TUCSON LIGHTING, 1882-1912, WITH INFORMATION ON LIGHTING THE HISTORIC INTERIOR

by

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STATEMENT BY AUTHOR

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This research concerned Tucson lighting from 1882 to 1912. It researched the energy sources which were used for lighting during that time frame. Then the type of lamps used for each energy source was studied. Lamps for both residential and commercial interiors and exterior lighting devices were considered. A section on lighting the historic interior was included in order to relate how the researched material could be implemented. The research culminated in the development of a slide presentation of the material which is on file at the Division of Clothing, Textiles, and Interior Design in the School of Home Economics, The University of Arizona, Tucson.
CHAPTER 1

INTRODUCTION

The interior of a structure should reflect the lifestyle of the people who live within it. The design for such a space can only be complete when all the parts are integrated into the whole. The designer must pay attention to every detail no matter how small. This is a synopsis of the personal design philosophy that led the investigator to look into lighting in the City of Tucson, Arizona, at the turn of the century. A blank page in Tucson's past existed concerning residential and commercial lighting.

Lighting was an unexplored part of the material history of early Tucson. Yet artificial lighting had a special significance. It made it possible for Tucsonans to use the hours of darkness for pleasure, work, or study. There were no historical texts dealing directly with Tucson lighting during the period 1882-1912. Newspapers, books, and the city directories only made passing references to lighting.

The period between 1882 and statehood in 1912 is particularly interesting because in 1880 the Southern Pacific Railroad connected Tucson to the rest of America. This allowed for a faster exchange of ideas. The period
began with the evolution of the coal-oil lamp into gas illumination when the first gas company was established in 1882, the start of an unbroken line of public utilities serving Tucson with artificial illumination. The period ended with the widespread adoption of the electric light. The transition was marked by combination gas and electric fixtures, which took advantage of whichever utility was working, or which was more economical. In style the period 1882-1912 ranged from Victorian, 1851-1901, to Edwardian, 1902-1914.

Victorian styles were characterized by "massive proportions, generally dark colors and a dense ornamentation of all surfaces" (Faulkner and Faulkner, 1975, p. 571). The Edwardian era was dominated by revivals of earlier periods, but it also included the Arts and Crafts and the Art Nouveau movements. The Arts and Crafts movement was "a return to honest craftsmanship" (Whitton, 1974, p. 378) whereas the Art Nouveau movement was an attempt to create an entirely new style that owed nothing to the past and "was based on the asymmetrical flowing lines of plant forms" (Whitton, 1974, p. 378).

**Purpose of Study**

The purpose of this study was to add to the body of knowledge about Tucson's past, while simultaneously aiding the homeowner, interior designer, restorer, or museum
personnel to develop interpretive studies and to accurately reconstruct period rooms or whole buildings.

Method of Study

Following an historical overview of the energy sources used for lighting, this study surveyed the kinds of energy sources available during the period under study. Then the history of the Tucson power companies was reviewed.

This was followed by research into the kinds of lighting fixtures actually used in residential and commercial interiors. The research began with an investigation of the picture files at the Arizona Historical Society Library and the University of Arizona Special Collections to find photographs of historical interiors. A visit to the Ft. Huachuca Post Museum, the A. J. Bayless "Cracker Barrel" Country Store in Phoenix, Arizona, and some local Tucson antique stores provided examples of period lamps, which were photographed. In addition, several homes built between 1882 and 1912 were visited and their period lamps were photographed. A listing of sources for all photographs is given in Appendix A.

Exterior lighting was included so that a complete picture of the lighting environment in Tucson between 1882 and 1912 would be generated. A source of examples for exterior lighting was the picture files of the Arizona Historical Society Library. Historic neighborhoods were
then visited and streetlights installed during the period, 1882-1912, were photographed.

Both interior and exterior photographs were filed by type of energy source, i.e., kerosene, gas, combination gas-electric, and electric, with notations made of their historic use. When more than one lighting source was illustrated the photograph was filed under the predominant source used or, if all sources were of equal importance, under the earliest source used. The photographs were then studied and those most representative of the major styles of the period, 1882-1912, were chosen for inclusion in the study.

Because of the technicalities involved in making prints of old photographs it was found that slides made of old photographs were of better quality than prints. Because of this and the wish to make the material readily available for the use of groups, slides of all illustrations used in this study are on file in the School of Home Economics, Division of Clothing, Textiles, and Interior Design, The University of Arizona, Tucson.

The Old-House Journal and books on historical interiors aided the development of the section on lighting the historic interior. The investigator's own experiences also contributed to this part of the study.
Goals and Objectives

The goals and objectives of the study are:

1. To find out what types of energy sources for artificial lighting were available in Tucson, 1882-1912.
2. To show the state of the development of energy sources at the time they became available in Tucson.
3. To discover what kinds of lamps were used in Tucson, 1882-1912.
4. To develop a photographic record of information on Tucson lighting, 1882-1912.
5. To provide guidelines for the development of interpretive programs for the incorporation of historic lighting.
6. To show how this material can be used in the lighting of historic interiors.
7. To show how present-day lighting systems can be incorporated into the historic interior.

Definitions

Lamp and bulb component details are defined by illustrations in Appendix B. The following definitions will hold for the purposes of this study:

1. **Lamp**—any lighting device. The lighting industry's definition of a "lamp" is synonymous with "bulb"; that meaning will not be used in this study.
2. **Fixture**—a lighting device attached to the structure as a bracket or hanging lamp.

Scope and Limitations

This research was intended to give an overview of the various kinds of artificial lighting in use in Tucson during the period, 1882-1912. The decision to limit this study to the years between 1882-1912, a period of rapid expansion and development in Tucson, was made on the advice of the investigator's thesis committee.

Although the primary focus was on interior lighting, both residential and commercial, a section on exterior lighting was included to bring into perspective the total lighting environment for the period. A section on lighting the historic interior was included to aid those interested in this subject.

According to the Tucson Electric Power Company, records of the early power companies no longer exist. The only sources of information on these companies were the local newspapers, the minutes of the Tucson City Council, and the article by Finney (1962). The investigator would have preferred better primary sources.
CHAPTER 2

REVIEW OF LITERATURE

To the knowledge of the researcher there were no studies dealing directly with Tucson lighting, 1882-1912. Research was divided into the various aspects of the subject: the City of Tucson, energy sources, lighting devices, and lighting the historic interior. There was no clean line separating these areas in the written literature. Books and articles often had material relating to more than one area. When that occurred they were catalogued under the area with which they were primarily concerned.

The City of Tucson

Although there are numerous books on Tucson covering this period, there are few specific references to lighting. Lighting, even in early times, seems to have been taken for granted. Neither the establishment of the first gas company nor the establishment of the first electric company was documented in books on the history of Tucson.

Martha Summerhayes (1908) wrote Vanished Arizona. She had a few references to lighting, but most were too early and concerned the use of candles at military camps when traveling with the Army. Her one reference to lighting within the time frame of this study concerned stage lighting.
in Nebraska in 1887. Summerhayes (p. 263) mentioned that it was primitive lighting "... as there was no gas or electricity there in those days. ... ."

Yet Summerhayes gave glimpses of Tucson before and after the coming of the railroad which brought luxurious changes to Tucson. The author mentioned that after the coming of the railroad Tucson had ice and impeccable waiters, but nothing was recorded about the changes that occurred in lighting.

_Tucson—the Old Pueblo_ by Frank Lockwood and Donald Page (n.d.) and _On the Border with Crook_ by John G. Bourke (1902) are excellent sources of background material for early Tucson. Most of the material in these books concerns Tucson before the 1880s.

George Herbert Smalley (1966) wrote _My Adventures in Arizona_. He covered the time frame but was more concerned with understanding the people and politics of Tucson than with the historical perspective of its lighting. The one reference to lighting concerned his house that was in Globe, Arizona, at the turn of the century in which he (1966, p. 125) mentioned that his wife liked bright lights. Thus, their dining room had 20 electric lights in ceiling panels.

_Pioneering in Arizona_ written by Emerson Oliver Stratton and his daughter Edith Stratton Kitt (1964) contains reminiscences of two generations of early Arizonans. In the first section Stratton was mostly concerned with
mining and ranching but he had one reference to electricity at the close of the time period when he (p. 79) wrote of driving to his mine and that it was lit with electric lights. In the second section Kitt had one reference to lighting in the mid-1880s in which she (p. 128) told of the disagreeable task of cleaning kerosene lamps.

Bernice Cosulich's (1953) book Tucson is well documented and gives dates, an item often missing in the earlier books. Although Cosulich gave a comprehensive history of Tucson through the nineteenth century, she gave only two references to lighting. In the first reference she (p. 78) stated that "... although gas for illumination had arrived in 1882, the crystal lamp chimneys would have to be cleaned and polished every day." In the second reference she (p. 110) listed prices for 1874 in which coal oil for lamps cost $8 per gallon. The beginning of gas and electricity are not included in the table of chronological events in the history of Tucson.

Rosemary Taylor's books, Chicken Every Sunday (1943) and Ridin' the Rainbow (1944), are tales of her parents. In these books she showed the changes that occurred in Tucson with the passing of time. In Chicken Every Sunday Taylor (p. 34) mentioned the low cost of kerosene. No mention was made about gas but she told of plugging in an electric hotplate and blowing out the lights (p. 211) and of having an electrician repair a light switch (p. 241). The only
problems with these books is that there are few dates and research had to be done on the incident portrayed to put it into a time perspective.

Tucson's Historic Districts: Criteria for Preservation and Development by the City of Tucson Planning Department (1977) is primarily concerned with the architecture of the districts, their preservation and development, and the Tucson Historic Zone Ordinance. The City of Tucson Planning Department gave background material on architectural styles and the time period in which they developed.

The Tucson Preservation Primer: A Guide for the Property Owner, a class project of the advanced students of The University of Arizona, College of Architecture studio "Architecture as Conservation" (Giebner, 1979), is a guide for owners so that they can understand the architectural features of their old buildings. The class also presented a procedure for the preservation of the building. The class prepared a useful background tool for anyone interested in historic Tucson, but lighting was not handled as a separate topic in this work.

The Tucson city directories, begun in 1881, added to the knowledge about lighting. The earliest ones arranged names under each letter of the alphabet but the names in each list were not alphabetically arranged which made it difficult to cross reference. They contained advertisements for lamps and lamp parts.
A good source of material on lighting in Tucson was the newspapers, *The Arizona Daily Star* and *The Tucson Daily Citizen*. These papers also had weekly editions. Although their philosophies differed, the articles in both papers contained similar information so only *The Arizona Daily Star* (hereafter referred to as *The Star*) was quoted. They contained articles, editorials, and advertising. Some ads appeared unchanged for months.

The Special Collections of the University of Arizona and the Arizona Historical Society Library are repositories of historical photographs. Both the gas and electric companies began service in the business district, so photographs of commercial interiors were more often found than photographs of private interiors. Some photographs of street lighting were also found.

**Energy Sources**

The Minutes of the Tucson City Council contain information regarding lighting contracts. The Minutes also recorded debates over which type of system, gas or electric, was to be used by the city.

Mark Cesnik, the Assistant Public Information Director of the Tucson Electric Power Company, gave the investigator a copy of an article by Frederic Finney (1962), "The Tucson Gas, Electric Light and Power Company," which appeared in the special seventy-fifth anniversary edition of
Electrical West. In this article Finney gave a history of Tucson's power companies. He also gave valuable details of the early power companies, including dates, rates, and types of service. Frank Russell, long time manager of the electric company, contributed material to this article.

Matthew Luckiesh, who was an early director of the Lighting Research Laboratory for the National Lamp Works of the General Electric Company, was considered the authority on lighting. In Artificial Light he (1920) thoroughly covered the history and development of gas and electricity and included one chapter on oil lamps. In Lighting Fixtures and Lighting Effects he (1925) related the various kinds of lighting possible from the turn of the century until the twenties. In this book he presented material on lamps, styles, and various uses of electrical lighting systems.

Denys P. Myers (1978) presented a comprehensive study of gas service in America in Gaslighting in America. In it he included both the history of gas service and styles of lamps. He illustrated his book with reprints of period photographs, catalogue pages, and devices for gas service.

Two early works on electricity were Killingworth Hedges' (1886) Precautions To Be Adopted on Introducing the Electric Light and Henry Schroeder's (1923) History of Electric Light. The history of electricity can be found in Lamps for a Brighter America by Paul Keating (1954) and in

Henry B. Cox had an article, "Plain and Fancy: Incandescence Becomes a Household Word!", in the Autumn 1980 issue of Nineteenth Century. In this article he gave a short history of the rapid rise in the popularity of Edison's invention. He illustrated his book with leaves from the 1880 catalogue from Bergmann and Company, New York City, New York. This was one of the earliest catalogues for electric lamps and lamp parts.

Lighting Devices

An excellent source for background in the history of lighting is a book by Leroy L. Thwing (1958), Flickering Flames. He covered the very beginning of artificial light through candles and a bit on kerosene lamps. Most of the material is too early for this study but it gives a valuable overview of lighting.

In Light on Old Lamps, Larry Freeman (1946) covered lighting from colonial American days through kerosene, an area of concern in this study. His illustrations seldom gave a source or a date, or corresponded to the text.

Lamps and Other Lighting Devices, 1850-1906 was compiled by the editors of the Pyne Press (1972). They looked at lighting through the catalogues of seven companies
making either lamps or lamp parts. Five of these catalogues were appropriate for the period of this paper. They were all concerned with either gas or kerosene.

Loris Russell (1968) wrote a history of Canadian lighting in *A Heritage of Light*. His history ranged from early primitive lighting through electricity. Although he was primarily concerned with Canadian lighting history he gave many references to United States companies and patents.

Stanley Wells (1975) covered lighting fixtures by country and style in *Period Lighting*. He included a section on American lighting from colonial days to the beginnings of electricity. He used illustrations of fine antiques. He also wrote on selecting the appropriate lighting fixtures for period rooms.

Alastair Duncan (1978) looked at lighting through the eyes of the designer in *Art Nouveau and Art Deco Lighting*. He covered lighting at the turn of the century, with Art Nouveau, and then showed the progression to Art Deco in the 1920s.

The 1902 Edition of the Sears, Roebuck Catalogue, reprinted by Bounty and Company in 1969, illustrates what was available at that time through mail order catalogues. Another catalogue from the New York Gas Appliance Company, *Bargain Catalogue #12*, shows lighting fixtures and supplies from 1912.
Tom Gerhardt (1975) wrote an article for the magazine *The Old-House Journal* entitled "Victorian Lighting Fixtures." He covered style and the level of lighting in Victorian homes as well as hints on determining the appropriate replacement lighting fixture.

Chester Hess (1952) wrote an article, "The Lamp that Lighted the West," for *Arizona Highways*. He was mainly concerned with western lighting using kerosene.

**Lighting the Historic Interior**

*Interior Design and Decoration* by Sherrill Whitton (1974) and *Inside Today's Home* by Ray Faulkner and Sarah Faulkner (1975) are good background sources. They both have sections on the major interior design styles.

William Seale (1979) wrote *Recreating the Historic House Interior*. He had a good section on lighting although some of the material he presented was pre-1882. He had only one paragraph dealing with kerosene lighting, but his coverage of gas lighting and early electric lighting was quite comprehensive.

Carolyn Flaherty's (1976) "A Guide to Lighting the Old House" appeared in *The Old-House Journal*. She covered Colonial (up to 1790) and Early American (1790-1850) periods which are too early for this study. She also covered the Victorian (1851-1901) and the Edwardian (1902-1914) eras which are both within the time frame of this study. She
included a short illustrated history of the major styles of each period.

The Old-House Journal also contained "Lighting for the Old House" by Jean Gillett (1975) which covers lighting both before and during the period researched for this study. She was concerned with relating lamps to architectural style, with ways of adapting old fixtures to modern lighting, and of using modern lighting to augment historic lighting.

Tom Blalock's (1978) "Reviving an Old Lighting System" is also in The Old-House Journal. He traced his steps in discovering and reviving the original electrical system of an 1850s Italianate house electrified in the 1890s.
CHAPTER 3

SERVICING THE COMMUNITY

The material in this chapter is arranged chronologically. There was no distinct line of events separating the gas company from the electric companies. Likewise there was no distinct line separating the events pertaining to interior lighting from those of exterior lighting.

