to a lack of capacity of the combined turbine industry to meet the present war and near future requirements of the marine and the war situation in general.” The news meant that the city would rely on the street railway power plant at Second Street and Grand Avenue for their electric current. Plans were described as “makeshift,” though the plant had been improved the previous winter. The shortage of steam turbines remained acute and sources were dubious that they would arrive “even next year.”¹³⁶

The country continued suffering, sacrificing and swearing at the coal and railroad combination until the Armistice was signed on November 11, 1918. By March 1, 1919, the Fuel Committee was disbanded. As an arm of the government it had done its work. It had secured a certain solution for the nation in that it simplified the shipping across country by eliminating much of the cross shipping. It maintained the coal prices within “reasonable limits” that kept the prices from rising to intolerable heights. It paved the way for more equal distribution of fuel to consumers, and saved fuel from waste through stringent economies.¹³⁷ The coal crisis was not over, however. A new one would arise in the early 1920s.
CHAPTER 28
WOOD TO THE RESCUE

The unintended consequence of the whole event was to change the role of coal for the American public and to open opportunity for oil and gas to show their advantages through new markets. Looking back, the most unexpected but, in the end, predictable alternative fuel was wood. When coal is unavailable, when the infrastructure for fuel oil and natural gas cannot meet the demands, the population falls back on wood. Having watched the nation agonize over fuel availability and a certain amount of wood cutting injudiciously and even illegally done, the United States Department of Agriculture published a forty-page booklet called “The Use of Wood for Fuel” in March of 1919. Its publication may have been after the fact, but it addressed the subject of wood gathering twentieth-century style to a generation who had grown up with coal.

The manual begins with this statement: “Wood has always been of considerable importance as fuel in this country, and the present emergency has greatly increased its comparative value for this purpose.” Clearly, the first part of the sentence is an understatement while the second part acknowledges its revival as a fuel. The shortcoming of wood has always been difficulty in moving its bulk great distances; and certainly from the middle of the nineteenth century onward the coal industry excoriated wood as being bulky and difficult, but here its weight has been compared against the difficulties of getting coal and found desirable because wood can be found locally. “The use of wood for fuel saves transportation, it utilizes wood that would otherwise go to waste, and it releases coal for ships and railroads and munitions plants.” Very much a product of the fuel milieu of 1919, the
author says “preparing wood for fuel involves slightly more labor than is required to produce coal.” He must have been thinking of the use of electricity in coal mining that had made it easier than chopping and sawing wood, or the relative ease with which oil came from the ground.\textsuperscript{139}

The real purpose of the bulletin was to encourage a rural population of twenty million people to tap into local resources to substitute for the eighteen million tons of coal they normally use. Such a move would reduce the use of coal by nearly three million tons or between 65,000 and 70,000 carloads.\textsuperscript{140}

The coal squeeze of the previous two years had increased the price of wood 24 per cent in 1917 to an estimated value of $43.13 per farm. Missouri was estimated to have 275,000 farms with an average of 13 cords per farm. (Tennessee had the highest at nineteen, and North and South Dakota and Nebraska had the fewest at three.)\textsuperscript{141}

The bulletin advocates using wood in factories to keep them running until replaced by coal, and to stockpile wood for future fuel shortages as had already been done by the cotton mills in South Carolina and throughout the South. It further describes how to stack and measure a cord, how to cut with a gasoline- or kerosene-powered saw, how to split the wood, skid and haul it at no more than $1 a cord, what kinds of wood split easily (birch, maple and conifers), what woods are hard to split (sycamore, gum, apple) and how long to season (nine to twelve months) each kind of wood when stacked in the manner prescribed, plus a relatively small loss of heat if the unseasoned wood had to be burned immediately.\textsuperscript{142}

Although readers are discouraged from shipping wood farther than five to ten miles from production point, “because its great bulk makes it expensive to ship,” the bulletin
nevertheless gives detailed directions and costs for shipping by rail, $1.50 a cord per hundred miles. Municipalities are encouraged to “get in a reserve of wood for the winter, sufficient to insure its members against a fuel famine” with the estimated cost of sawing it (again) into stovewood lengths to be fifty cents per cord.”

Not leaving the most basic part to chance, the bulletin describes “how to use wood fuel.” Grates, as always have been the difference between wood and coal. “Coal has been so generally used lately and furnaces and stoves have become so adapted to its use that it seems impractical to many to burn wood without going to great expense.”

Coal grates hold small chunks with a small firebox of brick, while wood grates are larger for pieces of wood and lie several inches below. The bulletin suggests that the firebox can be modified to create more space to burn pieces of wood and that it was not necessary to cut wood into “very small blocks.”

The bulletin closes with the encouraging statement that by using wood that is freely available on local landscapes “there is not excuse for suffering because of inability to get coal” but the possibility of hauling wood by rail “is not economical,” and any wood should be “wagon-hauled” instead. It is doubtful whether country people without coal had to read a booklet before cutting down a tree, since they were the last ones to have gone to coal in the first place, but the government had pointed out the obvious to some and the necessary details to a new generation shivering for lack of coal.

Thus came to a close the first hundred years of the fuel and energy story of the site known as Kansas City. From dense forest to dense humanity and industry, such was the growth of an
“instant city,” of the kind that could only proliferate within the context of a swift fuel increase.

In 1873 the young coal industry put forth the requisites that create a fuel in harmony with its consumers. Within this deceptively simple list can be felt all of the pain and hard-earned lessons of the decades to come, particularly in the first decades of the twentieth century. 1) A good quality of coal, 2) a sufficient quantity, 3) cheapness and regularity of production, 4) cheapness of transportation, 5) a sufficiency of transportation, and 6) a good market.147

Each one of these items speaks volumes from the experience of coal through the next 50 years as it peaked and tried to maintain its spot atop the fuel pyramid. It was easy to expand against wood because it had been tried and found wanting for century upon century to move humankind beyond its current limitations. But the emergence of oil and other fuels like natural gas, manufactured gas, even its own creation, electricity, crowded the field and gave the public many points of comparison that showed both the up- and downsides of coal as the fuel for all occasions. Too harsh, messy, and undependable in terms of delivery for home fuel (See Appendix, Care of Coal), it retired to its niche as an industrial fuel and has been there ever since. After reading the list of coal characteristics in the Appendix, it would be hard to imagine today’s home-fire builder digging into a pile of coal, attempting to judge the individual chunks for their qualities and throwing it into a furnace or fireplace. Coal has its place, but it is definitely not in the hearth. Like oil it has found its best use removed from personal contact making industrial fires and internal combustion engines do the bidding of a highly fueled population. Ironically, it is the wood fire that people still enjoy though natural gas has found its place as a steady fuel for decorative fireplaces and displays. Coal and oil,
however, offer romance in the way of massive capital, huge profits and international shipping. Face to face, there is no way for us to enjoy a fire from these fuels. They belong to furnaces and tanks, engines and motors. Coal and oil do the dirty work of our lives while the more elegant electricity, natural gas and wood keep us in touch with our fascination with and need for fire up close.
PART IV CONCLUSION

It would be unwise to assume the growth of “instant cities” like Kansas City occurred without a massive input of fuel and energy. Such a supply meant fuel a plenty in a long pipeline that began with wood from local sources and then small mines in the downtown area, then shipped in from regional sources like Bates County, Missouri, and then natural gas from Kansas and oil from Oklahoma right behind them. The plenitude of that fuel drew people. The energy that people brought put that fuel to use to fulfill the various roles they played in the cityscape as it grew from hamlet to urban power. The more fuel, the more energy available and the faster the city grew.

Kansas City simply did not grow apace without a great deal of fuel being available and the accompanying energy from people, animals and machines to exploit it to fulfill human values. Fuel is a way to express through fire the values of a culture. If fire has been used to create metallurgy then that is a continuous thread throughout the culture. The reward of having fire for metallurgy is pots, knives, swords, metal fasteners for livery, blades for harvest, metal reinforcement for wheels, and, of course, decoration and jewelry.

City growth multiplied as fast as the combination of fuel and energy became available, energy often in the form of money, as the twin forces were put to work to extract from an ecosystem and transform into an econosystem that which the human spirit desired. The first coins were minted in Lydia in what is now Turkey around 600 bce, a testimony to the level of energy available in that city state that an abstract symbol could circulate among merchants with an agreed value. Only an economy of some complexity could generate the idea, let alone the reality of money, i.e., frozen energy with intrinsic value all its own. Its abundance
of both fuel and energy must have already conquered the necessities of food, clothing, shelter, and systematized, civilized exchange for a market multifaceted enough that coins could be supported by trade. In other words, not until about 2600 years ago did human society evolve sufficiently, learned to control and organize fuel and energy elements enough to create an abstract symbol like money. That idea rippled throughout the world and on through history to reach the shores of the Missouri River in the 1820s and continue to accumulate at that spot. The geography of that location as the jumping off point for western pioneers and the passage of so many thousands of them through this small area gave residents the border-money energy to build a town.

Three kinds of fuel and the resultant energy available created the multiplicity of “small things to gigantic proportions” that aggregated at the bend of the Missouri River. The expansion of transportation, commerce, manufacturing and material goods held little in common with the Kansas City site of 1820, since no city existed then. From zero population to 324,000 in a hundred years means a great deal of fuel and energy went into that growth.

Nature does not deal in fuel; its only currency is energy. Wind and water in the natural ecosystems do the work. An endless complexity of abundant species help to process and shape the ecosystems that make up planet Earth. It is man who has created fuel and learned to manipulate it to expand his work and increase the size of his material world.

King Coal did not arrive at that perilous height without a great deal of pain and misery on the part of workers and citizens, a sacrifice of air quality and a long-term fight in the marketplace for market share. For coal to arrive at almost 75 per cent of fuel supply meant forced growth as witnessed in the pages of Coal Age, a most revealing house organ. In its
pages can be read between the lines the long, slow good-bye to the Wood Age. This includes the slow phasing out of timbers for structural support and the longsuffering mule for brute strength. It is a testimony to this species endurance that so many worked so productively for so long. (See the Appendix for a description of both coal care and mule care).

The disappearance of the Wood Age also appeared in the Kansas City landscape. With the expansion of the railroad in Kansas City the population looked southward toward the new Union Station built on 24th Street that opened in 1914. The site lay far from the flooding waters of the Kaw and Missouri Rivers that had repeatedly damaged the West Bottoms from the time the Chouteaus arrived in 1821 up to and including 1903 and 1908.

Figure 4-14. Downtown Airport This shot of the old riverfront, the Kaw River coming in on the left and the Missouri River turning north are the geographic outlines of the original Wood Age site. The Hannibal Bridge barely visible on the right introduced the Coal Age, while the wetlands in the center have been taken over for runways for the airport so vital in the Oil Age. Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Missouri.
Farther south around 41st Street Westport had been annexed by Kansas City. The once riverside portal to Westport, the Westport Landing, it had grown because of the Hannibal Bridge and its railroad connections to become Kansas City, the strongest of the three early villages. The city limits grew south and west and annexed Isaac McCoy’s profitable trading-post site turned emigrant mecca in 1897. Even farther south around 47th Street lay the Country Club Plaza and its design of landscaping and cityscaping that would become a jewel of Kansas City’s effort to join in the nationwide movement of city beautification while separating itself from its early scrappy beginnings.

The once vital river had now become a liability. The railroad became the artery of transportation and industry while the automobile made progress in that area as better roads were built. The Plaza was designed in the 1920s for the automobile that had made its way successfully onto the city streets. The elements of energy transitions and the effects of the fuel transitions had sculpted this real estate into a settlement, a spirit and a city that would continue to prosper in the century ahead.

The new Union Station became the center of hurly burly travel up through World War II then died back as did all coal-fired utilities as oil dominated the scene. The new focus in the
years ahead would be on the airport, across the river from the original steamboat landing in the 1820s. First the steamboat landing, then the railroads and the union depot in the West Bottoms, then the new Union Station, and finally the downtown airport became the nexus of the city’s transport activity. First wood, then coal and then oil supplied the motive power. That the awestruck crowd lined up to see a machine fly speaks to the wonder of oil and the inventions created to use that versatile fuel. We have been flying high with oil ever since. The question for the future is how high shall we fly without it?
CONCLUSION: ELEMENTS OF FUEL AND ENERGY TRANSITIONS

The Kansas City story has put flesh on the bones of a periodization tool for fuel and energy transitions. It has given us an opportunity to see a population and a particular site through the lens of these two primary forces. Within this study fuel and energy have become separate but intertwined elements that each impacted the populations and changed human behavior. Their impacts changed landscapes, lives and culture.

We stand at the beginning of the study of fuel and energy transitions. This wholly human phenomenon has hidden in plain sight in our history from its beginning to the present time and is just now in the last 40 years being revealed. While the term energy transition has been around for at least fifty years or more—Schurr and Netschert used it in their seminal text in 1960--thousands of books, papers and newscasts later, the term itself has not been fully defined and analyzed.

The growing field of energy history realizes the need for description and differentiation, analysis and comparison and a small body of literature has begun to take on the history of various types of fuel. Schurr and Netschert differentiated between the term fuel for wood, coal and oil and energy for hydropower. Because they used the term “energy transition” to summarize the combined forces of fuel, hydropower, “mechanical work output” and animal power, the term seems to have become mainstream without further differentiation. This failure to notice the difference between the two elements blurs the very subject they attempt to define.¹ But, judging from the examples uncovered in the Kansas City development, the two forces can and do act separately from each other. That is an area for historical scholarship.
As fuel use changes in the twenty-first century and some fuels retreat from easy access to expensive niche products, the availability of energy to do work will change as well. It would be wise to consider each separately and the two in relationship to each other. With the tool developed here as guide and indicator, it may be possible to do so more easily.

**The Scale of Fuel Transitions**

The identification, description, analysis, and comparison of fuel and energy transitions are made available by a framework of dates and a series of indicators. Time, not gallons, barrels, tons or cords, is the unit of measurement for these events. The dates have been generated by human activity—growing fuel scarcity of one kind and abundance of another, wars, infrastructures, technological advances, and the sheer human desire for increased energy by way of increased fuel availability.

The rise, dominance and demise of any one of the three fuels has been predicated by another fuel’s path. Together the competing fuels carve up the markets, the technology and the preferences of the cultures that use them. Here are the dates for these divergent but reflective routes taken by fuel use. Divided into four parts they follow the four stages.

**The Wood Age as Defined by the Rise of Coal**

1607 to 1701  
Stage I: Discovery and Development of the Fuel Source  
Coal was first found on record in 1701 in Virginia.²

1701 to 1758  
Stage II: Systems Organization of Fuel Delivery  
Coal was first shipped on record in 1758 from Virginia to ports north as far as New York as a commercial product.³

1758 to 1885  
Stage III: Expansion and Defense of Fuels
Coal and wood continued to trade places in hearths, stoves, and fuel boxes on steamboats and railroad engines until the steep rise in manufacturing and increasing price of wood pushed coal to the forefront and crossed over wood as fuel resource. Though this crossover occurred statistically in 1885, it by no means meant the demise of wood.

1885 to 1955 Stage IV Niche and/or Decline of Fuel Source and Use
A slow die-back from the time coal crossed over wood to the eventual demise of wood as an organized fuel resource. It continues as a niche fuel.

Had coal not been exploited and eventually oil, there would be few dates for wood, and it would still be the reigning monarch of fuels. Certainly within wood’s history on this continent, human populations modified the wood supply through use and technology. Native Americans used wood for fuel and burned areas for better game hunting, an activity for which few dates can be offered. Iron plantations prospered on the East Coast and exploited wood sources, an enterprise with better records.

