THE OIL WEAPONS

Ancient Oil Industries

by

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[The medieval Muslim oil age began with a tale of treason. To break the Arab siege of Constantinople in 680 CE, the Emperor Constantine IV ordered his high command to work with the defector from Damascus in strictest secrecy. In the end he succeeded in breaking the seven-year siege by using the Umayyad oil-weapon technology against them. By the early ninth century, the Abbasid caliph in Baghdad had appointed an "oil czar" (wali al-naft) in every major producing district. The kerosene lamps were in use in the Muslim world more than a thousand years before they became known in the West.

Several large oil pits were operating in Iraq and nearby areas in the eighth century. So vast and strategically important was the pit at Dir al-Qayyara (near Mosul, Iraq) that at one time it had to be guarded day and night. It provided not only crude oil but most of the bitumen used by the state to pave roads. In Europe, roads paved with anything but flagstones or cobbles were unknown until 1838, when asphalt was first laid on a street in Paris.

In 1167, Caliph Athid's vizier Shawar used 20,000 naphtha pots in Fustat to discourage the crusader king of Jerusalem, Amalric I, from taking Cairo. The naphtha pots had the strongest walls and the most aerodynamic designs. Their large scale deployment and the efficiency of operation indicated that the technicians manufacturing them had sophisticated knowledge not only of explosives and incendiaries, but also of soil sciences, ceramics, mechanics and at least the rudiments of aerodynamics.]

Sometime in the early years of the l5th century, an old man of Persian descent came to Makkah to perform the Hajj, the pilgrimage. His name was **Abu Tahir** al- Fayruzabadi, and he was one of the foremost scholars of his time. After spending most of his life traveling in the Mongol-devastated lands of the Middle East, soaking up what knowledge he could find in the remaining schools of Baghdad, Damascus and Jerusalem, Abu Tahir had only one ambition left: to write a lexicon of the Arabic language that would have no equal.

Makkah, the old man found, was just the place he had been longing for. Away from the turmoil and misery of his time, it offered him the tranquility he needed to fulfill his dream. Seven years later, he finished his monumental work, more of a condensed encyclopedia than a lexicon, titled ***Al-Qamus al-Muhit***, or *The All-Encompassing Dictionary*. To this day, it remains one of the best references ever written on the Arabic language and Arab culture.

Al-Qamus, it turns out, contains a remarkable section that deals with oil. Not only does Abu Tahir dwell on the origin and nuances of the word ***naft*** - then the Arabic word for natural naphtha, today meaning "petroleum" - but he elaborates: "**The best grade of naphtha is the water-white**. It is a good solvent, a diluent and an expectorant. Taken internally, it relieves cramps and aches of the belly, and, when applied topically, it can sooth skin rashes and infections....The word naffatah has three

meanings," he continues, "a naphtha well or fountain, a naphtha lamp used for lighting, or the brass instrument used to throw naphtha."

What Abu Tahir is telling us is not only that oil was known to his Muslim contemporaries, but that it was commonly sold as a medicine and as a fuel for lighting, and that it was used as an incendiary in what must have been a type of military flame-thrower. In fact, **we can legitimately infer from this passage all the elements of a thriving oil industry, in the modern sense of the term**, if on a medieval scale and powered by fire and by human and animal muscle rather than machines. Laborers evidently worked the oil wells, or *naffatah* to obtain the oil; cameleers and merchants transported and sold it in the cities as lighting fuel; craftsmen built lamps to burn the oil and weapons of brass or bronze to use in war; and pharmacists made an assortment of remedies from it.

But the most intriguing word of Abu Tahir's passage is his statement that **"water-white" naphtha** was the best kind, implying that there was another grade of inferior quality. Could "water-white naphtha" be the l5th-century Arabic term for kerosene or another light petroleum fraction, as opposed to the darker crude oil? If so, then **the Muslims of that era must have practiced some form of crude-oil refining**, and there must have been refiners and other associated technicians in this line of work.

Fortunately, we don't have to rely on guess-work to reconstitute the story of oil in medieval Islam. Many other Arab scholars before Abu Tahir had written in more detail on the subject, including physicians, historians, travelers, philosophers, military experts, alchemists and even poets. What might be called the Early Muslim Oil Age began more than 700 years before Abu Tahir's book, and it opened with a tale of defection and treason worthy of the best modem spy thrillers.