With the coming of the railroad, March 20, 1880, Tucson was connected to the rest of the United States (Cosulich, 1953, p. 241). As people began to travel more easily, ideas and goods began to be exchanged between east and west at a faster pace than ever before. There were rapid changes in the quality of life in Tucson.

By 1881 the city water works were under construction. Improvements were made to city streets, sidewalks were being constructed, and telephones were in use (Directory of the City of Tucson for the Year 1881, Barter, 1881, p. 23). Tucsonans read the news in three daily papers, The Tucson Daily Citizen, The Star, and The Daily Journal, and two weeklies, The Mining Journal and El Fronterizo (Barter, 1881, p. 38). They relaxed in Silver Lake, Fuller's Springs, and Levin's Park Stream (Barter, 1881, p. 40). Food
and drink were cooled with ice from the ice works (Barter, 1881, p. 44). This was a far cry from the Tucson John Bourke (1902, p. 63) knew in 1870:

Streets and pavements were there none; lamps were unheard of; drainage was not deemed necessary, and water, when not bought from the old Mexican who hauled it in barrels in a dilapidated cart from the cool spring on the Bishop's farm, was obtained from wells...

The importance of the introduction of gas to Tucson can be seen from the January 11, 1882, editorial in The Star (n.p.):

Before the first day of April this ancient and honorable pueblo, which has been lost in darkness for more than a century, will doubtless be illuminated. Light means progress, for 'tis said the man who invented the tallow dip did more to advance the race than all other discoveries previous to his time; it increased time for brain work. If this is so, lo, what benefactors they will be who give Tucson gas.

On the same day Mayor P. Tully also referred to this event in his inaugural address (The Star, January 11, 1882, n.p.):

The lighting of our city is also of great importance. This too, we have reason to believe, will be attended to at an early date, as we have given a franchise to a good and responsible company, and have every reason to believe that the company will at an early day give us light.

Before the Lights Came

On March 1, 1880, W. W. Williams, Claude Anderson, and J. L. Fried petitioned the City Council for a 25-year
franchise for gas and electricity. This franchise for the Tucson Gas Company was granted March 22, 1880, as Ordinance No. 26.

In December of that year the Tucson Gas Company purchased Block 34, East 6th Street at Church Avenue, City of Tucson, as the site for the gas plant. The company had $200,000 in capital stock (Finney, 1962, n.p.). On October 20, 1881, The Star reported that work on the $40,000 gas plant had begun. By January 11, 1882, 12 carloads of building materials had been shipped from San Francisco for the construction of the gas plant. The next day The Star (January 12, 1882, n.p.) reported:

Gas mains are being strung along our streets and the A. & H. P. (Ancient and Honorable Pueblo) is evidently arousing from its slumber of darkness.

The gas pipes and fixtures will be temporarily stored in Colonel Toole's building, formerly occupied by Lord and William's.

The Star kept the City of Tucson well informed on the progress of the gas works. On January 15, 1882, The Star reported:

The excavation for the gas tanks is about completed. They are sinking a well 5 feet by 8 feet and are down 18 feet. The ground is very hard and the prospects are good that they will strike good mineral. The engine room 34 by 40 feet is ready for the roof, the machinery is all on the ground and ready to be placed in position upon the completion of the engine room.

The city recognized a need for order among city services using underground pipes. On January 19, 1882, the
City Council passed a resolution that gas mains would go on the north side of all streets running east and west, and on the east side for streets running north and south, leaving at least 6 feet on either side of the center of the street. This was to allow the water company to use the opposite side. Unfortunately the gas company was not notified and some pipe was laid on the wrong side of Camp Street (The Star, January 25, 1882, n.p.). To resolve this dilemma and not delay the lighting of the city it was agreed that the pipe would stay until the space was required for water or sewer lines. The gas company would then remove its gas lines at its own expense (The Star, January 26, 1882, n.p.). No evidence was available that indicated that these gas lines were ever removed.

By January 27, 1882, Elmore, superintendent of the gas company, was advertising in The Star that the gas company had pipes and fittings and was prepared to install them in buildings. The ad urged those who wanted to "light up the first night" to leave their orders at the office, 11 Main Street. Those who wanted to see a gas installation before deciding were urged to visit the Thomas Fitch home and the new Zeckendorf & Company store where installation of gas lines was already completed.

On the same date The Star (January 27, 1882, n.p.) ran news of the gas company's progress in its "Local Notes" column, stating that air pumps would ensure that the system
would not leak and that installation of gas mains was progressing along Camp, Congress, and Meyer Streets. The paper also reported that the quality of gas put out by the Hanlon Oil Process plant on East 6th Street at Church Avenue would be "of 28 or 30 candlepower, the same as the best quality used in all large cities and superior to the 15-candlepower light used in many places."

The light of a 2.67-ounce mold candle (six candles were molded out of one pound of tallow) was "considered a standard of luminous intensity when it was consuming tallow at the rate of 0.4 ounces (1,775 grains) per hour" (Luckiesh, 1920, p. 71). A standard candle burned about 7 hours. Candlepower was the amount of light given off by a tallow candle in 1 hour. Candlehours were obtained by multiplying the candlepower of the source by the number of hours burned. These standards allowed a comparison of light from different sources (Luckiesh, 1920, pp. 214-215).

Elmore had help in encouraging people to use gas. On February 1, 1882, The Star (n.p.) urged people to patronize the gas company even though they were in business for profit because:

Gas is cheaper, safer and more cleanly and in every way more desirable than oil or candles, and more than this it makes one step to the front in the progress of Tucson. And more, if this enterprise is well sustained by the citizens, others as useful and as equally helpful in building up Tucson will soon follow.
From early February, 1882, the Tucson Gas Company ran daily ads in *The Star* stating that anyone who applied for gas lighting of their home or business before the date gas was to be turned on for the city would get free tap in to the main and setting of gas meters. This was to be a savings of about $15.00.

H. J. Brown also ran a large ad for several months in which lamps and chandeliers were mentioned in the middle of a list of crockery, cutlery, pistols, and paints. The fuel for these lamps was not specifically named but the ad ended with the mention of "Starlight Oil" in bold print.

By February 9, 1882, the City Council determined on which corners in Tucson gas lamps would be located. The list was published in *The Star* (February 9, 1882, n.p.) adding that the 40 lamps and posts were to be erected by the company. Actually only 38 lamps were put in service. The locations of these first gas street lights were marked on the map (Figure 1).

**Early Gas Service**

Because gas was a service new to Tucson its citizens did not know much about it. To explain their service the gas company distributed a handbill to Tucsonans (Finney, 1962, n.p.):
Figure 1. Map of the Proposed Locations of the First Gas Street Lamps. -- From the Planning Department, City of Tucson, Arizona.
Gas is compared with candles and called 15, 16, or 28, etc., candle gas, meaning that a burner burning five feet per hour of gas shall give as much light as 15, 16, or 28 sperm candles. The gas as usually sold to customers is 15 to 16 candles.

The gas will be pure and bright, free from smoke, and with an illuminating power of 28 to 30 candles—better gas than has been seen by any person in Tucson, unless they have seen gas at the following places, lighted by our company, to all of whom we refer: Palace Hotel, San Francisco, and the cities of San Diego, San Pedro and Bernicia, California, where we have created works.

Prices will not exceed $7 per 1,000 cu ft at which rate it will be as cheap as the ordinary 15-candle gas is at $4.50 per 1,000 cu ft and about as cheap as coal oil for the same amount of light.

By referring to gas works in California, the handbill pointed to the real owners of the Tucson Gas Company, the Pacific Gas Improvement Company of San Francisco. It was not until 1896 that the company sold its interests to Tucsonans (Finney, 1962, n.p.).

**Early Gas Street Lighting**

Street lighting followed the "moonlight system," or calendar lighting, as it was also called. This system used the light of the moon to augment artificial light. In Tucson, street lights were to be lit (Finney, 1962, n.p.) from 6 p.m. to 6 a.m. daily for $8 per month per lamp, or the company will light by the calendar as accepted by many gas companies in the United States: Los Angeles, San Francisco, included for $7 per month per lamp; the city to clean and maintain the lamps.
The formula: No lights during full moon.
Example: April 2, 3, 4, 1882, full moon; no lights. April 5—lights on at 7 p.m., out at 9:45 p.m. (moon up). Light one-half hour after sun sets; lights on one hour before moon sets.

Extinguish one hour before sunrise; extinguish one hour after moonrise.

Fleishman's Drug Store, which opened in 1881, was on the corner of Congress and Court Streets, one of the corners designated for one of the first street lights in Tucson. Figure 2 shows this corner with one of the first street lamps. Figure 3 shows Congress Street before 1884. The gas lamp on the pole just left of the center should be noticed. Its gas line came from the column on the building behind it.

The Tucson Electric Light Company Begins

The Tucson Electric Light Company filed and recorded Articles of Incorporation on March 6, 1882. Although its incorporators were Tucsonans, its actual operations were controlled by the Brush-Swan Electric Light Company of Cleveland, Ohio (Finney, 1962, n.p.).

The original Tucson City Ordinance No. 26 gave exclusive rights of gas and electricity to the gas company. Despite this fact, the City Council granted the rival electric company the right to erect poles and string wire. In July, 1883, the Tucson Electric Light Company established an arc light service (Finney, 1962, n.p.).
Figure 2. Early Gas Lamp on Corner of Congress and Court. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
Figure 3. Congress Street Gas Lamp before 1884. -- Photograph through the courtesy of the Arizona Historical Society, Tucson.
Competition for Street Lighting

Both the gas and electric companies wanted the city street-lighting business. From early 1882 onwards the minutes of the Tucson City Council reported on the moves made by each company to put itself in power.

The competition began on March 12, 1882, before either the gas or electric company was in operation. The electric company promised lower rates than the gas company. The City Council agreed to look at both electric and gas company proposals before making a decision (The Star, March 12, 1882, n.p.). It ended well for the gas company as it was awarded the first contract on April 3, 1882 (Finney, 1962, n.p.). The first city payment to the Tucson Gas Company was for $457.60, which covered the period April 10, 1882, to June 1, 1882 (Finney, 1962, n.p.).

By August 17, 1883, the electric company had the upper hand and was given the contract to begin street lighting in September (Finney, 1962, n.p.). Even though the gas company lost the city street lighting contract it continued to light city interiors until a cyclone destroyed the gas works in 1898.

The City Council continued to seek lower rates for street lighting by playing one company against the other. By February, 1885, the electric company's contract called for a flat payment of $350 per month, but this was only for 16 lights (The Star, February 20, 1885, n.p.). The gas
company offered to serve the city with street lights for $5 per light for a minimum of 50 lights. The electric company countered with an offer of $300 per month and was awarded the contract (Finney, 1962, n.p.). Even with the street-lighting contract the Tucson Electric Company went bankrupt. On May 22, 1885, it was ordered sold to its creditors (Finney, 1962, n.p.).

The streets of Tucson were to remain dark until October, 1888, when the City resumed its 1882 contract with the gas company. This contract remained in effect until July, 1893, when another electric company got the contract (Finney, 1962, n.p.).

The researcher could find no definite reason for the long delay in giving the gas company the contract. The City Planning Department library listed the Tucson population as declining by almost 2,000 people from 7,007 in 1880 to 5,150 in 1890. The city may have felt it could not afford street lights while it had a declining tax base.

The Tucson Electric Light and Power Company

On October 28, 1892, leading merchants and bankers incorporated the Tucson Electric Light and Power Company with Albert Steinfeld (merchant) as president, A. V. Grossetta (another merchant) as vice president, L. M. Jacobs (banker) as treasurer, and J. M. Ormsby (manager of Tucson's Western Union) as secretary. The company accepted Guерovich
and Wetherell's low bid of $1,393 to erect a 40-foot x 40-foot building on Lot 1, Block 179, City of Tucson. This lot on Church Street was purchased from the Fitch family for $1,550. The electric plant, featuring an Edison bipolar generator driven by a high-speed steam engine, was purchased from the General Electric Company. It delivered D-C to the business district (Finney, 1962, n.p.).

According to Finney (1962, n.p.) the January, 1893, rates for lighting, based on a 16-candlepower lamp per month, were:

<table>
<thead>
<tr>
<th>Time</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 o'clock light</td>
<td>$1.50</td>
</tr>
<tr>
<td>10 o'clock light</td>
<td>1.65</td>
</tr>
<tr>
<td>11 o'clock light</td>
<td>1.85</td>
</tr>
<tr>
<td>12 o'clock light</td>
<td>2.00</td>
</tr>
<tr>
<td>All night</td>
<td>3.50</td>
</tr>
<tr>
<td>Private residence, three lamps</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Public halls, hotels and places with a large number of lamps in one place subject to special contract: six or more lamps 10% discount.

At this same time the electric company hired Frank Russell as superintendent with a beginning salary of $40 per month. He was to run the power company, even through changes of ownership, until his death in 1923.

**Tucson Gas, Electric Light and Power Company**

With the installation of service behind them the gas and electric power companies slid into the background, seldom making news. They did make news in 1896 when the Tucson Electric Light and Power Company bought the Tucson Gas Company for $14,000, and added "Gas" to its name. The
gas company was no longer a rival because at this time the
gas works were run down. The gas company served few
customers and averaged only $150 to $250 per month in gross
revenues until the cyclone of 1898 destroyed the plant
(Finney, 1962, n.p.).

On June 5, 1899, the City Council passed Ordinance
No. 124, which was a 2- to 5-year franchise for city ser­
vice. One stipulation of the ordinance was that the gas
plant be restored. It took 2½ years and two changes of
ownership before the gas plant was operating again.

Sometime before 1902 the Tucson Gas, Electric Light
and Power Company was sold to J. J. Henry for $35,000 cash
and the assumption of a $15,000 mortgage (Finney, 1962,
n.p.). Frank Russell told Finney, "When we unloaded on him
we all thought we had caught a sucker and were tickled to
death" (Finney, 1962, n.p.). On February 20, 1902, Henry
turned around and sold the company to the U.S. Light and
Traction Company of Denver, Colorado. He received stock of
$299,500 par value and bonds of $175,000 par value (Finney,
1962, n.p.).

At the annual stockholders' meeting of February 3,
1903, the Tucson Gas, Electric Light and Power Company
reported it had spent over $40,000 to refurbish the gas
plant. The old system of gas mains was still being used.
On January 15, 1902, the City Council replaced Ordinance
No. 124 with Ordinance No. 157, which included gas service.
During all these changes Russell continued to run the business. In return for stabling the company's horses Russell got free electricity for his home next to the Church Street plant. In 1904 he phased out the old electric plant while he was building a new plant on 6th Street. As money was short, he mortgaged his home to help pay for the move (Finney, 1962, n.p.).

According to Finney (1962, n.p.), a typical 5-year service contract in 1904 to Consumers Ice and Cold Storage Company read: "first 2 years, 13¢ per kwh; 3-4 years, 12½¢ per kwh; 5 years, 12¢ per kwh; power, 8¢ per kwh."

The University of Arizona received different rates on its 5-year contract: "Lighting at 10¢ per kwh and power at 5¢ per kwh" (Finney, 1962, n.p.). Gas lines were not extended to the university until July, 1909 (The Star, July 2, 1909, p. 8).

Frank Russell continued encouraging the extended use of gas and electricity. His ads urging people to get gas stoves and heaters were a common feature of the city's newspapers. He proclaimed that gas heaters gave light as well as heat (The Star, March 4, 1905, n.p.).

Again Russell remained on as supervisor when the Federal Light and Traction Company, New York City, obtained controlling shares of the Tucson Gas, Electric Light and Power Company. This new ownership was announced at the February 15, 1911, annual stockholders' meeting (Finney,
1962, n.p.). A year later Russell convinced the Tucson Rapid Transit Company to convert to electric energy. In 1912 the horse-drawn cars were withdrawn. Electric-driven cars began their run from Congress Street west to Elysian Grove (Finney, 1962, n.p.).
CHAPTER 4

KEROSENE LAMPS

Although gas was available from April, 1882, for both interior and exterior lighting people still used kerosene. Post-1882 photographs of home and business interiors in this chapter substantiate the extensive use of kerosene lamps as an alternative lighting source.

People knew kerosene, already had lamps, and were comfortable with it. There was reluctance to invest money in an unproven system, especially if the home was rented or not permanent. Kerosene, or coal oil as it was popularly called, was "efficient, relatively safe, and cheap enough to be used by both city merchant and backwoods farmer" (Russell, 1968, p. 131). In 1898 when chicken was 25 cents per pound, eggs never more than 15 cents per dozen and ice was 3 cents per pound, kerosene was still considered cheap (Taylor, 1943, p. 24).

