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Artificial Lighting in America: 1830–1860

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[With 8 plates]

THE THREE decades from 1830 to 1860 are of special significance in the history of artificial lighting in America. It was during this period that radical departures were made from tradition, and profuse invention paved the way to modern lighting. It was an era of trial and error, of the search for cheaper fuel and light. It bridged the gap between the primitive lamp and the mass-produced lighting device and ended with the adoption of the first refined petroleum fuel.

In its limited sphere this development reflected the larger design taking shape over the country as a whole. During these years traditional colonial patterns began to be disrupted by novel forces whose effects marked the emergence of modern America. Railroads, factories, cities, and population shifts were the outward indications, and causes as well, of enormous transformations. The boiling upsurge of the era impressed foreign visitors to America. Lady Emmeline Stuart Wortley observed in 1850:

> Everything in nature and art almost seems to flourish here. Schools, universities, manufactories, societies, institutions, appear spreading over the length and breadth of the land, and all seem on such a gigantic scale, too! Lakes, forests, rivers, electric telegraphs, hotels, conflagrations, inundations, rows, roads, accidents, tobacco, juleps, bowie knives, beards, pistols, &c.! moderation or littleness appear not to belong to America, where Nature herself leads the way and seems to abhor both, showing an example of leviathanism in everything, which the people appear well inclined to follow. [Wortley, 1851, p. 33.]

Frederika Bremer observed at about the same time that "to hurl mountains out of the way, to bore through them and build tunnels, to move hills into the water as a foundation for roads in places where this is necessary—all this the Americans regard as nothing at all. They have indeed the faith to move mountains." (Benson, 1924, p. 20.)

Dynamic innovation, however, was silhouetted against a background of enduring habit. Change, indeed, was as conspicuous in its absence as in its presence. The static feudal economy of the South, for exam-

ple, emphasized the opposing dynamics of the North's industrialism. Let the visiting stranger "pass into Virginia," wrote Alexander Mackay in 1847, "and the transition is as great as is the change from the activity of Lancashire, to the languor and inertness of Bavaria" (Mackay, 1849, p. 67). In New England, the Western Railroad, boldly conquering the barrier of the Berkshires, brought modern engineering techniques and industrial commerce to the very backyards of rural traditionalism. In Pennsylvania, Mennonite farmers lighted their houses with the medieval-style lamps of their Palatine ancestors, while a few miles away in Philadelphia the latest advances in household illumination were in daily use. At every hand there were evidences of two contrasting worlds.

In artificial lighting, generally, this duality was as apparent as in the larger picture. On the one hand were brilliant concentrations of gas light in theaters and music halls and museums. There were improved fuels and principles of combustion developed by scientific experiment in learned institutions. In urban homes new inventions made the household lamp a vivid contrast to its predecessors. On the other hand were steadfast marks of enduring habit, which only gradually were to yield to change and achievement. These were most evident in those places where isolation, poverty, and ignorance combined to exclude even the simplest improvements. On the frontier and in cultural backwaters the means for artificial lighting were little better than what had been available to aboriginal man. In some instances, indeed, these primitive circumstances have survived until recent times. There are persons living today who can recall seeing kitchen fat used in a saucer, with a rag for a wick, in backward sections of the country. Vance Randolph, in his study of the Ozarks, stated as late as 1931 (p. 27): "Not long ago, however, I visited a home in which the only artificial light was a 'slut'—simply a dish full of grease, with a twisted rag stuck in to serve as a wick." During the years we are considering, the Ohio settlers used crude open lamps of iron and pottery, and in parts of Alabama simple iron lamps were in use that reportedly still continue their function today.

This negative side of the characteristic duality of the period is best illustrated in remote parts of the deep South. In 1853 and 1854 Frederick Law Olmsted traveled through that region and recorded his impressions in valuable detail. Not even a "slut" was in evidence in the Tennessee slave cabin that he observed on a comparatively prosperous farm:

> The negro cabins were small, dilapidated and dingy, the walls were not chinked, and there were no windows—which, indeed, would have been a superfluous luxury, for there were spaces of several inches between the logs, through which there was unobstructed vision. The furniture in the cabins was of the simplest and rudest imaginable kind, two or three beds with dirty clothing upon them, a

chest, a wooden stool or two, made with an axe, and some earthenware and cooking apparatus. Everything within the cabins was colored black by smoke . . . During the evening all the cabins were illuminated by great fires, and, looking into one of them, I saw a very picturesque family group; a man sat on the ground making a basket, a woman lounged on a chest in the chimney corner smoking a pipe, and a boy and two girls sat in a bed which had been drawn up opposite to her, completing the fireside circle. [Olmsted, 1907, p. 153.]

Such a setting was not restricted to Negroes, however. Allen Eaton, describing the early cabins of the Tennessee and North Carolina highlands (1937, p. 49) says: "The usual light for the interior of the house would be firelight from the hearth, supplemented in fair weather by daylight from the opened door or in rare cases from the so-called window." Olmsted, stopping at one meagerly furnished Alabama farmhouse, stated that his host went to bed immediately after supper and left him alone without a candle. Elsewhere, he found that candles were the usual source of light. Candlesticks to put them in, however, were apparently nonexistent. In an Alabama house of more than the usual appointments he sat in the well-furnished parlor, "alone in the evening, straining my eyes to read a wretchedly printed newspaper, till I was offered a bed . . . My host, holding a candle for me to undress by (there was no candlestick in the house), called to a boy on the outside to fasten the doors" (Olmsted, 1907, p. 188). This situation was repeated several times at subsequent stopping places. "The same Negro was called to serve me as a candlestick at bedtime. He held the candle until I got into bed," and later, "The master held a candle for me while I undressed."

Even in the rural areas of eastern Virginia, in places that had earlier known higher standards of luxury, there were instances of exactly similar conditions. Olmsted, in "A Journey in the Seaboard Slave States" (1856, pp. 77, 79, 85–86), described a remote farmhouse in the vicinity of Petersburg, where he spent the night: "It was a simple, two-story house, very much like those built by the wealthier class of people in New England villages, from fifty to a hundred years ago, except that the chimneys were carried up outside the walls." The large room on the first floor was wainscoted and had a carved mantelpiece. "The house had evidently been built for a family of some wealth, and, after having been deserted by them, had been bought at a bargain by the present resident, who either had not the capital or the inclination to furnish and occupy it appropriately." He was finally led to his bedroom to retire. He continues:

Into a large room, again, with six windows, with a fire-place, in which a few brands were smoking, with some wool spread thinly upon the floor in a corner; with a dozen small bundles of tobacco leaves; with a lady's saddle; with a deep feather-bed, covered with a bright patchwork quilt, on a maple bedstead, and without a single item of other furniture whatever. Mr. Newman asked if I wanted a candle to undress by, I said yes, if he pleased, and waited a moment

for him to set it down: as he did not do so I walked towards him, lifting my hand to take it. "No—I'll hold it," said he, and then I perceived that he had no candle-stick, but held the lean little dip in his hand: I remembered also that no candle had been brought into the "sitting-room," and that while we were at supper only one candle had stood upon the table, which had been immediately extinguished when we rose, the room being lighted only from the fire.

In these surroundings candles were, of course, homemade. In a one-room cabin in Tennessee Olmsted saw "bunches of candles [hanging] from the rafters" in the manner customary in New England farm kitchens of a century and more earlier.

Insufficiency of artificial light was not altogether confined to rural farms in the South, however. Olmsted, in the work just quoted (1856, pp. 334–336), recounts an amusing episode that occurred in a stagecoach inn at Fayetteville, N. C. It suggests that the absence of light may have been related in some cases to the general nature of things in the old South's economy and social organization, rather than to lack of access to the means of good light.

I followed the negro up to number eleven, which was a large back room, in the upper story, with four beds in it.

"Peter," said I, "I want a fire made here."

"Want a fire, sar?"

"Yes, I want you to make a fire."

"Want a fire, master, this time o' night?"

"Why, yes! I want a fire! Where are you going with the lamp?"

"Want a lamp, massa?"

"Want a lamp? Certainly, I do."

After about ten minutes, I heard a man splitting wood in the yard, and, in ten more, Peter brought in three sticks of green wood, and some chips; then, the little bed-lamp having burned out, he went into an adjoining room, where I heard him talking to some one, evidently awakened by his entrance to get a match; that failing, he went for another. By one o'clock, my fire was made.

"Peter," said I, "are you going to wait on me, while I stay here?"

"Yes, sar; I 'tends to dis room."

"Very well; take this, and when I leave, I'll give you another, if you take good care of me. Now, I want you to get me some water."

"I'll get you some water in de morning, sar."

"I want some to-night—some water and some towels; don't you think you can get them for me?"

"I reckon so, massa, if you wants 'em. Want 'em 'fore you go to bed?"

"Yes; and get another lamp."

"Want a lamp?"

"Yes, of course."

"Won't the fire do you?"

"No; bring a lamp. That one won't burn without filling; you need not try it."

The water and the lamp came, after a long time.

The following evening, as it grew too cold to write in my room, I went down, and found Peter, and told him I wanted a fire again, and that he might get me a couple of candles. When he came up, he brought one of the little bed-lamps, with a capacity of oil for fifteen minutes' use. I sent him down again to the office, with a request to the proprietor that I might be furnished with

candles. He returned, and reported that there were no candles in the house.

"Then, get me a larger lamp."

"Ain't no larger lamps, nuther, sar;—none to spare."

"Then go out, and see if you can't buy me some candles, somewhere."

"Ain't no stores open, Sunday, massa, and I don't know where I can buy 'em."

"Then go down, and tell the bar-keeper, with my compliments, that I wish to write in my room, and I would be obliged to him if he would send me a light, of some sort; something that will last longer, and give more light, than these little lamps."

"He won't give you none, massa—not if you hab a fire. Can't you see by da light of da fire? When a gentleman hab a fire in his room, dey don't count he wants no more light 'n dat."

"Well, make the fire, and I'll go down and see about it."

As I reached the foot of the stairs, the bell rung, and I went in to tea. The tea-table was moderately well lighted with candles. I waited till the company had generally left it, and then said to one of the waiters:

"Here are two dimes: I want you to bring me, as soon as you can, two of these candles to number eleven; do you understand?"