Sometime between the years 670 and 680, wrote the Byzantine historian **Theophanes**, roughly 40 years after Muslim armies added Syria to the growing Islamic state, a **discontented Umayyad subject from Damascus** sought refuge in Byzantium. Hardly anything is known about the identity of this man except what Theophanes wrote about the secret he gave the Byzantines, which may partly explain why his Byzantine name, **Kallinikos**, means "handsome winner." Kallinikos likely had served with the Muslim military, perhaps as a naval recruit in the service of the young Umayyad navy stationed in Antioch - now Antakya - in Turkey.

Kallinikos brought with him information that the Byzantine navy, then besieged by the Muslims, welcomed very warmly. He was, as we would say today, a petroleum consultant, and **he taught the Byzantines no less than a secret formula for a petroleum mixture that would burn even in water.** All the Byzantines had to do was to build on the bow of one of their ships a large siphon to squirt the liquid. The **Emperor Constantine IV**, Theophanes wrote, saw this as a chance to eliminate the Muslim threat to Constantinople. He ordered his high command to work with the defector in strictest secrecy.

In the seventh year of the siege, in 680, the fire of Kallinikos, later erroneously called "Greek fire," was used in naval combat in what became known as the Battle of Kyzikos. For the Muslim navy, the consequences were disastrous, Theophanes wrote. The entire flotilla, manned mostly by Syrians and Egyptians, was burned at sea. Theophanes put the losses at 30,000 men, although his figures are likely much overstated. In any case, the siege was broken, and the Muslims signed a 30-year truce. Thus, if we are to believe Theophaines - and there is little reason to doubt at least the general outline of his account - the oil weapon must have been an awesome invention, for the Muslim navy that suffered its lethal effects had only a few years before destroyed 500 Byzantine ships in a single battle.

There is no mention of oil, fire or Kallinikos in any surviving Muslim account of the battle. That Kallinikos Red Syria makes it more than likely that the secrets he took with him were already known to the Muslims, though as yet unadapted to their navy. By one account, however, when news of the debacle at Kyzikos reached **Caliph Mu'awiyah ibn Abi-Sufyan** in Damascus, he promptly sent word to his dockyards in Alexandria, home of some of the best shipbuilders in the Eastern Mediterranean, to equip his galleys with the **"firespouting devices"** of the Byzantines. This raises a historical question: Could Kallinikos have changed sides just as the Muslims were about to bring their own petroleum-based weapons to the battle scene? The answer lay not at sea, but in the heart of Arabia.

Shortly after the defeat at Kyzikos, Mu'awiyah lay dying, causing a crisis far more serious than the failure of his designs on Constantinople. He called **Yazid**, his son, and warned him that he must soon face **'Abd Allah ibn al-Zubayr** [ra],...who would surely contest Yazid's succession....In 683 the conflict began....[On the way to Makkah, the Umayyad commander Ibn 'Uqbah died of exhaustion a few kilometers outside Medinah]. Under a new commander, the Umayyad troops then embarked on a siege of Makkah.

Reluctant to enter the holy city, the Umayyads mounted a battery of their fire-hurling mangonels on a nearby hill and began a systematic bombardment that was to last nine weeks....Despite Umayyad efforts to spare the shrine [Ka'bah], a flaming projectile struck the Ka'bah midway through the siege. At first the *kiswah*, the black cloth covering the shrine [**Ka'bah**], caught fire, and then, as the heat became more intense, the Black Stone built into one corner of the Ka'bah split into three pieces....For another month, neither 'Abd Allah [ra] nor the Umayyads were willing to budge. Then...the Umayyad forces received word to withdraw immediately, for Yazid had died and the troops were needed in Damascus. Nine years later, another Umayyad army returned to the holy city with its mangonels, catapults and oil incendiaries. For more than half a year fires raged around the haram until 'Abd Allah [ra] was finally slain...

The extent of the use of petroleum-based weapons in the two campaigns against 'Abd Allah ibn al-Zubayr [ra], the first one only three years after Kaillinikos taught the secret of the new fire to the Byzantines, demonstrates that the Muslim forces in Syria had access to oil and could transport it and deploy it anywhere in their empire. But the Umayyad army, it turns out, was not alone among the Arabs to have used oil as early as the seventh century.

While fighting was raging at Makkah in the summer of 683, a physician named **Masarjawah** was busy in the city of Basra, in what is today southern Iraq, translating the first medical text ever put into Arabic. That this book was written at all was no small feat, for at that time, written Arabic as we know it today was in its infancy. But Basra was then the largest military camp in the Gulf area, and the Muslim commanders were eager for a manual with which to train their medics. Masarjawah, the most prominent physician in the city, was commissioned by agents of the caliph to work on the project. What resulted was ***Kitab Qiwa al-'Aqaqir***, or The Book of the Powers of Remedies, a collection of herbal recipes taken from a text originally written in Greek by an Egyptian priest and later translated into Syriac, the common language of many parts of the Middle East in pre-Islamic days. It was in this book that the term **"water-white naphtha"** was first used in Islamic medicine.