In addition, gasification was limited to the business district of Tucson and the surrounding area, and it was expensive. To attract customers the gas company offered free hookup to anyone requesting service to their house or business in the 2 months preceding April 1, 1882. According to daily ads run in The Star (February-March,
1882, n.p.), this saved about $15. But installation was only a partial cost of the gas distribution system; other costs involved putting the pipes and fittings into the home and purchasing all new lamps.

**Kerosene—the Fuel**

By 1864 kerosene "was almost the universal lamp fuel in North America" (Russell, 1968, p. 131). What was kerosene? In 1840 Abraham Gesner, in Nova Scotia, and James Young, in Scotland, independently studied the effects of distilling coal at about 800°F. This was a lower temperature than the 1,000°F required to produce illuminating gas. This distillation produced a substance which when purified burned with a clean, bright flame (Russell, 1968, pp. 131-134). It was Gesner who named the substance that was produced "kerosene," "a contraction of the Greek "keroselaion," meaning wax-oil" (Russell, 1968, p. 132). By 1854 Gesner had a New York patent for kerosene made from bituminous coal and oil shale.

Improvements in purification of the oil were made along the way. By the 1860s kerosene made from distilled petroleum was available to all (Russell, 1968). Certainly this was the beginning of a social revolution—man's day had been increased to 24 hours.
The principle on which kerosene lamps operated was quite simple. "The oil rose through a wick by capillary action and was consumed, not without a certain amount of smoke and odor" (Editors of the Pyne Press, 1972, p. 61). Kerosene lamps had flat wicks until the advent of the Rochester burner (discussed later), in the late 1880s. The Rochester burner had a cylindrical wick. All lamps mentioned in this thesis have flat wicks unless otherwise stated.

Kerosene lamps had to be well maintained. They gave the best light when kept filled, clean, and with the wick well trimmed. Edith Stratton Kitt gave an account of the maintenance of kerosene lamps on their Pandora ranch in the mid-1880s: "In the mornings . . . we had a few regular chores. What we disliked most was to fill the coal-oil lamps, trim their wicks and clean their sooty chimneys" (Stratton and Kitt, 1964, p. 129).

When the combustion of the kerosene was complete there was less smoke. The chimney was a simple means of forcing a draft to supply the necessary amount of air for a more complete combustion of the kerosene (Luckiesh, 1920, pp. 59, 60). Through the years there were hundreds of American patents on improvements to the coal-oil lamp. Russell (1968) covered these extensively in Chapters 7-10, A Heritage of Light.
Kerosene lamps were difficult to precisely date as the same styles were both manufactured and used from the 1860s to World War II. As late as 1920 Luckiesh (p. 62) wrote of kerosene:

Its extensive use at the present time is shown by the fact that about eight million lamp-chimneys are now being manufactured yearly in this country. It is convenient and safe when carelessness is avoided, and is fairly free from odor. Its vitiation of the atmosphere may be counteracted by proper ventilation and there remains only the disadvantage of keeping it in order and of accidental breakage and overturning.

By the 1880s most of the major innovations in the operation of the kerosene lamps were made, but the lamps were already getting competition from gas and electric lighting. "Kerosene lighting met the threat by exploiting the decorative possibilities of its lamps, based on their greater variety and portability, a strategy which fitted with the late-Victorian love of lavish decoration" (Russell, 1968, p. 231).

The period after 1885 saw "the increased use of coloured glass, of painted glass and china, of elaborate patterns in pressed glass, of prism pendants, of statue-like pedestals, and even of fabric shades and fringes" (Russell, 1968, p. 231).
Types of Kerosene Lamps

The lamps discussed in this section are representative of the major kerosene lamp styles to be found in Tucson during the period 1882-1912. They are arranged from earliest to latest, simplest to most ornate, by category of wall bracket lamps, table lamps, and hanging lamps.

Wall Bracket Lamps

Bracket lamps were an improvement of an early hand lamp. After 1880 the lamps were made specifically for iron or brass brackets. The fixed piece of the bracket was nailed or screwed to a wall and supported a swinging arm with a ring or basket attached in which the lamp sat (Hess, 1952, p. 36).

The font was made of glass or tin, with a chimney, with and without a reflector. Bracket lamps were generally used in the kitchen but could also be found in halls and bedrooms, where they often "had an auxiliary frosted glass open umbrella shade added for decorative value" (Freeman, 1946, opposite Figure 29).

The font (also spelled "fount" in early catalogues) on the lamp shown in Figure 4 is very plain and fits evenly with the bracket. A similar style was listed in the Bellaire Goblet Company's catalogue, 1891, as "Mammoth Fount" (Editors of the Pyne Press, 1972, p. 108). This was the last Bellaire Goblet Company catalogue as that same
Figure 4. Bracket Lamp.
— Photograph by author through the courtesy of Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.
year the company merged into a conglomerate along with 18 other companies, and became Factory M of the U.S. Glass Company of Pittsburgh, Pennsylvania. Words to this effect were rubber stamped on the catalogue (Editors of the Pyne Press, 1972, p. 83).

Chimneys of kerosene lamps were always clear glass to give maximum light. This one (Figure 4) has a bead trim on its lip. This chimney is similar to a chimney in the 1900 catalogue of the Macbeth-Evans Glass Company, Pittsburgh, Pennsylvania, which described the chimney as a "Bulge Comet Pearl Top." This style of chimney came in various sizes: the fitting diameter from 2-3 inches, the bulb from 3-4 inches, and the height from 6½ to 8½ inches (Editors of the Pyne Press, 1972, p. 14). The Macbeth-Evans Glass Company, the largest producer of glass chimneys obtained the patent for the "Pearl Top" in 1883. The rim of which was adorned with 36-40 glass beads (pearls) depending on the size of the chimney (Editors of the Pyne Press, 1972, p. 111).

The bracket shown in Figure 4 is elaborate cast bronze. The three major companies who manufactured this type of bracket were the Plume and Atwood Company of Waterbury, Connecticut, The Miller Company of Meridian, Connecticut, and the Bristol (Connecticut) Brass and Clock Company (Freeman, 1946, opposite Figure 29). Simpler
versions of brackets were found in The 1902 Edition of the Sears, Roebuck Catalogue, page 801.

The reflector on the bracket lamp shown is unusual. Hess (1952, p. 36) described a similar one: "This unique reflector is a circular, concave piece of hollow molded glass coated on the inside with mercury and sealed airtight. Thus both the front reflecting area and the back is a bright mirror surface which seems to defy time indefinitely." The 1902 Edition of the Sears, Roebuck Catalogue (p. 801) had three bracket lamps with this type of reflector ranging from $0.75 to $0.90 for bracket lamps without chimneys, simple mechanisms and 7- to 8-inch reflectors, to $2.98 for a bracket lamp with a center draft mechanism (discussed later) and a 10-inch diameter reflector. Earlier reflectors were simple crimped or plain polished tin as in No. 2R716 and No. 2R720 of The 1902 Edition of the Sears, Roebuck Catalogue (p. 801).

Table Lamps

Stand Lamp. The stand lamp is also known as a parlor or boudoir lamp. Early versions of this style of lamp were made in sections rather than one piece and were known as composite lamps. Each lamp had common features of a "pressed glass oil font, a black iron or stone base, assorted decorated stems and polished brass fittings"
These parts were assembled in various ways to give infinite variety.

The lamp shown in Figure 5, one of a pair, was made of opal glass (now known as milk glass). This opaque glass was not as common in lamp bases as clear or colored glass. Factory K, formerly the King Glass Company, of the U.S. Glass Company issued a catalogue, 1890-1891, showing numerous pressed glass stand lamps, 7½ to 11 inches high. Smaller than this and with handles they were known as hand lamps and were either plain or had a small foot. Larger than this they were known as banquet lamps. Stand lamps came in crystal, flint, amber, blue, or opalescent but not opal glass (Editors of the Pyne Press, 1972, pp. 75-822). Another U.S. Glass Company catalogue of the same year from Factory M (the former Bellaire Goblet Company) had similarly styled lamps all in crystal, blue or amber—no opaque glass (Editors of the Pyne Press, 1972, pp. 83-110).

The lamp shown in Figure 5 has a Rochester-type burner, the final resurgence of a central draft burner. The central draft idea was redeveloped by more than one person at the same time. Charles Stanford Upton of Spencerport, New York, got the idea and worked it out with Leonard Hinkle of Rochester, New York, who was issued a patent. Upton formed a company with his two brothers in New York City and had lamps manufactured by numerous Connecticut lamp makers of whom Edward Miller of Meriden
Figure 5. Stand Lamp. — Photograph by author through the courtesy of Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.
appears to have been the first" (Russell, 1968, pp. 241, 242). Lamps made by these lamp makers retained the "Rochester Lamp" name. The lamp shown has "Kosnos Brenner" on the wick wheel, but it may have been a replacement part, rather than one from the original manufacturer.

"In 1888 Henry E. Shaffer was also granted a patent for an improved central draft burner, which he promptly assigned to the Rochester Burner Company, of Rochester, New York" (Freeman, 1946, opposite Figure 31). That company also used the name "Rochester Lamp" for its product.

Advertisements for Rochester lamps from the Rochester Lamp Company of New York City were a common occurrence in The Star. The ads showed a floor lamp and a metal Rochester lamp with fluted shade. The ads, which were the same every day, read (The Star, July 15, 1893, n.p.):

"Seeing is Believing." And a good lamp must be simple; when it is not simple it is not good. Simple, Beautiful, Good--these words mean much, but to see "The Rochester" will impress the truth more forcibly. All metal, tough and seamless, and made in three pieces only, it is absolutely safe and unbreakable. Like Aladdin's of old, it is indeed a "wonderful lamp," for its marvelous light is purer and brighter than gas light, softer than electric light, and more cheerful than either.

Look for this stamp--The Rochester. If the lamp dealer hasn't the genuine Rochester, and the style you want, send to us for our new illustrated catalogue, and we will send you a lamp safely by express--your choice of over 2,000 varieties from the Largest Lamp Store in the World.

Rochester Lamp Co., 42 Park Place, New York City.
Rochester lamps were characterized by a tall chimney and white glass shade set on a wire tripod. The Miller Company catalogues of the 1890s listed this shade as an "Opal Dome Shade" (Freeman, 1946, opposite Figure 31).

**Banquet Lamp.** "The class called banquet lamp varied greatly in style and construction, but had one thing in common: a relatively high stem. The extra height permitted illumination of a large area and reduced the shadows cast by other objects on the table" (Russell, 1968, p. 256). Some banquet lamps were composite lamps with glass fonts and standard burners, but "metal construction made it possible to have banquet lamps with centre-draft Rochester-type burners" (Russell, 1968, p. 259) as the one pictured in Figure 6. The air for the center draft entered through the openings in the cup on which the ornate font rested. This font rested on a stem decorated with wavy grooves identical to Figure 152 in Russell (1968, p. 258). Figure 152 was identified as a "Juno" lamp made by the Miller Company (Russell, 1968, p. 259). Other banquet lamps had figures of angels or humans as the stem (Freeman, 1946, opposite Figure 58). Both glass and metal banquet lamps usually had chimneys and often added globular shades. The shade pictured here is painted with a floral design. Banquet lamps also come with plain or etched glass shades.
Figure 6. Banquet Lamp. -- Photograph by author through the courtesy of Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.
The unidentified saloon in Tucson, ca. 1890s, shown in Figure 7 sported a banquet lamp at the end of the bar near the bird cage. The banquet lamp shown was a purely utilitarian mode, very plain. Made of metal, the high perforated collar indicated that it had a Rochester-type burner. The figure shows this lamp without a chimney. It is not known whether it was broken or came that way.

**Vase Lamp.** Probably the most characteristic of Victorian ostentatiousness was the vase lamp which was intended more for ornamentation than light. Russell (1968, pp. 259, 260) gave a good description of this style lamp:

The distinctive feature of the vase lamp was the font, or more often the apparent font, which was like a globular or egg-shaped vase, supported on a low metal base, with little or not stem. What appeared to be the font was usually a shell of opaque glass, painted by hand in some floral or scenic design. The shade was either spherical or hemispherical, and was painted the same design. Variants had frosted rather than painted glass, or fonts of china or metal. In some vase lamps the lower part or vase really was the font, but in the majority the true font was a separate receptacle called an oil pot, which was suspended inside the glass or china vase.

Freeman (1946, opposite Figure 62) credited the movie "Gone with the Wind" for a revived interest in this lamp. This type of lamp is often called the "Gone with the Wind" lamp. He (1946, opposite Figure 62) predicted this interest would pass and be "quite literally, gone with the wind." The use of this lamp in a movie portraying the time of the Civil War was incorrect as the original patent for
Figure 7. Banquet Lamp in a Tucson Saloon, ca. 1896. — Photograph courtesy of the Arizona Historical Society, Tucson.
this lamp was issued to James H. White, New York City, in 1883 (Russell, 1968, p. 260).

The lamp pictured here without its chimney (Figure 8) is similar in shape to some found in the 1906 Fostoria Glass Company's catalogue, which was totally devoted to vase lamps (Editors of the Pyne Press, 1972, pp. 127-156). By 1906 the era of the elaborate oil lamp was almost at an end and the Fostoria Glass Company of Fostoria, Ohio, soon shifted its emphasis to such other things as hand-molded dresser sets and table serving pieces (Editors of the Pyne Press, 1972, p. 127).

The 1902 Edition of the Sears, Roebuck Catalogue (pp. 802, 803) had several versions of this lamp. No. 2R908, selling for $2.10, at 23 inches high, had a similar shape but the bottom on the pictured lamp had an extra decorative lip, which probably raised its price above that of the Sears lamp. The price range for vase lamps was from $0.98 for a 21-inch floral design on a brass stand to $6.95 for an elaborate 25-inch lamp with a Rochester-type burner and a gold plated base.

Figure 9 shows how the vase lamp was used in the home. This photograph and the following one (Figure 10) were of the Fred Brown home. They were difficult to date. Some photographs in the family album had late 1890 dates on them, but there was also a picture with an electric streetcar which would be at least 1912. Fred Brown was first
Figure 8. Vase Lamp. — Photograph by author through the courtesy of the Arizona Historical Society, Tucson.
Figure 9. Vase Lamp in the Brown House. — Photograph through the courtesy of the Arizona Historical Society, Tucson.

Figure 10. High China Parlor Lamp in the Brown House. — Photograph courtesy Arizona Historical Society, Tucson.
listed in the Tucson city directory in 1899 living at 175 South Meyer Avenue. In 1901 his residence was listed as 37 West Pennington Street and from 1902 onwards he was listed as living on Second Street, east of the city. This photograph was probably from one of the first two addresses.

The upper shade on the vase lamp in the Brown home presented a problem. The researcher went through many volumes and did not find any vase lamp with such a combination. It is possible that it was a replacement piece as The 1902 Edition of the Sears, Roebuck Catalogue (p. 663) had two globes similar in shape but they were listed as gas globes. The replacement theory gains plausibility because the same room in the next photograph had a different lamp.

This predicament also brought up one of the drawbacks of the vase lamp. Because both globes were usually painted to match, if one broke and the lamp was no longer being manufactured, the piece could not be replaced. Then the lamp became less desirable as a decorative piece.

**High China Parlor Lamp.** The same room of the Brown home is shown in Figure 10. The draperies and carpeting are the same but the table covering changed as did the lamp. The lamp shown in the Brown home in Figure 10 is a high china parlor lamp. Freeman's (1946) Figure 57 is an example of this type of lamp. The popularity of the high china parlor lamp began in Dresden in the late 1870s and it
was found in the better American homes of the 1800s. The high collar on this one indicated it had a Rochester-type burner, which means it was post-1888 and probably one of the last of this style. Earlier versions of this type of lamp were the precursors of the vase lamp. The oldest versions were of soft solid colors such as pale yellow and gold. The lamp pictured here had marbling, softer on the top and deeper toward the bottom. The lamp did not conceal a brass oil pot but the china bowl itself contained the oil (Freeman, 1946, opposite Figure 58).

**Rochester-type Lamp.** The lamp shown in Figure 11 is a very simple brass version of a metal Rochester-type lamp used in the Stratton-Kitt home. Edith Stratton Kitt was married to George Kitt in 1903 and the young couple moved into the Stratton house on Third Street. This photograph was of their bedroom (Stratton and Kitt, 1964, p. 107) and confirmed the fact that kerosene was used long after other forms of lighting were available. Popularity of the Rochester lamp was lasting, and it was manufactured up until World War II (Freeman, 1946, opposite Figure 34).

