Published: July 20, 2005
Last Updated: November 16, 2012

LIGHTING EQUIPMENT AND HEATING FUEL

LIGHTING EQUIPMENT AND HEATING FUEL Before the widespread use of electricity in Iran, the main illuminants were vegetable oils and animal fat, in addition to wax and tallow candles, and to some lesser extent naphtha and, in Baku, natural gas. Vegetable oils and animal fat began slowly to be replaced by stearine candles by mid-1850 in the urban areas. Here naphtha was also being used (northern towns). It was replaced by kerosene as of the 1890s, and then became the most important urban household illuminant. In the rural areas, vegetable oils remained the most important lighting fuel to be slowly replaced by candles around 1900. It was only in the 1880s that in Tehran modern gasworks were introduced to provide limited (both in time and space) public and private lighting. The lighting situation in Afghanistan did not differ in essence from that in Persia.

Vegetable Oils. Probably the oldest form of lighting, other than that of a burning biomass fueled open fire is the use of vegetable oils. In Safavid Persia, in the rural areas, vegetable oils were almost exclusively used, whereas, in urban areas, the middle and wealthy classes used mainly vegetable oils and tallow, in addition to candles, while the poor used vegetable oils and tallow, in addition to naphtha. For this reason, the cultivation of oil seeds such as ricinus or *konjed*, *rowḡan-e bazrak* or *bazr* (linseed), *rowḡan-e konjed* (sesame), rape seed (*kaḥjak*), bastard saffron seed (*kafiše*), opium seed (*ḵašḵāš*), eruca sativa (*rowḡan-e tel*), sugar melon seed, cotton seed, and wild rocket seed-oil (*keh-*

kuj), and *badanjir* (a kind of castor oil) (Chardin IV, p. 85-87; Tournefort III, pp. 157, 173; Floor 2003a, pp. 523-25 [also for its other uses], pp. 523-32). If oilseeds supply was deficient people used unsalted butter as an illuminant (Blau, p. 65). Oils were produced in a *rowḡan-ḵāna* (oil-works) (for the oil-presssing technology involved see Mohebbi, pp. 161-70).

Tallow –wax stearine candles. The use of tallow and other forms of animal fat as a lighting fuel were as common as that of vegetable oil. Candles were already made in pre-Islamic Iran and generally were made of tallow (*šamʿ-e pihi*). People used different kinds of fatty materials such as tallow, suet and household cooking fat (Eskander Beg, tr. Savory, II, p. 1273). Visiting ambassadors received, as part of their daily needs, also tallow. In the royal palace in Safavid Persia, the *mašʿaldār-bāši* was in charge of all lighting materials, including torches, sheep fat, tallow, lamp oil, melted fat, and wicks (*Taḏkerat al-moluk*, tr. Minorsky, p. 68; Marcinkowski, pp. 199, 371). He was assisted by a number of subordinate officials such as the *čerāḡči-bāši* and the *šammāʾi-bāši* and the *majmaračі-bāši* (superintendent of perfumes) (Āṣef, p. 101). The custom to give tallow candles an aromatic odor such as with cinnamon oil (*rowḡan-e dārčin*) and clove oil (*rowḡan-e miḵak*) continued right down to the 20th century (Katirā'i, p. 300). The candle makers or *šammāʿ* used mainly tallow, but also wax or *mumiā* (Keyvani, p. 272).

There were large (3 pounds and more) and small candles, which were hand held, and served to light the way, for example, for individuals (Canby, p. 94, fig. 10). Candles became more popular in urban areas in the 19th century. The middle class in Qajar Persia used tallow candles, which, unlike those in Europe, were not made by casting of the wick (*palite*), but by pouring molten sheep tallow over the wick, which then became spindle-like in form, i.e. thin on top and thick towards the bottom (Polak 1865, vol. 1, p. 79). In rural areas various kinds of homemade tallow candles were used (Aitchison, pp. 32, 175). By the mid-19th century, tallow candles went out of fashion, also because tallow was not available in sufficient quantities and there were alternative uses for it. Furthermore, the rich and government officials had started to use stearine candles. These were mostly imported from Russia, and were known as *šamʿ-e kāfuri* or white wax candles, and as *šamʿ-e gači* or stearine candles (Blau, p. 146). Beeswax also was used in Persia to make candles (Polak 1876, p. 139).