By 1850, the earliest reliable source for statistics, the best estimate of use of wood per capita amounted to about 4.39 cords per person compared with .36 of a ton of coal. Without the arrival of coal the dates for wood will necessarily be centered around any technological breakthroughs that might have increased usage, changes in and expansion of charcoaling, for instance, local scarcities and movements of populations to exploit new forests.

The commercialization of coal in 1758 and the War of 1812 increased the output of that fuel, forced the domestic output to organize and, subsequently, helped to create the American market for coke and iron production. In 1885 coal use surpassed wood. For the first time in history a new fuel overtook the dominance of wood use after millennia of singular eminence. The story of wood’s demise, then, is the story of coal’s rise in almost perfect reflection.
The first of these two dates, 1701 and 1758, are production changes based on commercial needs that furthered the expansion of that use. In ripples across the western edge of the colonies to the Ohio Valley, on across the Mississippi, each new settlement—like the Kansas City site—started over from the beginning at Stage I and moved on to Stage II. The discovery and gathering of a steady fuel supply is the basic pioneering activity along with food creation. Such activity was replicated countless times across the continent in its first three hundred years. Along with these two dates focusing on historical discovery, the second two dates, 1885 to 1955 are verifiable by statistics of fuel use.\(^5\) Wood dropped out as a measurable fuel source at around two per cent in 1955.\(^6\)

The dates for coal follow a path that reflects those of wood beginning a hundred years later and refer to the events in the development of coal as a fuel. They leave wood behind and continue on to the present time.

**Coal**

<table>
<thead>
<tr>
<th>1701 to 1758</th>
<th>Stage I: Discovery and Development</th>
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<tbody>
<tr>
<td></td>
<td>Dating from this first recorded sighting and then transport and sale of Virginia coal to northern cities, the exploitation of coal for commercial purposes begins.</td>
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</table>

<table>
<thead>
<tr>
<th>1758 to 1885</th>
<th>Stage II: Systems Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Efforts by coal mine owners to mine, market and transport coal were always individual to begin with, then local and regional at best, but nevertheless, strides were made and increasing quantities of coal were extracted, shipped and used by a growing industrial sector.</td>
</tr>
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<table>
<thead>
<tr>
<th>1885 to 1955</th>
<th>Stage III: Expansion and Defense</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Coal crossed over wood in perfect symmetry in a great exchange of energy suites that had been overlapping for decades and would continue to do so—the horse in horsepower generated by wood slowly</td>
</tr>
</tbody>
</table>
to be replaced by joules of mechanical power and electricity generated by coal.

1955

Stage IV: Niche and Decline
Coal is in anything but a decline though the graph shows its percentage of use less than that of oil. Coal has become a niche fuel, producing electricity almost to the exclusion of any other use. Stringent environmental and air quality laws have infringed upon its once exuberant use as ubiquitous fuel during its Stage III days.

Because oil’s use for the first 30 years amounted to less than four per cent by 1900, it had only a marginal effect on the coal picture, though kerosene for lighting and electric light competed in the market place. Williamson and Daum suggest that the oil industry leapt over the learning curve followed by coal to become an industry ready for systems organization within its first decade.7 In 1920 oil crossed over wood to become the second most powerful fuel considerably behind the domination of coal, but nevertheless, the next most powerful.

Oil

1859-1869 Stage I: Discovery and Development
In this brief period most problems of oil production were resolved to the point of steady and vigorous exploitation.

1869-1955 Stage II: Systems Organization
This long period includes the first 30 years of oil as illuminant and lubricant, an industry sufficiently different from oil as fuel to require some adjustment to the response to new uses. Oil crossed over wood by 1920 and became the fuel for transportation, but did not exceed coal’s dominance until 1955.

1955 Stage III: Expansion and Defense
Oil is holding on to dominance in 2009. At what point it will be overtaken by other fuels remains unknown.

2050? Stage IV: Niche and Decline
Oil will become even more of a niche fuel than it is already, its current use being mainly devoted to transportation. Its niche may be to fuel the military for defense purposes, while public transportation is fueled by natural gas, hydrogen and other small streams of fuel to make up a new fuel basket.

Figure 5-1. The Full Sweep of Fuel and Energy Use in America from 1607 to 2005

**Triggers for Change**

It is important here to look at what triggered the change from one stage to another. In the case of wood, Stage I: Discovery and Development was repeated as often as a farmer cleared his land. Felling trees for hearth and home has such a long history that it was repeated on an individual and local basis at every new settlement. It was the arrival of more immigrants and the growing scarcity of wood around the growing towns that forced some into burning coal by the middle to the late 18th century.⁸
The beginning of coal export from Virginia in 1758 to northern cities meant a market existed and market forces drove the increased use of coal thereafter even as wood continued to supply over 90 per cent of the fuel used. Nevertheless, it was a harbinger of coal use to come. The War of 1812 drove local merchants to fund their own coal mining activities that spurred the local markets. The technology of turning coal into coke for metallurgy was then pursued until that process was conquered by the 1840s. This skill supported the creation of railroad rails and cars though the engine still burned wood.9

This Fuel Revolution was so named by anthropologist Leslie White in 1949: “The consequences of the Fuel Revolution were in general much like those of the Agricultural Revolution: an increase in population, larger political units, bigger cities, an accumulation of wealth, a rapid development of the arts and sciences. In short, a rapid and extensive advance of culture as a whole.” The Fuel Revolution fired the Industrial Revolution so named by Frederick Engle in England in 1844 when he spoke of "an industrial revolution, a revolution which at the same time changed the whole of civil society."10

Here historical statistics take us to the point at which in 1885 coal crossed over wood to become the dominant fuel. This statistic shows that the systems organization phase lasted at least as long as 127 years. How many times the system of delivering coal changed and transformed as new technologies came on line to assist in the delivery may be much longer than these 127 years, and is, of course, a source of study in itself. The twentieth century experience of coal shortages during World War I suggest that the long task of learning to deliver coal went through many iterations before maturing to the current state in the first decade of the twenty-first century.
From 1885 to 1955 coal dominated the fuel basket. For an even 70 years coal held sway over the industrial growth of the United States, and moved the population from the Wood Age to the Oil Age. Coal turned out to have been the fuel that bridged the chasm between wood and oil; it was the heavy lifter and transformer of industrializing processes that created a world in which oil could thrive. Coal and the railroads, a vital symbiotic relationship for industry, carried the industrial might of America, and for that matter, the world, from the mid-nineteenth century to the mid-twentieth century, a hundred-year span of the greatest inventiveness and rise of standard of living in history to that point.

In 1955, and not until 1955, did oil cross over coal as the leading fuel of our civilization. Coal has been in a niche position from this point forward. Ninety-two per cent of coal is used to generate electricity in the United States, and coal supplies about half of the electricity generated in the country. This niche position of supplying electricity has been supplemented by oil for transportation and heating, gas for electricity and heating, and atomic power for electricity.

The record of oil has been covered by statistics since the first decade. Like wood and coal before it, the dates of coal and oil reflect each other. If scholarly assessments are true that oil matured through the discovery and development phase in the first decade after discovery, then Stage II: Systems Organization was achieved over a very long period from 1869 to its crossing over coal in 1955, a total of 86 years. Though oil crossed over wood between 1915 and 1920, the output of oil was under 10 per cent. Oil would not dominate the fuel basket for another 35 years, and then only at 48 per cent as opposed to coal’s 75 per cent and wood’s 90 to 100 per cent.
Oil’s rise may have been based on the kind and amount of oil available and perhaps less on technological and political events. In the first decade production bottlenecks from drilling equipment to barrels to transportation problems were overcome steadily. Stage II: Systems Organization from 1870 to 1955 included the discovery of new fields of oil in Ohio and Texas and the invention, the introduction of the internal combustion engine, and the fueling of the modern world of transportation.

Comparison of Stages

There has been more than one fuel in production in America since at least 1701. For the past three hundred years we have added fuel after fuel losing eventually only wood, the original ubiquitous, cradling, culture-building fuel. Wood is still available as a fuel, of course, ready to rescue humanity should it become necessary, but wood delivery in an organized fashion has long since become the province of men in the countryside bringing in a few cords of wood in a pickup truck to the city to sell door to door. In fact, substitute wagons for pickup truck and it has never been much more than this. The problems with falling back on wood at some point is the increase in human population that would create unsustainable demand, the source and delivery infrastructure being far from cities and industrial areas, and the less intense Btu’s of wood vs. mineral fuels to generate sufficient energy to generate power.

Coal compares at its height about 75 per cent to that of wood’s 100 per cent. Wood, oil, hydropower and natural gas made up the difference to 100 per cent. The Stage I of wood was repeated again and again from farm to town across miles, millennia and continents, while
coal in America lasted 54 years and oil 10 years. Stage I of new fuels demand new
technology. Every new fuel demands and creates its own technological solutions and
processes. Each of these energy suites generates its own techno-adaptations to increasing the
use of the resource in pursuit of human values.

We now see in the twenty-first century as we turn to new fuels that State I is the difficult
stage when potential fuel meets immature technological attempts to extract and process it.
How many decades have already been spent on perfecting hydrogen fuel cells, for instance,
that have no infrastructure to service them once on the road? How many solar-powered,
featherweight, one-passenger cars have we witnessed at the annual college competition?

Stage II for wood lasted 54 years, and coal lasted 127 years, while that of oil lasted
86 years. In this stage the overlaps occur between the new fuel and old in both adapted
technology to produce the new fuel and applied technologies to use it. Extraction industries
borrow old technologies and employ old infrastructures as they also did in Stage I to midwife
the new fuel into its own fuel system complete with finance and delivery and finally new
ways to supply the needs and desires of the end customer to use it. But there is a period
between Stages I and II when new technologies are in the making and old technologies are
doing the dirty work to extract the fuel. This is a period of inventiveness forced by the
demand for the new energy. Since there can be no new technology without a new fuel, of
necessity, the old has to do until the new can be developed.

Stage III in wood lasted from 1758 to 1885, or 127 years. That of coal lasted 70 years. The
length of Stage III for oil has not yet been determined. Stage II thrusts the fuel use upward,
sometimes slowly, sometimes fast. To reach Stage III that fuel has to cross over the dominant
fuel and continue to hold on to its rising curve. In Stage III fuel use is either going up or down. The direction may be slight, but it is nevertheless there. The graph shows that coal crossed over wood in 1885 and continued its upward thrust until 1900 when it began to level off. It continued on a slight rise until 1920 when it made a precipitous decline from 1920 to 1955 when oil crossed over coal and took first place.

**Fuel/Energy Overlaps**

An overlap occurs when one fuel starts to come onto the commercial scene and another subsequently loses ground and the two energy suites integrate processes, technologies and unfilled potentialities as they pass through each other. In other words there is a crossover of different energy components as one fuel succeeds and the other recedes.

Since technologies develop to work with a particular fuel, technological inventions help to trigger the shift in fuel that create overlaps. The open flame of wood was eclipsed by the furnace of coal. At first wood and coal used virtually the same grate, but differences were made in the coal grate that helped coal burn more efficiently, and the invention of the stove, a product made possible by metallurgy increasingly fired by coal, enclosed the flame and turned the heating element into a furnace (See the engraving of the furnace in Part III). The enclosure of the flame necessary for coal to do its best work became essential for the products of oil since their containment required both a vessel and a fire source to combust the oil, kerosene, gasoline or other product of the oil family.

The Kansas City story is full of overlaps: the steam engine fueled by wood; the bridge built over the Missouri River for the railroad with movable spans to let the steamboats sail
through; the horse car, in fact the long, slow phasing out of the horse that goes on clear to the
cavalry units in World War II at the beginning of oil’s dominance. Another series of
overlaps is the combative fuel picture of the 1870s to 1900s when kerosene, gaslight and
electric light work out their differences as light sources and went their ways to their best use
positions.

The Energy Curve

If there is a fuel curve, is there an energy curve? Since fuel has its own infrastructure, it
must be possible that energy, as we have captured it to work in our lives, must also have its
measurable features. Energy results from fuel ingested or burned to produce power to do
work. The more fuel is used, the more energy results to create more power. The more fuel
burners, either flesh or mechanical, the more fuel is burned and the more energy there is to
do work.

More fuel begets more fuel burners that beget more energy. As long as more fuel infuses
these fuel burners, the amount of energy continues to increase. If the fuel source dies back or
dies out, the animal and human fuel burners, fuel in the form of calories, can move on to new
sources of fuel or suffer local die outs or die backs. At least that is what has happened
historically. If fuel dies back for mechanical burners, they produce little or no work. When
fuel is plentiful, the culture expands and a great deal of energy is expended to satisfy the
needs and desires of the population. The energy curve, then, rises and falls with the fuel
curve. Separate as they are, they are still in close relationship to each other. The bell curve of
fuel use also creates the bell curve of energy use. One drives the other; one reflects the other.
Energy is not always tied to fuel as has been amply described with the Osage and their horses, as well as all the animal energy used on the Santa Fe Trial. A sailing ship can be buffeted by winds or becalmed without them with no fire at all involved. Water power offered the ability to turn wheels that manufactured goods from the eighteenth century onward. Energy comes in many different forms, encompasses, but is not tied to fuel.

In a Wood Age energy suite the amount of fuel is miniscule compared to the amount of energy being expended. All energy in that suite is created by animal and human muscle, wind and water. Energy, though used for work, including fuel for process heat and space heat, has no multiplier effect to create more energy by way of machinery. For this reason energy can be calculated by individual units of labor and included with the outputs of wind and water.

When machines arrived on the scene, were fueled and began to exert power, each one could multiply by horsepower and kilowatts many times over the unit of energy put forth in the Wood Age, thus multiplying the entire energy picture by many orders of magnitude. It is this multiplication of energy that has given us the rise in human population (the decline in animal population—by 1920 only six per cent of work was done by animals), the rise in the standard of living, the rise in health, the rise in longevity, the rise in materiality, education and so on.  

Does energy rise and fall in a bell curve like fuel? Certainly when there is a long term period of plenty of fuel, more people are born, caring for an increased population creates more jobs that both generate and use up the available energy. When fuel production is at full throttle, population expands and so does manufacturing. Many, many demands for goods and services use up available fuel production. A great deal of energy is spent as a result of the
abundant amount of fuel available and the two rise together. People, goods and services proliferate in an abundant fuel atmosphere. When fuel resources die back, many goods and services cannot be either produced or consumed, and the people who make or serve them become superfluous as energy units.

Energy can, with the flip of a switch in our highly fuel and energized world today, die out in a moment. Just turn on the toaster or the car or the television to understand this. But those examples are slivers of the main body of energy being used to power civilization. The whole energy curve is tied to the fuel curve. As fuels change they create their own kind of energy depending on the kind and amount of technology available to use the energy supplied by the fuel.

As the fuel curve rises, then, so does the energy curve. While fuel is inert and when burned turns into a waste product, energy is active and potential as it is generated, lives for a moment and is gone when fuel as mechanical power or motion such as wind and water is gone. The sum total of all that human activity and machines doing the work of producing our materiality is roughly equal to the Gross National Product (GNP). That may be the nearest measurement for the energy generated and used, including fuel in our lives today.