"Yes, sar; I'll fotch 'em, sar."

And he did.

Most often, rude conditions in the South were attributable to geographical isolation, rather than other causes. In Pennsylvania, however, we find a different kind of isolation that likewise enforced the survival of primitive forms of lighting. This was the barrier of language, religion, and culture, all differing from that which prevailed elsewhere. There was a deep-seated traditionalism among the Pennsylvania Germans, which made the continued use of ancient forms of copper and iron crusies a congenial habit.

In Germany and Switzerland, at the time of the first German migrations to America, the prevailing lighting devices among the common people were either simple hanging lamps with slanting metal troughs to hold the wicks, or merely shallow pans for burning fat or lard. In Pennsylvania the former came to be called "betty" lamps, or "judies," or "kays," or "frog lamps." The latter, of Alpine origin, either hung from hooks or had elaborate wrought-iron standards, in which case the pans themselves took on a variety of shapes. From these prototypes the "Dutch" metalsmiths in America developed their own characteristic versions. In collections today there are many examples bearing the names of such Pennsylvania lamp makers as Peter Derr, Joseph S. Schmitz, J. Eby, Hurxthal & Co., or J. Boker. So solidly entrenched was the custom in Pennsylvania of using these ancient lamp forms that there are numerous instances of their employment late in the nineteenth century. Henry C. Mercer (1898, p. 7), indicating that the "betty" lamp had sometimes survived up to his day, gave the following directions for its use:

Thrust the point horizontally into a beam or catch the barb upon a hook, nail or log crevice, then filling the vessel with lard, light the twisted tow (later

cotton) wick, laid along the internal trough, so tilted as to allow the oil oozing from the flame to flow back into the vessel. By the light, brighter than a candle, work at the loom after dark or fry potatoes at night on the open fire, as David Getter still does (October 1897), in his log cabin in the hill country of Springfield township.

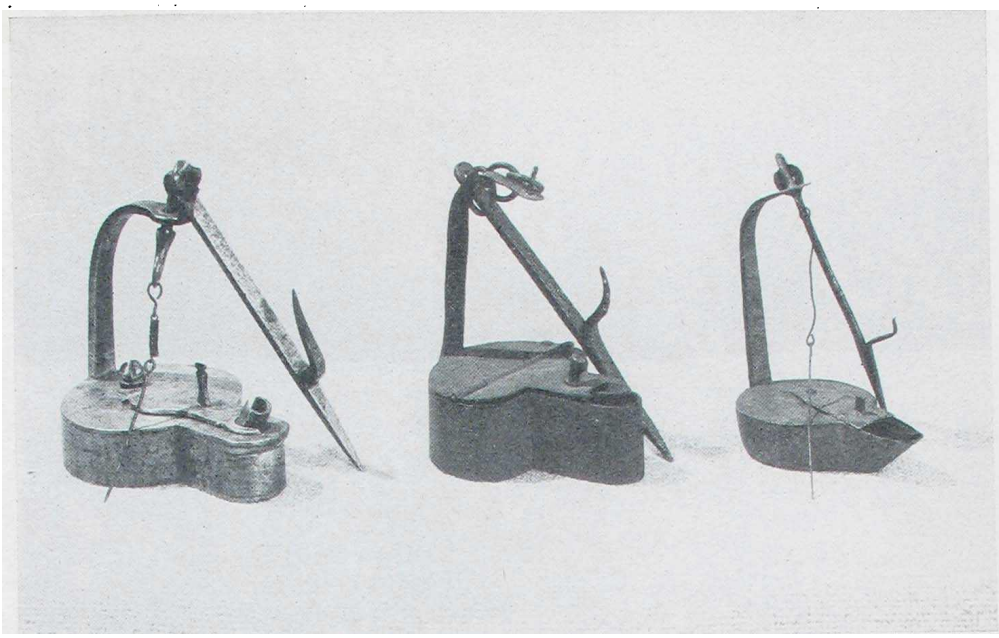
The "betty" lamp was to be found not only in Pennsylvania, but all along the course of German emigration. Among the Germans of Ohio it was probably as commonly used in the 1830–60 period as in Pennsylvania. A lamp in the United States National Museum collection of heating and lighting devices (No. 345938) is a typical Pennsylvania example but was used in Arkansas in the early days of the settlement. Other illustrations of the employment of these devices in the newly settled areas of the Midwest frequently occur.

In rural regions, not only in the South and West, but in isolated parts of the East as well, it is probable that candles more often held a foremost place. Made of tallow, they were sometimes dipped and sometimes cast in molds. Hough (1928, p. 18), stated:

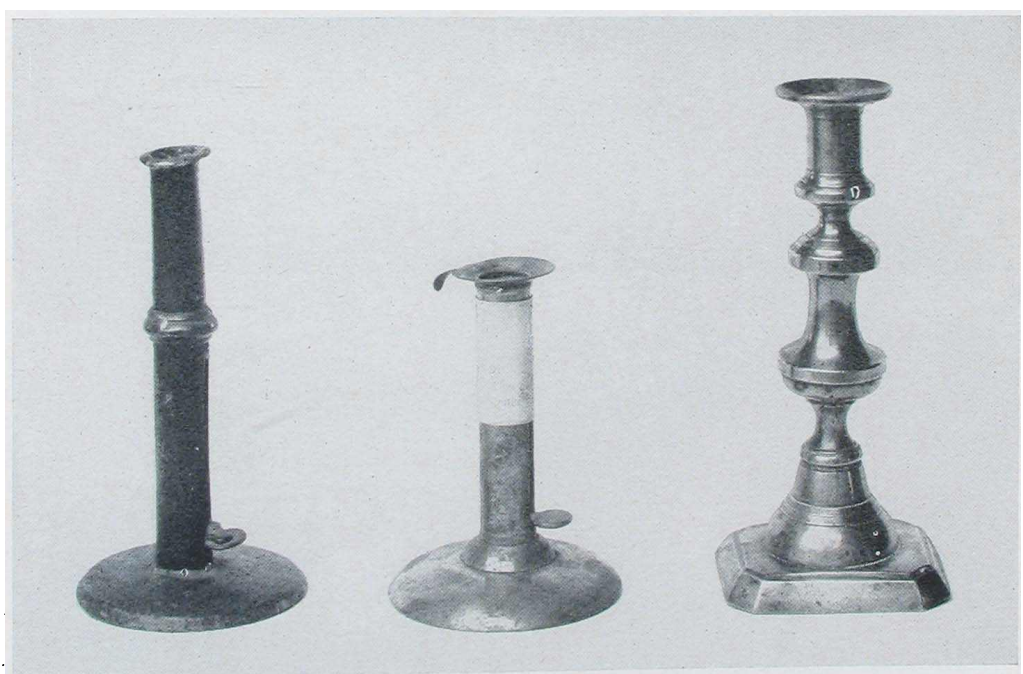
In reality the molds represent a method of economy among our ancestors in that small amounts of fat could be worked up into candles with the molds when required. Generally on the plantations, where a great many candles were necessary, sufficient were made for the whole year by dipping, which was far more expeditious than by molds. Candle dipping was usually coincident with the butchering of the winter stores of meat, at which time much fat was accumulated.

Candle dipping was accomplished on a large scale by the use of revolving candle driers. These devices were especially popular in Pennsylvania, but they occurred elsewhere, as among the New England Shakers, where large quantities were produced at one time. They consisted in each instance of a series of horizontal spokes, like a rimless wheel, which revolved on an upright spindle supported on a waist-high stand. From the end of each spoke was suspended a wooden disk or square. On the bottom of this were numerous small hooks to which the candle wicks were tied. When the molten tallow or wax was prepared by heating it on the surface of a kettle of hot water, a disk was removed from the drier, the wicks were dipped in the tallow and withdrawn, and the disk hung back on the drier. The process was repeated with each drier. By the time the entire series had been dipped once, the first wicks were sufficiently hard to be dipped again. Thus, repeated coatings of tallow were allowed to accumulate until the candles reached the desired size.

Another simpler method of dipping was used in New England. Here, the wicks were suspended and dipped from long sticks or "broaches." Each stick, with a dozen or more wicks, was placed across a pair of long poles supported at the ends on the backs of two chairs. The wicks were then dipped successively and repeatedly as with the revolving drier (Earle, 1898, pp. 35–36). It was necessary, for the



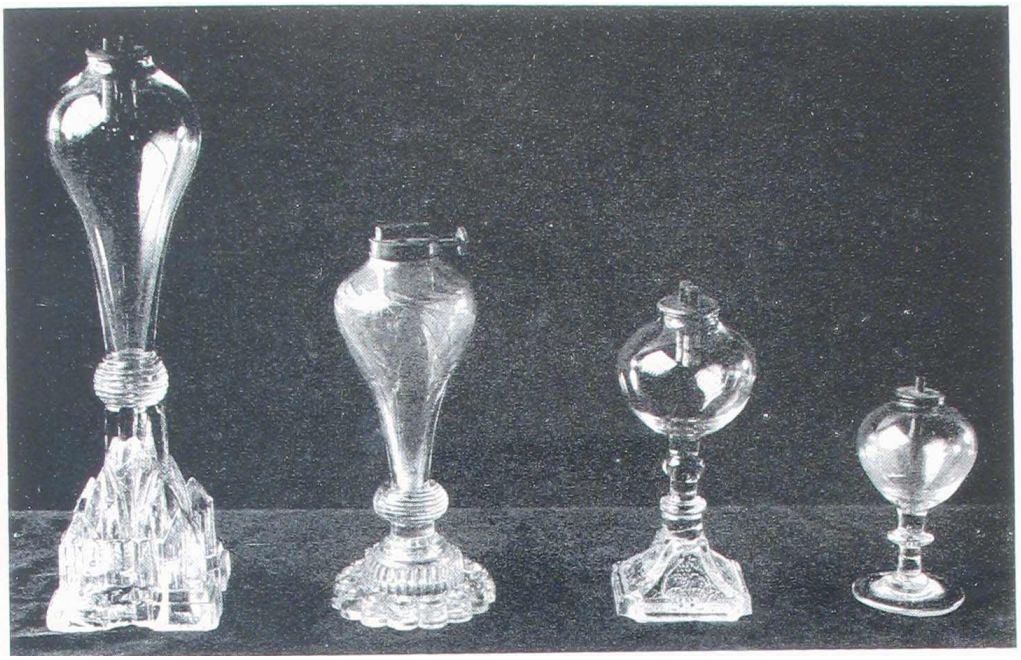
Three 19th-century iron "betty" lamps: *Left*, Stamped "E. Brown" and "1835," used in Washington, D. C. *Middle*, A typical Pennsylvania-style lamp of the midcentury, from Newkirk, Okla. *Right*, Lamp found in the stock of a Philadelphia hardware store in 1898. The harpoonlike hooks were hung on chair backs or from nails or thrust into chinks in fireplaces.