The production of stearine candles began in Tehran in 1862 (Polak 1865, p. 184). By 1880, the new plant (*kārḵāna-ye šamʿ-risi*), went out of business and

only old-fashioned tallow candles continued to be produced in Persia. In 1892, a concession was granted to a Belgian group for the manufacturing of glass, pottery, paper and candles. The Belgian factory (*kārḵāna-ye šamʿ-e ferangi*) was erected on the site where currently the British embassy has been built. The candle factory was no success (Hedāyat III, p. 130).

Tallow candles continued to be made in Persia until well into the 20th century. Their production was dependent on how much meat was slaughtered in town. The suet or tallow (*pih*) was carefully removed by the butchers and set aside for the candle makers, and was sold at higher prices than meat. However, tallow candles had become of marginal importance by the 1880s (Wills, p. 299). Russia dominated the candle market (about 50%), followed in second place by the Netherlands, British-India and Belgium, depending how the market behaved (Gleadowe-Newcomen, p. 68; Küss p. 119). However, after the First World War, imports originated entirely from India. (Government of Great-Britain, Trade Report for 21 March 1922 to 20 March 1923, pp. 4, 19.)

Naphtha. Naphtha had been used as a lighting fuel since antiquity, though only in a very limited way. Herodotus (VI, 119) mentioned that the Persians used a bituminous black foul-smelling liquid, called *rhadinké*, or petroleum. The modern Persian term *naft*, like the Greek word *naphtha*, probably has been derived from the Akkadian *napṭu*. In Sumerian it is ‘mountain oil’ and distinct from ‘fish-oil’ and ‘vegetable-oil’. Akkadian literature distinguished between black and white naphtha, as did the Persians later (*The Assyrian Dictionary of the Oriental Institute of the University of Chicago*, Chicago, Ill., 1956), s.v. *napṭu*; Mohebbi, pp. 61-63). The *Ḥodud al-ʿālam* (tr. Minorsky, p. 145), a 10th-century text, mentions that naphtha from Baku was transported for use to Gilān. At that time, there also were naphtha sellers (*naffātun*) in Baghdad (Busse, p. 267, n. 2). In the 10th century, Abu Dolāf mentioned that the lease of the Baku oil wells yielded 1,000 *tumān*s per day, and that the lease of the white naphtha wells yielded the same amount (Abu Dolāf, ed. Minorsky, p. 35; see also idem 1958, pp. 27, 77, 151 (Gorgān, Arab.: Jurjān, is referred to as *belād al-naffāta*), 153; Baku as producing white naphtha and other kinds; see also idem, 1953, p. 65 (naphtha-throwers or *naffātun*); and Anonymous, n. 413, 543 (Baku), 596 (Fārs). The Baku naphtha resources continued to be mined, for Yāqut (Lexicon geographicum, cui itulus est: Lugduni Batavaroum, Apud E.J. Brill, 1852-64, p. 78) mentioned that in 1225 the daily revenue of a certain oil well was 1,000 *derham*s. Also, in the early-14th century, a dervish had dug and operated his own well to feed his family (Bāstāni-Pārizi, no. 4, p. 110). In the Safavid period,

this fuel had acquired an increased role as a household lighting fuel, in particular for the lower income classes. The lighting oil used in these torches was petroleum or naphtha that was collected at Baku. There were also production sites in Khuzistan (Ḵuzestān) and Turkmenistan (Chardin, p. 359-60; Hanway I, p. 383). Naphtha was used in particular along the Caspian littoral people (Villotte, p. 98). In the 19th century, naphtha also continued to be used as a lighting fuel, mainly in northern Persia (Kinneir, pp. 39, 360; Polak 1865, vol. 1, p. 79; Höltzer, p. 51; for the location of the oil wells as well as the other uses of oil see Floor, 2003a, pp. 112-85; idem, 2004).