**Hanging Lamps**

**Harp Lamp.** A popular kitchen lamp, the harp lamp, was also known as a "store lamp" because that is where it
Figure 11. Rochester-type Lamp from the Kitt House. — Photograph through the courtesy of The Arizona Historical Society, Tucson.
was often found. The one shown in Figure 12 is from the Ft. Huachuca Post Museum.

The harp lamp was:

Characterized by an ornate embossed brass fount seated in a ring attached to a lyre-shaped hanger (harp) supporting the tin shade on its shoulders. A smoke bell, hung directly above the chimney top, also deflects the heat when the lamp is close to a ceiling. The shade has its natural tinned surface on the under or reflecting side, is ordinarily painted green on top (Hess, 1952, p. 36).

The opaque glass version shown in Figure 12, which has a glass dome shade rather than the more common tin, a matching glass smoke bell, and filigree work on the harp, is a cut above the ordinary lamp. It is an unusual transitional lamp because, although it has a harp, the shade rested on a ring more like a library lamp (discussed later) than a harp lamp. Because of that and its elaborate brass work, it is probably early twentieth century. Early harp lamps were not elaborate.

The lamp in Figure 12 has an etched glass chimney. It must be a replacement piece as all original chimneys were clear glass in order to get the greatest amount of light out of the lamp.

The harp lamp in Figure 13 is called a "mammoth harp lamp" because of its size. Russell (1968, p. 272) had a good description of this lamp:

Apart from largeness, their main feature seems to have been the wick-raising draw-bar, which was adjusted from below the font and secured by a set screw. The mammoth lamps all had true fonts, there
Figure 12. Harp Lamp. — Photograph by author through the courtesy of the Post Museum, Ft. Huachuca, Arizona.

Figure 13. Mammoth Harp Lamp. — Photograph by author courtesy of the "Cracker Barrel" Country Store, Phoenix.
being no possibility of having an oil pot with this wick mechanism. Commonly, but not invariably, they had a broad, conical, sheet-metal shade, which rested on shoulders on the harp. Mammoth lamps were made by Plume & Atwood and by the Bristol Brass and Clock Company.

Although the smoke bell is missing from this example it still has its tin shade. The high collar gives evidence that it once had a Rochester-type burner.

No catalogue studied had a harp lamp with the exact features of the lamp pictured in Figure 13. The 1902 Edition of the Sears, Roebuck Catalogue (p. 802) had one with a similar font, wick, and burner advertised as a "Juno Mammoth Stove and Hall Lamp." The mechanism for hanging was different on the Sears version, and it also came with an opal glass shade, which sat inside the harp rather than outside. It sold for $3.69 with the glass shade and $3.25 with a 20-inch tin shade.

There are two harp lamps, one behind the other, shown in the photograph (Figure 14) of Isadore Gotthelf's American Grocery Store on Stone Avenue in the 1880s. The lamps were far enough from the ceiling so that a smoke bell was not needed. Whether the shades were lost or absent because they cut off too much light from the high shelves is not known.

The small numbers on the photograph were for identification purposes on the original photograph. The second man behind the counter was Adolf Steinfeld (2); seated in
Figure 14. Lighting in the American Grocery Store, ca. 1880. -- Photograph through the courtesy of the Arizona Historical Society, Tucson.
front was Dr. Adler (3); standing behind him was the owner, Isador Gotthelf (4); and across from him stood Joseph Ferren (6)—all prominent Tucson citizens of the 1880s.

**Hall Lamp.** The hanging oil lamp in the center of Figure 15 is an example of an early hall lamp from the Delta Club Rooms. Hall lamps are distinguished from other hanging lamps in that the font, burner, and chimney are inside the shade, usually a glass globe which was open at the top and had draft holes in its metal base. Hall lamps were already in use in the 1870s. The early ones had uncolored, usually etched, glass in their shades, as did this one from the Delta Club Rooms. Alternate shade styles were six- or eight-sided prism shapes (Russell, 1968, p. 223). In the early 1800s, "The insertion of the lighted lamp must have been quite an effort, for no way was provided for lowering the fixture to within easy reaching distance. The lighted lamp had to be carried up to the fixture, by stepladder or some related contrivance" (Freeman, 1946, opposite Figure 74).

Despite this difficulty this photograph attested to the fact that this style persisted as this lamp was in the Delta Club Rooms, McNiel and O'Keefe, proprietors, in 1902. This saloon was at 65 West Congress.

As time went on the shade became more ornate as can be seen in Figures 16 and 17. Shades were usually mold blown with ribbed designs, often swirled as the one shown
Figure 15. Lighting in the Delta Club Rooms, ca. 1902. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
Figure 16. White Swirled-glass Hall Lamp, Closed. — Photograph by author courtesy Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.

Figure 17. White Swirled-glass Hall Lamp, Open. — Photograph by author courtesy Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.
here. Common colors were cranberry, blue, candy-stripe pink, and satin white as this one was.

The 1902 Edition of the Sears, Roebuck Catalogue (p. 802) had a similar lamp, No. 2R816, called a "Zenith Hall Lamp." It was advertised as:

Just the thing for a small hall. Ruby, opal or pink globe. This is the cheapest and best hall lamp in the market. In ordering state which color globe you prefer. Shipping weight, 25 pounds.

Price..................$1.49

This same lamp is shown open in Figure 17 to demonstrate an improvement of the 1890s. A person no longer had to stand on a chair or get a ladder to light the hall lamp. The 1890s saw the use of a new suspension system to raise and lower the lamp. It consisted of a system of four chains with pulleys. As Russell (1968, p. 271) described it:

The lower opening, with its collar, rests on a brass cup, which holds a simple cylindrical font with burner and chimney. From this cup two chains extend upward to a pair of pulleys in a concave brass disc, then down to attach to a flaring brass collar which is secured by bent projections to the upper, rimless opening of the shade. This arrangement does not permit any adjustment of the height of the lamp, as is possible with counterweight hanging lamps, but when the bottom ring is pulled down, the lower cup descends and at the same time the shade rises, so that the lamp inside can be reached for lighting, adjusting, or cleaning.

The lamp shown in Figures 16 and 17 was electrified even though the new system had made it easy to maintain the lamp. The oil font and chimney would have been where the electrical works sit.
The hall lamp shown in Figure 18 is the same style, but the green color is unusual. The 1902 Edition of the Sears, Roebuck Catalogue listed just ruby, pink, blue, amber, opal, and etched glass as choices for their hall lamps.

The design of the hall lamp in Figure 19 was taken from the structural details of Gothic architecture and indicated this lamp is in the Gothic Revival style. Other indications of this style can be found in the pointed arch shape, the tracery, finial designs, and the stylized wheat design of the arms ( Luckiesh, 1925, p. 137). The arms seem to be styled after buttresses. This lamp shows a good electrification as the wires do not interfere with the design.

Library Lamp. Although generally called a library lamp, the style of lamp shown in Figure 20 was also used in dining rooms and some commercial establishments. The basic features of the library lamp are a hemispherical shade of translucent glass, with or without prisms (glass pendants), a chimney, and a metal framework to support the font and shade (Russell, 1968, p. 271).

The lamps shown in Figures 20 and 21 are library lamps. The lamp shown in Figure 20 is a basic brass library lamp, which ordinarily had a chimney and probably an opal glass dome shade. The smoke bell is also missing.
Figure 18. Green Glass Hall Lamp. — Photograph by author courtesy of the "Cracker Barrel" Country Store, Phoenix, Arizona.

Figure 19. Gothic Revival Hall Lamp. — Photograph by author courtesy of the "Cracker Barrel" Country Store, Phoenix, Arizona.
Figure 20. Brass Library Lamp. — Photograph by author courtesy Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.

Figure 21. Opal Glass Library Lamp. — Photograph by author courtesy Christine's Curiosity Shop and Doll Museum, Tucson.
Most simple designs like the one shown here were used in commercial establishments.

The triangular chain configuration marks this lamp as having an "automatic spring extension" mechanism for lowering and raising the lamp. The mechanism of this lamp has missing parts probably because it had been electrified and there was no longer a need to raise and lower the lamp. The mechanism will be explained with the next lamp as it has a complete system.

The version of the library lamp seen in Figure 21 shows the beginnings of elaboration. The bowl and shade are opal glass, hand painted in a matching floral design. The use of prisms below the smoke bell is unusual, as prisms were usually around the bottom of the globe ring. This lamp was later electrified, a common end of many library lamps.

Although it was electrified, the automatic spring extension mechanism is still intact. This mechanism works on the principle of the pulley. Two pairs of chains are attached to the ring that supports the shade. Each pair comes together on opposite sides of a balance ring (other versions used a balance arm or balance cup rather than a balance ring). The ring is suspended from two chains, which are partially wound on pulleys hidden inside the cup-shaped ceiling attachment. The pulleys are spring loaded, giving the mechanism its name. The pulleys allowed the lamp to be raised and lowered like a window shade (Russell,
According to The 1902 Edition of the Sears, Roebuck Catalogue (p. 801) the extension length was 25 inches closed and 61 inches extended. The automatic lamp extension was available separately for $1.15 each (p. 803).

The style of library lamp shown in Figure 22 rivaled the vase lamp as the most ostentatious lighting device of Victorian times. This library lamp has a clear glass font and an ornate brass frame. The shade is a hand-painted floral design on opaque glass. The prisms around the bottom of the shade ring are a common feature of library lamps of that period.

The lamp has never been electrified, so the automatic spring extension is still intact, although the chimney was missing. A lamp similar to this in The 1902 Edition of the Sears, Roebuck Catalogue, No. 2R790 (p. 801) sold for $4.24. A simpler version sold for $2.95, and the most elaborate sold for $6.95.
Figure 22. Elaborate Library Lamp with Pendants. -- Photograph by author through the courtesy of Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.
CHAPTER 5

GAS AND COMBINATION GAS-ELECTRIC SYSTEMS

Beginning in April, 1882, gas for lighting was available in Tucson. Still not everyone had gas because the original mains were only in the downtown district. Calculating from the positions of the original street lights, gas service was available from Franklin Street on the north to Corral Street on the south, and from Main Street on the west to Fourth Avenue on the east. The mains extended as far as Franklin only on Main Street: the rest of the area's northern boundary seemed to be Alameda Street.

The investigator found many more examples of gas and gas-electric combinations in commercial establishments than in private homes because the mains were located in the downtown district. Also, stores and business offices were more apt to install gas because gas was cheaper and cleaner and required less maintenance than kerosene—characteristics that are important to a businessman. Gas was not only cheaper to operate but was less expensive to install in a business property because commercial buildings usually had only one or two rooms whereas a house had six or more rooms. Simple business fixtures were less expensive than the more elaborate ones used in homes.
The novelty of gas fixtures was a help to businesses as gas lighting meant progress. *The Star* encouraged the use of gas so that other business enterprises would see Tucson's progress and decide to locate in Tucson. That would help Tucson grow. The growth and stability of Arizona cities were important in the drive for Arizona statehood.

The store owner or businessman spent less time on the maintenance of gas fixtures than kerosene lamps. In the home the wife, children, or household help got the laborious job of lamp maintenance. In the business establishment this task fell on the businessman or his hired labor. The less time spent on lamp maintenance the more time could be spent on business-related tasks that would yield a profit.

Good lighting was important for the businessman so that he could conduct his business on dark days and early winter mornings and evenings. A business was sold or rented more easily if it had good lighting.

**The Challenge of Electricity**

Almost 2 months before the gas plant was operating Richard Starr and R. E. Kearon petitioned the City Council on February 9, 1882, for permission to erect telegraph poles to string wire for electricity. Although this petition was referred to the city lawyer (*The Star*, February 9, 1882, n.p.), the challenge of a rival electric company had been made. The February, 1882, petition was not granted, but
a month later, March 6, 1882, the Tucson Electric Light Company was incorporated by Charles Silent, Hugh Farley, B. M. Jacobs, C. M. Straus, and Henry Harten. They were given permission to erect poles and string wire. By July, 1883, the Tucson Electric Light and Power Company was in business (Finney, 1962, n.p.).

There was great rivalry between the two companies. Each one wanted the city street-lighting contract. The city contract was steady income and was something to use to show customers the superiority of one system over the other. (See Chapter 3 for a more detailed account.)

By the late 1880s Tucson businesses and homes often had both gas and electric systems. This allowed them to take advantage of whichever system was operating and/or which was cheaper.

**Production of Illuminating Gas**

Coal gas was made by distilling coal with an external fire of 700°F. Hydrocarbon gases emanated and coke was the residue. The gases were then heated to 1,000°F to 1,500°F, and the chemical composition of the gases was changed giving an illuminating gas. That gas was then purified, often by washing with water and ammonia, to remove undesirable constituents (Luckiesh, 1920, p. 104). The byproducts of this process were useful and became the basis for nineteenth century chemical industries (Russell,
1968, p. 292). Even pressure was kept on the gas so that the pressure in the mains would remain constant.

The gas was stored in a gasholder called a

... 'gasometer' which consisted of a huge cylindrical vessel held inverted in water by a giant framework. The gas bubbled up through the water and was trapped in the inverted container, which rose as the gas content increased. As long as the rim of the container remained below water the gas would be safely stored (Russell, 1968, p. 292).

Any urban area that had such a structure on it became known as the "gas-house district." Because of the odor and the possibility of fire such a district was less desirable as a residential area.

The process used for producing gas in Tucson was the Hanlon Oil Processing method, which produced carbureted water-gas. This method raised the temperature of the coal or coke by forcing hot air over it, then steam was mixed with the gases produced. Oil gas, made by heating oil in retorts, was then added to the above gases. The resulting gas mixture also needed purification. The mixture of gases produced by this method gave much better light than ordinary coal gas. The gas company pointed out this fact in their handbill.

Development of Gas Devices for Household Lighting

Gas lighting in Tucson was the product of a long development, which began when early man discovered that seeping natural gas burned. Centuries passed before it
began to be scientifically studied. Luckiesh (1920, p. 71) related that The Philosophical Transactions of the Royal Society of London began reporting incidences of burning gases in 1667. Watching such an occurrence prompted John Clayton to experiment with coal spirits—as he called the gas made by distilling coal. He reported on these experiments in 1739 in The Philosophical Transactions of the Royal Society of London, "Experiment Concerning the Spirit of Coals." He found he could fill bladders with the "spirits" from distilling coal. He pricked the bladders with pins and found that the spirits coming out would burn (Luckiesh, 1920, p. 71).

Russell (1968, p. 288) pointed out that shortly after, in France, Philippe Lebon was experimenting with collecting gases over water and using them for both heat and light. He recognized the possibilities of coal gas but did most of his experiments with wood. In 1799 he got a patent for his "thermolamp." He also tried lighting public buildings. He was murdered in 1804 before he completed any further developments.

Luckiesh (1920, p. 72) pointed out that the next publication in The Philosophical Transactions of the Royal Society of London concerned industrial gaslighting written by William Murdock and published February 25, 1808. Murdock was called the "Father of Gaslighting" for his contributions to the industry (Luckiesh, 1920, p. 72).
In Murdock's early experiments he tried distilling many different minerals and vegetable substances before he settled on coal. Murdock also discovered that burning gas at the open end of pipes was wasteful. His wife's worn thimble, which he used as a stopper for a pipe, gave him the first idea for a gas burner.

Murdock had a steam car (he worked for James Watt, inventor of the steam car). He used gas bladders to power the car's headlights. These lights astonished all who saw the car (Luckiesh, 1920, pp. 65-67).

By 1798 Murdock had installed gaslighting in a London cotton mill factory. This installation proved gaslight to be more economical than candles. The cost of gaslight for 1 year was 600 pounds and the cost of furnishing the same amount of light by candles (based on 2 hours of artificial light per day) would have been 2,000 pounds (Luckiesh, 1920, pp. 70, 71).

In 1802 Murdock set up a public display of the various kinds of gaslights which attracted people from all over (Luckiesh, 1920, p. 72). Among those interested in this display was Frederick Winsor from Germany (originally his name was either Winzler or Winzer, historians disagree). Winsor recognized the possibility of gas. As he was mainly a promoter with little technical knowledge he associated himself with Samuel Clegg, one of Murdock's assistants. Clegg, in turn, devised a number of devices to improve gas
distribution and for the purification of coal gas which made it possible to set up town lighting systems (Russell, 1968, p. 290; Luckiesh, 1920, pp. 75, 76).