Left, Iron "hogscraper" candlestick of late 18th or early 19th century. The sharp-edged base was convenient for scraping bristles from newly slaughtered hogs. *Middle*, Patent model for "hogscraper" candlestick. Patented by Merriam, Harris, Wheeler & Merriam, of Poultney, Vt., in 1853. *Right*, Brass candlestick of style used about 1825–1840.

Mid-19th-century Pennsylvania lamps: *Left*, Iron lard lamp with swinging reservoir. *Middle*, Iron "betty" lamp on turned wooden stand, Bucks County. *Right*, Tin lamp designed to slide up and down on an iron rod mounted in a weighted base.

Brass whale-oil lamps of early 19th century (based on Miles's English patent of 1787 for an "agitable" lamp with enclosed reservoir): *Left*, Hand lamp, about 1800–1810. *Middle*, One of a pair of mantel lamps, about 1815–1825. *Right*, Chamber lamp.

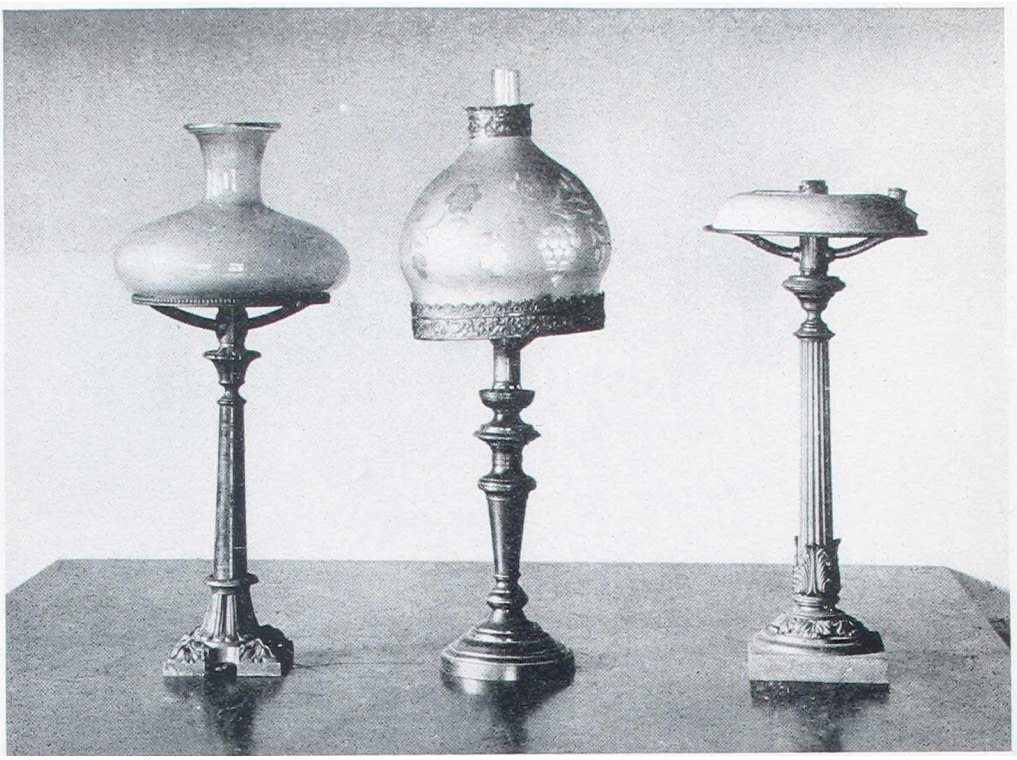


Glass whale-oil lamps with enclosed reservoirs and tight-fitting burners were an American innovation. The earliest (like that shown at far right) were simple blown-glass devices. After the mechanical pressing of glass was introduced in 1826, lamps were made with blown fonts and pressed bases. Second lamp front right was made at Sandwich, Mass., about 1830; the others are somewhat later.

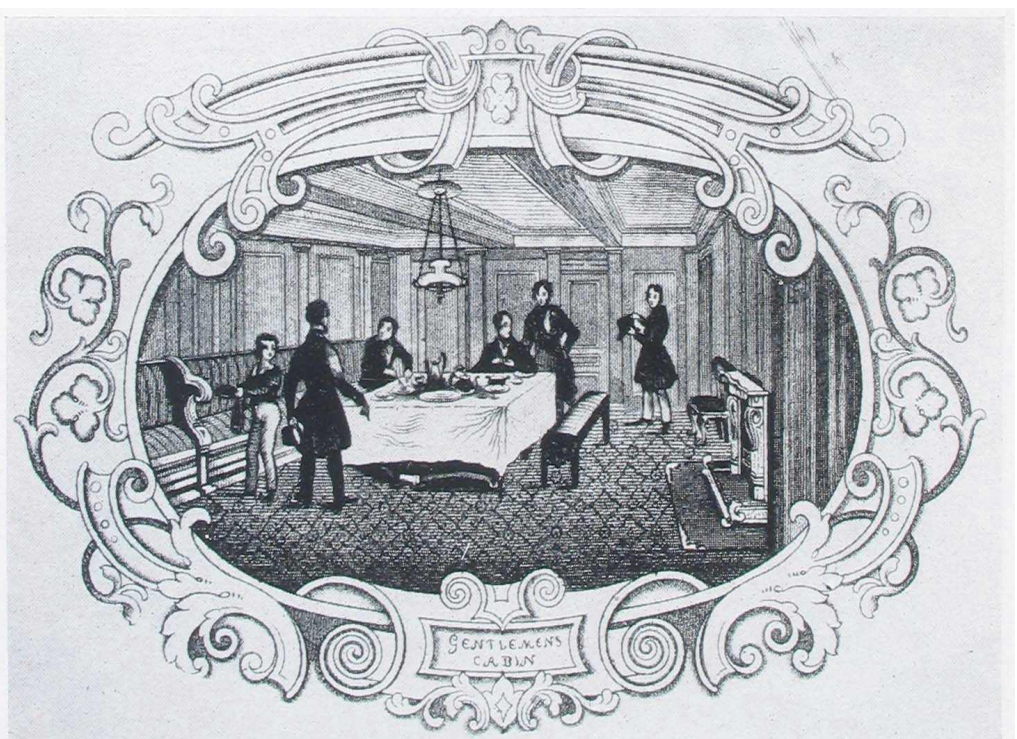
Glass lamps of about 1830–1860. *Left*, Lamp, supposed to have belonged to Ralph Waldo Emerson, fitted with a stopper-type whale-oil burner of tin and cork. *Middle*, Lamp with fluid or camphene burner, probably made at Pittsburgh about 1830. *Right*, Whale-oil lamp with pewter screw-type whale-oil burner.

Silver Argand lamp, mounted on cut-glass base, originally owned by George Washington. The oil supply was held in central reservoir and fed to burners through the bracket arms. Air was admitted through slots at base of each burner case. Glass chimneys, an innovation of Argand's, increased the draft.

Two versions of the Argand lamp: *Left*, Patent model of Argand lamp designed to burn lard oil (patented by C. Wilhelm, April 6, 1843); glass chimney not shown. *Right*, Tin wall-type for common use; glass chimney and tin reflector missing. Early 19th century.

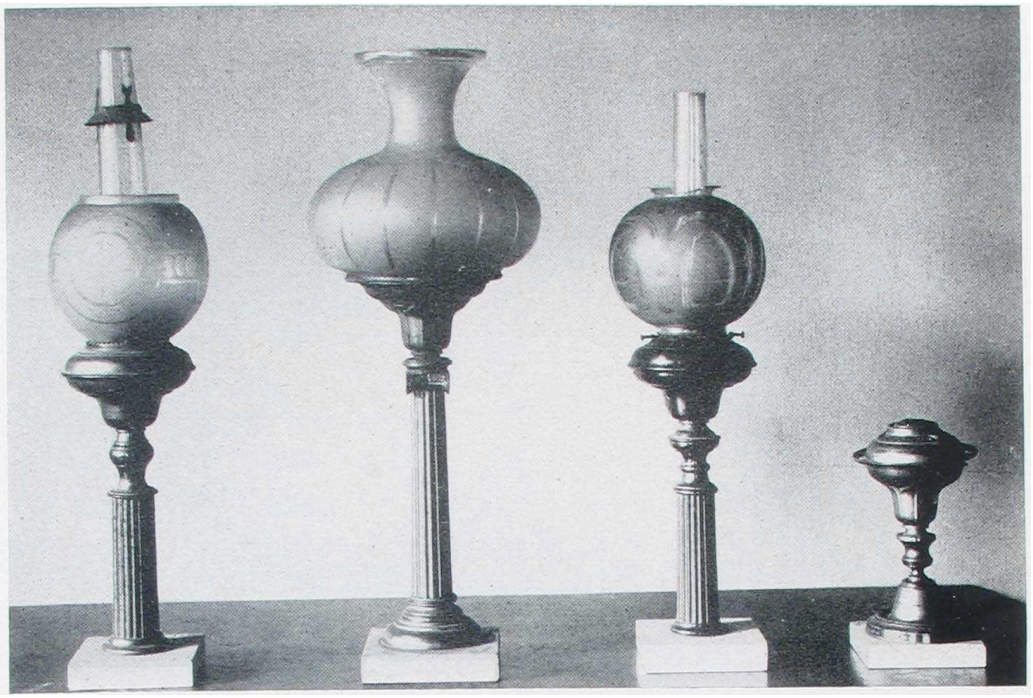


Three astral, or "sinumbra," lamps. These embody the Argand burner in combination with ring-shaped reservoirs (shown at right), designed to minimize amount of shadow. They were used with chimneys and glass shades of varying shapes, of which the one at left is most typical. American, about 1830–1840.