Gas. Not only naphtha was used, but also the associated gas that was naturally produced by the naphtha wells. Between the 1720s and 1740s, in Baku, the inhabitants were observed to make a gully in the soil of about one half foot (3-4 inches) deep and drive a pipe of more than one-foot length into it. The escaping gas was lit with a straw cane. The resulting flame was used for lighting purposes as well as for cooking (Müller IV, p. 136, and VII, pp. 334-35; Lerch, p. 25). This use of gas for culinary purposes and as an illuminant was continued throughout the 19th century (De Freygang, pp. 182, 184).

Kerosene. After 1890, kerosene (*naft-e lāmp*, *naft-e safid,māzut*) became the most important lighting source in Persian homes until recent times (Government of Great Britain, *DCR* 2346, p 4). By 1890, petroleum import was a quasi-Russian monopoly. Since the use of kerosene had become more general in the early 1890s candles were in less demand, and the old vegetable oil and fat lamps also were gradually abandoned. In fact, Eʿtemād al-Salṭana (1843-96), with some exaggeration, wrote in 1886 that naphtha had replaced castor (*karčak*) oil and the stearine candle (*šamʿ-e gačin*) the suet-burners (*pih-suz*) (Eʿtemād al-Salṭana, p. 153.)

Coal. Although Minorsky (*Ḥodud al-ʿālam*, tr. Minorsky, p. 116) mentions, with regard to the 10th century, the occurrence of *čerāḡsang* or literally lamp-stone, which Minorsky translated as combustible schists, or a kind of coal. However, coal was used for heating only (see COAL). The lamp-stone probably was sal ammoniac that often combusted spontaneously and then looked like lamps during the night in the mountains during most of the year, but not during winter, when they were covered with snow (Mez, pp. 414-15).

Public Lighting. Until the arrival of public lighting those going about town after nightfall lighted their path with a lantern. This was not only necessary for one's own protection, because the roads were dangerous due to pot and other

holes, but having a light indicated to the night watch that one was good people (Orsolle, p. 223). Vegetable oil lamps were also used to illuminate the passageways of the bazaars as well as single shops, teahouses, and public-kitchens, a practice continued right into the 20th century (Brugsch I, p. 227, II, p. 195; Jackson, p. 109; Johnson, p. 185). Around 1860, Nāṣer al-Din Shah (r. 1848-96) had the road in front of his palace lighted up, in European fashion, with many lanterns, equipped with tallow candles (Eastwick I, p. 235). However, in 1866, the Dutch traveler Lycklama noted that there was no public lighting in Persian towns, which observation is at odds with the many other travelers, and must be ascribed to a problem of definition (Lycklama, vol. 2, pp. 107, 150, 355-56).

After Nāṣer al-Din Shah's second trip to Europe he wanted to introduce electricity and build a gasworks in Tehran. The new gasworks were operational as of 14 October 1881, illuminated some streets in the royal quarter by gas-spouts, which had been regularly aligned along the sidewalks. (Maḥbubi-Ardakāni,–III, pp. 382-83). It did not take long, however, before the gasworks went out of business. In 1892, a Belgian company installed gas pipes and meters in Tehran. By contract the company had to light at least 1,000 street lamps. High cost and the inferior quality of the coal to make gas made the entire undertaking very expensive and inefficient. As a result, the street remained moonlit as before (Lorini, p. 160). By the turn of the 20th century, the gasworks of Tehran were history. When Amin al-Żarb established his electric plant in Tehran in 1908, he bought the old gasworks to house his electric power plant. Some public electric lighting was also introduced in Tehran, though its service area was and remained rather limited (see BARQ i.).