Improvements continued to be made in burners. Appendix B shows the different burners, their names, and year of introduction. These early burners were made of brass and "quickly corroded thereby impairing the intensity and constancy of the flame" (Duncan, 1978, p. 19).

In 1858 William Sugg introduced a burner with a steatite top which would not corrode. Steatite is a mineral composed mainly of talc and is often known as soapstone. It also allowed less heat to escape with the flames. By 1874 he had developed a governor for the gas flow that "increased the output of light (from the same volume of gas) by more than 50%" (Duncan, 1978, p. 19).

It was at this state-of-the-art that gas illumination came to Tucson. Many of the early gas lamps had simple burners with steatite tips. Early gas fixtures were generally utilitarian rather than decorative.

The next big development came when Auer von Welsbach was studying rare earths. He realized that cotton ash with metal oxides glowed brilliantly in flame. Murdock proceeded from this to the development of an incandescent gas mantle (Luckiesh, 1920, p. 100). It took almost 3 years to develop practical gas mantles.
Incandescent refers to the luminosity of gas due to unburned carbon particles coming in contact with the gas. The gas mantle is a mesh fabric hood (originally cotton) impregnated with oxides of thorium and cerium (metallic elements associated with rare earths). The hood is mounted over the burner. The fabric is then burned away leaving an open cone of noncombustible oxides. This cone is heated by the gas flames to incandescence giving an intense white light (Russell, 1968, pp. 296, 297). Although early mantles were fragile, after 1887 they lasted up to 2,000 hours (Myers, 1978, p. 207).

The flame to activate a Welsbach burner has to be cylindrical so burners were flat on top with circular holes. Near the bottom of the burner tube were air intake openings. This permitted the use of long narrow chimneys to accentuate draft and aid combustion (Russell, 1968, p. 298). These chimneys identify a lamp having a Welsbach burner and the lamp was probably built after 1887. This development permitted gas to give electricity fierce competition. As Duncan (1978, p. 20) said,

Householders could therefore postpone the huge financial outlay that conversion to electricity would entail (if, that is, they could even consider such costs: the great majority of the populace could not). Not only were the gas mains and pipes already in operation, but gas cost less than the early electric bulb.
Gas Lamps

The following illustrations reflect the kinds of gas lamps used in Tucson from 1882-1912. It has been seen that by 1896 the gas company was in decline serving few customers averaging only $150- to $250-per-month gross revenues (Finney, 1962, n.p.). Because of this, and the fact that gas fixtures did not lend themselves to electrification, few examples of gas lamps are left.

Inverted-T Gas Fixtures

A basic type of gaslight was established early and continued until the late 1880s. It consisted of an inverted-T with the vertical shaft being attached to the ceiling and to the gas supply, and the horizontal arms terminating in a stopcock and gas jet.

The Sandborn Insurance Map of 1883 mentioned that L. Zeckendorf and Company had open gas jets in the basement. The inverted-T type fixture was most likely the type referred to. By 1904 that note was no longer on the Sandborn map. The company may have converted to electricity.

The inverted-T type was used in the Pioneer News Depot ca. 1881-1882, as shown by Figure 23. The fixture in the foreground shows prongs around the gas jets. This indicates that this fixture once had glass globes. The fixture did double duty as it was also used to hold a
Figure 23. Inverted-T Gas Fixtures in the Pioneer News Depot, ca. 1881-1882. -- Photograph through the courtesy of the Arizona Historical Society, Tucson.
string of merchandise. This photograph shows a fishtail burner. The fishtail and candle burners were universally used until the advent of the Welsbach burner in 1887 (Myers, 1978, p. 15).

A gas lamp has to be lit before it can illuminate. This was not a problem with wall bracket and table lamps but it was difficult with chandeliers like those shown in Figure 23. A torch and key lighter like the one shown in Figure 24 was used to light and turn out chandeliers. Longer ones were used to reach chandeliers more than 7 feet off the floor. Myers (1978, p. 229) had a good description of this implement, "The 'key' was a bifurcated flange designed to grasp a gas key and turn it on or off. The 'torch' was a wax taper that could be slid up and down within a metal tube."

Gaselier

An elaborate gas chandelier is called a "gaselier." The interior of the American Grocery Store shown in Figure 14 had a gaselier. The gaselier had three arms with burners and with a stopcock on the lowest point of each arm. It had opal glass globes to diffuse the light. This was a type of gas chandelier found in living rooms and dining rooms—a grocery store was an unusual setting for it.
Figure 24. Torch and Key Lighter. -- From Myers (1978, p. 229), Gaslighting in America.
The earliest patent for reflector chandeliers went to Isaac P. Frink in 1857. By 1883 he had 13 patents for reflectors. Originally designed for gas lamps by 1883 they were used with gas, kerosene, electricity, or daylight (Myers, 1978, p. 181).

Reflector chandeliers were used to light churches, theaters, depots, stores, and other public buildings. It was one way to increase the amount of light given off by a single chandelier. Reflectors were lined with silvered metal or mirrored glass for use wherever intense concentrated light was needed, or for large areas. The example shown in the center of Figure 25, a photograph of Reid's Opera House in the Park View Hotel, Tucson, Arizona, was suspended from the ceiling, but they could also be built into the ceiling. The ring burner under the reflector had as few as 6 or up to 30 individual burners on it (Myers, 1978, p. 181). The reflector chandelier in Reid's Opera House was supplemented with two inverted-T fixtures.

The 1883 Tucson city directory had an ad for W. E. Stevens, manufacturer and dealer, for stoves, ranges, tinware, and pumps. It also mentioned gas fixtures and pipes, lamps, chimneys, reflectors, and shades. Whether this referred to the type of lamp and reflector that was in the photograph of Reid's Opera House could not be ascertained from the ad.
Figure 25. Reflector Chandelier in Reid's Opera House, 1894. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
The 1901 Sandborn Insurance Map ("corrected in 1904") showed Reid's Opera House with electric lights. Somewhere between 1894 and 1901 (or perhaps 1904) the system had been converted to electricity. No picture was found of the interior after 1904.

**Inverted Gas Hall Lamps**

Myers (1978, p. 211) quoted an unidentified 1908 technical report to describe this type of lamp,

The latest modification of incandescent gas lighting, introduced in 1905, consists in the use of inverted burners. The inverted gas burners throw the light downward and hence do not cast shadows; so easily; the light given off is better and stronger, and the gas consumption is less. For these reasons the inverted incandescent gas lamp has quickly proven successful, and its popularity is bound to increase. . . .

Despite the enthusiastic note in the technical report, this invention was one of the last in gaslighting improvements. Another, a gaslight wall switch, was never used to any extent as electricity was fast advancing in popularity and gas was being used less (Myers, 1978, p. 211).

The gas hall lamp shown in Figure 26 was reported to have come from a downtown Tucson hotel. The chains shown in this photograph were attached to a bar which regulated the flow of gas. In this way the amount of light was easily controlled.
Figure 26. Inverted Gas Hall Lamp. — Photograph by author through the courtesy of Betty's Junktique, Tucson, Arizona.
Combination Gas-electric Lamps

Combination gas-electric lamps were popular after the gas plant was rebuilt in 1902. These lamps are included in this chapter as gas and electricity were both sources of energy in the same fixture. The technical aspects of the other component, electricity, is discussed in Chapter 6.

Inverted-T Gas-electric Fixtures

The fixture directly behind the kerosene hall lamp in Figure 15 is a combination gas-electric fixture, a style that became popular at the turn of the century. The gas jets point upward and the electric sockets point downward. The fixture shown in Figure 15 is a simple utilitarian model. It is very similar to one in The 1902 Edition of the Sears, Roebuck Catalogue (p. 662) described as:

No. 24R8630 All Brass Combination, Gas and Electric Pendant. Rich gilt finish, wired complete with shade, holder and sockets. Length overall, 36 inches.

Price, each .................. $3.00

If wanted over 36 inches long, add 25 cents per foot.

A three-armed version of this type of fixture can be seen in the photograph of the interior of the Fashion Saloon and Gambling House, Figure 27. The fixture is similar to a two-armed model illustrated in Myers (1978, p. 225) of the Staten Island Women's Club dancing class about 1900. The opal shades appear to be the same too.
Figure 27. Combination Gas-electric Lamp from the Fashion Saloon and Gambling House. -- Photograph through the courtesy of the Arizona Historical Society, Tucson.
Opal shades give a pleasant, evenly diffused light. Apparently more light was needed in this saloon as one shade was replaced by a reflector variety, and another electric fixture was added. This type of light was widely used wherever utilitarian light was needed. This photograph of the Western Union Telegraph Office at 18 North Stone Avenue (Figure 28) was taken around the turn of the century and shows the same type of utilitarian light as Figure 27. The rings around the gas burners show that these fixtures once had globes. It is not known if they broke or whether the globes made lighting them more difficult and so were removed.

Combination Gas Candle and Electric Light Fixture

Gas candles became popular at the turn of the century, although they appeared in catalogues as early as 1860. The candles were made in various shapes: square, hexagonal, spiral, or round. Gas candles in combination with electric lights can be seen in the Steinfeld Dining Room (Figure 29). These are at least 1910 because the Steinfelds purchased the Owls Club on Main Street that year. The center fixture was supplemented with a bracket fixture on either side above the mantle. The design is known as either "Flemish" (originating from seventeenth century Flemish designs) or "Colonial" (Myers, 1978, p. 217). There was a gas chandelier, but without any electricity, listed in the McKinney
Figure 28. Combination Gas-electric Fixtures from the Western Union Telegraph Office, ca. 1900. — Photograph courtesy the Arizona Historical Society, Tucson.
Figure 29. Combination Gas Candle and Electric Light Fixture from the Dining Room of the Steinfeld House. -- Photograph through the courtesy of the Special Collections of The University of Arizona, Tucson.
and Waterbury catalogue, ca. 1900-1910, which was 42 inches high with a 24-inch spread at a cost of $26.50 (Myers, 1978, p. 217).

Another combination gas-electric fixture was in a Steinfeld bedroom (Figure 30). This fixture is not as elaborate as the Steinfeld dining room fixture, but it has the same Flemish influence in its design. It had two electric lights and two gas candles. Remote wall switches can be seen on the door molding, but each light has its own key switch, a common occurrence. A matching bracket lamp can be seen on the far left side of the photograph.

Combination Gas-electric Systems

There was another type of combination gas and electric system. In this second system the fixtures in the same building were run off gas or electricity. The photograph of the interior of Samuel Drachman's Cigar Store, 18 Congress Street (Figure 31), taken about 1898, shows this type of system. The system consisted of a three-arm inverted-T for gas and four electric bulbs just hanging on wires.

The continuing popularity of this type of system is attested by the photograph of the same interior of Drachman's Cigar Store (Figure 32), ca. 1908-1909, taken about 10 years later. The lighting installations remained the same. The only change is the decorations over the
Figure 30. Combination Gas Candle and Electric Light Fixture from the Steinfeld House Bedroom. — Photograph through the courtesy of the Special Collections of The University of Arizona, Tucson.
Figure 31. Combination Gas-electric System in Drachman's Cigar Store, ca. 1898. -- Photograph courtesy of the Arizona Historical Society, Tucson.
Figure 32. Combination Gas-electric System in Drachman's Cigar Store, ca. 1908-1909. -- Photograph courtesy of the Arizona Historical Society, Tucson.
electric wires. If the system had not proved itself satisfactory, it probably would have been removed long before the 10 years.

The photograph of the Congress Hall Saloon (Figure 33) shows a much more elaborate combination gas-electric system. In 1868 at the age of 39 Charles Owen Brown, the smaller man in the photograph, built the Congress Hall Saloon on the corner of Congress and Meyer. This photograph was probably taken quite a few years later, because the taller man is his son, William. The Congress Hall Saloon was considered to be one of the finest buildings in Arizona, fully equipped with billiard tables, a reading room, and gaming equipment. Both parties and grand balls were given here (Stratton and Kitt, 1964, pp. 22, 23).

The lighting fixtures show how elegant it once was. The hanging gas fixtures are of the four-armed inverted-T style. Three of these fixtures are visible in the picture. The middle one shows that originally the fixtures had opal glass globes. On the bar, reflected in the mirrors, are two gas table lamps. A flexible rubber hose ran the gas to the lamps. These are of the figure stem style, with a human figure holding aloft a glass globe. These are very ornate lamps and one of the few examples showing that gas table lamps were used in Tucson.

Completing the dual gas-electric system are two electric wall brackets. Although these are not as elaborate
Figure 33. Combination Gas–electric System in the Congress Hall Saloon. — Photograph by courtesy of the Arizona Historical Society, Tucson.
as the rest of the lamps in this room, they were similar to a style in *The 1902 Edition of the Sears, Roebuck Catalogue* (p. 661) called a "Fancy Electric Bracket" and described as:

No. 24R8580  One Light Bell Bracket, all brass, wired complete with socket, shade, and holder. A very neat, low priced fixture.

Price, each.................................$1.35
CHAPTER 6

ELECTRIC LIGHTING

From the first wick laying in tallow to gaslighting man was relying on flame for light. Man had the first flameless, non-flickering light with the coming of electricity. The electric light was not a single invention but a series of inventions that evolved over time. It would take volumes to give an account of all the inventions involved. This chapter discusses only the milestones that eventually brought electric lighting to Tucson.

The fundamental principle of electricity was recorded about 25 centuries ago by Thales, a Greek philosopher. He recorded the fact that when amber was rubbed it attracted light-weight objects. Electricity comes from the Greek word for amber, "elektron" (Schroeder, 1923, p. 1).

Early Experiments with Electricity

By the seventeenth century Otto Von Guericke had invented a machine that generated electricity by friction against a ball of sulfur. Through experiments with this machine he discovered that electricity could be conducted away from its source. Von Guericke also invented a vacuum air pump—an object closely related to the light bulb, as will be seen later (Schroeder, 1923, p. 2).
About 50 years later, 1709, Francis Hawksbee, an Englishman, made a similar machine but used a glass globe with the air removed rather than a sulfur ball. This ball would glow when rotated at high speed and rubbed by hand. This was the first "electric light" and it "created great excitement when it was shown before the Royal Society, an organization of scientists, in London" (Schroeder, 1923, p. 2).

By the mid-eighteenth century experimenters at the University of Leyden, the Netherlands, and Bishop Von Kleist of Pomerania, Germany, found a way to store electricity in bottles partly filled with water. In the bottle was a cork with a nail on it that was connected to an electricity-producing machine. The bottle became known as a "Leyden" jar.

A few years later, Benjamin Franklin used the Leyden jar in his famous kite experiments. When he drew electricity from the lightning he showed that lightning and electricity were the same. He also did experiments with the jars connected in parallel (which produced a strong enough discharge to kill a turkey) or in series. These experiments established the principles of parallel and series connections.

While skinning frog legs for soup Luigi Galvoni, an Italian scientist, accidentally touched a metal clamp and a scalpel to a frog's leg causing it to move. This led
him to experiment with animal nerves and electric current (Schroeder, 1923, p. 4).

Allesandro Volta, another Italian, repeated these experiments and went a step further and found that the amount of movement in the frog's leg depended on the type of metal in the rods used to touch the leg. To prove his point he made piles of silver and zinc discs with wet salted cloths between them thus creating the first battery. Schroeder (1923, p. 4) reported this was published in the Philosophical Transactions of the Royal Society of London in 1800.

Working with this setup Volta found the current to become weaker as the cloths dried so he turned to cups of water or weak acid in combination with zinc and silver strips. "This was the first time electrical energy became available in a continuous supply. To honor him the "volt," a unit of electrical pressure, was named after him" (Schroeder, 1923, p. 7).

By creating the electric battery Volta added a great impetus to research in electrical sciences. In 1808 Humphrey Davis demonstrated the first "arc" light. This was light caused by the arcing of electricity between two metal poles. Michael Faraday studied and organized Davy's notes from the years 1805 to 1812 (Luckiesh, 1920, p. 113). From this beginning Faraday went on to invent the dynamo. Joseph Henry, an American working independently, also
invented a dynamo (Keating, 1954, p. 7). This invention made the study of electricity for light both possible and practical.

Faraday's dynamo was a copper disc, cutting the lines of force of a horseshoe magnet by rotating. This produced a current. Although he discovered this in 1831 it took almost 40 years before it became commercially practical for incandescent light (Lewis, 1961, p. 17).