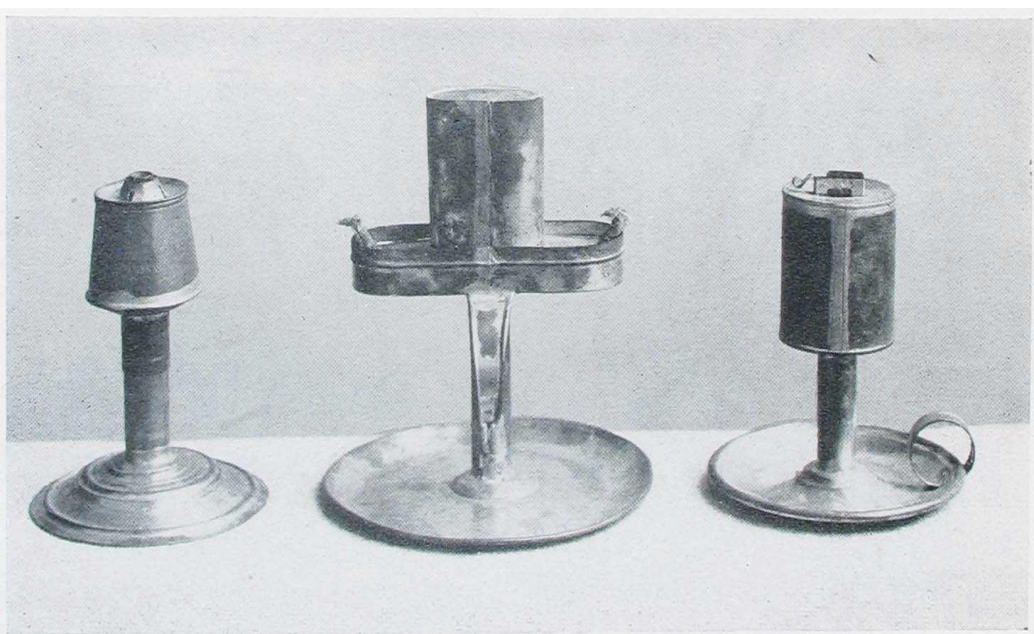


Transfer-printed scene from Staffordshire platter of the "Boston Mails Series," made by J. and T. Edwards of Burslem in 1841. A suspension-type astral lamp hangs above the table in the "gentlemen's cabin." (Courtesy Mrs. Arthur M. Greenwood.)

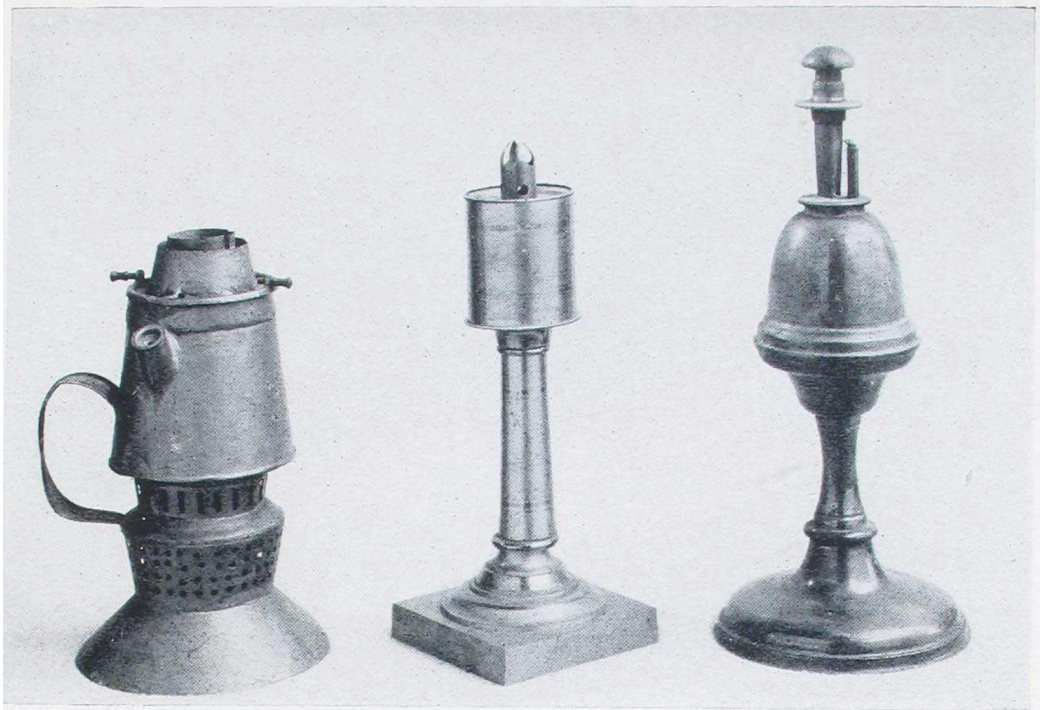
"A New York Interior," by Alexander Lawrie, painted about 1850. This carefully factual portrayal of a parlor in a well-to-do New York home shows an astral lamp on the table between the windows. (Courtesy of The Old Print Shop, Inc.)



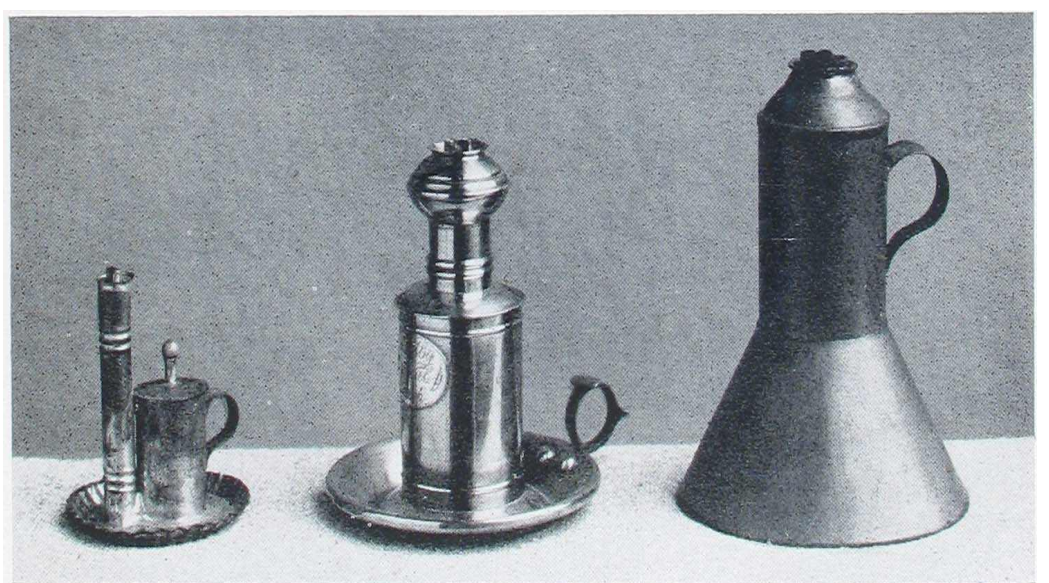
Four solar lamps. Usually designed to burn lard oil, these used a modified Argand burner with a device to shade the flame into a column of light. The shades were often globular, with engraved designs. The solar lamp was economical and efficient and was especially popular in the 1840's.



Three patent models of tin lard-burning lamps: *Left*, Harvey Temlinson's patent, Geneva N. Y., September 1, 1843, embodying an Argand burner with copper air tube. *Middle* Zebulon Warroll's patent, Chester Hill, Ohio, February 7, 1842, depending upon gravity for flow of fuel, the heat from the flame warming the lard in the reservoir. *Right*, One of several patents by Robert Cornelius, of Philadelphia, this one dated April 6, 1843. A ribbon wick with copper conductor strip is the working principle.



Patent models illustrating inventive ingenuity: *Left*, Rosin lamp, with heater underneath to keep the rosin fluid, patented by Prentice Sargent, Newburyport, Mass., March 4, 1856. *Middle*, Lard lamp patented by Silas B. Terry, Plymouth, Conn., February 24, 1843. *Right*, Fluid vapor lamp patented by C. A. Green, Philadelphia, April 21, 1857. The small burner seen at right superheated the volatile fuel in the large burner, causing it to vaporize and burn as a gas.



Patent models of lard lamps using pressure to feed fuel to wicks: *Left*, Tin lard lamp patented by John Grannis, Oberlin, Ohio, August 25, 1842. A plunger drives lard from secondary reservoir to primary reservoir and wick. *Middle*, Maltby and Neal's lard lamp patented by Benjamin K. Maltby, Rootstown, Ohio, May 4, 1842. The patented feature is a pair of perforated copper wick tubes to assure equal distribution of lard into wicks when pressure is applied, preventing wicks from being displaced. *Right*, Lard lamp patented by Thomas Sewell, New York, October 2, 1847. Turning the inner portion of the base forces the lard upward.

most satisfactory and economical performance, to allow the candles to dry and harden for many weeks. Bundles were suspended from the beams of the kitchen, as described by Olmsted above, or in the attic.

Candle molds were usually made of tin in a variety of sizes and combinations. Molds were easier to use, since fewer operations were involved. That they are to be found on each side of the Mississippi, in areas settled by people of both German and Anglo-Saxon stock, indicates that candles were used generally. Their continued use is attested by the fact that there were occasional inventions of candle molds during the period under discussion. In 1837 the following notice was given of a mold exhibited at the Mechanic's Fair in Boston:

> E. Haywood, of Boston, has produced candle moulds, which open lengthwise, in halves, and can be curved or cast upon figured moulds, so as to yield spermaceti or wax candles of beautiful ornamented patterns. (Boston Daily Sentinel and Gazette, Sept. 25, 1837.)

It is apparent from this that not only the tallow candles of the rural areas but also the expensive spermaceti candles we usually associate with aristocratic eighteenth-century surroundings were still in fashion. Spermaceti is the crystalline wax from the head of the sperm whale and, though expensive, was unsurpassed as a candle illuminant.