Tinder matches. Before there were matches there was the tinderbox (*āteš-barq*), which consisted of the steel to get a spark from flint (*čakmak* or *sang-e āteš*). Cotton-wool was used as tinder (*fandak*). Matches (also known as *gugerd-e ferangi* or European sulfur) were introduced into Iran around 1830. Fraser in 1833 recounted that he "astonished the good folks [Guklān Turkmens near Astarābād] by the sight of some Promethean Lucifer matches" (Fraser, vol. 2, pp. 335, 340; Conolly, vol. 1, p. 312, had the same experience in Mashad, when he showed some "patent matches"). These early matches had only been invented in 1828. In 1856, one year after the invention of the safety match in 1855, these matches were for sale in Persia (Momtaḥen al-Dawla p. 41; Brugsch II, p. 127; Amanat, p. 242). Eʿtemād al-Salṭana in 1886 mentioned that European matches (*kebrit*) had totally replaced the previously used sulfur (*gugerd*). As

early as 1891, a match factory was started in Ḵarrāzin, near Tehran, but it failed due to the fact that is inferior products could not compete with Austrian and Swedish imports (Eʿtemād al-Salṭana, p. 153; Afżal al-Molk, pp. 159-60; Jamālzāda, p. 94; Floor 1984, table 5). The market for matches in Persia was dominated by Russia that slowly pushed out the early marketers, Austria and Sweden (for more details see Floor, 2003, pp. 179-81).

In Afghanistan, lighting fuels and lamps followed the same path as in Persia, both before and after the separation of the two countries in the second half of the 18th century. (Floor 2003, pp. 182-83). Even today the traditional vegetable oil lamps continue to be used in rural Afghanistan (US Government, p. 118.)

Lamps. Throughout the centuries, the main lighting vessel was the simple vegetable oil lamp (*čerāḡdān* or *pihsuz*) with a small reservoir for the fuel, and a wick. It used tallow or vegetable oil. They were either self-made of clay or of metal (D'Allemagne II, pp. 49-53; Gluck, p. 60.). The *šamʿdān* was widely used by the Persian elite, as evidenced by depictions in miniatures as well from remaining artifacts (Loukonine, nos. 98, 109, 122, 123, 145, [from here the next pictures referenced provide images of post-1500 *šamʿdān*s], 163, 203, 221). *Qandil* or lusters were mainly in use in mosques and other similar public buildings (Eastwick II, p. 227; Buckingham, pp. 244, 306). Torches or *mašʿal*s were quite heavy, because it consisted of a stout pole of wood, on top of which there was a fine iron grid, in which they put rags of old cloth, soaked in *naft* (Membré, p. 23). The Chinese lantern (*fānus-e kāḡaḏi*, *fānus-e šamʿi* or *fanār*), was a cylindrical lamp made of a pleated piece of waxed cloth, oiled muslin (which was called the shirt or *pirāhan*), or varnished paper held together by two copper plates on the top and the bottom. On top there was a hole in the copper plate to enable the carrier to adjust the candle (Morier, pp. 161-62, with a drawing of the lantern on p. 161). The *lāla* was a nickel-plated candlestick with a tulip-formed glass globe (Malcolm, p. 25). The *Čehelčerāḡ* or chandelier was already a feature in Safavid Iran. It was exclusively used by the rich (Fryer III, p. 15). The naphtha alternative to the *fānus* was the *čerāḡ-e bāḡdādi*, *fānus-e bāḡdādi* or *čerāḡ-e bādi*, which had a glass guard. It was used to illuminate the bazaars and was hung from the roof (Katirā'i, p. 300). The *čerāḡ-e muši* or the mousy lamp consisted of a metal container with a hole to insert the wick. These were used in public places (Šahri III, p. 91). The *lānter*, a word borrowed from French, was different from the *fānus* in that it was stuck on a stick, pole or wire and that it was usually of stationary use. Also, it had a glass shade with later a separate reservoir for the fuel (Küss, pt. 2, p. 11; for more

detailed information on lamps see Floor 2003b, pp. 163-78).

BIBLIOGRAPHY

Abu Dolāf Mesʿar b. al-Moḥalḥel, *Travels in Iran (circa A.D. 950). Arabic text and commentary*, ed. Vladimir Minorsky, Cairo, 1955.