Masarjawah's book, much of which is now lost, was the first work in Arabic to teach the benefits of ingesting oil - naphtha - for fighting disease and infection. From that time onward, right up to the beginning of the present century, every other Muslim physician echoed, in more or less the same words, what Masarjawah wrote: "Warm naphtha, especially water-white naphtha, when ingested in small doses, is excellent for suppressing cough, for asthma, bladder discomfort, and arthritis."

How the Muslims obtained the oil is another story. In many areas of the Muslim world especially the lands that now comprise Kuwait, Iraq, Iran and the newly independent republic of Azerbaijan, Turkmenistan and Uzbekistan, oil upwellings and gas vents had been known since the beginning of time. The Mesopotamian peoples who built some of the first civilizations were also the first to describe crude oil oozing from natural wells. Akkadian clay tablets from about 2200 BC referred to crude oil as *naptu* - from which derives the root of the Arabic *naft* as well as the Greek *naphtha*, the Hebrew *nepht*, the old Persian *naptik*, and the modern Farsi *neft*. **In the modern era**, it was these same surface seepages that attracted Western oil prospectors to the region. **The first productive oil well in Iraq was sunk in 1927 at Baba Gurgur**, some 225 kilometers (140 miles) north of Baghdad, almost within view of a natural oil spring called "Eternal Fires" that had been burning continuously since at least 600 BC.

When the Muslim armies first arrived in Iraq and Persia around 640, they found hundreds of open oil pits. Arab records from the 10th century show that the province of Faris, in Persia, paid an annual tribute of 90 metric tons of oil to light the palace of the caliph. And an early Muslim historian, **Ibn Adam**, wrote that the Arab governors of northern Iraq refrained from taxing the oil- and mercury - producing industries in their districts as an incentive to boost production. Clearly the demand for oil was high.

Of these oil pits, the largest and most famous in medieval times were at **Jabal Barama** [Burmah], east of the Tigris in the north of Iraq, and the well of **Dir al-Qayyara** near Mosul. The caliph leased this latter well to private entrepreneurs, we are told, and derived thousands of dirhams of annual revenue from them. So vast and strategically important was the pit at Dir al-Qayyara that at one time it had to be guarded day and night; it provided not only crude oil but most of the bitumen used by the state to pave roads. In the early 13th century, the **geographer Yaqut** described how **"asphalt"** was made from this pit:

> There are workers who collect [Bitumen] from the spring in woven reed baskets and pour it over the ground. They also have large iron kettles placed over cauldrons which they load with known proportions of bitumen, water and sand. They then light the cauldrons and heat the mixture until the bitumen melts and mixes with the sand while the workers are continually stirring it. When the stirred mixture reaches the right consistency it is poured over the ground as pavement. People visit this site on outings and to drink the water that comes out with the bitumen. They also bathe in the water, for it is as good in clearing pustules and other diseases as public baths and other remedies. This spring is under guard at all times.

The heated cauldrons and constant stirring of the medieval roadworkers were in fact not fundamentally different from today's more mechanized methods. Yet in Europe, roads paved with anything but flagstones or cobbles were unknown until 1838, when asphalt was first laid on a street in Paris.

By the early ninth century, the strategic and economic importance of oil led the Abbasid caliph in Baghdad to appoint what we might today call an **"oil czar"** in every major producing district. The **wali al-naft**, as he was called, acted as the eyes, ears and, above all, the tax-collecting arm of the caliph in the lucrative oil works. An excerpt from a poem addressed to such a wali by a disillusioned friend reads:

> You, where is your modesty?
> As if you'd been given the throne itself!

If by guarding the stinking wells
You have gained such aloofness,
How would you behave if instead
You were guarding amber and musk?

Two developments around the year 850 increased the power of the oil czars. The first was the increased demand from a new fighting corps established in the regular Abbasid army called the **naffatun**, or naphtha troops. The second was the introduction of refined lamp oil, or kerosene, manufactured from crude oil by distillation. This was what the Muslims called white naphtha, or *naft abyad*. It was made then much as it is today, except that instead of high- volume, continuous-process distillation towers, the medieval Arabs used an apparatus called **al-inbiq**, batch-process still whose name we have taken into English as alembic.