Candlesticks ranged from crude holders of tin and iron, and even pottery, to those of pewter, brass, and silver. Elaborate electroplated examples with embossed designs were popular in "elegant" settings after 1850, while the turned types of brass sticks (essentially like their eighteenth-century predecessors, except for greater mass and less restraint) were for common use. Devices for expelling the stubs of candles were common by 1830. A popular barn and kitchen candlestick with a slide-style expeller was called a "hog-scraper" because of its sharp-edged base, adaptable to scraping bristles from newly slaughtered hogs. This remained in use throughout the century and within recent years has been sold by a large mail-order house with the candle socket omitted, its adopted function having become its primary purpose. The United States National Museum exhibits a heavy brass stick with internal expeller which is a patent model of 1840 (No. 251-722). The Franklin Institute commended an iron candlestick, exhibited in the 1832 Exhibition, as being one that "will compare with the English both in quality and price." It is significant that there were as many as 13 candlesticks patented between 1830 and 1860, as well as one design for snuffers.

In an apparently characteristic up-State New York farmhouse, brass candlesticks formed part of the decorative scheme in the best parlor. Susan Fenimore Cooper described this room in 1851 ("A Lady," pp. 157–158):

It was both parlor and guest chamber at the same time. In one corner stood a maple bedstead, with a large, plump feather bed on it, and two tiny pillows in well-bleached cases at the head. The walls of the room were whitewashed, the wood-work was unpainted, but so thoroughly scoured, that it had acquired a sort of polish and oak color. Before the windows hung colored paper blinds. Between the windows was a table, and over it hung a small looking-glass, and a green and yellow drawing in water colors, the gift of a friend. On one side stood a cherry bureau. . . . The mantel-piece was ornamented with peacock's feathers, and brass candlesticks, bright as gold; in the fireplace were fresh sprigs of asparagus. An open cupboard stood on one side, containing the cups and saucers in neat array, a pretty salt cellar, with several pieces of cracked and broken crockery, of a superior quality, preserved for ornament rather than use.

But if we are to see the other side of the picture and observe the achievements of invention in lighting and that spirit of "leviathanism" which so impressed Lady Emmeline Stuart Wortley, we must remain in the cities and urbanized areas of the seaboard. Here important improvements had been introduced before the close of the eighteenth century, and some had been widely adopted in America. Contributing as much as any one individual to the development of lighting, a Swiss chemist, Ami Argand, in 1783 had invented the first lamp to be constructed on scientific principles of combustion. This embodied a hollow tube, open at both ends, which extended upward through the center of the burner. A cylindrical woven wick was fitted tightly around the tube, and an outer cylinder was placed around this. Oil from the reservoir was fed into the side of the cylindrical chamber containing the wick. The hollow tube in the center served to admit air to the center of the flame, thus increasing combustion and the amount of light as heat from the flame acted automatically to create a draft. The draft was further increased by the addition of a glass chimney. Argand is credited with the first practical use of the lamp chimney.

Well-to-do Americans, among them Washington and Jefferson, had installed Argand lamps before 1800, and after that year several modifications and adaptations of Argand's idea were adopted by city folk who could afford them. Their greatly superior light, amounting to as much as 9 candlepower, was considered revolutionary, as we shall see.

More significant from a cultural and economic standpoint, if not from a technological one, was the widespread adoption of an English weaver's invention, John Miles's "agitable" lamp, patented in England in 1787. Although apparently but little concerned with scientific principle, Miles succeeded in designing an eminently simple device consisting of a container with a hole at the top into which a burner with one or more vertical wick tubes could be screwed or tightly fitted. Sperm oil or even common whale oil could be drawn up into the vertical wicks, and the stopper-type burners minimized the spilling

of oil. The symmetrical design permitted making handsome lamps of tin, pewter, brass, and glass, and their simplicity made them economical and easy to clean. The whaling industry, already well established, was able to provide the necessary fuel for these devices, particularly in the Northeast, their increasing popularity after 1800 having been a basic reason for the expansion of whaling. By 1830 the "common" or whale-oil lamp (as Miles's lamp came to be called) had become a standard household device in the East. A large part of the output of the glass factories in Pittsburgh, Sandwich, and Cambridge consisted of glass whale-oil lamps, while pewterers and tinsmiths welcomed the new form so admirably adapted to their skills. However, the light emitted from a whale-oil lamp with a single wick was not much greater than that of a candle. This lamp had a solid wick and rarely included a chimney. Its popular appeal was therefore attributable to economy, simplicity, and satisfactory appearance.

It is initially surprising that the most radical innovation of all, though introduced before 1830, was not widely accepted until after the Civil War. This was illuminating gas, first used for domestic lighting by David Melville, of Newport, R. I., in 1806. Although Melville's enthusiasm for gas light led him to install it in a nearby textile mill as well as in street lamps outside his house, it remained for a long time a novelty. As early as 1799 or 1800 one Mr. Henfry had demonstrated gas light in Baltimore, and in 1816 Rembrandt Peale used gas to light his museum in that city. So successful was it there that the first commercial installation of gas street lights was urged and adopted by the Baltimore citizenry within the following year. Except for street lighting in most of the larger cities, gas illumination was confined principally to theaters, museums, and other public gathering places. Elaborate technical requirements and installation problems remained as hurdles that were difficult to overcome. Gas lighting was still uncommon in 1843, when the Franklin Institute conducted experiments to prove its utility. It was concluded that gas could be credited with giving "bright and continuous light," cleanliness, and freedom from variation, smell, smoke, or care, yet "its disadvantage is that it is a fixed light, and can be used only at points previously determined upon" (Journal, 1843, ser. 3, vol. 5, p. 105).

The fixtures then used for gas ranged from simple brackets projecting from the wall to very elaborate chandeliers. The predominantly public use of gas during the 1830–60 period accounts largely for the latter, which are both illustrated and commented upon in contemporary literature. The Report on Lamp and Gas Fixtures in the 13th Annual Exhibit of the Franklin Institute in 1844 describes "the richly ornamented gas pendants and chandeliers finished in ormolu, the workmanship of which is exceedingly beautiful, the color faultless, and the whole such as to satisfy the most fastidious taste, and in com-

bination with the judicious arrangements of the glass ornaments produce a very brilliant effect" (Journal, ser. 3, vol. 6, p. 402).

The Cornelius firm of Philadelphia, the largest manufacturer of lighting devices in America at the time, exhibited two gas chandeliers at the London International Exhibition of 1851. The Art Journal's catalogue of the display comments as follows: "They stood about fifteen feet and a half high, by six feet wide, having fifteen burners with plain glass globes, and are rich brass lacquered. The design is very rich in ornament, and possesses some novelty in the succession of curves ingeniously and tastefully united: the gas keys represent bunches of fruit, thus combining beauty with utility" (1851, p. 212). Such dubious marriages between beauty and utility were to become increasingly frequent in American lighting devices as the century wore on.

Gas street lights were simple inverted truncated pyramids of glass and tin, mounted on posts and enclosing gas jets. Charles Dickens remarked upon the lights of Broadway in 1842 (p. 103): "As the eye travels down the long thoroughfare, dotted with bright jets of gas, it is reminded of Oxford Street or Piccadilly. Here and there a flight of broad stone cellar-steps appears, a painted lamp directs you to the Bowling Saloon, or Ten-Pin Alley . . . At other downward flights of steps, are other lamps, marking the whereabouts of oyster-cellars."

Public illuminations of a celebrative nature were frequent urban occurrences in the exuberant years we are considering, and the possibilities of gas light were exploited to the utmost on those occasions. Gas pipes were sometimes bent to odd shapes, and when perforated with holes for jets, were mounted on buildings and lighted with impressive effects.

At the Railroad Jubilee held in Boston in 1851 to commemorate the completion of the railroad between Boston and Montreal, an illumination "emblematic, not only of present joy, but of bright hope for the future . . . irradiated the scene," according to the official account. "The Tremont House," it was narrated, "is especially worthy of notice for the extent and splendor of its illumination. The columns of the portico were like pillars of flame. Two thousand lights were placed in the windows, besides which there were two dazzling rosettes of gas in front. The exhibition called forth the warmest encomiums of thousands." The Boston Gas Light Co. naturally made the most of its product, and we find that "in front of the office of this Company was seen the word 'Union,' in 'letters of living light,' supported by four vines, above all which blazed a single star of dazzling brilliancy" (Railroad Jubilee, 1852, p. 188 ff.).

Such public demonstrations were all the more wondrous because they were unfamiliar. In the ordinary household a meager amount

of light was the expected thing, and a greater concentration was often regarded with disfavor under normal circumstances. As early as 1804 the Domestic Encyclopedia had commented on the "superior utility of lamps," but "as the light emitted from them is frequently too vivid for weak or irritable eyes, we would recommend the use of a small screen" (Mease, 1804, vol. 3, p. 432). Presumably the Argand lamp, with its unprecedented candlepower, was the basis for this caution. Count Rumford had stated in 1811 that "no decayed beauty ought ever to expose her face to the direct rays of an Argand lamp." By 1847 this hostility to unusual brilliance was still expressed. The Franklin Institute Journal in that year (ser. 3, vol. 14, p. 410) remarked that "the unpleasant, and to many sights, painful effects of the naked flame of a candle, lamp or gas-burner, have long been known and felt." At almost the same date (August 21, 1847), the Scientific American observed some extraordinary precautions taken against glare: "The introduction of gas lights into private houses has been taken advantage of by the ladies, who under protest against the glare and uncomfortableness of such bright lights, deliberately spread parasols in evening soiree . . . A pink parasol judiciously held between a lady's face and a gas burner throws a tender, roseate hue over the complexion."

In commonplace surroundings, particularly outdoors, the light afforded on ordinary occasions was seldom sufficient to damage one's eyesight, all fears to the contrary notwithstanding. Alexander Mackay (1849, pp. 129, 162), looking across the Delaware River, found the lights of Philadelphia "as few and far between as are those of London and the Thames." On the "cold moist platform" of the Washington railroad station "we stood shivering by the light of one wretched lamp," while in front of his hotel there "the solitary lamp which burned over the door only made darkness visible." Dickens remarked upon the "feeble lights" of Harrisburg, which "reflected dismally from the wet ground" (1842, p. 170).