The GNP is the economists’ attempt to monetize the amount of energy generated to do the work that creates a marketplace for all goods and services to be consumed by a population in a particular time period. When human and mechanical energy increase output the GNP rises; when those sources of energy die back (an environmental term) then the economy loses energy or “steam,” (a mechanical term) as it is often described. Its rise or fall measures economic activity based on the labor and production output within a country. In this way the
energy paths of a population have become discernable, made finite and monetized for the purposes of government taxation and exchange in local, regional, national and international terms.\textsuperscript{15}

**Interaction of Fuel vs Remote Supply**

One of the under-reported advances that occurred in the nineteenth century was the slow disappearance of fire. Even as fuel increased, visible fire decreased. The open hearth was replaced by the Civil War with the enclosed stove that burned much more efficiently and which coal required for maximum burning effect and a good chimney to carry away the coal dust and exhaust. Furnaces arrived by the 1880s to supply central heat. Electric motors provided remote fire to fuel the kilowatts that coursed along the wires.\textsuperscript{16}

Electric motors now do the same for everything in our homes from the furnace and air conditioner to the electric toothbrush. Unless we light a fire in the fireplace or turn on the barbecue, we have no relationship with the fire around which our ancestors clustered. We no longer interact with fuel, only with its remote benefits. We derive the benefits of those fuels without any witness to or knowledge of their extraction, production, labor force, impact on the environment, cost to transport, local and national politics and the many other factors that are entwined in this fuel system. Fire has simply disappeared from our lives. It is worth noting that only when the electric lines go down due to storm or other damage do we quickly drop back to using wood, mankind’s number one rescuer fuel.
The Fuel Basket Now

In an attempt to give some perspective to the historical discussion, current figures are included here for some appreciation of how extensive and mixed the fuel picture has become. For the year 2007 these are the statistics supplied by the Energy Information Agency: The United States now consumes 20,687,000 barrels of oil per day, or an amazing 3,086,683,820 billion barrels per year. (A barrel contains 42 gallons for consumption over 129 billion gallons per year.) Even so, that is only 39.8 per cent of our fuel consumption. (See the graph in this section page 382.) Of this amount the United States produces 5,064,000 million barrels per day, which makes “our dependence on foreign oil,” a well-known phrase, 58.2 per cent of oil for our fuel picture.

Coal consumption is 1,112.3 million short tons (2,000 pounds) per year or 22.8 per cent of our fuel consumption. Natural gas is at 23.6 per cent to tie with coal for fuel consumption. Renewables are 6.8 per cent and nuclear power for electricity 8.4 percent of the fuel basket. The goal then for the alternatives fuel industry is to create an increase of 85 per cent in production by means and material that yet remain unknown.

A 2007 expenditure of $3,525 per person/energy expenditure x 303,824,640 current estimated United States population equals $1,070,981,856 paid by various sources for the yearly use of fuel. In the years ahead we will be looking for a combination that can offer the same quantity and quality of fuel to support a greatly enlarged human population.
Fuel and Energy Transitions as a Concept for Further Study

This work introduces a framework with which to describe, analyze and compare this important human phenomenon. Now that a transition can be laid out in its entirety with stages, indicators, overlaps and other features to be studied in whole and in part, a field for scholarship opens for those interested in pursuing it. The accompanying grid offers a cross section of places to begin. (See Essential Requisites and Four Stages in the Appendix, page 396-397).

The “six essential requisites” of fuel provide an insight into the world of coal in the nineteenth century. They were generated before the coal industry had grown to its dominant position, been bruised by labor strikes and its difficulties in World War I. These requisites also make a worthwhile list for organizing a tour through any fuel. Coupled with the four stages, they make an effective grid for discussion and research.

In the final analysis, the Wood Age, Coal Age, and Oil Age are under-appreciated delineations of history that change the way we see the human activity of a particular era. They can be mapped and measured. The fuel transition and its relationship to energy transitions can be measured in years, in stages, in technological terms and in impact of individual fuels. Its triggering events and bottlenecks can be identified and analyzed. Its stages can be compared within a particular fuel use and among other fuel uses. A whole vocabulary is required to define it. The opportunity for scholarship is deep and rich and begs for analysis. Until fuel and energy transitions are fully articulated, they cannot be fully evaluated. At some point scholarship should be able to tell by indicators developed from
historical data where we currently are in terms of the social behavior of fuel users rather than by estimation of remaining fuel.

As we go farther into the current transition from oil to alternative fuels, more scholarship is needed to deepen our understanding and to create a new body of literature in historical, analytical and comparative terms. It would seem appropriate to spend time becoming intimate with this event as we pass through it.
APPENDIX

A. The Osage History

B. The Osage Treaty Signatures

C. Racing Steamboats *James H. Lucas* and *Polar Star* Became a Legend on the Missouri River

D. Duties of Master of the Levee

E. The Log of the Steamboat Columbian

F. A Brief Timeline of Petroleum’s Early Years Against a Backdrop of Kansas City and Civil War Events

G. Care of Coal

H. Care of the Mule

I. Essential Requisites and Four Stages
Appendix A

The Osage History

As the relationship between the United States and the Osage tribe lengthens over the decades, the government has to take more and more care of a once independent and feared tribe. The tradeoff is that the Osage must concede more and more land and rights. Though the treaty sections are long, the details are revealing in their evolution as each side capitulates to the other. The last treaty with the Osage in 1865 left them to weather the loss of the buffalo, their primary food source, the invasion of locusts on the fields of these reluctant farmers and relocation to yet another spot in Oklahoma. The government outfitted them with modern, agricultural tools in 1808, 1839 and 1841. Thereafter, they were to provide for themselves.

The Timeline

Moved to mid-Missouri in a time before white explorers came. Shared territory with Missouri Indians who were absorbed into the tribe after Missouri numbers were decimated by disease.

Acquired horses in the 17th century. Mooney’s estimated population in 1780 at 6,200. Interacted with French in 18th century. Received metal knives, woolen blankets, guns. Interacted with Spanish in 18th century.

First of ten treaties with the Osage, November 10, 1808, caused a fort to be built to “protect them from insult and injury of other tribes,” Fort Clark, and to supply them with merchandise at that fort to furnish a blacksmith to mend their arms, to build a horse mill or water mill, to furnish ploughs and to build a block house for the chief. Great Osage would be paid yearly $1000 and the Little Osage $800 for the lands relinquished. Further established boundary lines on the west between their nation and the United States, made provision for stealing of horses and so on.

Second Treaty September 12, 1815 reconfirmed all previous agreements.

Third Treaty September 25, 1818, moved the boundary line west and compensated them for their lost property in the amount of $4,000.
Missouri made a state in 1821. Plans were immediately made to remove Indians to Indian Territory west of the new state.

Fourth Treaty, August 31, 1822. Reconfirmed the 1808 promise to supply the Osage with merchandise in exchange for “peltries,” and furs brought in. Paid $2,329.43 in merchandise to discharge said promise.

Fifth Treaty, June 2, 1825 The Great and Little Osage Tribes or Nations do, hereby, cede and relinquish to the United States, all their right, title, interest, and claim, to lands lying within the State of Missouri and Territory of Arkansas, and to all lands lying West of the said State of Missouri and Territory of Arkansas, North and West of the Red River, South of the Kansas River, and East of a line to be drawn from the head sources of the Kansas, Southwardly through the Rock Saline, with such reservations, for such considerations, and upon such terms as are hereinafter specified, expressed, and provided for.

1825 Moved to territory that would become Kansas. Lived there amidst other tribes until 1874.

1825 Sixth Treaty with the Great and Little Osage, August 10, 1825, established a road through the Osage Territory to the Mexican Republic for purposes of trade. The road “would be forever free, for the use of the citizens of the United States and of the Mexican Republic, who shall at all times pass and repass thereon, without any hindrance or molestation on the part of the said Great and Little Osages. They would be paid $500 in merchandise for this privilege, plus the chief had already received $300 in merchandise.

1835 Seventh Treaty with the Comanche, and Witchetaw nations and their associated bands or tribes of Indians, and between these nations or tribes and the Cherokee, Muscogee, Choctaw, Osage, Seneca and Quapaw nations or tribes of Indians. August 24, 1835. They agreed to live peaceably and to allow passage on the road that intersected their lands. They could hunt on the Great Prairie, and to had pay “the full value” of any property taken or destroyed from white settlers or each other.

1839 Eighth Treaty with the Osage January 11, 1839, agreed to pay to the said Great and Little Osage Indians, for the term of twenty years an annuity of twenty thousand dollars to be paid in the Osage nation plus twelve thousand in money and eight thousand in goods, stock, provisions, or money. To furnish the Osage nation, for the term of twenty years, two blacksmiths and two assistants, a grist and saw mill, a miller to each for fifteen years, and an assistant to each for eleven years including one thousand cows and calves, two thousand breeding hogs, a thousand ploughs, a thousand sets of horse gear, one thousand axes, and a thousand hoes to be distributed under the direction of their agent, and chiefs, as follows, viz: to each family who shall form an agricultural settlement, one cow and calf, two breeding hogs, one plough, one set of horse gear, one axe, and one hoe. The stock tools &c. to be in readiness for delivery, as soon as practicable after the ratification of this treaty, and the Osages shall have complied with the stipulations herein contained. To pay all claims against
said Osages, for depredations committed by them against other Indians or citizens of the United States, to an amount not exceeding thirty thousand dollars, provided that the said claims shall be previously examined under the direction of the President. To purchase the reservations provided for individuals in the fifth article of the treaty of June second, one thousand eight hundred and twenty-five, at not exceeding two dollars per acre, to be paid to the respective reserves, excepting however from this provision, the tracts that were purchased in the fourth article of the treaty with the Cherokees of December twenty-ninth one thousand eight hundred and thirty-five. To reimburse the sum of three thousand dollars deducted from their annuity in one thousand eight hundred and twenty-five, to pay for property taken by them, which they have since returned. To pay to Clermont's band, their portion of the annuity for one thousand eight hundred and twenty-nine, which was wrongfully withheld from them, by the agent of the Government, amounting to three thousand dollars.

1841 Census showed 3,580 members of the tribe.

1865 Ninth Treaty with the Osage, September 11, 1865, Agreement with the Cherokee and other Tribes in the Indian Territory, viz: Cherokees, Creeks, Choctaws, Chickasaws, Osages, Seminoles, Senecas, Shawnees, and Quapaws since representatives of these tribes joined the Confederate States are liable to forfeiture of all rights and privileges with the United States which has maintained its supremacy. These tribes agreed to come back under the protection of the United States and to offer allegiance only to the United States.

1865 Tenth Treaty with the Osage, September 29, 1865. “All payments from the Government to them under former treaties having ceased, leaving them greatly impoverished, and being desirous of improving their condition by disposing of their surplus lands. From the sale of the lands, a “civilization fund” would be created to build schools and hire teachers for the children of the Osage people. Rights of way for roads and railroads would be available through the Indian territory. Within six months after the ratification of this treaty the Osage Indians shall remove from the lands sold and ceded in trust, and settle upon their diminished reservation.

About half of the lands of these tribes were confiscated for their part in supporting the Confederate States.

1868 Non-tribal members were able to settle on the remaining lands.

1868 Surrendered remaining Osage lands in Kansas.

1868 Very destitute. Lost numbers of horses. Were unable to complete annual buffalo kill. Moved farther out on plains where white man would bother them no more.

1871 Creation of Oklahoma reservation. Moved to new location.

1874 Osage returned from buffalo hunt on the plains with “great loads of meat and tallow and 10,800 buffalo robes.”

1875 Boundary of the new Osage reserve finalized March 5th.

1875 Osage boy Joe graduated from Catholic mission school and immediately rejected and returned to Osage dress and ways.

1875 Osage did not want to become full-time farmers. Gave it up when grasshoppers came in waves.

1876 Last buffalo hunt on the open plains.

1876 Grasshopper invasion threw Indians into debt.

1870s-1880s Children forced to go to school or parents would not be paid annuities.

1877 Half the tribe succumbed to diseases; Survivors adopted a constitution.

1880s Moving into buildings for the first time; some Osage did not understand the doorknob, stairs, or the brake on the wagon.

1881 Great Osage and Little Osage became one, “the Osage Nation.”

1880s The ancient governing body of the tribes, the so-called Little Old Men, were disbanded, taken over by the constitution and the merging of the two tribes.

1880s Horse stealing and whiskey peddling by whites; Indians arrested for possessing whiskey.

1887 Dawes Act designed to eliminate tribal citizenship and force Indians to accept individual allotments.

1893 Purge of rolls still included many whites who had bribed or married their way in.

1897 Oil discovered under the reservation. The Osage became “the richest tribe in the world.”

1890s Riches brought more white men. Indians in debt.

1896 Prospector Edwin Foster organized Phoenix Oil Co. The Osages were to be paid a
royalty of 10% on petroleum production and an annual payment of $50 for each producing gas well. For his part the leaseholder could use as much surface area and resources--timber, building stone, water and wood as needed--for fuel construction or housing. This became known as the "blanket lease."

1897 Foster blanket lease was made available to Osage 2,229 members, 900 fullbloods and 829 mixed bloods. Per capita income was now $214.

1898-1900 Former warriors became medicine men who became a nuisance to white population.

1901 Osage now had about $603 per capita. Reign of Terror—guardians robbing, murdering, cheating.

1903 ITIO monopoly breakup, production boomed; 64 firms active in area; J. Paul Getty begins his association that builds his fortune (ITIO-Indian Territory Illuminating Org).

1904 High-grade petroleum found; 155 producing oil wells, 18 gas wells.

1904 ITIO managers had not been collecting bonuses and payments from subleases nor making payments to tribes.

1906 Act of 1906 established an Osage Council with elected chief, assistant chief, and eight councilmen.

1906-16 Renewed blanket lease covered 68,000 acres and over 1,000 producing wells. Production hampered by transport facilities, a problem remedied in 1910 by Gulf Pipe Line Company, Standard Oil and Uncle Sam Oil Company.

1907 Osage Nation became part of state of Oklahoma and reservation became Osage County.

1907+ “The Frenzy,” in which numbers of people tried to get a share of the oil money while the Osage themselves indulged in extravagances.

1916 Osage earned $384 per capita headright.

1917 Osage earned $2,719 per capita headright.

1917 work started on a major 18-inch natural gas transmission line.

1919 Osage volunteered for World War I.

1920s Oil merely gave the Osages more money for white men to grab.
1925 The nation reached their peak at $13,200 each headright.

Congress passed an act in 1925 to protect the Osage from further plundering. It forbade any but heirs of Indian blood from inheriting from allottees of one half or more Osage blood quantum. This helped to keep the voice of the full bloods alive even after their deaths.

1928 over half of the Indian population in America had per capita incomes of less than $200 and only two percent made more than $500 a year. 18
Appendix B

The Osage Treaty Signatures

The signatures on these treaties were recorded by officials of the U. S. government, giving us a rare look into how the signers viewed themselves and their world. Their signatures bespeak their orientation to nature and their culture as warriors of a proud tribe, who, no matter how sophisticated they may have been in their world, were no match for representatives of the United States government using such words on paper as “abrogated,” meaning nullifying the rights of the Indians or the loss of their lands. Even signing a paper with a mark was a new concept where word, ceremony and body language had previously sufficed to honor agreements.