In the meantime the dynamo was developed to run arc lights. Arc lights were used in lighthouses and some public buildings. They were impractical for the home because the light was too intense. While looking for ways to tone down this intensity the incandescent electric light was developed.

By 1880 great strides had been made to improve arc lighting, the dynamo and the vacuum pump (Keating, 1954, pp. 8, 9). These improvements were needed before the incandescent lamp could become practical.

Experiments on lighting were being done in laboratories around the world. Joseph W. Swan in England and William E. Sawyer and Albon Mann in the United States were the first to produce working electrical lights with carbonized paper as the conductor or filament. These bulbs were laboratory creations and not very practical (Russell, 1968, p. 307).
The First Practical Light Bulb

It was Thomas Edison in the United States who first made incandescent lighting practical. His demonstration at Menlo Park, New Jersey, on January 1, 1880, was so successful that the value of gas company stocks suffered an immediate, although temporary decline (Russell, 1968, p. 307). This demonstration came after 2 years of extensive study. His experimentation was financed by $300,000 capital from the Edison Electric Light Company, incorporated October 17, 1878, through the efforts of his friend Grosvenor P. Lowrey (Keating, 1954, pp. 112, 113).

His search began with a study of gas illumination to help determine his objective which was to create an electric lamp that would give abundant light at low cost to compete with existing lighting. To meet this objective Edison had to create an entire incandescent lighting system. He devised a parallel distribution circuit to replace the series circuitry used in arc lighting. This new system allowed any lamp in the system to be operated independent of the others.

This circuitry was not compatible with existing dynamos, so Edison invented a completely new dynamo that produced 110 volts. This dynamo achieved a 90% efficiency in converting mechanical energy to electrical energy. That was an 80% gain on the previous 50% efficiency, which was
considered optimum in old-style generators (Keating, 1954, p. 13).

Then a light bulb was needed to be used in the new system. Earlier devices used thick low-resistance burners, Edison replaced these with a thin filament that would resist the passage of electricity.

Edison knew that carbon particles would glow from studying incandescent gas mantles. Experiments were made with countless substances trying to find one that could be made into a 1/64-inch-diameter filament and that could be carbonized. Carbonization is done by heating a substance in a vacuum so the material will not be consumed but will leave a carbon residue (Keating, 1954, pp. 14, 15).

The first bulb to burn for 40 hours had a cotton sewing thread filament. The success of this bulb encouraged Edison to find an even better filament. He went to a thin carbonized paper. The bulb with this filament burned 100 hours and was equivalent to the light of one gas jet. That carbon filament bulb was also expensive—selling at a standard price of $1.00 per bulb until 1887. In the beginning it cost $1.10 to make but by the fourth year of production it cost only $0.40 per bulb to make (Keating, 1954, pp. 19, 20, 39). Edison gave his January 1, 1880, demonstration with this bulb (Lewis, 1961, pp. 54, 55). This was the bulb that was used in Tucson when electricity was introduced.
Lighting New York City

Soon after the January, 1880, debut of the light bulb Edison improved the filament. He went to Japanese bamboo suitably treated. But at this time, building a better bulb did not interest Edison as much as lighting a city. Edison contracted to light 1 square mile of New York City in 1880. The knowledge gained and industries begun through this installation made lighting other cities, including Tucson, possible.

Lighting New York was a monumental task. There was no industry to make electrical components. Everything had to be invented and manufactured from the start. To light the 1 square mile he ran 18 miles of cable. Large-scale dynamos were made ready; meters, switches, and sockets all had to be produced. The installation of equipment and cables was done underground with items made at the Edison Electric Tube Company at 65 Washington Street. The first generator and distribution plant were at 257 Pearl Street.

On Monday, September 4, 1883, at 3:00 p.m., Edison threw the switch and lit the city. That gave gas companies their first real competition in the illuminating market (Wells, 1975, pp. 148-150).

Edison went to England where he joined forces with Joseph Swan, who was the parallel of Edison in England. The two great inventors pooled their information to improve both systems.
Technological Advances Since 1883

From that start in 1883 Edison and others refined the principles he discovered to make a long-lasting, efficient, low-cost bulb to work in an efficient system. Although basic features of the light bulb—an all glass bulb fused at all joints, with a screw base, having a filament with lead-in wires fused into the glass bulb—remained the same, improvements were made.

Better methods of exhausting the air from the bulbs were found. Construction was improved and simplified and new testing methods gave a more unified product. The most useful advances were the development of the tungsten filament and the gas-filled lamp.

The use of tungsten for filaments was examined by scientists worldwide. Many claimants came forward to be named the inventor, but the patent for the tungsten filament went to Alexander Just and Franz Hanaman, lab assistants to a chemistry professor in a Vienna technological high school. Working from 1902 to 1904 (Keating, 1954, p. 64) they created a pressed tungsten filament, but it was both fragile and expensive (Schroeder, 1923, pp. 85-86). A 40-watt bulb with this filament sold for $1.50 in 1907 (Keating, 1954, p. 66).

The search continued for a ductile tungsten filament. William D. Coolidge began work at the General Electric Company (formerly the Edison Electric Light
In March, 1910, he finally announced success in making a ductile tungsten filament. General Electric continued improving the process and began marketing the lamps in 1911 (Keating, 1954, pp. 70-72).

There were many advantages to the new filament. Ductile tungsten was strong, so the lamp could withstand the shock and vibration of moving vehicles—automobiles, streetcars, and railroad cars. The filaments could be accurately sized for specific voltages and efficiencies. They could be coiled to obtain concentrated light, as in headlights. Production costs were lower and manufacturing easier and more accurate and gave a more uniform product good for 1,000 hours. By October, 1912, the price of a 40-watt tungsten filament bulb was $0.45 (Keating, 1954, pp. 70-72). This was $1.05 less than the pressed tungsten filament of 1907.

The light bulb still had one drawback: it blackened quickly and therefore gave out less light. This blackening was caused by the evaporation of the filament, not to an incomplete vacuum. Because of this, further improvements to the vacuum would not help. Irving Langmuir, also of the General Electric Laboratory, decided to work on the blackening problem.

Langmuir worked 3 years on this problem before coming up with any practical application. He found that
adding nitrogen gas to the bulb reduced evaporation of the tungsten considerably, but it also "increased the loss of heat from the filament, and thus reduced the efficiency (light output) of the lamp" (Keating, 1954, p. 112). This loss of efficiency was greater than the amount of light lost through blackening. To compensate for this loss he increased the size of the filament which permitted operation at a higher temperature. Then he filled the bulb with nitrogen and got a nondarkening bulb with the same light (Keating, 1954, p. 113).

These bulbs were not marketed until 1913—-a year after the period under discussion ended—-but they were developed during the period under discussion. The first sizes to be put on the market were 750- and 1,000-watt bulbs. By 1917 the wattage was down to 100 watts. These bulbs found a ready market because of their higher efficiency.

Figure 34 shows a collection of old light bulbs from the A. J. Bayless Grocery Company's "Cracker Barrel" Country Store in Phoenix, Arizona. The light bulb on the far right shows a tungsten lamp of 1907, marked by the long glass rod in the center (Schroeder, 1923, p. 86). The next three bulbs were post-1919. That was the year that vacuum exhaust tubes were included in the stem at the bottom and covered by the lamp base (Cox, 1979, p. 64).
Figure 34. Old Electric Light Bulbs. -- Photograph by author through the courtesy of the "Cracker Barrel" Country Store, Phoenix, Arizona.
Electricity as a Light Source

Even before the coming of the first electric company in Tucson admonitions came for precautions in using the new system. On January 14, 1881, The Star had a front-page article entitled "Danger of the Electric Light Wire." In that article people were warned that touching electric wires would kill, "giving a shock to the system, producing paralysis of the heart."

In 1886, Killingworth Hedges wrote a small book Precautions to be Adopted on Introducing the Electric Light. In the preface he stated that he wrote the book because the electric light industry was expanding and those responsible for installing the systems and those for whom the system was installed needed to know the concise details of electrical installation. He wanted to make sure that the public was informed about the dangers of electrical shock and fire and how to prevent them.

These cautionary words did not prevent the people of Tucson from welcoming the first electric company in 1883. Although that company only lasted 2 years the citizens had been given a taste for the ease and cleanliness of electric lighting. The rapid decline of the gas company from 1896 to 1898 pointed toward Tucsonans' using an alternate light source: the Tucson Electric Light and Power Company. By 1897 the Tucson city directory had an advertisement for
electric fixtures and lamps which were sold at the Russell and Sheldon Company.

Some people bought new lamps but others just wired existing lamps. Figure 35 shows a kerosene hall lamp from the Whitaker (Brammeier) House that has been electrified. The electric cord follows the chains so that it is unobtrusive. Standard parts made electrifying oil lamps easy, but parts were standard only within a manufacturer's inventory, not between inventories of different manufacturers. Special kits were available to electrify oil lamps (Flaherty, 1976, p. 9). Figures 36, 37, and 38 are from the Whitaker (Brammeier) House. Although they are all different styles they have been successfully electrified from kits made especially for this purpose.

The brightness of the electric bulb was the only limiting factor with the use of electricity. In interior lighting situations light bulbs needed to be shaded or diffused. As Luckiesh (1925, p. 193) said of this problem:

Except in large interiors, the absence of shades and of diffusing media which protect our eyes from these modern light sources of relatively great brilliance and soften the shadows is inexcusable. There is adequate proof that shades and diffusing media are necessary, and the designer or user of lighting fixtures who uses the modern substitutes for flames without providing the necessary shades or diffusers is negligent or ignorant of the principles of proper lighting.

For the designer this was a marvelous period. Gone were all the restrictions of combustion lighting. Because
Figure 35. Electrified Oil Hall Lamp in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
Figure 36. Electrified Bedroom Oil Lamp in the Whitaker House. -- Photograph by author through the courtesy of the Brammeier family.
Figure 37. Electrified Pantry Oil Lamp in the Whitaker House. -- Photograph by author through the courtesy of the Brammeier family.
Figure 38. Electrified Kitchen Oil Lamp in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
remote switches made lighting lamps easy, accessibility was no longer important. Lights could be concealed in bowls, in pendant shades, in high fixtures, or even in architectural details. A new era of possibilities was introduced with the electric lamp.

Types of Electric Lamps

The lamps discussed in this section are representative of the major electric lamp styles of the period 1882-1912. They are arranged accordingly: exterior lighting, commercial interior lighting, residential interior lighting, and the use of electric lighting in an entire turn-of-the-century home—the Franklin House.

Exterior Lamps and Street Lighting

Electric street lighting in America began in 1877 with the illumination of the Public Square of Cleveland with arc lights. Arc lights gave brilliant light but only at a 45° angle. This gave light right around the light pole but none at any distance from the pole. They also required almost daily maintenance (Luckiesh, 1920, pp. 159, 160).

In 1879 the incandescent filament bulb was introduced. Although not as brilliant a light source as the arc lamp it could be easily installed and maintained. The carbon incandescent filament bulb was used extensively until 1910 when the tungsten filament bulb began to rapidly replace it (Luckiesh, 1920, p. 161).
The photograph of Congress Street ca. 1903 shows early private commercial exterior lighting (Figure 39). Attached to the center of the Buehman Building was a purely functional electric globe lamp. The electric fixture may have been added after the gas company lost the street lighting contract in 1885. Figure 2 shows this same street about 1883 with a gas lamp. In the intervening years poles were erected and lines strung for telephones, telegraph, and electricity. Also the street-level shops were personalized, sometimes ruining the integrity of the building, as in the case of the Buehman Building. This practice has been carried down to the present.

The street lamp on Main Street and Washington (Figure 40), probably erected ca. 1896, represents early electric street lighting of the second electric company in Tucson. This street lamp combines some of the ornateness of the Victorian era with the Flemish (scroll) influence found in the Edwardian era. Across the street from this light, the Franklin House fixtures reflect this same design influence.

This same ornate styling could have been seen in a pair of lamps adorning the Carnegie Free Library when it was finished in 1900 (Figure 41). The library lights were a five-branch version and carried the scroll motif down to the base. The center arch had a global ceiling fixture.
Figure 39. Exterior Electric Lighting on Congress Street, ca. 1903. -- Photograph through the courtesy of the Arizona Historical Society, Tucson, Arizona.
Figure 40. Street Light on the Corner of Main and Washington, Installed ca. 1898, Still in Use. — Photograph by author.
Figure 41. Lamp Posts in Front of the Carnegie Free Library, ca. 1900. -- Photograph through the courtesy of the Arizona Historical Society, Tucson.
The next style in street lighting came around the turn of the century. It can be seen in the photograph of South Stone and Broadway ca. 1900 (Figure 42). The simplification in the design of the street lights seemed right at home with the adobe and the stuccoed mission and bungalow styles coming into vogue at that time.

A five-globe street lamp on Toole Avenue at 10th Street, still in existence, is the short-pole version of the South Stone and Broadway street lamp shown in Figure 43. Examples of this style of light can be found throughout the Armory Park area today.

**Commercial Interior Lighting**

Knowing that increased time of operation meant money, commercial store operators were very willing to try any new system of lighting that would enable them to remain open after dark. During the period under discussion store operators often had more than one type of lighting system as was discussed in other chapters. This section covers commercial interiors, which were predominantly electrical.

In Figures 14, 29, and 30, the typical early commercial installation of a bare light bulb hanging from a cord is seen. Ezra C. Bartlett, proprietor of the Legal Tender Saloon, 94 West Congress Street, had two of this type of bulb installed and then went a bit further with his
Figure 42. Four-globe Street Light at South Stone and Broadway, ca. 1900. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
Figure 43. Five-globe Street Light on Toole Avenue at 10th Street, Still in Use. — Photograph by author.
electrical system (Figure 44). He had two bracket lamps with simple fluted reflectors mounted on the back of the bar, making a total of four bulbs lighting the entire saloon. There is a glass-tipped bulb in the foreground. This type bulb was popular even after bulbs were sealed off at the bottom (Lewis, 1961, p. 101).

The manual light switch is clearly shown on the hanging bulb in the foreground. Remote wall switches, which were also used at that time, would have simplified operation of these high bulbs in the Legal Tender Saloon. Often both individual and remote switches were used on the same circuit. If no remote switch was used the bulbs were turned on by hand with a "socket key turner" (Cox, 1979, p. 50). No illustration of this device was found.

Note should be taken of the three electrical wires leading to the fan in Figure 44. That was a typical type of installation for buildings built before electricity was available and that later added electricity.

At the turn of the century many different kinds of fixtures were used in the same interior as seen in C. J. Cunningham's saloon ca. 1907 (Figure 45). This saloon had combination gas-electric fixtures on each end of the room, but electricity was the major system. A glass-tipped bulb can be seen through the shade in the foreground. These pointed downward; also attached to this bracket is an open gas jet.
Figure 44. Electric Lighting in the Legal Tender Saloon. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
Figure 45. Electric Lighting in C. J. Cunningham's Saloon, ca. 1907. -- Photograph through the courtesy of the Arizona Historical Society, Tucson.
Above the back of the bar were three glass-tipped bare bulbs pointing downward. Each of these lights had its own key switch. These lights were reflected in the mirror giving greater light. Along the top of the partition on the left were a series of globe lights which lit both sides of the room. Six of these globes were visible.

As time went on more attention was paid to the design of commercial fixtures. Figure 46 shows an Art Nouveau transitional fixture that was used commercially close to the end of the period 1882-1912. The glass at the corners of the shade showed the sinuous lines and curves of Art Nouveau, yet the designs between are the straight-lined geometric repetitive forms that marked the Art Deco period.

Residential Interior Lighting

Even after electric service was in operation in Tucson some people still elected to use gaslights, some homes had both systems, and some just used electricity. This section is concerned with those homes whose principal system was electricity.

A photograph (Figure 47) found in the album of the Fred Brown family shows an early electric fixture. The rocking chair, plant table, and carpet are the same as those shown in another room in Figures 8 and 9. This room appears to be a different style and later period as shown by the
Figure 46. Art Nouveau Transitional Fixture. — Photograph by author through the courtesy of the "Cracker Barrel" Country Store, Phoenix, Arizona.
Figure 47. Electric Lighting in the Brown House. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
electric fixture. The photograph is probably of the Fred Brown home on Second Street, east of the city, after 1902.