For those who traveled at night, illumination in public conveyances must have been even more dismal. John S. Kendall in "The Connecticut and Passumpsic Rivers Railroad" (1932), states: "Sperm candles were used at first for lighting the cars, giving way to oil lamps later. They gave just about light enough to keep passengers with good eyesight from falling over the seats." Mackay (1849, p. 36), traveling from Worcester to Norwich, stated, "A solitary lamp burned at one end of the car." When the Western Railroad was completed between Worcester and Springfield, Mass., in 1839, the new passenger car was equipped with a glass-encased boxlike frame beside each seat. Passengers placed their own candles in these frames at first, but because one's candles did not always fit the socket, the railroad later furnished them (Ayers, 1944).

As might be expected, the stagecoach traveler had the ultimate minimum of light. Mackay (1849, p. 213), about to ride from Milledgeville to Macon, Ga., attempted to examine the vehicle which was to take him "by the glimmering light of a tin lantern, which had the peculiarity of never being precisely where it was wanted."

Steamship lighting was glamorous by contrast. Lady Emmeline Stuart Wortley (1851, p. 25) voyaged up the Hudson in "a floating island of painting, marble, gilding, stained glass, velvet hangings, satin draperies, mirrors in richly carved frames, and sculptured ornaments with beautiful vases of flowers, Chinese lamps of various indescribable forms, arabesques, chandeliers—in short, you might fancy yourself in Haroun Alraschid's palace."

The lighting of churches was usually austere. Many churches had no lights at all, while others merely had a minimum of light in the form of simple sconces. The Wells Collection at Old Sturbridge Village (Sturbridge, Mass.) includes a chandelier from a Baptist meetinghouse, near Brunswick, Maine, that dates from about 1820. This consists of a turned wooden central section, radiating spidery arms of heavy iron wire which support tin candle saucers and are decorated with tin leaves. The same collection exhibits four candelabra, two in the form of a cross and two in the form of an ellipse, from a Mennonite church in Pennsylvania. The Rocky Hill Meetinghouse in Salisbury, Mass., still has three astral lamps suspended from overhead. These were probably installed about 1830, or slightly earlier. No other means of artificial light have since disturbed them.

Domestic lighting was seldom brilliant. Harriet Martineau (1838, vol. 1, p. 37), landing in New York from England in 1838, complained that in her Broadway boardinghouse bedroom the four bed posts looked "as if meant to hang gowns and bonnets upon, for there was no tester. The washstand was without tumbler, glass, soap, or brush tray. The candlestick had no snuffers." It is to be concluded that one candle was supposed to light a whole room.

The refinement of city houses was, of course, in striking contrast to the crude cabins of the frontier. Mrs. Felton (1842, pp. 36–37), said that in New York "the number of superb houses is very great. . . . They appear all to be built upon one plan; the chief feature of which is, that the dining and drawing rooms are situated on the lower floor, and so arranged, as by throwing open a large pair of folding doors, to form one splendid apartment. Their furniture is magnificent in the extreme."

The lighting for so elaborate a home as these was usually on an appropriate scale from the standpoint of the appearance of the fixtures. In function, however, even the more expensive gas or oil-burning devices left something to be desired, although they were vastly

superior to candles and whale-oil lamps. Frederika Bremer in 1849 described the evenings she spent in New York City in the well-furnished home of her American friends, Mr. and Mrs. Downing. Among her happiest hours, she said, were "those passed in the evening with my host and hostess, sitting in the little darkened parlor with bookcases and busts around us, and the fire glimmering in the large fireplace. There by the evening lamp, Downing and his wife read to me by turns from their most esteemed American poets" (Benson, 1924, p. 11). Here is a vivid picture from the home of cultured persons, where the light of one lamp was sufficient for one individual to read by, but still so dim as to leave the room "darkened." The lamps thus used for parlor tables were commonly "astral" lamps, fitted with ground-glass shades resting on ring-shaped, or "annular," reservoirs. Designed to minimize the amount of shadow cast by the reservoir, these were modifications of the Argand lamp. They were made of brass or bronze, as a rule, though sometimes their bases were of pressed glass. Like the "common" lamps that were used in the less important parts of the house, astral lamps burned sperm oil.

Miss Leslie in 1840 defined in great detail the types of lamps used in a well-to-do home, with instructions concerning their use and care. She pointed out that "lamp shades painted in bright colors are now considered in very bad taste" and also advised that a separate oil can should be used for the parlor lamps.

Besides the astral lamps, there were other types that gained favor for parlor use as inventive activity increased. One was the Carcel, or "Mechanical," lamp, invented in France in 1800 but not until considerably later adopted here. The Carcel lamp embodied an elaborate clockwork which activated a pump that in turn flooded its Argand burner with oil. It was surely very costly in comparison with other lamps, but it was by far the most efficient lamp that had yet been devised for burning viscous fuels. The Franklin Institute conducted various tests with the Carcel lamp, and the findings must have been influential in stimulating its use. Among other things, it was found that the Carcel lamp using fall-strained sperm oils burned with an intensity of more than twice that of a gas burner, and at only slightly higher cost. The Journal (1843, ser. 3, vol. 5, p. 105 ff.) observed: "The Carcel lamps, although from their construction, expensive, give an exceedingly steady long enduring, and bright light, and are characterized by beauty of form, and total absence of shadow."

Although the breaking of conventional shackles on illumination was not always recognizable in terms of increased light, it was manifested by a growing spate of inventions, which served progress by the trial-and-error method. Bred in the new atmosphere of mechanical and scientific advancement, approximately 500 patented inventions were

recorded in the United States Patent Office between 1830 and 1860 for lighting devices alone. Scarcely 50 had been listed between 1790 and 1830 (Hubbard, 1935). It is true that improvement upon what was already in existence was a leading motive for this inventive activity; but there were also underlying economic reasons, of which one was the state of the whaling industry. Even before the demand for whale oils had reached its height in the middle 1840's the whaling industry, while seeking to supply a growing demand, had found itself faced with diminishing returns. Whales became scarcer, voyages in search of them grew longer, and the risks of both the owners and the crews increased with each voyage. Hohman states (1928, pp. 273, 302, 330), "It was estimated that during the middle years of the nineteenth century approximately ten percent of all American whaling vessels made voyages which resulted in a net loss to their owners." Between 1846 and 1861 the whole fleet declined from 735 to 514 ships. Meanwhile, the wholesale price of sperm oil fluctuated upward in increasing peaks. In 1848, to cite an extreme contrast, the dockside price in New Bedford was 95 cents a gallon, while in 1855 it was $1.70. Earlier than this, however, whale oils had been expensive, although they could be burned comparatively cheaply in the simple common lamp. As early as 1821 winter-strained sperm oil had cost the city of Boston $1.07 a gallon on a contract basis. In 1843 the price of fall-strained oil was quoted by the Franklin Institute Journal (ser. 3, vol. 5, p. 105 ff.) at 90 cents a gallon, and the winter-strained variety at $1. It is easy to see why farm folk preferred to rely on lard and tallow from their own animals.

A few of the inventors sought to improve the efficiency of lamps intended to burn sperm oil. Samuel Rust, of New York, took out several patents involving the use of ribbon wicks and chimneys to increase combustion, wick raisers to permit finer adjustments, and other modifications of the common lamp which sought to improve its function. In 1831 William Lawrence designed a hanging lamp with a reservoir in the shape of a hollow truncated cone and with slanting ribbon-wick burners enclosed in a glass shade. This provided, in theory at least, proper draft-fed combustion and a good central light. Closely related in form was Couch & Frary's lamp patented two years later.

It remained for Isaiah Jennings in 1830 to patent a new fuel and thereby make the outstanding contribution to the development of lighting prior to the discovery of kerosene. His "burning fluid" combined alcohol and spirits of turpentine in a proportion of eight to one. It was the first chemically made, volatile illuminating fuel. The Franklin Institute Journal, a regular commentator and frequently severe critic of new inventions, was enthusiastic: "We have

seen the above mixture in combination in an Argand's lamp. The flame was clear, dense, and brilliant. The light may be made greatly to exceed that from oil, without the escape of any smoke, and there is not the slightest odor of turpentine. The patentee says the mixture is as cheap as spermaceti oil, and that he is making arrangements which will enable him to afford it at less cost considerably below that material." It concluded with an afterthought: "The friends of temperance will not object to the burning of alcohol" (1831, ser. 2, vol. 7, pp. 75–76). The Journal did not then foresee the dangers inherent in the use of so explosive an agent in a common, or even an Argand, lamp. By 1834 they had reason, as we shall see, to comment on Samuel Casey's patented burning compound (one of several variants of Jennings's fluid): "The late fatal accidents resulting from the use of such ingredients in lamps will, however, probably put a final stop to the use of these mixtures, and we have no doubt that a court of law would now decide that they are not useful, within the meaning of the statute" (1834, ser. 2, vol. 14, p. 247).

Nevertheless, the cheapness of these fluids and the comparative excellence of the light afforded by them led to their gradual adoption. There were several followers in Jennings's footsteps, among them Henry Porter, of Bangor, Maine, who added camphor, rosin, and tincture of curcuma to the formula in 1835. Finally, in 1839, Augustus V. X. Webb of New York began to manufacture distilled turpentine under the name "camphine." Later (when usually spelled camphene) that became a generic term applied loosely to all the fluids.

The use of undiluted turpentine was not new with Webb, however, for only a year earlier Luther Jones had patented a lamp for burning this substance. The lamp was advertised in the Boston Transcript (November 27, 1839):

A New and Superior Lamp. Jones's Patent Reverse Lamp, for burning the oil of turpentine. For light, this lamp is without a parallel, producing more light from the same width of wick than any other. The material used in them is perfectly harmless. The lamp can be filled at any time without the least danger; it costs less than oil, and the lamp is a very excellent one for Stores, Factories, Work Shops, &c, &c . . .

The claims made here for its safety are not supported by the Franklin Institute Journal's commentator: "So far as experience may serve as a guide, the lamps for burning spirits of turpentine are not likely to supersede those for burning oil; there are serious objections to the use of the former, and amongst them is the inflammability of the fluid" (1838, ser. 2, vol. 24, p. 323).