The chiefs signing their mark for the Osage were listed as follows:

1825 Treaty

Pa-hu-sha, (white hair,) head chief of the G. O., his x mark
Ca-he-ga-wa-tonega, (foolish chief,) head chief of the L. O., his x mark
Shin-gawassa, (handsome bird,) chief of the G. O., his x mark
Ta-ha-mo-nee, (swift walker,) chief L. O., his x mark
Ca-he-ga-wash-im-pee-she, (bad chief,) chief G. O., his x mark
Wee-ho-je-ne-fare, (without ears,) chief L. O., his x mark
Ca-he-ga-shinga, (little chief,) chief G. O., his x mark
Waw-bur-cou, warrior Little Osages, his x mark
Maw-sho-hun-ga, warrior Great Osages, his x mark
Waw-lo-gah, (Owl,) warrior Little Osages, his x mark
Maw-she-to-mo-nee, warrior Great Osages, his x mark
Che-he-kaw, warrior Little Osages, his x mark
Ne-ha-wa-she-tun-ga, warrior
Great Osages, his x mark
Ho-no-posse, warrior Little Osages, his x mark
Waw-kun-chee, warrior Little Osages, his x mark
Pwa-ne-no-push-re, warrior Little Osages, his x mark
1835 Treaty

Pa-hu-sha, (white hair,) head chief of the G. O., his x mark
Ca-he-ga-wa-tonega, (foolish chief,) head chief of the L. O., his x mark
Shin-gawassa, (handsome bird,) chief of the G. O., his x mark
Ta-ha-mo-nee, (swift walker,) chief L. O., his x mark
Ca-he-ga-wash-im-pee-she, (bad chief,) chief G. O., his x mark
Wee-ho-je-ne-fare, (without ears,) chief L. O., his x mark
Ca-he-ga-shinga, (little chief,) chief G. O., his x mark
Waw-bur-cou, warrior Little Osages, his x mark
Maw-sho-hun-ga, warrior Great Osages, his x mark
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Che-he-kaw, warrior Little Osages, his x mark
Ne-ha-wa-she-tun-ga, warrior Great Osages, his x mark
Ho-no-posse, warrior Little Osages, his x mark
Waw-kun-chee, warrior Little Osages, his x mark
Pwa-ne-no-push-re, warrior Little Osages, his x mark

1837 Treaty

Clermont, the Principal Chief
Ka-hi-gair-tanga, the Big Chief
Ka-hi-gair-wa-chin-pi-chais, the Mad Chief
Chan-gais-mon-non, the Horse Thief
Wa-cri-cha, the Liberal
Ta-lais, the Going Deer
Chonta-sa-bais, the Black Dog,
Wa-clum-pi-chais, the Mad Warrior
Mi-ta-ni-ga, the Crazy Blanket
Hec-ra-ti, the War Eagle
Tan-wan-ga-hais, the Townmaker
Ha-ha-ga-la, the One They Cry For
Chongais-han-ga, the Learned Dog
Man-pa-cha, the Brave Man
Joseph Staidegais, the Tall Joseph
Tais-ha-wa-gra-kim, the Chief Bearer
Sa-wa-the, the Dreadful
Ca-wa-wa-gu, the One Who Gives Horses
U-de-gais-ta-wa-ta-ni-ga, the Crazy Osage
Appendix C

Racing Steamboats *James H. Lucas* and *Polar Star*

The energy transition of the steamboat using wood as motive power brought about the need for speed and the joy of winning in a race on the frontier waters. This is the story of a race run in 1858 on the Missouri River, one of the golden years of steamboating:

The fastest of these [boats] was the *James H. Lucas*, which held the record for the quickest time from St. Louis to St. Joseph. In the early fifties the *Polar Star*, with a bow like a knife, and paddle wheels low set in the water, engines quick in stroke and powerful, a load well bestowed so that the stern sat low, and the bow raised like a bird just starting in flight, had made a phenomenal run from St. Louis to St. Joseph. So delighted were her St. Louis owners that they had old Jim Bridger, the famous scout, trapper, guide and explorer, to secure for them the finest pair of elk horns to be found in the upper Missouri valley. Bridger delivered the horns and there was a great blow out when these were presented to the proud captain of the *Polar Star*. Tacked on to the horns was a sterling silver tablet, upon which was engraved the record of the *Star’s* run, and following that, this couplet;

The fleetest elk hath shed them from his brow;
Fit emblem, *Polar Star*, to deck thy prow.

About this time the *James H. Lucas* came into commission and its captain, having in one or two runs arrived at the conclusion that his boat had some speed, made up his mind to try and win those horns. Abiding his time until the stage of water was just right he carefully adjusted his up-stream cargo—for upon a proper loading a boat largely depended its ease of motion—he stored his lower decks with much rich pine, several barrels of rosin, a few tons
of fat pork, and started forth. The swift strokes of the buckets churned the river into foam while the shapely bow cut and turned the water like a plowshare. The Lucas made the same stops the Star had made and remained as long at each landing. When she pulled in at Kansas City she had gained a little on the Star’s time, but not enough for safety, so the stokers chucked in more rosin and pork and the black smoke curling in a dense cloud from her lofty funnels told of the lively work going on down below. As the boat left Atchison the captain took his stand in front of the pilothouse and holding his chronometer in his hand kept the time while he closely watched the river on ahead. Soon the siren signaled St. Joseph, and the captain turned to receive the congratulations of his officers and passengers. He had beaten the Star’s time, as I remember, by about three hours and 16 minutes. The master of the Star was game, and as soon as his successful rival returned to St. Louis the horns were transferred to the hurricane deck of the Lucas, which held them as long as it ploughed the muddy waters of the “old Mizzo.”
Appendix D

Duties of Master of the Levee

This description of the master of the levee drawn up by the town of Kanzas city council in the 1850s indicated how much responsibility he had for the half dozen large boats a day and dozens of smaller, “tramp” boats, cannel coal, wood and keelboats that landed at the limestone pier. Busy as the master of the levee was by this description, the arrival of the railroad trains and the opening of the railroad station on the West Bottoms dwarfed his efforts. The number of trains arriving and departing increased to 200 or more a day by the 1880s. The increase in complexity had as much to do with the efficiencies brought on by greater use of fuel, forced systems organization built on previous models of steamboating, and the demand for service brought on by sheer numbers of people and vehicles as central to the widening circle of transportation, mail and hotels to be handled on a daily basis.

The levee master had the following duties:

To direct the landing and stationing of all water craft arriving or lying at any point on the river bank within the City, and the discharge and removal, and lading of their cargo, so as to prevent interference between different vessels and their repairs on the river bank, so that they shall occupy as little space and cause as little inconvenience as possible; to see that all combustible materials on the river bank are sufficiently protected from fire; to keep the wharf and river along the shore free from all improper obstructions; to keep in repair the ring bolts and posts provided for fastening boats and to vessels; to regulate and control, by proper rules to be established and published, all vehicles traversing the wharf; and to remove thence such as unnecessarily obstruct free passage upon the wharf or street, and generally to exercise complete supervision and control over the wharf, river bank, landing and Front street.
Appendix E

Receipt Book of the Steam Boat Columbian

Receipt book of the steam boat *Columbian*, February 15, 1849 to October 9, 1851, along the Pittsburgh to Cincinnati to St. Louis routes indicate the many stops for small amounts of wood and coal, form of fuel delivery that would not be able to promote growth of the industry. Compare this to the winding map Figure 2-6, page 117, along the Ohio River in Part II, to see how piecemeal was the supply of fuel and how often these stops inhibited the speed of the trip:

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pages missing in historical record

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Voyage 13 from Cincinnati to Pittsburgh

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Voyage 15 from Pittsburgh to Cincinnati

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**Voyage 18**

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**Voyage 19 Pittsburgh to St. Louis**

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**Voyage 22 Pittsburgh to St. Louis**

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**Voyage 24 Nashville to Pittsburgh**

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**Voyage 26**

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**Voyage 32 Louisville to Pittsburgh**

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<td>Description</td>
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</tr>
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<td>31/2 cords</td>
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<td>$ 18.43</td>
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<td>05/29</td>
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</tr>
<tr>
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<td>05/29</td>
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</tr>
<tr>
<td>100 Bu</td>
<td>$ 5.00</td>
<td>05/29</td>
<td>H Rock</td>
</tr>
<tr>
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<td>06/02</td>
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</tr>
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<tr>
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**Voyage 37 Louisville to Pittsburgh**

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</tr>
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<td>06/07</td>
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<td>$ 4.50</td>
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</tr>
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<td>$ 2.25</td>
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<td>$ 3.50</td>
<td></td>
</tr>
<tr>
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<td>$ 5.50</td>
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</tr>
<tr>
<td>41/2</td>
<td></td>
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</tr>
<tr>
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<td></td>
<td>$ 2.62</td>
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</tr>
<tr>
<td>5 cords</td>
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<tr>
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<td>$ 9.00</td>
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</tr>
<tr>
<td>50 Bu</td>
<td></td>
<td>$ 4.50</td>
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<tr>
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<td>$ 9.00</td>
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</tr>
<tr>
<td>50 Bu</td>
<td></td>
<td>$ 4.50</td>
<td></td>
</tr>
</tbody>
</table>
Appendix F

A Brief Timeline of Petroleum’s Early Years Against a Backdrop of Kansas City and Civil War Events

<table>
<thead>
<tr>
<th>EVENT</th>
<th>YEAR</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pony Express began from St. Joseph, MO to Sacramento, CA</td>
<td>1858</td>
<td>Covered 2,000 miles that had no telegraph, man and horse instead</td>
</tr>
<tr>
<td>Drake’s Well brought in first oil in Titusville, Pennsylvania</td>
<td>August 27, 1859</td>
<td>The frenzy began.</td>
</tr>
<tr>
<td>Coal fuel consumption, 16.4% Oil at .1%</td>
<td>1860</td>
<td>Fuel wood 83.5% of total used - Railroads reached 36,000 miles</td>
</tr>
<tr>
<td>Abraham Lincoln elected.</td>
<td>November 6, 1860</td>
<td>“Government cannot endure permanently half slave, half free...”</td>
</tr>
<tr>
<td>“Barrels, barrels are the great want now and much is lost by the scarcity of this article.”</td>
<td>1860</td>
<td>Box vats began to be made instead of barrels with several hundred barrels capacity, eventually replaced with round vats with metal straps.</td>
</tr>
<tr>
<td>Confederate States of America formed. Kansas City leaders chose neutrality though holding slaves</td>
<td>February 9, 1861</td>
<td>Jefferson Davis elected President. Missouri one of Confederate States</td>
</tr>
<tr>
<td>Confederate forces fired on Union Fort Sumter in Charleston Harbor</td>
<td>April 12, 1861</td>
<td>Fort Sumter surrendered. The Civil War began.</td>
</tr>
<tr>
<td>Three gushers in quick succession at Titusville</td>
<td>April 17, 1861</td>
<td>Waiting investors rejoiced and real business began.</td>
</tr>
<tr>
<td>Nomenclature and standards developed for newborn oil industry</td>
<td>1861</td>
<td>Based on coal-oil refining Measured relative densities of crude oil, refined distillates and residues.</td>
</tr>
<tr>
<td>Learned that naptha, benzine, and kerosene had different boiling points</td>
<td>1861</td>
<td>Adopted standard of degrees Baume to accommodate differences</td>
</tr>
<tr>
<td>Production of oil overwhelmed transportation and produced</td>
<td>1861</td>
<td>Most refineries changed from coal-oil to petroleum distilling at this early point.</td>
</tr>
<tr>
<td>Event</td>
<td>Year</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>more than the refining facilities could handle.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The first shipment of oil crossed the Atlantic Ocean in wooden sailing ship</td>
<td>1861</td>
<td>Shipped in barrels from Philadelphia to London</td>
</tr>
<tr>
<td>Telegraph lines reached coast to coast Owners spent $700,000 and ended w/ $200,000 deficit. Proved the central route could be traveled all winter and set up that route for the railroad to come.</td>
<td>October 24, 1861</td>
<td>Official end of Pony Express. In 1858 price for ½ ounce of mail was $5.00. By the end it was $1.00. Kept communication open at beginning of Civil War.</td>
</tr>
<tr>
<td>Many small refiners opened shop processing as little as 5 to 100 gallons of kerosene a day.</td>
<td>Early 1860s</td>
<td>Complexity of oil processing created roles for drillers, wildcatters, sales gallons of agents, “dumpers,” who sold storage space; “oil farmers,” who produced or owned the land; brokers and investors; refiners and distillers</td>
</tr>
<tr>
<td>“Torpedoing” required to free oil wells of paraffin and mud. A “dry hole” could be returned to production with the right charge.</td>
<td>Early 1860s to 1870s</td>
<td>Steam, gun-powder charges and nitroglycerin variously used to re-open clogged wells. Highly volatile charges set by “shooters” and “moon-lighters” led to many fatalities</td>
</tr>
<tr>
<td>First iron-clad ships battled each other, Monitor and Merrimac Battle was a draw</td>
<td>1862</td>
<td>Increased metallurgy from coal made metal ships possible and wooden ships obsolete</td>
</tr>
<tr>
<td>Coal first used to power the steam engines at oil wells; replaced by gas hooked up free from well itself</td>
<td>1862</td>
<td>Drilling 200 feet max w/costs $1,200 to $1,500</td>
</tr>
<tr>
<td>First wooden pipeline for oil built</td>
<td>1862</td>
<td>A length of 1,000 feet Soon replaced by cast iron pipes Both leaked.</td>
</tr>
<tr>
<td>Standards of illuminating oil set for five grades of refined petroleum: “strictly white,” “white,” “light straw,” “straw,” and “dark straw.”</td>
<td>1863</td>
<td>By New York Petroleum Association Premium was “strictly white” with fire test of 115 degrees Farenheit</td>
</tr>
<tr>
<td>Lawrence, Kansas,</td>
<td>August 21, 1863</td>
<td>By Confederate Bushwacker</td>
</tr>
<tr>
<td>Event</td>
<td>Date</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Massacre, Over 150 civilian casualties</td>
<td></td>
<td>Ordered evacuation of the rural areas of Jackson, Cass, Vernon and Bates counties, Missouri, of Southern sympathizer families</td>
</tr>
<tr>
<td>General Order No. 11 issued in retaliation for Lawrence Massacre</td>
<td>August 25, 1863</td>
<td>Ordered evacuation of the rural areas of Jackson, Cass, Vernon and Bates counties, Missouri, of Southern sympathizer families</td>
</tr>
<tr>
<td>Lincoln signed <em>Emancipation Proclamation</em></td>
<td>January 1, 1863</td>
<td>Freed the slave population throughout the country</td>
</tr>
<tr>
<td>Gettysburg speech, “Four score and seven years ago . . .”</td>
<td>July 1-3, 1863</td>
<td>Tide turned against the South</td>
</tr>
<tr>
<td>North invaded the South and destroyed towns, cities, crops and railroads</td>
<td>1864</td>
<td>Included General Sherman’s “March to Atlanta” across Georgia</td>
</tr>
<tr>
<td>Battle of Westport, Kansas City, MO</td>
<td>October 22-3, 1864</td>
<td>Left the city in ruins; Union forces won.</td>
</tr>
<tr>
<td>Robert E. Lee surrendered to Ulysses S. Grant at Appomattox, Virginia.</td>
<td>1865</td>
<td>Total casualties at least 618,000 from battle and disease</td>
</tr>
<tr>
<td>Confederate War was over. Reconstruction began.</td>
<td></td>
<td>Wanted to improve refining methods and cut costs</td>
</tr>
<tr>
<td>John D. Rockefeller invests in refining</td>
<td>1865</td>
<td>Wanted to improve refining methods and cut costs</td>
</tr>
<tr>
<td>Petroleum byproducts marketed after</td>
<td>1865</td>
<td>Paraffin chewing gum “highly recommended for ladies’ sewing circles“</td>
</tr>
<tr>
<td>Rockefeller began to market kerosene to foreign countries.</td>
<td>1866</td>
<td>Built new refinery in Cleveland. Opened office in New York City</td>
</tr>
<tr>
<td>About 90% of the industry’s estimated total daily crude of 12,000 barrels processed in Pittsburgh, New York-New Jersey and Oil Region</td>
<td>mid-1860s</td>
<td>Pittsburgh’s maturity as an industrial center influenced more to arrive and stay. Legacy of coal-oil boosted oil refining here.</td>
</tr>
<tr>
<td>Oil fires common at storage sites and during railroad transit; barrels and tanks had chronic leakage problems</td>
<td>1860s</td>
<td>Piping to fire-resistant iron storage removed a safe distance from wells</td>
</tr>
<tr>
<td>Water traffic in Oil Region declines</td>
<td></td>
<td>Railroads run trunk lines into Region</td>
</tr>
<tr>
<td>Gathering lines introduced</td>
<td>midi-1860s</td>
<td>Based on water and coal-gas</td>
</tr>
<tr>
<td>Event</td>
<td>Date</td>
<td>Details</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>Breakthrough in piping to storage tanks and railroads considered the greatest impact on the early oil industry.</td>
<td></td>
<td>models</td>
</tr>
<tr>
<td>Drilling depths down to 700-900 feet&lt;sup&gt;35&lt;/sup&gt;</td>
<td>1868</td>
<td>Costs increase to $6,100 labor and fuel, $2,100; engine, boiler, rig, etc. $3000, tubing, casing, pumps, $1,000</td>
</tr>
<tr>
<td>Steel-topped and all-steel rails replaced iron rails on the railroad lines&lt;sup&gt;36&lt;/sup&gt;</td>
<td>1868</td>
<td>Another byproduct of coal at work using coke increasingly over charcoal</td>
</tr>
<tr>
<td>Intercontinental Railroad connected May 10, 1869 Promontory Point, Utah</td>
<td></td>
<td>Connected both East and West Coasts</td>
</tr>
<tr>
<td>Hannibal Bridge opened across Missouri River on July 3rd</td>
<td>1869</td>
<td>Final link in the Intercontinental RR - Kansas City population mushroomed</td>
</tr>
<tr>
<td>First formal oil exchange was organized in Oil City, PA</td>
<td>December, 1869</td>
<td>Similar associations would start in other cities to trade oil stocks</td>
</tr>
<tr>
<td>A new petroleum byproduct used for leather processing, water proofing</td>
<td>1869</td>
<td>Vaseline still popular today</td>
</tr>
<tr>
<td>Standard Oil Company organized&lt;sup&gt;37&lt;/sup&gt; John D. Rockefeller, president</td>
<td>1870</td>
<td>Established in Cleveland, OH, on sixty acres. Two refineries, barrel-making facility, on the shores of Lake Erie, tank cars, railroad sidings, ware-houses in Titusville area and timberlands for barrel making, other facilities in New York area and NY Harbor.</td>
</tr>
<tr>
<td>The first mansion built in Titusville the beginning of Millionaire Row&lt;sup&gt;38&lt;/sup&gt;</td>
<td>1870</td>
<td>Oil soaked terrain suddenly sprouted formal gardens and acres of flowers</td>
</tr>
<tr>
<td>Coal consumption 26.5% Oil rose to .3%&lt;sup&gt;39&lt;/sup&gt;</td>
<td>1870</td>
<td>Wood consumption fell to 73.2% Railroad miles now 52,900</td>
</tr>
</tbody>
</table>
Appendix G