Ḡolām-Ḥosayn Afżal al-Molk,, *Afżal al-tawāriḵ*, ed. Manṣura Etteḥādiya (Neẓām-Māfi) and Sirus Saʿdvandiān, Tehran, 1982.

J. E. T. Aitchison, "Notes on the Products of Western Afghanistan and of North-Eastern Persia," *Transactions of the Botanical Society* (Edinburgh) 18, 1890, pp. 1-228.

Abbas Amanat, ed., *Cities & Trade: Consul Abbott on the Economy and Society of Iran 1847-1866* London, 1983.

Anonymous, *ʿAjāʾeb al-donyā*, ed. L. P. Smirnova, Moscow, 1993.

Moḥammad-Hāšem Āṣef "Rostam al-Ḥokamā," *Rostam al-tawāriḵ*, ed. Moḥammad Moširi, Tehran, 1969.

Moḥammad-Ebrāhim Bāstāni-Pārizi, *Siyāsat wa eqteṣād-e ʿaṣr-e ṣafavi*, Tehran, 1978.

Otto Blau, *Commercielle Zustände Persiens*, Berlin, 1858.

H. Brugsch, *Die Reise der K.K. Gesandtschaft nach Persien 1861-1862*, 2 vols. Berlin, 1863.

J. S. Buckingham, *Travels in Assyria, Media and Persia* London, 1829.

Heribert Busse, *Chalif und Grosskönig. Die Buyiden im Iraq (945-1055),* Beirut, 1959.

Sheila R. Canby, ed. *Persian Masters – Five Centuries of Painting* Bombay, 1990.

Arthur Conolly, *Journey to the North of India*, 2 vols. London, 1834.

H. D'Allemagne, *Du Khorasan au pays de Bakhtyaris*, 4 vols. Paris, 1911.

Edward B. Eastwick, *Journal of a Diplomate's Three Years' Residence in Persia*, 2 vols. London, 1864; repr. Tehran, 1976.

Eʿtemād al-Salṭana, *Ketāb al-ma'a2t3er wa'l-āṯār*, Tehran, 1984.

Willem Floor, *Industrialization in Iran 1900-1941*, Occasional paper series 23, Durham, 1984.

Idem, *Agriculturein Qajar Iran*, Washington, D.C., 2003a.

Idem, *The Traditional Crafts of Qajar Iran* Costa Mesa, Calif., 2003b (esp. pp. 112-85).

Idem, *Public Health in Qajar Iran* Washington, D.C., 2004.

J. B. Fraser, *A Winter's Journey) from Constantinople to Tehran*, 2 vols. London 1838; repr. 1973.

Frederika von Freygang, *Letters from the Caucasus and Georgiato which are added, the Account of a Journey into Persia in 1812, and an abridged History of Persia since the Time of Nadir Shah*, London, 1823.

John Fryer, *A New Account of East India and Persia Being Nine Years' Travels, 1672-1681*, 3 vols. London, 1909-15.

A. H. Gleadowe-Newcomen, *Report of a Commercial Mission to Persia* Calcutta, 1904.

Jay Gluck, Sumi Hiramoto Gluck, and Carl J. Penton, *A Survey of Persian Handicraft: A Pictorial Introduction to the Contemporary Folk Arts and Art Crafts of Modern Iran*, Tehran and New York, 1977.

Government of Great Britain, *DCR* 2346 ("Trade and Commerce of the Persian Gulf for the Year 1898 London, 1899.

Ibid., Trade Report for Bushire, 21 March 1922 to 20 March 1923. Conditions Affecting Trade"), London, 1924.

Jonas Hanway, Jonas. *An Historical Account of the British Trade over the Caspian Sea*, 4 vols. in 3 London, 1753.

Mahdi-qoli Khan Mokāber al-Salṭana Hedāyat, *Gozāreš-e Irān*, Tehran, 1984.

Ernst Höltzer, *Persien vor 113 Jahren*, ed. Mohammad Assemi, Tehran, 1976.