The inflammability of the fluid was a factor that came to be reckoned with in ever-increasing degrees as these fuels grew in use. Ample evidence can be found in the periodicals of the day. The following was printed in the Scientific American for June 19, 1847: "Miss

Mary Watson was burned to death in Philadelphia last week, while attempting to fill a fluid lamp when it was burning, and the liquid taking fire caused the catastrophe. Her mother and brother, who were in the room, were also badly burned in attempting to save her." The same periodical reported on April 27, 1850, "A serious fire took place at a camphene distillery in our city on last Friday, by which several of the hands were severely burned. There is scarcely a week passes over our heads without a number of accidents from the use of camphene." The next year this state of affairs was still continuing. "Two daughters of Alderman Ramass of New Orleans were burned to death by the explosion of a camphene lamp; two others were also shockingly burned by the accident" (Gleason's Drawing Room Companion, July 7, 1851). On September 17, 1853, the Scientific American again commented with some astonishing statistics: "According to a record kept by Mrs. F. Merriam, there were, during the year ending September 1st, 1853, some thirty-three fatal explosions, mostly in the cities of New York, Brooklyn, Williamsburgh, and vicinity, in which nineteen persons were killed, twenty-three persons fatally or severely injured, three persons slightly wounded, and some three or four buildings fired. The preparations alluded to are burning fluid, camphene, spirit gas, rosin oil, etc."

Probably the first effort to obviate these dangers was to design a new burner less dangerous to use than the common whale-oil burner. This was made so that its wick tubes extended upward, away from the fuel, instead of downward. Thus less heat was conducted into the reservoir from the flame, and the flame itself was a greater distance from the fluid. Extinguisher caps obviated the dangerous necessity of blowing out the light. This burner was widely adopted, as its frequent survival in collections and antique shops indicates. It was designed to fit the same lamps that had burned whale oil, so that the difference between a whale-oil lamp and a so-called "camphene" lamp is often distinguishable only by its burner. An undated advertising card of Marsh & Company's Patent Oil Manufactory of Boston, probably printed in the 1840's, announces "New tubes fitted to Common Whale Oil Lamps, from 6¼ to 12½ Cents."

It may be concluded that the fluid burner was only a relative improvement in safety, for most of the recorded accidents occurred after the burner was in common use. The next moves were therefore toward designing a "safety" lamp that would not explode. This hoped-for goal was probably never achieved, but the efforts to do so were numerous. Perhaps the most satisfactory was the one patented by John Newell, in 1853, consisting of a cylinder of fine wire-gauze screen, which encased the wick inside the reservoir. Evidently inspired by the Davy miner's safety lamp, this was supposed to keep the flame

from backing into the fuel supply. It was exhibited at the New York Crystal Palace Exposition in 1854 and was acclaimed by such notable scientists of the day as Benjamin Silliman. Another, consisting of a glass reservoir enclosing a metal lining, was patented by Prof. E. N. Horsford, a Harvard archeologist, and James R. Nichols.

Other improvements in the use of camphene and fluids were designed to make the flame burn more brightly. One was patented by "Doctor" Michael Boyd Dyott, a flamboyant Philadelphia manufacturer of glass, patent medicines, and a burning fluid he called "pine oil." In his lamp the fluid was vaporized and burned as a gas. This was followed by several other designs which were in effect gas lamps using vaporized fuel.

The Franklin Institute's experiments of 1843, already several times alluded to, led to the conclusion that "camphene possesses a remarkable intensity and higher lighting power, with a brilliant white flame, and from its cheapness presents strong claims, on the score of economy, upon public notice. Its disadvantages are, the great inflammability of the material, the liability to annoyance from its disagreeable smell, and the injurious and unendurable smoke which proceeds from the lamp when out of order, or not properly regulated" (1843, ser. 3, vol. 5, p. 108 ff.). The brilliance attributed to camphene was, of course, a matter of comparison and degree. To one used to the single-candle-power light of a whale-oil burner the light from a fluid burner was a vast improvement. That the fluids were widely adopted, both (we may assume) on the basis of their "high lighting power" and "on the score of economy," is evident from the large number of surviving examples.

To what extent the rural population, with its conservatism reenforced by a healthy fear of fire, may have taken up the burning fluids is open to surmise. Certainly most country residents were prepared to welcome a safer substitute than camphene for traditional lighting devices. Such a substitute was provided by lard from their own hogs, used in combination with any of the scores of newly invented lard lamps. Most of the lamps designed for burning lard were crude in appearance and bizarre in function. Few were based on scientific knowledge, but almost all were concerned with overcoming the difficulties of burning a semisolid fuel. There were three basic principles employed in the lamps: (1) Conduction of heat from the flame to the fuel supply; (2) gravity, usually in combination with conduction devices; and (3) mechanical pressure.

In 1830 Stephen P. Moorehead sought a patent on a lard lamp having copper wires wound around the wick tubes and leading down into the reservoir. Thus heat from the flame would, in theory, at least, be carried down to the lard. Moorehead was not the originator of

this idea, as the Franklin Institute Journal rather waspishly pointed out. "The task is not an agreeable one," it commented, "to inform a person who believes he has drawn a prize, that a small mistake has been made in his number" (1830, ser. 2, vol. 6, p. 15). It went on to explain that a lamp made in Philadelphia 20 years earlier had employed the conduction principle and that another had followed. What these lamps may have been cannot now be conjectured.

Notwithstanding its lack of originality, the conduction device was used over and over again, even though the patent claim in each case was ostensibly for some other feature. Southworth's patent of 1842 is a case in point, where both a copper wick tube and copper conductor strip were employed. Even as late as the following year, a chemist named Campbell Morfit had seen fit publicly to recommend the substitution of copper wick tubes for those of tin.

In 1834 Samuel Davis designed a lard lamp that similarly included copper parts in the burner. Davis's directions made it clear that something more than a copper conductor was needed, however. "If the lard lamp be cold, and there be no warm lard to start it, hold the lamp upside down, and with a match let it burn until the burner gets hot, then set the lamp down and put a little cold lard in the lid around the wick." The implications of hardship and difficulty in the simple act of lighting a lamp—an "improved" one, at that—are most interesting to reflect upon.

Delamar Kinnear, of Circleville, Ohio, patented a lamp in 1850 on the basis of its shape. In addition to having a wide flat wick for giving light, it included also a pilot burner from which a conductor wire descended into the fuel supply. Many of Kinnear's lamps have survived, indicating that they enjoyed some degree of success.

The second group of lard lamps depended upon gravity as well as heat conduction. Dexter S. Chamberlain's patent of 1854 prescribed a tilting reservoir in which the oil supply was kept at a constant level with the wick. The patent model is in the United States National Museum collection (No. 251802). Moses Woodward's earlier patent of 1842 also utilized this principle. Its functioning was described by the Franklin Institute Journal (1844, ser. 3, vol. 7, p. 252): "The lard can be burned until it is nearly exhausted, for by the tilting of the body of the lamp, the lard can be brought near to the ignited part of the wick."

The lamps of the third category were probably the least attractive but the most effective. These employed mechanical pressure devices to force the lard into the wick. An early and evidently popular version was patented by Maltby & Neal, of Middlebury, Ohio, in 1842. Their handsome patent model of brass with silver name plate (No. 251795) is illustrated in plate 8. Other examples of this lamp in tin

and brass also are represented in the United States National Museum.

John Grannis's patent of the same year claimed the application of a "forcing" pump, or hand plunger, "to the construction and use of lard lamps." Very similar, but embodying a key-propelled worm shaft with piston instead of a force pump, was Smith & Stonesifer's patent of 1854. Another mechanical piston lamp had been previously patented by Williams & Tew.

Most of the foregoing were crude looking and were more suitable for use in the farm kitchen than in the city parlor. A device called the solar lamp, however, answered all the requirements of "elegance" demanded by Victorian taste. Capable of burning any viscous oil, but especially suited to lard oil, the solar lamp was a modified Argand lamp. Its burner was fitted with a convex plate having a hole in the center to direct the flame upward in a tall column of light, plus a tapering glass chimney. It was in every respect a superior lighting device. Although used for many years previously in England, it was not introduced in America until 1841. From the Franklin Institute's aforementioned experiments of 1843 it was concluded: "The solar lamp, although not so steady as the Carcel, approaches very nearly, if it does not equal, that of the Carcel, in intensity. It is comparatively cheap, simple in its construction, not liable to get out of repair, and easily cleansed" (1843, ser. 3, vol. 5, p. 105 ff.). Since its initial cost was not great, and the cost of lard oil was less than that of sperm oil, and since the appearance of the solar lamp was agreeable in "genteel" surroundings, its success was assured. It probably displaced many of the less efficient and more expensive astral lamps. The solar lamp was made by several manufacturers.

Taste in the 1830–60 period was reflected in lighting devices as in other objects of furnishing. There were to be found handsome execution of good design on the one hand and esthetic atrocity on the other. The more expensive the lamp the more ornate and meretricious the decoration. Hand lamps of pewter and glass were essentially simple, as were most of the smaller types other than patented lard lamps. Astral lamps at the beginning of the period usually reflected the rather severe classicism of the Greek Revival, bronze Ionic columns and square plinths having been favorite forms for their pedestals. After the introduction of the solar lamp the multiple-unit assembly principle led to increasingly incongruous combinations of mass-produced bases and supporting shafts. Globes for solar lamps became spheres of frosted glass, etched or engraved with Gothic arches and arabesques. The classic column gave way to cast-brass fantasies in pseudorococo, and the marble base was introduced to the lamp for a long association.