Care of Coal

Coal was deceptively tricky to keep and burn. It required understanding and respect or the fire would not catch hold. The following instructions were generated to help users understand their coal pile better and to get more from it:

Coal should be stored in small quantities as near to the point of consumption as possible, says a recent statement of the Bureau of Mines on the subject of stocking coal in piles. Small coal piles rarely ignite from spontaneous combustion. Coal should be stored near the point of use to avoid rehandling, extra transportation and the degradation of size which follows each rehandling. For these reasons the bureau would advocate storage, so far as possible, in the bins and yards of the ultimate consumer, thus dividing the risk of loss from spontaneous combustion. If large storage piles are necessary, certain general principles must be borne in mind. The generation of heat is the result of slow oxidation of the coal surface. The oxidation is much more rapid from freshly mined coal or from freshly broken surfaces. The oxidation rate increases rapidly with increased temperature. Different coals have different oxidizing rates. These facts led to the following recommendations:

Where there is choice of coal to be stored, that having the lowest oxidizing rate should be chosen, if known.

Between two coals, that which is least friable, and therefore which presents the least total coal surface in the pile, should be selected.

The method of handling should be such as to produce the least freshly broken coal surface. The coal should be as cool as possible when piled. Piling warm coal on a hot day is more likely to produce spontaneous combustion.

The coal must be kept from any extraneous source of heat.

Alternative wetting and drying of coal during piling is to be avoided if possible. The fine coal, or slack, which furnishes the larger coal surface in the pile, is the part from which spontaneous combustion is to be expected. Piling of lump coal where possible is therefore desirable.

In the process of handling, if the lump coal can be stored and the fine coal removed and used immediately, the practice prevents spontaneous combustion in coals which would have otherwise given trouble.
The sulphur content of coal is believed by many to play an important role in spontaneous combustion. The evidence on this point is still conflicting, but to play safe it is desirable to choose coal having a lower sulphur content, when choice is possible.

There is a current belief that dissimilar coals stored in one pile are more liable to spontaneous combustion. The evidence on this point is also conflicting, but, to play safe, it is advisable to store only one kind of coal in a pile.

The ground on which a coal pile is built should be dry.

The foregoing recommendations are all derived from the factors affecting the heating of coal.

--Coal Age, March 30, 1918, 585.
Appendix H

Care of the Mule

Years went by and still mule care was a concern in the pages of *Coal Age*. A series of instructions was offered in 1917 as a definitive look at mule treatment. "Humane Treatment for the Mule" leaves no harness unexamined. These mules were animate units of energy employed to do the work that men could or would prefer not to do with greater efficiency. It is difficult to think of mules in an industrial setting, but the roots of the Coal Age grew from the Wood Age and carried forward with it certain components of that era until ultimately replaced by inanimate labor:

It seems to me that the mule doesn’t receive the proper sort of treatment when he is being broken in for work in the mines, and it has occurred to me that the following “Don’ts” may prove of help to those who are responsible for the care of these animals. A strict compliance with the few warnings set forth below will result in a greater degree of efficiency from “green” mules.

Don’t take a mule into a mine for the first time and set him to work on a steep grade hauling cars that would require the best effort of a practiced animal to draw out.

Don’t delegate the work of breaking in a new mule to an extra driver or some mine worker who has never had any experience in driving mules.

Don’t let the mule be harnessed by one who doesn’t know whether the harness fits or not, or whether the hames (pieces of the harness attached to the collar) are adjusted so as to throw the draft in the right position on the shoulder.

Don’t fix the trail chain so that the weight pulls down on the animal’s rump, or adjust his collar so that it pinches the top of his neck.

Don’t take a mule into a heading where the smoke is so thick you cannot see.

Don’t walk alongside a mule while he is drawing a car and belabor him at every step he takes.
Don’t put the halter chain around the animal’s jaw and stand in front of him and pull on it, while a helper whips him with a belt or a club. *(Is it the position of the handler or the beating of the mule that is in question here?)*

If a mule is balky, have the stable boss adjust his harness and let the mule haul something outside, such as drag rails, or let him haul empties for a few days. It is also a good plan to put a “green” mule in a strong team with an animal that understands the work and let the two mules do the work of one until such time as the new mule becomes accustomed to the work.

A mule lasted from five to ten years in a mine, “some mines use them up faster than this because of specially hard and adverse working conditions.” The mule, better than the horse, was well suited to this work and displayed “an almost human sagacity in getting about the mine and avoiding the many dangers incident to his precarious life, such as being run down by trips of loaded cats, etc.” They responded well to kind treatment, as the article above suggests, but could sulk and become vicious when abused.

Appendix I

Essential Requisites and Four Stages

The following grid of essential requisites and four stages summarizes at least 24 areas of study in fuel and energy elements during the course of a fuel’s use. The essential requisites came from the coal industry written in the 1850s. In these six elements can be read the story of the coal industry’s growth to come, labor problems, shortages across the country, the problems with undependable transportation and other facets a growing fuel industry under heavy demand to rise to supremacy of 75 per cent of the fuel basket in a matter of decades.
### Essential Requisites and Four Stages Chart

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<td>Initial technology</td>
<td>Organizing delivery systems</td>
<td>Competing in price, position, and demand.</td>
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<tr>
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<td>Energy for transformation</td>
<td>Technology for transportation</td>
<td>Expansion and tenancies of system</td>
<td>Retooling for new delivery</td>
</tr>
<tr>
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<td>Education for use with available or new technology</td>
<td>Waste, pollution safety concerns</td>
<td>Environmental laws competing with expanding markets and abundance of goods</td>
<td>Dealing with decline of primary fuel source</td>
</tr>
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Table 5-1 Essential Requisites and Four Stages
NOTES

Abbreviations:

Western History Manuscript Collection, University of Missouri-Kansas City—WHMC, UMKC

Proceedings of the Electric Light Association--Proceedings

Part I

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3 An energy suite is here defined as a matched set of man-made components with a common fuel denominator made identifiable by the amount and kind of fuel available. See the Glossary for more definitions.

4 Schurr and Netschert, 54.

5 Waste also comes out, and in many cases may be used again as a form of fuel, hence, another form of energy. As a human construct that the rest of nature ignores, waste is labeled undesirable and must be done away with. Humans have of late learned there is no ‘away’ and are becoming more creative and selective in generating and using waste. In the natural world, however, waste, as we have defined it, is not at all wasted but is caught up in the natural cycle and used again and again to regenerate life.

6 Howard T. Odum, and Elisabeth C. Odum, Energy the Basis for Man and Nature (New York: McGraw Hill, 1976) 27. This 1970s classic on energy flows further defines energy “as a quantity that flows through all processes, measured by its ability to generate heat.” The rate of flow of energy was defined as power. The concentration of energy affects the amount of useful work that can be done. Because all forms of energy can be converted into heat, energy can be defined and measured as the ability to generate heat. The Odums did not really
differentiate between fuel and energy, hence, a somewhat unclear view of energy.

7 Schurr and Netschert, 36-38. This source begins its records in 1850, the first reliable record keeping available. They do estimate that “only about 100,000 tons in 1800” were mined,” Schurr and Netschert, 62. One per cent of fuel use may be a generous estimate for this amount.


9 See the Twelfth Census of the United States, “Coal,” “Natural Gas,” (Government Printing Office, Washington, D.C., 1905) 775-6. Schurr and Netschert’s final figures include 3.6% production of hydro-power by 1920 that rounds out their figures to an estimated total fuel and energy picture. The remaining 3.6% or so of energy availability was supplied by hydropower. See Schurr and Netschert, 36.

10 Federal Censuses, popular writings, newspaper articles and personal records have contributed to these numbers. These figures by email from Jeremey Drouin, librarian, Missouri Valley Room, Kansas City Public Library, March 26, 2009.

1 Fred Cottrell, Energy and Society: The Relation Between Energy, Social Change, and Economic Development (Westport, CT: Greenwood Press, Publishers, 1955) vii. The 1607 date for the beginning of this period was a difficult choice. 1607 represents the founding of Jamestown as the date from which to mark the beginning of white settlement in what is now the continental United States.

2 Lewis Mumford’s paean to wood is in Technics and Civilization (San Diego, CA: Harcourt Brace, 1934), 77-81.


7 Joseph E. Walker, *Hopewell Village: A Social and Economic History of an Iron-Making Community* (Philadelphia: University of Pennsylvania Press, 1966), 240. Hopewell iron plantation in the early 1800s used 3-4,000 cords of wood per year in making iron. The furnace used 4.66 cords of wood to make one ton of pig iron. The yearly crop of iron then was about 1500 tons and static without more wood from farther away. Hopewell cut an area of wood clean and let it regrow, a practice of sustainability requiring 30 years for the next harvest.

8 White, 384.


12 Original survey maps of Jackson County, MO, 1818-1843 (containing detailed analyses of natural resources and political boundary surveys relating to the early settlement of the county). Jackson County (MO) Historical Society Archives. Unpublished atlas.


15 Hickman, 96-97. All the authors who write on early Kansas City mention the limestone pier that would entice steamboat traffic to move from Independence west to be closer to the river bend. The limestone pier represented a natural hard footing for loading and unloading instead of a river bank that could become a sea of mud in the winter and hard pan in the summer.

16 Moulton, Volume 2, 320.


21 Ibid., 2-3.

22 *James Mooney’s History, Myths, and Sacred Formulas of the Cherokees* (Asheville, NC: Historical Images, 1992). This expression is used in the National Museum of the American Indian exhibit on the Cherokee in Washington, D.C.
“Missouri at the time was considered the western confines of civilization, and it was believed then that there never would be in the future any white settlements of civilized people existing between the western borders of Missouri and the Pacific Coast, unless it might be the strip between the Sierra Nevada Mountains and the Pacific Ocean, which the people at that time knew but little or nothing about.” Speaking of the early decades of the nineteenth century was Alexander Majors, *Seventy Years on the Frontier: Lifetime on the Border* (Minneapolis: Ross & Haines, Inc., 1965), 30.

Alfred D. Chandler, Jr., “Anthracite Coal and the Beginning of the Industrial Revolution in the United States, *Business History Review* (Summer, 1972, 46), 146. Chandler quotes historian Samuel Batchelder that in machinery “metals were used only where friction was constant, where a cutting edge was needed, or to strengthen areas of stress.” Otherwise, the machinery was made of wood with leather belting tied to waterwheels for power.

Louis F. Burns, *Osage Indian Customs and Myths* (Tuscaloosa: University of Alabama Press, 1984). This entire book lays out every ceremony and its elements of reverence from moccasin making to naming of children to preparing for courtship or battle.


32 Paul Wilhelm, Duke of Wurttemberg, Travels in North America, 1822-24 (Norman: University of Oklahoma, 1973) “found a four-foot catfish, Pimelodus catus, on my set hook” one morning, 275. Many accounts of the passenger pigeon have been written: See. A. W. Schorger, The Passenger Pigeon (Madison, University of Wisconsin Press, 1961), E. Fuller, Extinct Birds (New York: Facts on File Publications, 1987). The Passenger Pigeon, perhaps the only species for which an exact time of extinction is known—“Martha,” the last pigeon died in the Cincinnati Zoo, September 1, 1914--made its home in primary forest that once covered North America east of the Rocky Mountains. Their flocks, a mile wide and up to 300 miles long, were so dense that they darkened the sky for hours and days as the flock passed overhead. When they roosted on trees, their weight often broke down branches. Population estimates from the 19th century ranged from 1 billion to close to 4 billion individual birds. Total populations may have reached 5 billion and comprised up to 40% of the total number of birds in North America. They may have been the most populous species of bird on the planet at one time, 2. “Martha, Passenger Pigeon, Roadside Pet Cemetery,” http://www.roadsideamerica.com/pet/martha.html. (accessed December 29, 2008).

33 James Williams, Energy and the Making of Modern California (Akron: Akron University, 1997), 17.


35 Carlson, 52.


40 Heizer, 191.

41 Ibid.


45 This conclusion is more by inference than outright statement. Sufficient scholarship states that women kept cooking fires going. It seems likely that men managed the larger fires that made their hunting possible.


48 Wilhelm, 399.


50 Bailey, 43.

52 McLeod, 345.


55 Burns (2004), 306.


57 Greene, Ibid.

58 Josiah Gregg, *Commerce of the Prairies: Life on the Great Plains in the 1830s and 1840s* (Santa Barbara: The Narrative Press, 2001, originally published 1844), 21. See also R. Douglas Hurt’s treatment of mules and mule breeding in Missouri in *Agriculture and Slavery in Little Dixie* (Columbia; University of Missouri Press, 1992), 140-151.


62 Mathews (1961), 129.

63 Burns (2004), 494.

64 Carlson, 39.

65 http://www.thefurtrapper.com/david_thompson.htm#Horses (Accessed January 15, 2009). Mathews (1961), 129. The most thorough treatment of the Indian horse culture may be found in Pekka Hamalainen, “The Rise and Fall of Plains Indian Horse Cultures,” *Journal of American History* (December, 2003), 833-862. He covers the intricacies of gains and losses from the horse culture, particularly climatic and environmental conditions such as wintering horses on the northern plains as well as exchange of woodlands for grasslands, increasing incursions into other tribes’ territories, raids and wars, creating caste systems and overhunting of buffalo for trade by virtue of being mounted that led to loss of food source.


67 Carlson, 52-53.

68 Carlson, 56-57.


70 John Bradbury, *Travels in the Interior of America* (Originally published in Liverpool, 1817; Readex Microprint, 1966), 42.