Essentially, the alembic consisted of three parts: a gourd-shaped lower flask called the cucurbit in which the crude oil was heated; a cooled, spouted condenser that sat atop the cucurbit and received the vapors that rose from the oil; and a receiver at the end of the condenser's spout in which the clear distillate was collected.

In Abbasid times, every school of chemists had its own variation of the alembic. Some were made of blown glass like today's labware, others were made of ceramic, copper or brass. Some were built for laboratory use, while others were much larger and might properly be called industrial stills. The Syrian naturalist **al- Dimashqi** wrote that in the early 13th century there was a quarter of Damascus known as ***Suq al-Qattarine***, the distillers market.

The first Muslim scholar to write about the distillation of petroleum was the Persian-born Muhammad **al-Razi (Rhazes)**, who spent most of his adult life in the late ninth century as a physi- cian and chemist in Baghdad. In his **Kitab al- Asrar**, or Book of secrets, he mentions the use of naffatah, or kerosene lamps, for heating and lighting, establishing that such devices were in existence in the Muslim world more than a thousand years before they became known in the West. He gives **two methods** for making kerosene, one using clay as an absorbent and another using sal ammoniac (ammonium chloride). The distillation is to be repeated until the distillate is perfectly clear and "safe to light," meaning that the volatile hydrocarbon fractions had been substantially removed.

Distillation made possible the use of kerosene throughout the entire Middle East, bringing it to such places as Palestine, Yemen, the Hadhramut and Egypt, none of which had any surface deposits of oil to speak off, but all of which had substantial deposits of either oil shale or bitumen. With either of these substances, a reasonably good grade of kerosene could be obtained by first extracting the oil by heating the rock, and then distilling the oil in the alembic. Speaking of the shale found around the Dead Sea basin, al-Dimashqi wrote: "The so-called 'stone of Moses's tomb' (may God bless his soul), found east of Jerusalem, releases naphtha when it is broken to pieces and then distilled in the alembic in the same manner as rose-water. When you light this rock it burns like wood."

As knowledge of oil grew, so did further refinements of its military applications. With the systematic exploitation of the large pits, enough oil was obtained to burn down both Baghdad and Cairo, two of the region's largest cities, in catastrophes that far surpassed the siege of Makkah.

Baghdad in the year 800 was the undisputed capital of the Muslim state and the seat of Harun al-Rashid, one of the most powerful rulers of his time. The city's position on the west bank of the Tigris put it in contact with all parts of the then-charted world. One-third of the city's area was occupied by the Golden Gate, the royal palace, and the rest of it included, in addition to the

dwellings of more than one million inhabitants, hospitals, paper mills, a postal headquarters, a military academy and several institutes of higher learning. However, by 813 the royal palace was gone, and much of the city lay in ruins.

Between 809 and 813 Iraq and Persia engaged in a civil war that pitted two of Harun al-Rashid's sons, **Amin and Ma'mun**, against each other. After two battles in Persia, in which Amin's forces were crushed, Ma'mun hoped to trap his brother in Baghdad. He had one of his commanders, a Turk named Tahir, march on the city from the west, while Ma'mun attacked it from the north and east. Tahir was determined to take the city even at the cost of its total destruction. He had his naphtha troops, equipped with hundreds of mangonels, bombard a section of the city called **Harbiyyah** with barrels of burning naptha. The resulting fires eventually engulfed the rest of Baghdad, causing its residents to flee. So total was the destruction that it was not until six years later, in 819, that Ma'mun, who had succeeded his father, reentered the city and began its reconstruction.

Cairo's turn came three centuries later, in the thick of the crusades. By that time, petroleum-based weapons had reached further levels of sophistication. In 1167, the crusader king of Jerusalem, **Amalric I**, decided that the time had come for the Christians to make a final attempt to annex Egypt to their holdings in the Levant. He had already crossed the Sinai on four previous occasions to intrude on the crumbling Fatimid regime. This time, however, his own crown was at stake, threatened by the Syrian Atabegs, who had vowed to evict the crusaders from the lands of Islam. A victory in Egypt would provide the resources to resist Syria.

At the head of an army of several thousand, Amalric crossed the Negev and Sinai deserts and arrived at **Bilbeis**, northeast of Cairo, which he sacked after slaughtering nearly all its inhabitants. He then set up camp just south of **Fustat**, or Old Cairo, and sent word to the Egyptian **caliph 'Athid**, then only 18 years old, to quit the city or face the fate of Bilbeis. But 'Athid was upstaged by his vizier, Shawar, who not only had his eyes on 'Athid's throne, but who had also, years ago, been allied with Amalric and betrayed by him. In revenge, **Shawar** swore to deny Amalric the satisfaction of capturing the city intact. "Instead of Fustat," he is said to have shouted, "they will get a mound of rubble!"