As early as 1833 the tendency of metal workers to outdo themselves in ornamental excess was already being felt. In the Eighth Exhi-

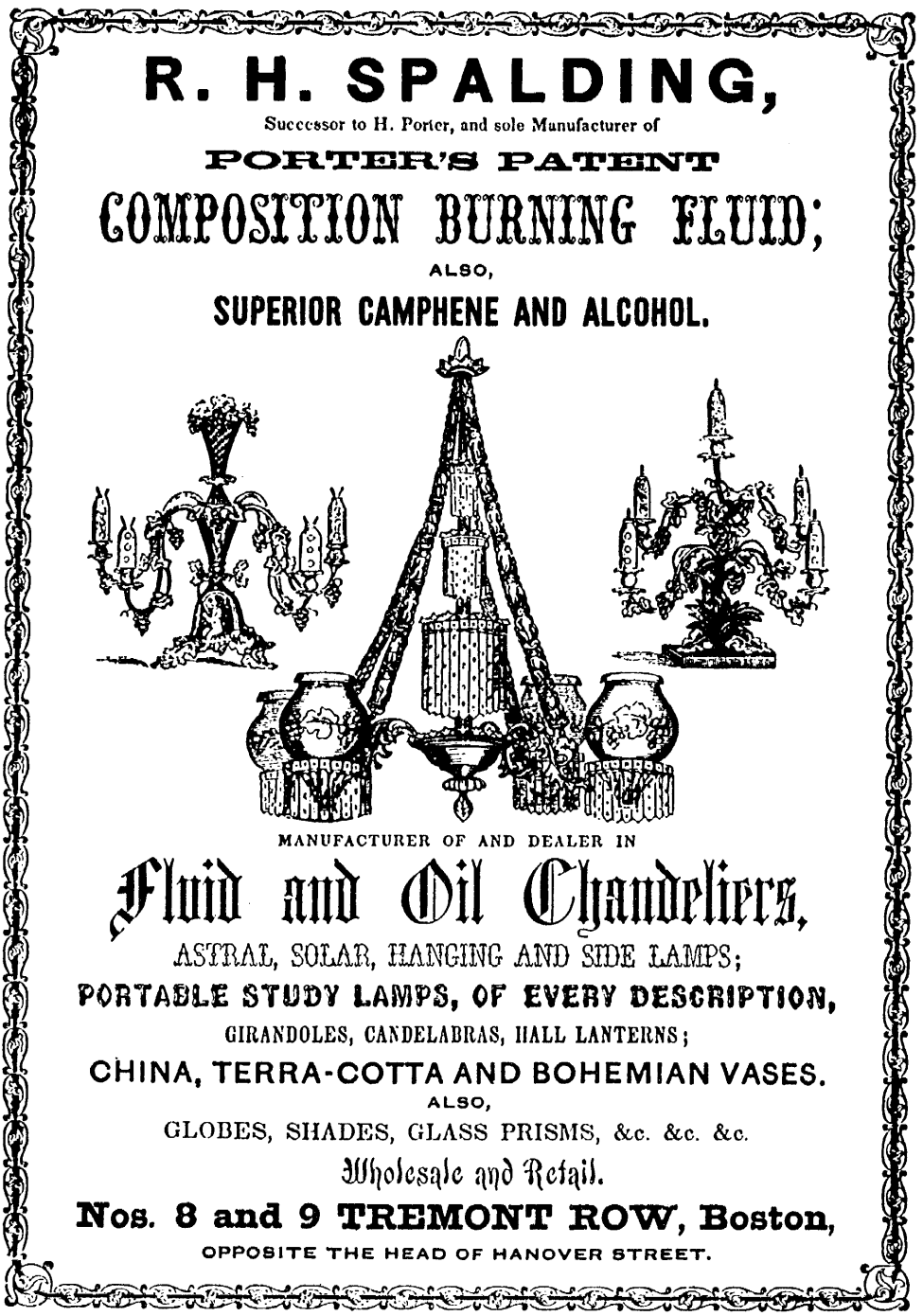


FIGURE 1.—Woodcut advertisement from the Illustrated American Biography, by A. D. Jones, vol. I, Boston, 1853.

bition of Domestic Manufacturers, sponsored by the Franklin Institute, the Committee of Judges on Lamps commented that in the mantel lamps of Cornelius & Company "the brass castings are graceful and durable, and exhibit a great richness of hue . . . The astral lamps of the same artists are remarkable for new, original, and delicate forms." The word "original" is here significant. In the same

report there is reference to an almost comic example of the outré: "The Committee were not less pleased with lamps of anthracite coal from the factory of J. W. and F. Kirk . . . The quantity of this article sold by the makers, indicates the public suffrage in its favour, and a confidence in its durability, which we were not prepared to expect" (1833, ser. 2, vol. 13, pp. 92–93).

In 1844, at the Thirteenth Exhibition, there was an increasing emphasis on fixtures such as "richly ornamented gas pendants in ormolu" and "silvered chandeliers and candelabra" (1844, ser. 3, vol. 6, p. 402). At about this time mantelpiece girandole candelabra were fashionable, and Starr & Co. of New York advertised a 3-unit set consisting of cast-brass human figures on marble bases supporting candle holders from which cut crystal drops were suspended.

The judges at the Thirteenth Exhibition gave due credit, however, to some of the simpler devices: "The humbler solar and lard lamps deserve more than the passing notice which they receive at the hands of the committee, and will, no doubt, serve to gratify the good taste, and aid the vision of a far greater number of our fellow citizens, than will the more showy and expensive chandeliers."

Like a tidal wave, however, a new discovery in lighting swept aside everything before it, both in form and function, at the close of the 1830–60 period. The coup de grace had actually fallen 6 years earlier, when Abraham Gesner of Williamsburg, N. Y., had patented his "new liquid hydrocarbon, which I denominate 'kerosene'." The blow was not then immediately felt, for Gesner's "kerosene" was regarded at first as merely another burning fluid. But the opening up of the Pennsylvania petroleum fields in 1859 marked the turning point by releasing an abundant source of cheap and superior fuel. Special burners were developed, and before a decade had passed the kerosene lamp, in dramatic fashion, had virtually displaced all its predecessors, except those that burned gas.

With the adoption of kerosene, as well as the increased urban use of gas, industrialism took command in the field of lighting, just as it did in so many phases of human activity. The period of 1830–60 had been one of transition between handicraft economy and mass production and distribution. It had been an era when the individual tinkerer applied his talents to inventing the mechanisms of a system which was soon to dispense with his services. Viewed from afar it appears today fresh and picturesque, with its tortuously conceived lard lamps being "teased" along in farmhouse kitchens and its naively "elegant" solar lamps symbolizing artistic progress in countless parlors. But it had been in fact an earth-shaking era, for it effected the final transition to a new material environment, not the least part of which was the conquering of darkness.

"What miraculous progress and improvement is visible on every side of the U. S.," Lady Emmeline Stuart Wortley had exclaimed. This expressed well the spirit of advance in the art of illumination, as well as of material progress in general. Every inventive step, however faltering or unguided, was in the direction of new techniques and discoveries. Every new embellishment in the decoration of lighting devices, however awful to modern eyes, represented progress in a growing estheticism. Thus the lamps of this era shone upon a stirring scene and were themselves symbols of the times, reflecting and illuminating a dynamic society.

BIBLIOGRAPHY

"A LADY" [SUSAN FENIMORE COOPER].
1851. Rural hours. New York.

ART JOURNAL, THE.
1851. The industry of all nations. Illustrated catalogue. London.

AYERS, CHARLES E.
1944. A brief history of railroad passenger car lighting. Rushlight, vol. 10, No. 4, pp. 55–57.

BENSON, ADOLPH P. (editor).
1924. America of the fifties: Letters of Frederika Bremer. London.

BOSTON DAILY SENTINEL AND GAZETTE.
1837. [Issue of September 25.]

BOSTON TRANSCRIPT.
1839. [Issue of November 27.]

BRYSON, FRANCES.
1950. From the days of iron lamps. Antiques Journ., vol. 6, No. 10, p. 26.

DAVIS, SAMUEL.
1934. Directions with Davis lard lamp. Rushlight, vol. 1, No. 2.

DICKENS, CHARLES.
1842. American notes. Leipzig.

EARLE, ALICE MORSE.
1898. Homelife in Colonial days. New York.

EATON, ALLEN H.
1937. Handicrafts of the southern highlands. New York.

FELTON, MRS.
1842. American life: A narrative of two years city and country residence in the U. S. London.

FORWARD, ALEXANDER.
1929. Gas supply in the United States. Encycl. Brit., 14th ed., vol. 10, pp. 49–50.

FRANKLIN INSTITUTE.
1830. Journal, ser. 2, vol. 6, p. 15.
1831. Ibid., vol. 7, pp. 75–76.
1833. Ibid., vol. 13, pp. 92–93.
1834. Ibid., vol. 14, p. 247.
1838. Ibid., vol. 24, p. 323.
1843. Ibid., ser. 3, vol. 5, p. 105 ff.
1844a. Ibid., vol. 6, p. 402.
1844b. Ibid., vol. 7, p. 252.
1847. Ibid., vol. 14, p. 410.

GLEASON'S DRAWING ROOM COMPANION.
1851. [Issue of July 7.]
HOHMAN, ELMO PAUL.
1928. The American whaleman. New York.
HOUGH, WALTER.
1928. Collection of heating and lighting utensils in the United States National Museum. U. S. Nat. Mus. Bull. 141.
HUBBARD, HOWARD G.
1935. A complete check list of household lights patented in the United States, 1792–1862.
KENDALL, JOHN S.
1932. The Connecticut and Passumpsic Rivers Railroad. Railway and Locomotive Hist. Soc. Bull. 49.
MACKAY, ALEXANDER.
1849. The western world, or travels in the U. S. in 1846–47. Ed. 2. London.
MARTINEAU, HARRIET.
1838. Restrospect of western travel. Vol. 1. New York.
MEASE, JAMES.
1804. The domestic encyclopaedia. 1st American ed.; with additions by A. F. M. Willich.
MERCER, HENRY C.
1898. Light and fire making. Doylestown, Pa.
OLMSTED, FREDERICK LAW.
1856. A journey in the seaboard slave States. New York.
1907. A journey in the back country in the winter of 1853–1854. Ed. 2, vol. 1. New York.
RAILROAD JUBILEE, THE.
1852. An account of the celebration commemorative of the opening of railroad communication between Boston and Canada. Boston.
RANDOLPH, VANCE.
1931. The Ozarks, an American survival of primitive society. New York.
WATKINS, C. MALCOLM.
1935. The whale-oil burner; its invention and development. Mag. Antiques, vol. 28, No. 4, pp. 148–149.
1936. A lamp dealer illustrates his wares. Mag. Antiques, vol. 35, No. 6, pp. 297–299.
WATKINS, LURA WOODSIDE.
1943. Development of gas lighting. Rushlight, vol. 9, No. 4, pp. 5–8.
WORTLEY, LADY EMMELINE STUART.
1851. Travels in the U. S. . . . during 1849 and 1850. New York.
WYANT, MAJ. L. B.
1840. The etiquette of nineteenth century lamps. (Quoting from Miss Leslie's Housebook.) Mag. Antiques, vol. 30, No. 3, pp. 113–117.

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