71 John Bradbury quotes George Sibley, the factor of Fort Osage, as saying that he came upon an Osage camp on the Arkansas River. They had “killed 200 buffalo within a few days.” Ibid., 184. He footnotes that in the fall the buffalo have acquired a good deal of fat on their
bodies after a summer of grazing, and use it to see them through the hard winters, 178. In regard to garden plots and crops see Bailey (1973), 26. Burns (2004), 211.

72 Mathews (1961), 29. Large fatty animals were favored as targets for hunting over smaller ones. A buffalo could take the place of twenty deer, and the fat was as desirable as the meat.


74 Ibid.

75 Rafferty, Ibid.

76 Burns (2004), 488.

77 Ibid., 493.


79 Mathews, (1961), variously calls them half faces and heavy eyebrows, 98.


81 Wilson, 6.


83 Mathews (1961), 306-7. The gun could only be used for show compared to the efficiencies of the bow and arrow. The gun metal reflected the sun and a row of warriors on a ridge shining their gun barrels in the eyes of their enemies increased their stature as warriors, but the gun could only be fired once. The Osage had no cotton for wadding; they had to carry wood shavings, bullets and powder for the gun, so could only fire one shot. On horseback this was problematic with wind blowing the powder away and the horse moving under them. They always carried their bows and arrows with them “and used them much more than they used their guns.”

85 Burns, (2004), Ibid., 159-60.


88 Christian, 353-354.


90 Cronon, 107.


92 Whitney, Vol. 1, 35


95 Ibid. 3.


98 See Hurt for an in-depth explication of this area.

99 Salt mines in Pennsylvania at the same time were using coal for fuel. Horse power was soon replaced by steam engines to pump brine from the wells and coal boiled off the residue by the 1830s. Carmen Di Cicchio, *Coal and Coke in Pennsylvania* (Harrisburg, PA: Pennsylvania Historical and Museum Commission, 1996), 22.


101 Jackson County Missouri, Censuses of 1830, abstracted by Hattie E. Poppins (Kansas City: 1959), Western History Manuscript Collection, University of Missouri Kansas City.

102 N. M. Harris, “An Old-fashioned Wedding in the Oldest House in Kansas City,” *Kansas City Star*, February 24, 1907. Western History Manuscript Collection, University of Missouri, Kansas City.

103 Ibid.

104 Jackson County Missouri, Censuses of 1830, 1840, 1850 and 1860, abstracted by Hattie E. Poppins (Kansas City: 1959), Western History Manuscript Collection, University of Missouri, Kansas City.

105 Poppins, Censuses of 1850 and 1860.


107 Dorsett, 22. Another testimony to this practice: “During the Civil War my grandfather Swinney sent fifty Negroes to Texas in the care of a responsible white man, so that in case the South won the war, they would be saved for him.” Berenice Morrison-Fuller, “Glimpses of the Past, Missouri Plantation Life,” *Missouri Historical Society* (Volume IV, January-March, No. 1-3, St. Louis, 1937), 32.
108 Burns (2004), 34.

109 For slaves traded see Bailey, 1973, 34; Fowler 23-4, 183-4; Burns, (2004), 34, 98.

110 Moulton, 325, 327.

111 Hickman, 96; Norall, 23, 82-85.

112 Everett Dick, Vanguards of the Frontier: A Social History of the Northern Plains and Rocky Mountains from the Earliest White Contacts to the Coming of the Homemaker (New York: Appleton-Century, 1941), 156.

113 Dick, 156.


115 Bradbury, 139.

116 Baldwin, 5.

117 Dick, 159. Baldwin, 41.

118 Baldwin, 4.


120 This woodcut is in the public domain according to http://www.scls.lib.wi.us/mcm/taylor/photos/photo411.JPG—originally Minnesota Historical Society.

122 Wilhelm, 278.

123 Dick, 163.

124 Moulton, 318-319.


128 Bradbury, 198. Estimates are that from 4,000 to 7,000 flatboats carrying 40 to 75 tons each engaged in Bradbury’s time frame in the New Orleans trade. Erik Haites, James Mak and Gary M. Walton, *Western River Transportation: The Era of Early Internal Development, 1810-1860* (Baltimore: Johns Hopkins Press, 1975), 22.

129 Baldwin, 5.

130 Christian, 352.

131 WHMC--KC.

132 Allen, 360.

133 Schurr and Netschert, 46.

134 Ibid., 54. Thirty-three per cent of work was done by wind and water as late as 1870.


137 Ibid., 38.

139 Ibid.


141 Hunter, 40.

142 Hurt, 8. Viles, 274.

143 John Calvin McCoy Collection (1811-1889), KC 296, Roll 001, Vol 2, 1871-1950, Western Historical Manuscript Collection--Kansas City.


145 James Williams, Seventy-Five Years on the Border (Kansas City: Standard Press, 1912), 48-49.

146 Evans, 319.

147 The corn hand mill was actually written about by a member of the Lewis and Clark expedition, Whitehouse, in which he said, “Tuesday June 11th We had a clear pleasant morning, about 8 o’Clock A. M. Captain Lewis & four Men of our party, set out for the Snowey Mountain, There was put into the holes or Carsh [erased, illegible] Yesterday 1 keg of powder, 1 keg barr lead, 1 keg flour, 1 Keg pork, 2 Kegs parched Corn meal, the Blacksmiths bellows & tools, Augers, planes, Saw &ca—. some tin cups, a dutch Oven, a Corn hand Mill, packs of beaver, bear Skins, horns of different kinds, Buffalo robes &ca. &ca—.” The Gary Moulton 1987 edition of the Lewis and Clark Journals of 11 volumes, does not contain the writings of other men on the expedition, only Lewis and Clark’s notes. The above reference “Corn hand Mill” can be found at
http://libtextcenter.unl.edu/examples/servlet/transform/
tamino/Library/lewisandclarkjournals?&_xmlsrc=http://libtextcenter.unl.edu/
lewisandclark/files/xml/1805-06-11.xml&_xslsrc=http://libtextcenter.unl.edu/

148 Rafferty, 60.

149 Rafferty, 69. G. W. Featherstonhaugh, 93.

150 “Early Settlers,” Joseph S. Chick, Native Sons Archives, Vol. II, Folder 1, 19,
Western History Manuscript Collection, University of Missouri, Kansas City.

151 Joseph Savage, “Recollections of 1854,” Territorial Kansas Online

152 William Grant, The Romantic Past of the Kansas City Region, 1540-1880 (Kansas City,
January 15, 2009).

153 Kansas City Journal, February 1, 1925. Western History Manuscript Collection,
University of Missouri, Kansas City.

154 Perlin, 281-283.

155 Ibid, 282.

156 Ibid., 285.

157 Ibid., 282, 285.

158 Ibid., 284.

159 Howard N. Eavenson, The First Century and a Quarter of American Coal Industry
(Pittsburgh, PA, 1942), 29. Some of the coal was provided by “privateers,” i.e. pirates who
confiscated a ship and sold its contents, while some came from Nova Scotia, as records show
in the 1770s and 1780s. Ibid., 59.
160 Ibid., 29.

161 Ibid., 37. Records show vessels cleared to sail from the port of Hampton, VA, in the years beginning 1758 to New York, Philadelphia, New Providence, Rhode Island, New England, Boston, Nantucket, Salem, and Baltimore as well as more exotic ports such as St. Kitts, Bermuda, Bahama (sic), Barbados, St. Augustine, Pensacola, and Antigua to the south and the Caribbean, and Newfoundland and Nova Scotia to the north with loads of from 25 bushels to 2,200 bushels. Eavenson, 32-33, 36.

162 Ibid., 30.

163 Ibid., “the production of bituminous coal in Pennsylvania started a few years after that in Virginia,” 446.

164 H. Benjamin Powell, Philadelphia’s First Fuel Crisis: Jacob Cist and the Developing Market for Pennsylvania’s Anthracite (University Park: Pennsylvania State Press, 1978). Jacob’s father Charles helped to promote coal use through the magazine Columbian he helped found in 1787, an interest to which Jacob was educated to and readily took on as an adult. “Hard coal” was being used then in small amounts. The book does not mention exact date of discovery in PA, which varies from source to source from 1762 to 1790. See http://www.msha.gov/District/Dist_01/History/history.htm (Accessed January 15, 2009).

165 Eavenson, 138.

166 Powell, 13-14.

167 Ibid., 8-9.

168 Eavenson, 15.

169 Ibid., 334.


Ibid.

See Perlin’s repeated treatment of this challenge from ancient Troy to London. Powell mentions transportation’s affect on the cost of coal: “Since the mine was only four miles from a coal landing [on a river], the partners could conduct business at a lower cost and sell anthracite cheaper.” Not only distance but season affected the shipping of coal. Arks of coal had to wait for spring waters to rise to ship coal to market. Autumn’s low water presented problems and shipping on winter’s ice was fraught with danger. Powell, 78-79.

Powell, 25.

Ibid.

Ibid., 26. In 1804 Jesse Fell invented a grate to burn anthracite in a fireplace where most fuel was burned. Stoves would come later. Powell, 18-19.

Schurr and Netschert, 59.

Powell, 28.

Ibid., 47, 49.


See Walter R. Borneman, 1812: The War that Forged a Nation (New York: HarperCollins, 2004) for a complete treatment of the war. One reviewer said Borneman’s claim that the war forged the nation may have been exaggerated, but that otherwise the book was a fine popular rendition of the events. Other authors have also made the claim, however, and have termed it “America’s second war for independence.” Nevertheless, the unexpected consequence was a turn to coal and a turn westward for pioneers to migrate over the mountains and to cross the Mississippi in search of new lands for settlement. See Sean Patrick Adams, Old Dominion: Industrial Commonwealth: Coal Politics, and Economy in Antebellum America (Baltimore, MD: Johns Hopkins University Press, 2004). Adams treats the war of 1812 as an impetus to rising interest in coal in Pennsylvania and Virginia’s decision to suppress coal in favor of tobacco.
182 http://news.bbc.co.uk/1/hi/sci/tech/3557077.stm (Accessed January 15, 2009). Scientists estimate fire use may be back into the past as far as 1.5 million years or as little as 230,000. Evidence gathered of late pursues the longer period.

183 Melosi, 10.

Part II

1 Hickman, 263.


3 A common nineteenth century reference to any treeless terrain with the understanding that it was also not fit for agriculture. The term suggests worthless and inhospitable land. Zebulon Pike, Thomas Jefferson and others used the term desert which meaning has changed over 200 years. D. W. Mein, The Shaping of America: A Geographical Perspective on 500 Years of History, Volume 2: Continental America, 1800-1867. (New Haven: Yale University Press, 1993) 76.

4 Hindle, 10.

5 Native Sons of Kansas City Collection, WHMC—UMKC.

6 Ibid.


8 Kansas City Journal, October 22, 1893, Native Sons Archives, Vol. II, folder I, p. 3 WHMC-UMKC.
9 Ibid., 10, WHMC-UMKC.


11 Christian, 360.

12 Ibid. Dick, 166.

13 The whole dramatic story of this commercial venture is well told in Andrea Sutcliffe, Steam: The Untold Story of America’s First Great Invention (New York: Macmillan, 2004), including the little known fact that the New Orleans was caught in the New Madrid earthquake on its way to New Orleans. See pages 202-203 for that description, p. 210 for description of Pittsburgh.

14 L. Stebbins, One Hundred Years’ Progress of the United States (Hartford, CT: By the author, 1872) 235, 240.

15 See the Appendix for a complete description of the race.

16 Hunter, 266.

17 See Sutcliffe’s Steam for a full description of early racing between steamboats while still in the experimental stage. At that point racing was more to prove patent rights and simple seaworthiness and durability than to win races.

18 Stebbens, 183.

19 In 1819 the City of Savannah sailed to London with no passengers and loaded with coal. Engines had been attached to a fully fitted sailing ship that used the engines only within sight of land. http://www.uh.edu/engines/epi550.htm (accessed January 20, 2009).

20 Hunter, 265.

21 Twain, Life on the Mississippi, 138.

23 Native Sons Archives, Volume 2, 102, WHMS—UMKC.


25 A bag of coal probably contained a bushel, roughly 76 pounds of coal. The bags made coal easy to handle to load on board quickly. An illustration showing bags of coal being filled on a loading dock is shown in Carmen Di Cicchio, Coal and Coke in Pennsylvania (Harrisburg, PA: Pennsylvania Historical and Museum Commission, 1996), 15.

26 See Hunter, 268, Twain, Life on the Mississippi, 51, 152, 158 for more discussion on coal.

27 Twain, Life on the Mississippi, 140.

28 Ibid., 141-2.


30 In 1856 there were over a thousand steamboats on the western waters, costing some nineteen million dollars and with a carrying capacity of four hundred and forty-three thousand tons. Before steamboats, travelers and merchants had to trust their lives and property to the bargemen, many of whom were suspected to have connections with the land robbers who infested the shores of the Ohio, and the pirates who lived along the islands of the Mississippi. Charles Louis Flint, et. al., One Hundred Years of Progress of the United States (Hartford, CT: Stebbins, 1870), 234.

31 See Twain’s detailed description of this phenomenon of communication and organization in Life on the Mississippi, 128-137.

32 Haites et. al. 142.

33 Ibid., 143.

34 Spalding, 72.

35 Haites, 145.
36 Ibid.

37 Ibid., 145-6.

38 Ibid., 147.

39 Shurr and Netschert, 48.

40 Wilhelm, 272.

41 Morgan, 33. Schob, 127.

42 Parkman, 10.


47 Receipt book of steamboat Columbia, 1848-1851, Steamboats and River History Collection, Missouri Historical Society, St. Louis. No further information on this steamboat in terms of tonnage, lifespan, wages paid to the men who wrote the receipts or other interesting facts. Records show that in spite of the short life of steamboats, usually around 3-5 years, the Columbia lasted until 1915! “From the Stacks: Western Historical Manuscript Collection—Columbia River Traffic: The Steamboat’s Mark on Mississippi,” Missouri Historical Review (Volume 103, No. 3, April, 2009, State Historical Society of Missouri), 186.

48 Twain, Life on the Mississippi, 101.
The bushel was adopted because it was a measurement with which everyone was familiar. The weight of a bushel varied from mine to mine from 72 pounds to 90 pounds, though by the writing of this book in 1939 it was still unsettled and varied from 89 pounds in Kentucky, Illinois and Missouri to 76 pounds in Pennsylvania and Montana, and 70 lbs in Indiana. Howard N. Eavenson, *The First Century and a Quarter of American Coal Industry* (Baltimore: Waverly Press, 1942.), 11. Government oversight began in Pittsburgh in 1802 to regulate the measurement of coal in full bushels. Coal carts and wagons must be clearly marked with their capacities, DiCiccio, 18.

Twain, *Life on the Mississippi*, 51.

Ibid., 209.


Ibid., Vol. 1, 95.

*Native Sons of Kansas City Collection (KC0465), WHMC--UMKC.*

See Appendix for complete description of the leveemaster’s duties as described by the city council.

Wyman, Walker D., “Kansas City, Mo., A Famous Freighter Capital,” *Kansas State Historical Society* (Vol. 6, no. 1, February, 1937), 341. Exactly where this figure originates or just what area it covers is not stated, but it surely included what became known as the West Bottoms—part of the original Prudhomme property which would support many a saw mill up to the 1880s and the two thousand acres across the river to the north mentioned by Spalding. Other descriptions of forests like the timber of walnut and oak between the levee and Westport or the “rich and luxuriant woods between Westport and Independence” noted by Parkman, abound but are unmeasured in the descriptions of passing wayfarers.

Gregg, 21.

Hickman, 160.