The horrors of the ensuing days were recorded vividly by the Egyptian historian al-Maqrizi:

> Shawar ordered that Fustat be evacuated. He forced [the citizens] to leave their money and property behind and flee for their lives with their children. In the panic and chaos of the exodus, the fleeing crowd looked like a massive army of ghosts.... Some took refuge in the mosques and bathhouses...awaiting a Christian onslaught similar to the one in Bilbeis. Shawar sent 20,000 naphtha pots and 10,000 lighting bombs [**mish'al**] and distributed them throughout the city. Flames and smoke engulfed the city and rose to the sky in a terrifying scene. The blaze raged for 54 days....

That the whole city could be set alight with "naphtha pots" on relatively short notice is an indication that during the era of the Crusades oil was readily available in military warehouses and that, in Cairo at least, it was available in large quantities. The oil in Cairo may have been imported from Iraq, Persia or the Caucasus, but most likely it was brought from the wells of **Jabal Tar** on the southwestern edge of the Sinai, a seepage which had been exploited since Roman times. Of it, an Arab writer of the l0th century wrote, "There exists one variety of naphtha known there as 'oil of the mountain' and its finest is the kind that is pure, transparent white, and volatile."

Nothing in the writings of Egyptian historians about the burning of Cairo gives clues as to what exactly these "naphtha pots" were. It was not until **1916** that two archeologists, Ali Bey Bahjat, director of the Cairo Museum, and Albert Gabriel, a Frenchman, unraveled a mystery that tells a

little-known story of Muslim technology at a time when Islam was threatened simultaneously by the crusaders and the Mongols. The two men set out to excavate in the rubble of Old Cairo in search of the peculiar broken clay pots, resembling hand grenades, that Egyptian "night diggers" occasionally sold to Western visitors. Years before, in fact, Gabriel himself had purchased one from a street peddler. He had taken it back to France for examination and concluded that it might well be one of those pots used to burn the medieval city. By 1916, Bahjat and Gabriel had gathered dozens of nearly intact "naphtha pots" of different types, and fragments of hundreds more. Indeed, the pieces had been found throughout the old city, lending support to Maqrizi's account of the tragic events of 1167.

In the 1940's, the pots caught the attention of yet another French scientist, **Maurice Mercier**. He noticed that those that had the strongest walls and the most aerodynamic designs often had their tops broken off, while the rest of the body was intact. Only a powerful internal explosion, he reasoned, could have caused such clean, sharp fractures. He had a number of the pots carefully examined and discovered that they contained traces of nitrates and sulfur, essential ingredients of gunpowder. Apparently the several varieties of "naphtha pots" used to destroy Old Cairo, many now on display in the Cairo Museum and the Louvre, were each something between a Molotov cocktail and a crude hand grenade, filled with a volatile jelly of kerosene, nitrates and sulfur.

Clearly, the makers of the firebombs were technicians with a sophisticated knowledge not only of explosives and incendiaries, but also of soil sciences and ceramics. They must have known which clay to use with which kind of bomb and to what extent to harden and glaze it. And because these bombs were thrown not only by hand but also by mangonel, their makers must also have known mechanics and at least the rudiments of aerodynamics.

These discoveries shed further light on a unique Arab manuscript brought to the **Bibliotheque Nationale** in Paris in the mid-19th century and titled ***The Book of Horsemanship and the Art of War***. Written in 1285 by Najm al-Din Ahdab, a Syrian officer, the book is packed with information on how to distill oil to make kerosene; how to prepare explosives from gunpowder; how to fit the multiple fuses into the various kinds of "naphtha pots"; and even how to build "flying fire"- rockets! The author includes sketches of the weapons he mentions, and one is indeed a crude missile armed with a "naphtha pot."

That petroleum was indeed known and widely used in the early Muslim world, as the author of *The All-Encompassing Dictionary* tells us, cannot be doubted. In fact, we may say that the most important period in the history of oil prior to our own age, the age of the internal-combustion engine, unfolded during the flowering of the Muslim civilizations that some have called "Islam's Renaissance." ....this was true not only in the Arabic-speaking Middle East, but in **Muslim Central Asia and the Caucasus** as well.

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Muslims and the Oil Industries (7th - 19th Century)

The Land of the Naphtha Fountain
Ancient Arabs and the Oil
Quotations From Famous Historians of Science
The Arab Roots of European Medicine
Muslim Scientists and Islamic Civilization
Biography of Prophet Muhammad (pbuh)

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