The idea for the long pipe, containing the electrical wires, that connected the fixture to the ceiling was borrowed from earlier gas chandeliers and was a common feature of early electric fixtures. This fixture had a key switch on each socket. This, too, was common even when there was a remote switch in use. Glass-tipped bulbs can be seen on the bottom of the shades. This type of two-armed fixture with its etched shades was a popular style during the Edwardian period 1902-1914, in which older styles were revived (Flaherty, 1976, p. 9). This fixture from the Brown home showed Flemish influence.

Another view of the same room is seen in Figure 48 in which a side view of the fixture can be seen. Underneath the fixture, almost blending in with the plant, is a matching wall bracket, also known as an alcove lamp. Matching the fixture and alcove lamp(s) was popular during this period.

Figure 49 is a photograph taken at the Los Amigos party at the J. Knox Corbett house on North Main Street in 1905. The room shows a variety of lighting devices in one room. The main chandelier was ornate, probably tinted glass. The tent shape and draping chains represent the American adaptation of the Empire style (Luckiesh, 1925, p. 207). This chandelier was supplemented by small ceiling
Figure 48. Side View of the Electric Fixture and Alcove Lamp in the Brown House. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
Figure 49. Interior Lighting in the Corbett House, 1905. — Photograph through the courtesy of the Arizona Historical Society, Tucson.
fixtures with opal glass globes. Although only two of these were seen, there were probably two more on the other end of the room as indicated by the shadow right in the center at the top of the picture. There were also two bracket lamps mounted on the side wall to the right. These had round opal glass globes to match the ceiling fixtures.

Another style revival can be seen in Figure 50, the dining room of the Winsor (Davis) house designed by Henry Trost in 1902 in the Classical style. The fixture is an original, but it has been moved to a different room in the house. The fixture is Mission Revival style whereas the house is Classical style, showing that the style of fixture did not necessarily correspond to the style of the house.

The vestibule was a popular feature of homes around the turn of the century, and the hall lighting fixture became an important accessory. The abundant revivals of the Edwardian era are reflected in the next four hall fixtures. The hall lamp shown in Figure 51 is similar to the inverted gas mantle hall lamp seen in Figure 26. The lamp in Figure 51 is more ornate, being made of brass rather than iron, and has much more detailing. The etched shade was of the style Luckiesh (1925, p. 208) called "Modern Colonial." The brass rod connecting the fixture to the ceiling was a common feature of early electric hall lamps. Later chains replaced the rod in hall lamps in the Edwardian period. The next three figures show hall lamps with chains.
Figure 50. Dining Room Fixture from the Winsor House. — Photograph by the author through the courtesy of the Davis family.
Figure 51. Electric Hall Lamp with "Modern Colonial" Shade. — Photograph by author through the courtesy of Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.
Figure 52 shows Elizabethan influence in heraldic motifs in the shield, rosette, scroll leaf, and strapwork "and old bronze, brass, and iron are appropriate" (Luckiesh, 1925, p. 197). Figure 52 also shows electric candle sleeves, another popular feature of hall lamps. The fact that these sleeves were of various sizes indicated that this fixture had no glass diffusers to obscure the candle lights. Rather than a key switch this fixture had a pull chain integrated into the total design.

The hall lamp shown in Figure 53 also uses brass and iron, but it is not as heavily decorated as the previous one. In Figure 53 the squared-off iron pieces show another Edwardian revival, Sheraton, and the pendants, a hold over from the Victorian era, reflected light. Its pull switches are hidden by the pendants in this photograph. This lamp probably originally had candle sleeves rather than the amber bulbs shown.

Another Edwardian revival is shown in Figure 54. Luckiesh (1925, p. 108) referred to this style as "Modern Colonial." It had an oil lamp influence in the blue fake font. The candle sleeves on the lamp were more detailed including drips and smoky shading. Luckiesh (1925, p. 193) wrote that most of the early electric candles had shades because the electric light was so strong.

Earlier flame-source lamps were often electrified, but others were made specifically for use with electricity.
Figure 52. Elizabethan Hall Lamp. -- Photograph by author courtesy of the "Cracker Barrel" Country Store, Phoenix, Arizona.

Figure 53. Sheraton Style Hall Lamp. -- Photograph by author courtesy of the "Cracker Barrel" Country Store, Phoenix, Arizona.
Figure 54. "Modern Colonial" Hall Lamp. — Photograph by author through the courtesy of the "Cracker Barrel" Country Store, Phoenix, Arizona.
The table lamp in Figure 55 was one of the first styles made specifically for use with electricity. Its boxy shape originated in the Arts and Crafts movement. The six-sided shade has blue-white opalescent glass and has motifs from the Classical Revival style. This indicates that it was made during the Edwardian era. The lamp shown in Figure 55 is metal, although the same boxy style also appeared in wood. It was popular with mission styled furniture.

Another lamp from the Arts and Crafts movement is seen in the chandelier from the Cheney House in Snob Hollow (Figure 56). It has features of both the Arts and Crafts and the Art Nouveau movements. It is six-sided and boxy indicating the influence of the Arts and Crafts movement. The brass trimmed lamp has leaded stained glass in a fruit motif that was popular in Art Nouveau designs.

The original dining room fixture of the Galloway (Gallego) house pictured in Figure 57 is another interpretation of the Arts and Crafts movement. The bottom shade is the same shape as the Cheney house chandelier and the glass is the same type as used in Figure 49. The cylinders give additional down light and were then known as beam lights (Gerhardt, 1975, p. 3).

Also in the Galloway (Gallego) house, the original parlor lamp shows French influence in its delicate scrolls and fleur-de-lis (Figure 58). The opal glass shades, cut on the diagonal with fluted edges, directed the light
Figure 55. Arts and Crafts Movement Table Lamp. — Photograph by author courtesy Betty's Junk-tique, Tucson, Arizona.

Figure 56. Chandelier from the Cheney House. — Photograph by author courtesy Christine's Curiosity Shop and Doll Museum, Tucson.
Figure 57. Dining Room Fixture in the Galloway House. -- Photograph by author through the courtesy of the Gallego family.
Figure 58. Parlor Lamp in the Galloway House. -- Photograph by the author through the courtesy of the Gallego family.
downward. The fixture is finished in oxidized copper, which gives it the spotted effect. This finish is very utilitarian as additional tarnish does not show.

The Franklin House Lighting

Dr. Selma M. Franklin, city attorney, built a bungalow style brick house at 402 North Main. The interior details, including the lighting fixtures, were purchased and shipped from California, according to Mrs. Gladys Carroll, one of his four children and present owner of the home. When the house was finished Franklin brought his bride, Henrietta Herring, there in 1898.

From the wide veranda, the house was entered through the living room where two hanging fixtures dominate (Figure 59). These fixtures are suspended from the ceiling by three chains. The shades are fluted opal glass with floral designs. An embellishment of this type of fixture became a popular Art Nouveau style a few years later.

Flanking the living room fireplace are a pair of bracket lamps (Figure 60). These have painted parchment shades in a floral design in red, gold, and green to match the sofa and portieres. Turning one of these bracket lamps around revealed a lovely brass bracket (Figure 61). The ring around the bulb with its set screws gives evidence that the fixture once had a glass shade, probably in opal glass to match the ceiling shades.
Figure 59. Living Room Fixture in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
Figure 60. Front View of the Living Room Bracket Lamp in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
Figure 61. Side View of the Living Room Bracket Lamp in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
An oriental-style lamp stands next to the sofa (Figure 62). The colors blend with the portiere and sofa cover. It shows both the Chinese Chippendale revival in shape, figures, and colors, and the French influences in the bows and cupids, a typical mixture during Victorian times.

Although the house had been rewired, the original light wall switches remain. A set of switches can be seen to the left of the lamp in Figure 62. Figure 63 shows a detail of these original living room wall switches. The push buttons are white and black pearl, white for "on" and black for "off." The counterset switch plate matches the woodwork.

The wall near the front door had a convenient chair and lamp table (Figure 64). The classical-urn style lamp with matching china finial is a composite lamp with a two-sectioned base. The lower base section has an oriental rolled foot base, but the designs on the urn represent the French rinceau motif. The shade on this lamp is a replacement.

The library, to the left off the living room, was a bedroom when there were children in the home. The library boasts of a lovely filigree brass fixture with three arms (Figure 65). The arms are a standard style throughout the Edwardian era. The essential shape of the chandelier is American Colonial style (Flemish influenced), but the filigree work with its intertwined leaf design shows the
Figure 62. Chinoiserie Table Lamp in the Living Room of the Franklin House. -- Photograph by author through the courtesy of Gladys Carroll.
Figure 63. Switches in the Living Room of the Franklin House. -- Photograph by author through the courtesy of Gladys Carroll.
Figure 64. Classical-French Table Lamp in the Living Room of the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
Figure 65. Library Fixture in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
beginnings of the move toward Art Nouveau. One shade has been replaced. The original etched and cut shades show the colonial lace designs and the cross hatch diamond design. This fixture has the familiar central rod support. Figure 66 shows the detail of the shades and filigree work. This fixture has both a wall switch and individual pull chains.

Between the library and the master bedroom was a connecting bath. The wrought-iron mirror frame was flanked by a pair of bracket lamps similar to the ones in the living room. These bracket lamps are very versatile and can be rotated down (Figure 67) and up (Figure 68). The shades do not match, so either one or both are replacements; both shades are from the Edwardian era and both brackets had pull switches.

On the other side of the bath is the master bedroom. It was originally two bedrooms, which were converted to one when the children grew up. The ceiling fixture in this room has been removed. This is a five-sided room, a rectangle with one corner cut off with a wall. A cheval glass was built into this wall. It is flanked by two brass bracket lamps (Figure 69). Their squared-off bases reflect the Sheraton style and fit perfectly with the plain frame of the cheval glass.

The dining room is in the center of the house, with the bedroom, living room, and pantry off of it. The dining
Figure 66. Detail of the Library Fixture in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
Figure 67. Down View of the Left Bath Fixture in the Franklin House. -- Photograph by author through the courtesy of Gladys Carroll.
Figure 68. Up View of the Right Bath Fixture in the Franklin House. -- Photograph by author through the courtesy of Gladys Carroll.
Figure 69. Bedroom Bracket Lamp in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
room has a brass filigree fixture with four arms (Figure 70). This fixture has the same mixture of styles as the one in the library, but it is larger and more ornate to fit the larger room. Figure 71 shows the details of the fixture. The shades are the original, etched glass with a pearl rim. Each socket has its own pull switch, and this room also has wall switches. The dining room switches were the same as the living room, but the counterset switch plate has been painted to match the painted woodwork (Figure 72).

The kitchen was remodeled, but the main fixture was retained. Originally the kitchen had a gaslight over the range, but it was removed during the remodeling. The kitchen fixture is simpler and more utilitarian than the other fixtures, but it still had a graceful design (Figure 73). The detail of the lovely fluted shade and graceful arm is shown in Figure 74. This chandelier also has pull chains in addition to the wall switch.
Figure 70. Dining Room Fixture in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
Figure 71. Detail of the Dining Room Fixture in the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
Figure 72. Switches in the Dining Room of the Franklin House. — Photograph by author through the courtesy of Gladys Carroll.
Figure 73. Kitchen Fixture in the Franklin House. -- Photograph by author through the courtesy of Gladys Carroll.
Figure 74. Detail of the Kitchen Fixture in the Franklin House. -- Photograph by the author through the courtesy of Gladys Carroll.
CHAPTER 7

LIGHTING THE HISTORIC INTERIOR

The objectives of a project, whether it is restoration, rehabilitation, adaptive use, etc., must be determined before any work can be done. Although the interior designer does not usually enter the project until after the objectives have been decided, objectives, in large part, determine the style and type of lighting to be used. Because of this, this chapter assumes that objectives concerning restoration or reconstruction of interiors for either the Victorian or Edwardian era of real property in Tucson have been determined.

Determining the Light Source

Even though the main objectives have been determined the designer should research the property before any design decisions are made. The more familiar the designer is with the property the better base he will have to make design decisions.

The year the house was built, the name of its original owner, and the name of the architect can be procured from city records. The Arizona Historical Society Library has a picture file which can be searched to see if any pictures of the interior exist. Also adjoining buildings built about the same time should be investigated as often
what was in one will be in the others. Newspaper accounts may give clues to the type of lighting used.

When the basic research is completed, the light source can be determined more readily. For the periods under discussion the choices would be kerosene, gas, gas-electric, or electric lighting. Usually the age of the building, architectural style, and availability of services to the area during the time frame of the restoration help to determine the type of the light source utilized.

A search should be made of the property for any physical evidence of previous lighting systems. For kerosene lighting, old ceiling hooks and wall brackets with neither wires nor pipes attached would constitute physical evidence. In most cases, though, kerosene lighting would have already been replaced by more modern systems. Kerosene lighting, especially in the Victorian era, was often used along with other light sources.

According to the Southwest Gas Corporation, gas can no longer be used for interior lighting in Tucson. This should not preclude the search for physical evidence of gas used as a light source. If gas was used then, gas-style fixtures could be electrified to look like gas.

Refer to Chapter 3 for the location of the original mains. It was not until 1909 that mains were extended to the university area, so if the property was built earlier or was outside the original area, chances of the property
having gaslighting would not be very good. Evidence of
capped gas pipes may be found behind fixtures or between
walls (if walls are to be moved).

Depending on the structure's age, electricity could
either have been added or put in when the structure was
built. Old wires are thick and round with woven fabric
insulation. Signs of the addition of electricity may be
found in exposed wiring. Figure 44 shows an example of
exposed wiring. If exposed wiring is not found, a further
exploration of the premises can be made. Often floor
boards were removed to lay wire and wood screws may have
been used to re-Old the floor. Finding and removing these
wood screws and floor boards may disclose evidence of
earlier wiring installations.

If the house was wired when it was built, a check
behind switch plates may show old wires that have been
taped off or old push-button switches themselves may still
exist. These are usually in the door moldings.

Old plates on the wall of attics or cellars may
conceal primitive fuse boxes or junction points. These
boxes would contain white procelain insulating devices.
If fuse cabinets were located in pantries, they often had
hinged glass doors and ornate wood trim (Blalock, 1978,
pp. 125, 126). Restoration of old lighting systems should
only be accomplished with the aid of a professional elec­
trician.
Determining the Function

Once the period has been researched and a light source determined, function must be considered. Is the interior to have general lighting? Are there any areas that need task lighting? Are there architectural details, art work, or displays that need accenting? Does a pathway need to be indicated? How much light is needed for safety? Would specially colored lights help set the desired mood? The answers to these questions will guide the designer in understanding the function of his lighting design.

Selecting the Lamps

When all the questions concerning the period, light source, and function are answered the lamps can be selected. Lamps presented and illustrated in this study can be used as guides for the selection of the proper lamps for a particular period. The best solution would be original fixtures, but these are rarely available. If photographs of the original fixtures exist, reproductions can be fabricated but this entails considerable time and expense on the part of the restorer.

The next choice would be fixtures and lamps from the same period and general locale. Lamps varied with locale so local sources are best. Figure 75 shows a hall lamp from the Whitaker (Brammeier) house. It is a replacement fixture, but it is the correct style for Tucson lighting at the turn
Figure 75. Hall Replacement Fixture in the Whitaker House. -- Photograph by author through the courtesy of the Brammeier family.
of the century, so it fits as well as if it were the original.

Figure 76 shows a fixture from the Evans (Saxton) house, which is in the middle of restoration. This house and the fixture shown in Figure 76 are of a later period (1920s Bungalow) than that examined in this study, but the principles still apply. The Saxtons have hung a fixture with two different shades to see which they prefer. In this case, an examination of the fixture revealed that originally there were no glass shades on the fixture as there are no rings or set screws by which glass shades could be mounted. Although there is a possibility that clamp-on diffusers were used, it was unlikely. A better choice might be bare bulbs of low wattage, either plain or frosted to remove glare, or normal wattage bulbs in conjunction with a dimmer switch. A case like this usually requires more research.

If a period effect is all that is required, reproductions can be used. The reproduction in Figure 77, used in the Whitaker (Brammeier) house, is effective. It combines a period lighting fixture with the fan that is needed for circulation. Most period fixtures would have had key or pull switches on each light, but this reproduction does not, however, the fixture does reflect the spirit of the period. The finish of the metal is also of a type that would have been used at the turn of the century.
Figure 76. Dining Room Fixture in the Evans House. -- Photograph by author through the courtesy of the Saxton family.
Figure 77. Combination Fan and Light Reproduction Fixture in the Whitaker House. Photograph by author through the courtesy of the Brammeier family.
Figure 78, a hall lamp from the Evans (Saxton) house, is a good reproduction of a Victorian fixture, but the finish of the metal is a bit too shiny for the style of brass used during that period. This type of problem is solvable with advice from an antique restorer.