61 Hubaleck, 54,32.

62 Gregg, 33.

63 Spalding, 73.

64 Parkman, 25. They readied themselves to “bid our final adieou to the frontier; or in the phraseology of the region, to ‘jump off.’”


66 Hickman, 245. “Westport: Where the West Began.” The name of Kanzas was still being used in 1852 in *Ballou’s Pictorial*, a magazine issued in Boston, MA. *Kansas City Star*, February 7th, 1907.

67 Hurt, 125-151.


70 Gregg, 23.


72 Hickman, 117.

73 Ibid., 116.
74 Ibid., 116-117.

75 Whitney, Vol. 1, 141.


77 Ibid., 12.

78 Thomas Becknell, “The Journals of Thomas Becknell from Boone’s Lick to Santa Fe, and from Santa Cruz to Green River,” Missouri Historical Review (Vol. 4, No. 2, January, 1910), 71. It appears that this article is a misprint since William Becknell is the name of the founder of the Santa Fe Trail. I suspect the trouble comes from the fact that Thomas H. Benton, senator from Missouri, introduced a bill in Congress to establish a road from Independence, MO, to Santa Fe, NM in 1824. The road became known as the Santa Fe Trail. Whoever titled the above article may have confused Thomas Benton’s first name for William Becknell’s name. Just a guess, but perhaps a plausible one. Otherwise, the article offers a slightly different approach and sources. See Beachum’s article cited above.

79 Gregg, 38.

80 See Appendix for entire list of signers of the treaty.


83 Hickman, 115.

84 Ibid., Lass 124.

85 Ibid., 144.
86 Ibid., 144-5.


89 Whitney, Vol. 1, 60.

90 Spalding, 20.

91 Ibid.

92 Majors, 30-31.

93 Parkman, 11.

94 See Jeffrey Bremer for a thorough treatment on the pre-market economy of Missouri.

95 Spalding, 22-23.

96 Ibid., 73.


98 *Native Sons of Kansas City Collection (KC0465,) WHMC—UMKC.*

99 Unruh, 120.

100 Ibid., 122.

101 Gregg, 260. Gregg's account ends in 1843 because the road was closed to freighting in 1844 after citizens of the republic of Texas attacked and robbed Mexican wagons with permission from the governor. As a result of these attacks, President Santa Anna of Mexico decreed in August, 1843 that the ports of entry at Taos, El Paso del Norte and El Presidio del
Norte should be closed. This cut off all overland trade. Trade was resumed the following year but in much smaller amounts. After the Mexican War of 1846-48, the trade was no longer international and freighting resumed in large measures. By 1857, the freighters had learned to make two trips per season thus doubling their profits. Walker, 144-45.

102 Walker, 56. Leavenworth was a rival town to Kansas City as was St. Joseph, MO, and Atchison, KS. The depot of Russell, Majors and Waddell that Greeley observed in Leavenworth moved to Kansas City in 1859, 55. Greeley traveled from New York to California, going by rail from New York City to St. Joseph, then across the river to Atchison. Horace Greeley, *An Overland Journey from New York to San Francisco, in the Summer of 1859* (New York: Alfred A. Knopf, 1964).

103 Ibid., 19.

104 Majors, 104.

105 Ibid., 105.

106 Walker, 54.

107 Ibid.


109 Majors describes the ride in *Seventy Years on the Frontier*, 186. Aubry may have used a shorter route he discovered in 1851 that cut off about fifty-two miles. Dary, 222.

110 Chaput, 67.


112 Chaput, 60-68, Majors, 185-86. Chaput’s book is the only one written to memorialize Aubry’s amazing speed which he performed again and again before being killed in a barroom challenge to his reputation August 18, 1854, at the age of 30 in Santa Fe. See Chaput, 155-158.
Chaput, 68.


Majors, 186.


Christopher Corbett, *Orphans Preferred: The Twisted Truth and Lasting Legend of the Pony Express* (New York: Broadway, 203) 252. Corbett says no certain origins have been found for this ad, but it has become a choice bit of Western Americana, and no one thinks of questioning its authenticity. Constant usage by such illustrious magazines as *National Geographic* and *Christian Science Monitor* have legitimized it.


Twain, *Roughing It*, 63.


Hurt, xii.

Ibid., xiii.


Ibid., 147.

Ibid., 322.
Coal first arrived from nearby Lexington County in 1876, and from Bates County in 1880. It is to be assumed that coal for the railroads was supplied by local mines and supplemented by wood or vice versa before that time. Case, 150.

The Kansas City *City Directory* 1870, 16.


Case, 80.


Case, 79.

Ibid. 73. Case’s thirteen-page description is the most complete short history of the city during the war. Not much has been written about the city’s survival during this period.

Ibid., 72.


Hughes, 58.

Ibid., 59.

141 Hughes, 54.

142 Ibid., 53.


144 Ibid.

145 Ibid.

146 Hughes, 62.

147 Morrison-Fuller, 33.

148 Hughes, 53.

149 Ibid., 54.

150 Perlin, 23.


152 DiCiccio, 25.

153 Spalding, 95. This document is called “Annals of Kansas” because that was the official name of the city at the time.

154 Kansas City City Directory, 1858.

155 http://www.uwsp.edu/CNR/wcee/keep/Mod1/WhatIs/energyresourcetables.htm (Accessed January 20, 2009) A Btu stands for British thermal unit developed in the nineteenth century in Britain as a standard of measurement in which one pound of water is heated by a certain amount of fuel to raise the temperature of the water one degree.

156 Di Ciccio, 22.
157 Ibid., 25.

158 Schurr and Netschert, 68. The United States surpassed Britain’s iron production in 1890 and pig iron output was 36 per cent of the world’s steel production with 28 per cent of the world’s coal output.


160 DiCiccio, 7.

161 Ibid., 21. Coal was being used as a household fuel in the Monongahela Valley of Pennsylvania by 1790. By 1810 Pittsburgh used it as well, earning for itself the name of the “smoky city.” Bituminous has 26.2 million Btu per ton. Schurr and Netschert, 35.

162 Schurr and Netschert, 519.

163 Larsen, Lawrence H. *The Urban West at the End of the Frontier* (Lawrence: University of Kansas, 1978), 100.

164 Ibid., 101.

165 Ibid.

166 Ibid., 102.

167 Case, 81.

168 Ibid.


170 Kansas City *City Directory, 1865-6*, 9.

171 Larsen, 103.
172 City Directory, 1870, 16.

173 Ibid. 17.

174 O. Chanute, The Kansas City Bridge with an Account of the Regimen of the Missouri River, and a Description of Methods Used for Founding in that River (New York: Van Nostrand, Publisher, 1876), 9, 15.

175 Ibid., 16.

176 Freese, 127.

177 Ibid., 84. Also Schurr used the phrase “purposely drilled to obtain petroleum,” 84.


179 Paul H. Giddens, The Beginnings of the Petroleum Industry (Harrisburg: Pennsylvania Historical Commission, 1941) 81. George Bissell was one of four original backers of Edward Drake’s oil well through the Seneca Oil Company. The others were Francis Beattie Brewer, Benjamin Silliman, Jr. and James M. Townsend. Williamson and Daum describe the drilling and catching of liquid, 80.

180 Ibid., 82. Dr. Francis Beattie Brewer, one of the partners in the original well at Titusville, was a physician who had been well acquainted with the oil from the area. He had been given a five-gallon can of the “exudate,” i.e., what was caught oozing out of the ground, and had found it to have “remarkable curative qualities” that he used as long as he practiced medicine. That oil was also used as a lubricant. Williamson and Daum, 64. The oil was called rock oil to differentiate it from whale oil or animal fats like lard. Daniel Yergen, The Prize: The Epic Quest for Oil, Money and Power (New York: Simon and Schuster, 1991), 19.

181 See Williamson and Daum for greater detail on the medicinal trajectory of rock oil, 12-24.

182 Yergen, 20.

183 Ibid, 83.
Williamson and Daum, 77, 94.


Black, 51.

Williamson and Daum, 46-47.

Yergen, 24-25, Williamson and Daum, 46-47.

Yergen 25, Williamson and Daum, 55, 59, 60.


Black, 55.

Williamson and Daum, 113-114.

Williamson and Daum refer to it as the Region throughout their narrative.

Ibid., 109. Kerosene developer Abraham Gesner surveyed available plants at the end of 1860. He found 56 plants producing coal oil with a dozen more distilling crude coal oil. All were located near wells.

See Timeline in Appendix Part II for a complete rollout of details of this period.

Williamson and Daum, 84-5.

Schurr and Netschert, 55.

Ibid., 48.
Part III

1 See Schurr and Netschert for discussion of changing fuel supplies, 63, that shows a 500% increase in coal use between 1850 and 1900, and 66, showing annual pig iron production smelted with coal and coke. Reference to “fuel revolution” comes from Leslie White, 382.

2 Encyclopedia of Missouri, Volume 1, 35-36.


5 Walter V. Seabright, Coal Production, Distribution and Consumption in Missouri, Information Circular No. 3, 1949, State of Missouri, Department of Business and Administration, Division of Geological Survey and Water Resources, Edward L. Clarke, State Geologist, Rolla, Missouri, 30.

6 Kansas City City Directory, 1867-8, 70.

7 Mercantile Illustrating Company, Imperial Kansas City 1900: Her Wonderful Growth and Resources (Kansas City, Missouri, 1900), 12.

8 Freese, 127.

9 Imperial Kansas City 1900, 51.


12 Imperial Kansas City, 1900. As far as the Midwest was from the bankers of the East Coast, they had become partners long ago in financing growth on the frontier. Kersey Coates, one of Kansas City’s most illustrious citizens, came from Philadelphia in the 1850s with strong East-Coast connections, built the Coates Opera House and the Coates Hotel as well as
financing and serving on the boards of a number of projects that promoted the city’s growth. The Abolitionists settling Kansas were financed by Bostonians through the Emigrant Aid Company, including by one Amos A. Lawrence, for whom Lawrence, Kansas, was named. (See Richard Cordley, D. D., The History of Lawrence, Kansas, from the Earliest Settlement to the Close of the Rebellion, (Lawrence: Journal Press, 1895). The hallmark of Kansas City politics in general was to approach eastern businessmen with legitimate opportunities for them to build railroads, bridges, hotels, factories. It is the nature of the frontier to return to the flow of higher energy systems for reinforcing materials and funds. The author of Imperial Kansas City, mentioned Gould’s name as a boast as well as an accepted part of the business scene of Kansas City.


14 Imperial Kansas City, 70.

15 Clark, 11.


17 The slope mine followed the land down to the coal seam underground not more than a hundred feet. If the coal seam was deeper, mine operators sank a vertical shaft to the needed depth called a shaft mine. If the coal seam lay open on a cliff or hillside, a drift mine would be excavated directly into it. If the coal lay on or near the top of the ground, workers and horses stripped off the soil creating a strip mine. This and the following description about coal mining was taken from two excellent books, Dorothy Schweider Black Diamonds: Life and Work in Iowa’s Coal Mining Communities, 1895-1925 (Ames: Iowa State University Press, 1983) 27-58, and Price V. Fishback, Soft Coal, Hard Choices: The Economic Welfare of Bituminous Coal Miners, 1890-1930 (New York: Oxford University Press, 1992) 42-49.

18 Schweider, 32.

19 Fishback, 43. Large chunks were the most desirable for easy handling and price. Small pieces and coal dust had little market value though they might add to the weight of the cart. Slate and dirt were forbidden.
20 Schwieder, 37.

21 Fishback, 66. After machine cutting began to speed up the production process less emphasis was placed on chunk coal. Screens to measure size were developed. Markets were found for smaller coal, ways to handle it evolved.

22 Schwieder, 43.

23 Fishback, 47.

24 Ibid., 44.


26 Schwieder, 32.

27 Fishback, 79-81. Statistics show that miners worked 70 fewer days per year than factory workers. Miners earned more per hour than their manufacturing counterparts, but with fewer days the earnings came out very close. The higher wage helped compensate for the danger of the work and the miner’s greater independence made mining attractive to many. Coal miners earned nearly double that which farmhands earned. Coal mining earned twenty-eight per cent more than manufacturing up to 1913. Wages matched manufacturing in the 1920s in most years. Coal wages dropped to three percent less than manufacturing by 1933.


29 Fishback, 104-5. Fatalities per million man-hours in coal mining more than quadrupled the levels seen in any other industry. Missouri suffered an average of 10.6 fatalities per year from 1903-1930. the average for the country was 20.91 with some states like New Mexico ranging as high as 41.1, Oklahoma 43.9 while Illinois and Pennsylvania, two large mining states suffered 16.8 and 16.1 respectively. Fishback, 104. Roof falls accounted for about fifty per cent of fatalities for small-scale accidents in which fewer than five people were involved, haulage accidents were eighteen per cent, misuse of small explosives four per cent, electrocutions four per cent. Gas and dust explosions and ensuing fire were to blame for most of the large-scale accidents.
30 Ibid., 106.


37 *Proceedings, Baltimore*, February 10th, 1885, 6.

38 *Proceedings*, Union Square Hotel, New York, August 18th, 1885, 164.

39 Werner Siemens proposed the name “dynamo machine” in a speech in Germany in 1867. By 1876 the dynamo had been developed to power a single-arc lamp. By 1877 Charles F. Brush had created an electric light system with his dynamo with copper-coated carbons for arc lamps. The carbons burned for eight hours before burning out. Brush introduced the first successful electric street lighting system in the United States by 1878 and the arc-lamp industry was born. *National Electrical Manufacturers Association, A Chronological History of Electrical Development from 600 B.C.* (New York, 1946), 36-43.
40 Bright, 34.

41 James P. Boyd, 43. The incandescent bulb took longer to create because of the difficulty of finding a substance suitable for the filaments. Edison eventually solved the problem. See the entire story of the invention of the incandescent bulb and lighting system by Edison in Martin V. Melosi Thomas A. Edison and the Modernization of America (New York: Longman, 1990), 58-76, and Arthur Bright, 35-70.

42 Bright, 20-21.


44 Proceedings, Baltimore, 1885, 17.

45 Edison Institute, The Electric Industry (New York: Edison Electric Institute, 1951), 35. Edwin Weeks, the manager of the Kawsmouth and Later Kansas City Electric Company, spoke to the size of engines at the second annual Proceedings of the Electric Light Association in Baltimore in 1886: “With a large engine, for instance a 250 horse-power, running 300 lights, one of the first objections would be, that in case of any disaster, the failure of any one of the hundreds of appliances that go to make up that 300-light lamp, the 300 light would be out unless you had a reserve equal to that number, or a duplicate of that part of the plant. But with a high-speed engine you, of course, do not have so much at stake. In case of stoppage, there is not so much dissatisfaction. These are two of the chief reasons why the high speed engines have come into favor.” Edwin Weeks, Second Annual Proceedings of the Electric Light Association, Baltimore, February 10, 1886, 96-7.

46 Proceedings, Detroit, August 31, 1886, 411.


48 Bright, 21.

49 Ibid., 32,33.

50 Ibid., 43.

52 Bright, 31.

53 Ibid., 33.

54 Ibid., 31, 32.

55 Proceedings, August 18, 1885, Union Square Hotel, New York, 116.

56 Bright, 33.

57 Ibid., 70.

58 Ibid., 34.


60 Bright, 43.

61 Gerald A. Motsinger, “The Development of Main Street, Kansas City, Missouri (Master’s thesis in History, University of Missouri, Kansas City, 1986), 67.

62 Ibid., 64.

63 Bright, 31. These two high school teachers developed their own systems of electricity generation early on by improving the dynamo and arc lamp, and had considerable success in promoting their systems in arc lighting before Edison’s incandescent lighting took over.


