The Secret Life of the Paris Obelisk

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It is well known that during the nineteenth century three great obelisks left Egypt bound for Paris, London, and New York. Their stories have been celebrated in books and articles, but for a variety of reasons the history of the Paris obelisk is not as well known as the other two, nor have the important innovations used in its transport been recognized. One reason why the Paris obelisk has not received its due is the lack of newspaper coverage. The transportation of both the London and New York obelisks were trumpeted in the *Illustrated London News*, *The Graphic*, and other popular periodicals, so everyone was aware of practically every movement of these obelisks. The Paris obelisk, however, was moved (1831-6) prior to the era of the great, illustrated newspapers, so the public was not nearly so involved.

In addition, both the London and New York obelisks generated longer accounts of their transportation that were more readily available to the public, which the Paris obelisk did not. Henry Gorringe, who moved the New York obelisk, quickly brought out his account,[1] which was soon followed by a British edition.[2] This in turn was followed by Moldenke's popular account,[3] so the story of the New York obelisk was well known. Similarly, in London, there was James King's quick popular publication that popularized their obelisk's journey.[4] Indeed, there was such interest in the London obelisk that Albert Hartman composed and published *Cleopatra's Needle Waltz* and dedicated it to Erasmus Wilson, who had paid to bring London its obelisk. The situation was quite different with regard to the Paris obelisk.

Unlike the London and New York obelisks, which were moved relatively rapidly, it took four years to bring the obelisk to Paris and erect it, with years-long delays of inactivity. Twice Apollinaire Lebas, the engineer entrusted with moving the obelisk, had to wait for the Nile to rise before he could move his ship. Then, when the obelisk finally arrived in Paris it waited more than a year while the pedestal was being designed

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[1] Henry Honeychurch Gorringe, *Egyptian Obelisks* (New York: H. H. Gorringe, 1882).

[2] Henry Honeychurch Gorringe, *Egyptian Obelisks* (London: John C. Nimmo, 1885).

[3] Charles E. Moldenke, *The New York Obelisk* (New York: Anson D. F. Randolf and Co., 1891).

[4] James King, *Cleopatra's Needle* (London: Religious Tract Society, 1880).

and quarried and a final site decided upon. Consequently, the moving of the Paris obelisk lacked the intensity and drama of the rapid movement of the other two obelisks.

The primary account of the moving of the Paris obelisk is still Appolinaire Lebas' *L'Obelisque de Luxor* which was published several years after the obelisk was erected.[5] Without a commercial publisher to distribute it, it had a small press run and today is considered a rare book and has never been translated. Even more rare is the account of Captain Leon De Joannis who commanded the *Luxor* when it carried the obelisk to Paris.[6] De Joannis mainly discusses the navigation of his ship, the *Luxor*, and provides little details about the engineering that went into lowering and erecting the obelisk. His work also was never translated.

For all the reasons above, the innovative and remarkable engineering that went into the transportation of the Paris obelisk have never been fully appreciated. To see why the moving of the Paris obelisk was so groundbreaking, we should briefly look at earlier attempts to move obelisks, so we will have a comparison.

The first to move and erect large obelisks were, of course, the ancient Egyptians. They left no accounts of how they achieved this; the closest we have are the reliefs on the lower level of Hatshepsut's mortuary temple at Deir el-Bahari. These reliefs tell us nothing about erecting the obelisks, merely that they were placed end-to-end on a barge and towed to their final destination. The important thing to note is that the Egyptians achieved their goals with strikingly simple technology; with only ropes, inclined planes, and rollers, they moved monoliths weighing 350 tons and balanced them on their pedestals, all without pulleys or winches.

Next to move obelisks were the Romans, who transported more than two dozen large obelisks to Rome. Today there are thirteen standing, but more remain buried beneath the streets. Like the Egyptians, the Romans left no records of how they erected their obelisks, but we do know that they were familiar with several mechanical devices unknown to the Egyptians such as the pulley, derrick, and winch. Another difference between the Egyptian and Roman methods is that when the Egyptians erected their obelisks, they merely balanced them on their pedestals. It seems as though the Romans did not have faith in this method and when they placed the obelisks on their pedestals

[5] Appolinaire Lebas, *L'Obelisque de Luxor* (Paris: Libraires des Corps de Ponts et Chaussees et des Mines, 1839).

[6] Leon De Joannis, *Campagne du Luxor* (Paris: Huzard, 1835).

they used a variety of metal devices to pin and affix the corners of the obelisks to the pedestals.