It should be remembered that both gas and early electric chandeliers had rod-type connectors to the ceiling. The rod is not necessarily a sign that gas was used. It should also be remembered that in the period 1882-1912, lamps and fixtures of more than one type of light source were used in the same room.

The Whitaker (Brammeier) house has several examples of successful mixtures of light sources. In the vestibule, a kerosene banquet lamp (Figure 79) is paired with a two-armed electric fixture (Figure 80). There is also an alcove lamp to match the fixture. The banquet lamp is typical Victorian, and the fixture and alcove maps show Art Nouveau influence. The cranberry glass shades help to unify the area and make the fixtures work together in the space.

The living room is dominated by a ceiling fixture showing Adams influence (Figure 81). There are also several large electrified Victorian vase lamps in this room and a miniature kerosene vase lamp on the desk (Figure 82). Again color, red and gold, is one of the unifying factors. Flower motifs and sinuous curves also help tie the room together.
Figure 78. Reproduction Hall Fixture in the Evans House. — Photograph by author through the courtesy of the Brammeier family.
Figure 79. Kerosene Banquet Lamp in the Whitaker House. -- Photograph by author through the courtesy of the Brammeier family.
Figure 80. Entry Fixture in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
Figure 81. Living Room Fixture in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
Figure 82. Miniature Oil Lamp in the Living Room in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
A star flower design can be found on both the small shades of the fixture and the pressed glass of the miniature lamp.

In the office a combination gas-electric fixture (Figure 83) from another home in Armory Park is paired with a kerosene student lamp (Figure 84) that was introduced in the 1830s. Gas pipes were found behind the ceiling fixture plates in the Whitaker (Brammeier) house so the fixture shown in Figure 83 is correct both for style and lighting source. Both lamps have been electrified. The fixture was well done with no wire showing and flame-shaped bulbs are used to simulate gas flames. Student lamps are difficult to electrify as they are meant to slide up and down the center rod, therefore the cord usually has to show a bit.

One of the Whitaker (Brammeier) bathrooms has a double-armed brass electric fixture (Figure 85) with paired kerosene bracket lamps, one of which is pictured in Figure 86. The etched glass shades, all with fluted edges, and the scroll arms unify the lighting treatment.

Sources for Lamps

The Buyer's Guide Catalogue from The Old-House Journal lists, and updates yearly, sources for period lighting. These sources are for both original and reproductions. Local craftsmen can often duplicate pieces or design period lighting fixtures. The Yellow Pages lists local antique dealers. For more reasonably priced lamps, second-hand
Figure 83. Gas-electric Fixture in the Office of the Whitaker House. -- Photograph by author through the courtesy of the Brammeier family.
Figure 84. Student Lamp in the Office of the Whitaker House. -- Photograph by author through the courtesy of the Brammeier family.
Figure 85. Two-armed Bath Fixture in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
Figure 86. Bath Bracket Lamp in the Whitaker House. -- Photograph by author through the courtesy of the Brammeier family.
stores, charity resale shops, auctions, yard sales, and/or salvage yards could be searched.

Perhaps the hardest pieces to find are shades. Figure 87 shows some of the wide variety of shades used. They come from Christine's Curiosity Shop and Doll Museum, but are for viewing only. Christine, like many other dealers, will not sell shades as lamps often come into the store sans shade and an on-hand selection helps in finding the right replacement shade.

**Precautions for Buying Old Lamps**

There are some points that should be considered when shopping for period lamps. Gillett (1975, p. 10) has outlined a few points. These points should be considered when shopping:

**FIRST**, is the piece complete and intact? Missing parts or pieces are becoming almost impossible to replace, and the expense of doing so may take the fixture out of the bargain category very rapidly.

**SECOND**, has the piece been damaged by previous repairs or earlier wiring? In that case, unless it is a gift it is not a bargain.

**THIRD**, does it have or require glass shades? This, too, can rapidly take a fixture out of the bargain class.

**Restoring Lamps**

Although truly fine antiques may not need restoration, old lamps often do. For those not lucky enough to
Figure 87. Shade Collection.
— Photograph by author through the courtesy of Christine's Curiosity Shop and Doll Museum, Tucson, Arizona.
acquire a really fine antique some elbow grease may be necessary to restore the lamp to its former glory.

The first step is to examine the finish. Iron fixtures and lamps usually just need to be repainted black, whereas white metal pieces may just need polishing to return them to a pewterlike finish. Plated fixtures may need replating.

Brass and bronze can be polished. If the fixture had lacquer over the finish it can be removed by soaking pieces in Mr. Clean in a glass container. Metal and plastic containers should be avoided as they interfere with the process. This cleaner also removes deep tarnish. This treatment should be avoided on oxidized copper (copper with black stripes or spots) because it will destroy the spots and the value of the lamp (Gerhardt, 1975, p. 7). After restoring a lamp it should be relacquered to prevent tarnishing. Local metal workers can be consulted for a source of lacquer for this purpose.

Selecting the Bulb and Shade

Any lighting center can explain and demonstrate the various styles of bulbs available. Appendix C lists standard bulbs that can be used in restoration and reconstruction situations. In addition, specialty bulbs can be ordered.
The first thing to remember is that light sources were not bright up to the time of the Welsbach gas mantle and incandescent electric bulb. Bulbs used for early light source replacements should be of low wattage or used with a dimmer switch. The dimmer switch is the more versatile, allowing for brighter light when needed. If it is not desirable to have these switches show by mounting them in the wall then individual socket dimmers can be used. These are available from hardware stores and lighting centers.

When a gas chandelier has to be electrified to meet building code standards, flame-shaped bulbs may be used. The Whitaker (Brammeier) house makes use of these bulbs in several fixtures. Figures 88, 89, and 90 show various kinds of kerosene fixtures that have been electrified. They are all successfully lit with satin-finish flame-shaped light bulbs. Figure 91 is of an electrified gas chandelier. It uses globe-shaped bulbs of low wattage. Because there are six bulbs in the fixture even low-wattage bulbs supply enough light. Special flickering light bulbs are also made for this purpose.

A kerosene or gas (for periods previous to the invention of gas mantles) lamps should have clear chimneys and shades, but because of the brightness of electric bulbs or to hide the bulbs, etched and colored shades can be used. Lamps from the age of gas mantles and those lamps using early electric bulbs usually had etched or colored
Figure 88. Electrified Oil Lamp from the Boy's Bedroom in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
Figure 89. Electrified Oil Lamp from the Girl's Bedroom in the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
Figure 90. Electrified Oil Lamp from the Master Bedroom in the Whitaker House. -- Photograph by the author through the courtesy of the Brammeier family.
Figure 91. Electrified Gas Lamp in the Dining Room of the Whitaker House. — Photograph by author through the courtesy of the Brammeier family.
shades to cut down the unaccustomed brightness of the bulbs. Bulbs for these lamps can be chosen from standard sources. There are straight-sided bulbs in frosted, clear, and tinted clear glass styles. There are flame-tipped lights both in standard base and the smaller candelabra base styles.

For those who want the authentic look, Blalock (1978, p. 127) listed a shop in New York—City Knickerbocker, 781 Eighth Avenue, New York, New York, 10036—that sells replicas of carbon filament bulbs. These bulbs were selling for $6.50 a piece and $4.00 shipping and handling in 1978. They have probably gone up in price in the last 3 years.

 Auxiliary Lighting

If period lighting does not give the amount of light needed, or fails to fulfill particular needs, modern lighting can be subtly combined with period lighting. Modern lighting must be unobtrusive when used in period interiors.

For work areas, fluorescent strip lights can be hidden easily yet give adequate light. Fluorescent bulbs now come in a wide variety, both in the type of mounting and the color of the light given out. In areas with cabinets they can be recessed in the soffit. If the cabinets go up to the ceiling, fluorescent strips can be mounted on the top edge and trimmed with a wood strip to match cabinets. The bottom should have a glass or Plexiglas
panel to diffuse and hide the bulb and allow access for changing the bulb.

For cabinets with glass fronts or glass shelves the fluorescent tube can be mounted on the top, inside the cabinet (Gillett, 1975, p. 8). Thin-line fluorescents can also be used under top cabinets. These can be concealed by extending the cabinet an extra 3 or 4 inches with a wooden apron to match the cabinet. The apron will also cut eye-level glare (Gillett, 1975, p. 8). These same ideas can be used for shelving or book cases. In addition, miniature spot lights are available. These can fit into shelves and can be used to illuminate art objects or special books.

Window or door cornice boards can conceal fluorescent strip lighting or rows of small incandescent bulbs. For maximum flexibility dimmers should be used. Dimmers are available for both fluorescent and incandescent use, but fluorescent dimmers are expensive.

If the interior has beams, indirect lighting can be installed into the beam. Track lighting can also be used with beams at a lower cost than installation in a beam. An unobtrusive track can be installed near the base of the beam. Housing for this kind of system should remain simple.

Pictures can have their own lighting while contributing to the whole area. Plants and wall decor can be up lighted—that is, lit from the bottom. The housing for these lights can be hidden behind the plant pot or other
furniture. Display cases can have top and/or bottom lighting which will spill over to the general lighting. The bases of such display cases can be made of translucent panels with lights hidden inside.

A familiarity with and understanding of the space to be lit will help in determining which system would best suit the space. Modern lighting systems are so versatile that the only limitation in lighting is the designer's imagination.
CHAPTER 8

CONCLUSIONS

After examining all the evidence certain lighting trends became evident. Kerosene lighting was popular in Tucson at least until 1912, even though incandescent lighting was available. This was probably because of its lower cost, availability, the public's familiarity with it, the limited areas of service, and limited service of the public utilities.

Gaslighting was used only a short period in Tucson; its use peaked around 1896 and then declined. The gas plant did not operate from 1898, when the cyclone destroyed it, until 1902. After 1902 there was little gaslighting. By that time the emphasis on gas use shifted to cooking and heating. This may have happened because people replaced their gaslights with lights using other sources of energy while the gas plant was out of operation. The use of electricity from the time of the second power company made steady progress. Early light bulbs burned only a few hours and were expensive, but as time went on their efficiency improved and cost declined. Incandescent lighting was safer than flame lighting and required less maintenance. Electric lamps had fewer restrictions on placement because
wires could be strung easily and cords could be longer than gas lines. All these things contributed to the public adoption of electricity as the main lighting source after 1898.

**Trends in Styles**

Kerosene lamps were a well-established light source, and their embellishment was at its height during the period under study. Gas and electricity, on the other hand, had their beginnings in this period in Tucson. Originally both gas and electric lamps were very simple and utilitarian devices. Early gas fixtures were often not more than an inverted-T with an open gas jet on each arm. Early electrical installations were often nothing more than a suspended bare bulb. As time went on, lamps evolved technically and refinements were included. These refinements included decorative features.

The most ornate of the early lamps were Victorian. Victorian-styled lamps persisted well into the beginning of the twentieth century right up to the end of the period studied. The Victorian style in lamps persisted because most Victorian lamps were kerosene lamps, which were widely used and accepted by the public. Also, kerosene lamps were easily converted to electricity. Many of those converted Victorian lamps enjoyed an extended use beyond what would be expected for obsolete technology.
Lamps of various revival styles were popular in Tucson, with Flemish and Empire styles predominating. Revivals usually mixed styles and motifs. Designers seemed to have preferred to use motifs from different eras in a single lamp. The evidence points to the popularity of the Arts and Crafts movement at this time. Quite a few of the boxy-styled lamps have survived. One might think this was because they went so well with the Mission Revival and Bungalow architectural styles that were prevalent in Tucson 1882-1912, but no evidence was found to suggest that any widespread effort was made to correlate interior fixture styles with exterior styling. Boxy-styled lamps were also embellished with other motifs. The Art Nouveau style was not adopted in its entirety (as the Art Deco was a few years later). Art Nouveau influences were seen but not in a pure Art Nouveau style.

In restoration work it is important to match the correct period lamp to the era of the interior space. Care must be taken not to use a lamp of a period later than the interior indicates. A careful study of the development of lamps and their components is of help in selecting a lamp of the proper style.

**Evaluation of Resources**

Primary sources were investigated as thoroughly as time permitted. A longer period of time may have uncovered
additional primary sources, but it was the investigator's belief the major styles of the 1882-1912 period have been adequately covered. Further research would have yielded quantity but not necessarily quality.

A thorough search for secondary sources was performed and these sources were thoroughly investigated for information on Tucson lighting. No other secondary sources are thought to be available at the present time although some may come to light at a later date.

The investigation of historical photographs, and the photographic study of the present-day use of period lamps in homes and of lamps in antique shops, resulted in a collection of illustrations (and slides on file in the Division of Clothing, Textiles, and Interior Design in the School of Home Economics, The University of Arizona, Tucson, Arizona) that covered the major styles used in Tucson for the period 1882-1912. Only photographs of the major styles of lamps were selected to be included in this thesis.

Evaluation of Objectives

The objectives of the study have been covered. It has been shown that the major sources of artificial light in Tucson during the period 1882-1912 were kerosene, gas, and electricity. The technical development of each of these light sources was covered to show their state of development when they were used in Tucson. The major lamp
styles of the period were investigated and recorded through the illustrations. The information on light sources and lamp styles provides the guidelines for development of interpretive studies. It has been shown how to use the material in making design decisions for lighting historic interiors and how to augment historic lighting with modern lighting systems.

**Suggestions for Further Study**

This study did not consider the lighting devices used before 1882. Lighting used during the Spanish-American and early American Territorial periods needs exploration to fill this gap. The period under study ended in 1912 before the Art Deco period. As there are many Art Deco buildings in Tucson, a study in this area would complete the picture of historic Tucson lighting. This study could also be used as a model for other geographical areas. A comparison of the style and type of lamps used in other areas with those used in Tucson in a specified period would also add to this small body of knowledge.
APPENDIX A

SOURCES OF ILLUSTRATED MATERIAL

An asterisk indicates an electrified lamp.

Historical Photographs

Arizona Historical Society, 949 E. 2nd Street, Tucson, AZ 85719. Figures 2, 3, 7, 9, 10, 11, 14, 15, 23, 25, 27, 28, 31, 32, 33, 34, 39, 41, 42, 44, 45, 47, 48, and 49.

Special Collections, Main Library, The University of Arizona, Tucson, AZ 85721. Figures 29 and 30.

Photographs by the Author

The name in parenthesis is the name of the present owner of historical property.

Betty's Junktique, 6309 E. 22nd Street, Tucson, AZ 85710. Figures 26 and 55.

Bygones, 6319 E. 22nd Street, Tucson, AZ 85710. Figure 5.


Evans (Saxton) House, 520 S. 4th Avenue, Tucson, AZ 85701. Figures 76 and 78.

Franklin (Carroll) House, 402 N. Main Street, Tucson, AZ 85719. Figures 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, and 74.

Galloway (Gallego) House, 630 S. 3rd Avenue, Tucson, AZ 85701. Figures 57 and 58.
Post Museum, Ft. Huachuca, AZ 85613. Figure 12.

Whitaker House (Brammeier), 509 S. Sixth Street, Tucson, AZ 85701. Figures 35*, 36*, 37*, 38*, 75, 77, 79, 80, 81, 82, 83*, 84*, 85*, 86*, 88*, 89*, 90*, and 91*.

Winsor (Davis) House, 422 S. 5th Avenue, Tucson, AZ 85701. Figure 50.
LAMP COMPONENTS

- chimney
- burner collar
- font
- stem
- base
- deflector
- flange
- screw
- thumb wheel
- wick tube
- set-screen
- clip
- base plate
- screw
- vapour vent
Rat-tail 1808.  Cockspur 1808  Cockscomb 1808.

GAS BURNERS
GAS BURNERS

Batswing 1816.

Fishtail 1820.
APPENDIX C

STANDARD REPLACEMENT BULBS
<table>
<thead>
<tr>
<th>Bulb</th>
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<th>Nominal Lamp Watts</th>
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<tr>
<td>S-14</td>
<td>▲Medium</td>
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<td></td>
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<td>15</td>
<td>Blue—Sign &amp; Decorative Green—Sign &amp; Decorative Orange—Sign &amp; Decorative Red—Sign &amp; Decorative White—Sign &amp; Decorative Yellow—Sign &amp; Decorative</td>
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<tr>
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## Incandescent Lamps

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REFERENCES