65 Harry Black, 42. Like other electric-light enthusiasts, Weeks had no background in electric lights and no experience running a station, but traveled to New Jersey to visit with Edison
himself and to learn the means and the ways of running an electric light company. He became one of the leading voices in the National Electrical Lamp Association proceedings and a voice of reason in Kansas City’s volatile field for several years. He was eventually elected president of the Association in 1889. *Proceedings*, Baltimore, 1885, 85. Election notice in *Electro-Mechanic*, Volume II, Kansas City, MO, March 1, 1889, No. 5, 81.

66 *Proceedings*, September 1, 1886, 57.

67 *Proceedings*, August 18th, 1885, p. 181-2.

68 James Donohue, ed. Secretary Manufacturers and Merchants Association, *Greater Kansas City Official Year Book 1904-5 Made in Kansas City, USA, the guaranty of Excellence*, 20.

69 Harry Black, 86.

70 Ibid., 85-86. Joel Tarr also mentions this counter trend (1999), 25.

71 *Proceedings*, August 1885, 130.


73 Harry Black, 42.

74 Motsinger, 71.

75 *Encyclopedia*, Volume VI, 363.

76 *Proceedings*, Baltimore, 1885, 147.


78 *Proceedings*, New York, August 18th, 1885, 153.


80 *Proceedings*, Baltimore, 1885, 130.
81 Harry Black, 31.

82 *Journal Post*, September 28, 1924.

83 Harry Black, 16.

84 *Encyclopedia*, Volume X, 364.

85 Ibid., 365.

86 Harry Black, 5.

87 Bright, 73.

88 Harry Black, 76.


90 Ibid., 68. Weeks also announced to “all electric workers and thinkers” that the National Electric Light Convention might be held in Kansas City, “but it will be some time before Kansas City will be as convenient a center, owing to the fact that the greater number of enterprises of an electrical nature and those engaged therein lie east of us,” 64.

91 *Encyclopedia*, X, 365.

92 *Encyclopedia*, X, 366.

93 *Proceedings*, Baltimore, 1885, 130.

94 Harry Black, 94-96.

95 Ibid., 43.


97 This document is labeled 1902 and printed in 1905 though it is included in the 1900 census. Thomas Commerford Martin, “Electricity in Mining,” Department of Commerce and

98 Ibid., 145.

99 Ibid., 146.

100 Ibid., 149.

101 Ibid., 153.

102 Ibid., 153.

103 Ibid., 155.

104 Ibid., 150.

105 Ibid., 150.

106 Ibid., 151.


110 Tarr and McShane (2005), 48-62.

111 *City Directory 1867-8*, 8.

112 Motsinger, 62.
113 Kansas City City Directory 1870, 29.

114 Kansas City City Directory 1869, 19.

115 Case, 423.

116 Ibid., 407.

117 City Directory 1869: brick works, 324; car builders—street, 343; hoisting machines, 358.

118 Ibid.

119 Boyd, 223.

120 Proceedings, Baltimore, February 10, 1886, 55. Local Kansas City representative and vice-president of the Electric Light Association, Edwin Weeks attended this meeting. The association was about electric lights because at the time, electric lights were all there was. Lighting had been a big challenge throughout the second half of the nineteenth century and power in the form of motors had not yet arrived, hence the names of the early utilities were known as “light and power” in the order in which they were developed, though Kansas City’s company reversed the name around 1912.

121 Proceedings, Ibid., 55.

122 Ibid.

123 Ibid., 56.

124 Case, 407.

125 Ibid., 408.

126 Ibid.

127 Ibid.

129 Ibid.


131 *The Railwayan* (Vol. VI, No. 4, 1923, Kansas City, Missouri), 9. Case, 413.

132 *The Railwayan*, Ibid., 10.


134 Ibid.

135 Ibid., (Vol II, No. 3, February 1, 1889), 48.

136 Ibid., (Vol. II, No. 14, August 1, 1889), 50.


139 Boyd, 82.

140 Case, 420.

141 Ibid.

142 Ibid.


144 Schurr and Netschert, 35.

145 Ibid., 47. Lumber and building materials came from as far away as Pittsburgh.


148 Whitney, Volume II, 12, 15.

149 *Imperial Kansas City*, 97.

150 Whitney, Volume II, 119.


154 *Kansas City City Directory 1870*, p. 27.

155 Schurr and Netschert, 36.

156 Chandler, 168. Chandler points out that in 1845 the cost of making wrought iron from charcoal was $82 a ton compared with $47 a ton for wrought iron from anthracite coal. The cost of the charcoal as fuel was $20 a ton vs. with coal as fuel at $3.25 a ton. Charcoal could no longer compete in either time or cost.

158 Ibid., 37.


160 Bishop, 28.

161 Temin, 149.

162 Bishop, 28.

163 Gordon, 231.

164 Schurr and Netschet, 57, 84.

165 Williamson and Daum, 371.

166 Schruben, xii.

167 Williamson and Daum, 492-3.

168 Schruben, xii.

169 Williamson and Daum, 466-470.

170 Kerosene was sold by container or barrel.


Imperial Kansas City, 26. Kansas City was heavily into boosterism in those years and published any number of glowing handbooks and yearbooks from the 1850s onward, probably well into the twentieth century. Still, this quote gives a brief glimpse into the way in which Standard Oil dragged its industry kicking and screaming into the modern world. Like the railroads, their plants and tracks required a tradeoff of slower more agrarian ways to business and life. A plant of this size and power in a community ultimately begged comparison to those much humbler businesses nearby and gave a standard, as it were, to which to aspire.

Ibid.

Williamson and Daum, 613.

Ibid., 610.

See Part II and Governor Reeder’s story for more information. “A Hoosier in Kansas-The Diary of Hiram H. Young, 1886-1895, Pioneer of Cloud County,” Kansas Historical Quarterly, Part Four, 1893, edited by Powell Moore, February 1947 (Vol. 15 No. 1), 42-80. This diary makes repeated mention of bringing home a bucket of coal or taking a bucket of coal to an event or as a guest at someone’s home.

The author’s uncle was in charge of a cavalry horse unit (as opposed to the cavalry units now made of tanks and trucks) in the early years of World War II. Though the American army did not use horses in battle, the German army was forced to use as much as 80 per cent of their transportation in horses because of fuel shortages. See Paul Louis Johnson, Horses of the German Army in World War II, (Gloucester, MA 2006). “German Horse Cavalry and Transport, and http://www.lonesentry.com/ articles/germanhorse/index.html. (Accessed March 9, 2008).

Part IV


2 The entire panoply of the revolution in industry created by great amounts of coal is beyond the scope of this study, however, the Homestead strike as a case in point is covered in the following works: Paul Krause, *The Battle for Homestead, 1880-1892: Politics, Culture, and Steel* (Pittsburgh, PA: University of Pittsburgh Press, 1992) and David P. Demarest and Fannia Weingartner, “*The River Ran Red:*” *Homestead 1892* (Pittsburgh, PA: The University of Pittsburgh Press, 1992). The intuitive artisanship of making steel in small batches was taken over by factories using the Bessemer process to create the metal in great quantity. The workers tried to retain some dignity and ownership of that process and were ultimately squashed by violence and the power of federal troops brought in by Henry Clay Frick, maker of coke for steel-making, and Dale Carnegie, owner of steel mills, to stop the strikers. See also [http://www.bgsu.edu/departments/acs/1890s/carnegie/strike.html](http://www.bgsu.edu/departments/acs/1890s/carnegie/strike.html) (accessed January 31, 2009).

3 Schurr and Netschert, 36, 145.

4 Ibid., 36.

5 Ibid., 145.

6 Pratt, 12.

7 Craig Miner, *Discovery! Cycles of Change in the Kansas Oil and Gas Industry, 1860-1987* (Wichita: Kioga, 1987), 89.

9 Miner, xvii.


11 Miner, 234.


13 John La Roe, Kansas City Magazine, (Volume 12, issue 12), 36-41.

14 Schruben, 69.

15 Ibid., 50.

16 Ibid., 51.


19 Ibid. Clark, 15-16.

20 Pratt, 15.


23 “Horseless Carriages Conquer Kansas City’s hills after many trials have been overcome by the Locomobile,” Kansas City Manufacturer, Summer, 1901.

24 The Kansas City Manufacturer, a journal devoted to the manufacturing interests of Kansas City (Vol 3. No. 10, Kansas City, MO, July 1901), 17.


26 Kansas City Annual, 1907, 110.

27 Kansas City Annual, 1908, 175.


29 “There, gentlemen, where the rocky bluff meets and turns aside the sweeping current of this mighty river; here, where the Missouri, after pursuing her southward course for nearly 2,000 miles, turns eastward to meet the Mississippi, a large commercial and manufacturing community will congregate, and less than a century will see a great city on these hills.” Where These Rocky Bluffs Meet, The Chamber of Commerce of Kansas City, Missouri, Kansas City, Missouri, 1938), 5.

30 Kansas City Manufacturer, 1901, 6, 16.

31 Ibid., 17-18.

32 Ibid., 4, 6, 14.

33 Ibid., 14.

34 Ibid., 4.

35 Ibid., 14, 22.

36 Ibid., 22.
37 Ibid., 15.

38 In the *Greater Kansas City Yearbook 1904-5*, 46, these features were advertised. Whether they existed in 1901 or not, the “ice box” was still evolving and had reached its highest level before true refrigeration set in the 1920s.

39 *The Kansas City Manufacturer, 1901*, 8.

40 Ibid., 2.

41 Ibid., 8.


43 *The Kansas City Manufacturer, 1901*, (Volume 3, No. 11), July, cover.

44 Ibid., 43.

45 *Greater Kansas City Yearbook, 1904-5*, 9, Kansas City, Missouri.

46 Wilson, 23.


50 Mathews, Ibid., 670.

51 Ibid., 693. The Osage in this treaty insisted on owning their land communally. They did not want it owned in “severalty,” but to own it in common. This decision would allow them to share the wealth of the still-undiscovered oil under the surface of their new reservation.

52 Ibid., 670-672.
53 Ibid., 771. In the Treaty of 1825 they had paid the Cherokees seventy cents an acre for over a million and a half acres. Now they were buying it back and both tribes were relocating along with others to the Indian Territory.


56 Mathews (1961), 719.

57 Ibid., 706. How the internal dynamics of the tribe must have changed and adjusted to having at least three horses per capita. The last two hundred years was a time of increasing materialism in the tribe if only in terms of horses.

58 Ibid., 716, 719.

59 Wilson, 20.

60 Franks, 6.

61 Wilson, 21.

62 Mathews (1961), 725, 731.

63 Franks, 8.

64 Wilson, 1.

65 Ibid., So decreed by Chief Justice John Marshall in 1832 in regard to the Osage.

66 Mathews (1961), 728.

67 Wilson, 132.

68 Mathews (Mathews), 772.

69 Wilson, ix.
Franks, 12, 141. Wilson, *Journal of the West*, 48. Congress passed an act in 1925 to protect the Osage from further plundering. It forbade any but heirs of Indian blood from inheriting from allottees of one half or more Osage blood quantum. This helped to keep the voice of the full bloods alive even after their deaths.

No further information is available at this time on whether fuel actually was sent or just the backwash of money from the exploration.

Wilson, 108.

Ibid., 129.

Not far from the Los Angeles International Airport, LAX, is a street called “Osage Street.” I had always wondered how it got its name. Now I think some of those vacationing Osages must have visited there if not settled.

Wilson, 131.

Ibid., xii.


Wolferman, 17.


*1907 Annual of Kansas City*, 121.

The first extant building in Kansas City with steel studs, the Dwight Building, was built in 1902-3, according to a photo and text at the Missouri Valley Room, Kansas City Public Library, 10th and Walnut, Kansas City, MO. Numerous ads and descriptions in the 1907 annual mention “fireproof” buildings, a combination of asbestos and steel.

The years are taken from the national censuses that are issued on the even numbered year after the records for the decade have been compiled. For instance, the 1870 census quotes figures up to and including 1869. The fuel wood information comes from another source that quotes only in even decades, so there is a year difference in the sets of figures with odd numbered years. The fuel wood figures begin with 1870 and end with 1920.
83 Coal Age, July 19, 1913, 95.
84 Ibid.
85 Ibid.
86 Coal Age, January 1, 1913, 53.
87 Coal Age, February 10, 1910, 578.
88 Coal Age, July 5, 1913, 47.
89 Coal Age, April 11, 1914, 617.
90 Coal Age, November 8, 1917, 650.
92 Coal Age, July 1, 1920, 8.
93 Schurr and Netschert, 55. Interview of the author’s husband, Carl Blomgren, in Overland Park, Kansas, about his father’s coal-mining career in Iowa.
95 Ibid., 225.
96 Ibid., 226.
97 Ibid., 230.
98 Ibid., 184, 188.
99 Coal Age, June 13, 1914.
100 Coal Age, January 16, 1913, 95.
101 The Oil and Gas Journal, May 18, 1911.
102 *Coal Age*, April 15, 1920, 769; April 22, 1920, 826.

103 Ibid., 769.

104 See Brian Black’s description of Oil City, Titusville, and environs in *Petrolia*.

105 Schurr and Netschert, 105.

106 Ibid.

107 *Oil and Gas Journal*, May 18, 1911, 26.


109 Ibid.


113 Ibid. 2.

114 Ibid. 3.

116 *Coal Age*, January 5, 1918, 11.

117 Ibid.

118 *Coal Age*, March 16, 1918, 515.

119 Clark, 58.

120 Ibid., 57.

121 Ibid., 56.

122 Ibid., 57-63.

123 Ibid., 51-52.

124 Ibid., 71.

125 *The New York Times*, February 4, 1918. *New York Times*, Nov. 22, 1918--Hotels in New York City, by the observance of meatless Tuesdays and wheatless Wednesdays and by other self-imposed restrictions, saved more than 116 tons of meat and 60 tons, or about 620 barrels, of flour last week, it was reported. (Accessed March 11, 2009).


127 Kansas City *Journal*, January 18, 1918.

128 Ibid.

129 *Coal Age*, July 13, 1918, 67.

130 *Coal Age*, January 26, 1918, 216.

131 Ibid.

132 Ibid.

133 Clark, 71.
Between its beginnings as a light company and the year in question, the company had added power to its offerings to customers and then reversed the words to their current order. Power, virtually unavailable in the beginning won out over lighting in the long run.

Kansas City Star, April 8, 1918.

McPherson, 4.


Ibid., 3.

Ibid.

Ibid., 4.

Ibid., 15.

Ibid., 16.

Ibid., 17.

Ibid., 24.

Ibid., 38.


Conclusion: Elements of Energy Transitions

1 See Schurr and Netschert, 53-55, and their various uses of the terms and explanations.

2 Ibid., 57.
3 Ibid., 32.

4 Ibid., 36

5 Schurr and Netschert, 36

6 Williamson and Daum (1959), 136. Schurr and Netschert, 85

7 See Perlin, Melosi and others for more of this story.

8 See Schurr and Netschert, 67, and Part II of this work for more detail on this subject.


12 Schurr and Netschert, 55.

13 The figures used to assemble data include the manufacture of tangible goods such as cars, furniture, and bread, and the provision of services used in daily living such as education, health care, and auto repair. “Gross National Product,” http://www.cftech.com/BrainBank/CORPORATEADMINISTRATION/GrossNatlProd.html. (Access date January 7, 2009).

14 Schurr and Netschert, 49.


16 Ibid

17 Ibid


Hickman, 199-201.


Schurr and Netschert, 36.

Williamson and Daum, 107.


Williamson and Daum, 112.

Ibid., 111.

Schurr and Netschert, 102.


Schurr and Netschert, 85.

Williamson and Daum, 320.

Ibid., 302.
32 Ibid., 249

33 Ibid., 291-293.

34 Ibid., 289

35 Ibid., 158


37 Ibid. 289.


39 Schurr and Netschert, 36.
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