A. V. Williams Jackson, *Persia Past and Present, a Book of Travel and Research* London, 1909.

Sayyed Moḥammad -ʿAli Jamālzāda, *Ganj-e šāyegān*, Berlin, 1916.

Lieut. Col. Johnson, *A Journey from India to England through Persia, Georgia, Russia, Poland and Prussia in the Year 1817*, London, 1818.

M. Katirā'i, *Az ḵešt tā ḵešt*, Tehran, 1969.

Mehdi Keyvani, *Artisans and Guild Life in the Later Safavid Period* Berlin, 1982.

John Macdonald Sir Kinneir, *A Geographical Memoir of the Persian Empire* London, 1813; repr. New York, 1973.

W. Küss, *Handelsratgeber für Persien* Berlin, 1911.

Johann Jacob Lerch, "Auszug aus dem Tagesbuch von einer Reise (...) von 1733 bis 1735 aus Moscau nach Astrachan, und in die auf der Westseite des caspischen Sees belegene Länder, gethan hat," in *Büschings Magazin* 3 (Hamburg, 1769), pp. 3-44.

E. Lorini, *La Persia economica contemporanea e sua questione monetaria* Rome, 1900; repr. Tehran, 1976.

Vladimir Loukonine, and Anatoli Ivanov, *Lost Treasures of Persia: Persian Art in the Hermitage Museum* Washington, D.C., 1996.

T. M. Lycklama à Nijeholt, *Voyage en Russie, au Caucase et en Perse*, 4 vols. Paris and Amsterdam, 1873.

Ḥosayn Maḥbubi-Ardakāni, *Tāriḵ-e moʾassasāt-e tamaddon-e jadid dar Irān*, 3 vols., Tehran, 1989.

N. Malcolm, *Five Years in a Persian Town* London, 1905.

Michele Membré, *Relazione*, ed. G. C. Scarcia, Rome, 1969; tr. by A. H. Morton as *Mission to the Lord Sophy of Persia (1539-1542)* London, 1993.

M. I. Marcinkowski, *Mīrzā Rafīʿā's Dastūr al-Mulūk. A Manual of Later Ṣafavid Adminstration. Annotated English Translation, Comments on the Offices and Services, and Facsimile of the Unique Persian Manuscript*, Kuala Lumpur, 2002.

A. Mez, *Die Renaissance des Islams*, Hildesheim, 1968.

Vladimir Minorsky, *Studies in Caucasian History* London, 1953.

Idem, *A History of Sharvan and Darband* Cambridge, 1958.

Parviz Mohebbi,. *Techniques et ressources en Iran du 7e au 19e siècle* Tehran, 1996.

Mehdi KhanMomtahen al-Dawla Šaqāqi, *Ḵāṭerāt-e Momtahen al-Dawla*. ed. Ḥosayn-qoli Khan Šaqāqi, Tehran, 1984.

James Morier, *A Second Journey through Persia, Armenia, and Asia Minor, between the Years 1810 and 1816* London, 1818.

G. F. Müller, *Sammlung russischer Geschichte*, 9 vols. St Petersburg, 1732-64.

E. Orsolle, *Le Caucase et la Perse* Paris, 1885.

J. E. Polak, *Persien, das Land und seine Bewohner*, 2 vols. Leipzig, 1865 (repr. Hildesheim and New York, 1976.

Idem "Beleuchtungsmateriale und Waschmittel," *Österreichische Monatschrift für den Orient* 12, 1876, pp. 138-39.

Jaʿfar Šahri, *Tāriḵ-e ejtemāʿi: Tehrān dar qarn-e sizdahom*, 6 vols., Tehran, 1989.

M. Tournefort, *Voyage into the Levant*, 3 vols. London, 1741 (esp. III, pp. 157, 173). US Government, *Handbook on Afghanistan* 5th ed., Washington, D.C., 1984.

Jacques Villotte, *Voyages d'un missionnaire de la Compagnie de Jesus en Turquie, en Perse, en Armenie* Paris, 1730.

C. J. Wills, *In the Land of the Lion and the Sun* London, 1893.

October 3, 2005