After the Romans, no one attempted to move an obelisk for more than a thousand years, and over the centuries, knowledge of how to move and erect an obelisk had been lost. Although the Romans moved dozens, the "how to" was lost during the "Dark and Middle Ages". By the time of the Renaissance, moving an obelisk was a daunting project.

Almost all the obelisks erected by the Romans were pulled down as "pagan monuments" by zealous Christians during the Middle Ages. Only the obelisk now known as the Vatican Obelisk, was permitted to remain standing in its original position in the Circus of Caligula because it witnessed the martyrdom of St. Peter when he was crucified. A basilica for St. Peter was constructed in the shadow of the obelisk, and that obelisk remained on its pedestal for more than a thousand years.

Near the end of the 16th century, when the new St. Peter's was being built, Pope Gregory XIII decided that the obelisk should be moved to the new basilica, but how to move it was far from clear. Michelangelo was asked if he would plan and supervise the move, but declined saying, "And what if it breaks?" One brave engineer who wanted the job was Camillo Agrippa, who in 1583 published *Trattato di Camillo Agrippa Milanese di Transportar la Guglia in su la Piazza di San Pietro,* which described his plan for moving the obelisk. His idea was to build a giant scaffold to support the obelisk as it was raised off its pedestal by massive levers. Then, while suspended vertically on the scaffold, the obelisk would be moved on rollers to its new location. Agrippa included an engraving of his scaffold, and this may be the reason he didn't get the contract. The scaffold as designed simply would not have been able to support the enormous weight of the obelisk. As William Parsons put it in his wonderful book, *Engineers and Engineering in the Renaissance,* any one could see that "the main timbers were unsupported at any point in their entire length, that there was no diagonal bracing and that the design was lacking every essential of sound engineering principles."[7]

In 1585 the new pope, Sixtus V, formed a committee of four cardinals, a bishop, and city council members to select an architect to move the obelisk. Applicants for the job submitted their plans and in September of 1585 architects and engineers came to

[7] William Parsons, *Engineers and Engineering in the Renaissance* (Cambridge Mass: MIT Press, 1968), 156.

Rome from as far away as Greece with plans ranging from the brilliant to the ridiculous. Many did not want to lower the obelisk to the horizontal, fearing it would break, so like Agrippa they suggested it be moved while vertical. In the end, Domenico Fontana was selected. Fontana came from a family of architects and was forty-two at the time he was selected. He would be the first man in more than 1,500 years to move an obelisk and many were not sure he would succeed.

Fontana's moving of the Vatican Obelisk has frequently been trumpeted as one of the great engineering achievements of the Renaissance, and I have often wondered, why that was the case. Didn't the Egyptian do the same thing and without winches and pulleys? And what about the Romans? They did it dozens of times, centuries before the Renaissance. Because Fontana was the first in more than a millennium to move an obelisk, he may have been reinventing techniques used by the Romans, but didn't know it. It is certainly true Fontana was a great organizer who carried out the operation with military precision, but this may not equate to great engineering.

There is, however, one surprising innovation that Fontana introduced to the enterprise of moving an obelisk that is related to engineering. He may have been the first to calculate the weight of the object he was moving. This is not an insignificant contribution.

The problem with calculating the weight of an obelisk is its geometry. The obelisk is not a regular or Platonic solid. Its sides are not rectangles with right angles at the corners. It tapers towards the top and the pinnacle is a pyramidion. An obelisk is highly irregular. To overcome these problems, Fontana first measured the obelisk's base and found that it measured slightly more than twelve palms – about nine feet square. At the top it tapered to a six-foot square. From the top of the obelisk he dropped a plumb bob to get an accurate length of the rectangular shaft – eighty feet. He now knew he was dealing with a shaft of granite eighty feet in length, six feet wide at the top and nine at the bottom. He next had his stonemasons cut a block of granite of one cubic palm and weighed it. Now it remained to calculate how many cubic palms were in the obelisk, and this is where his mathematical ingenuity came in.

Fontana began by imagining a rectangle the size of the smaller cross section extending downward inside the obelisk. The regular internal parallelogram that this thought experiment circumscribed was easily determined to be 7,024 cubic palms. The difficult part was calculating the cubic palms that remained in the rest of the obelisk that surrounded the internal rectangular column. Fontana realized that if he took one wedge-shaped side outside the internal shaft and rotated it 180 degrees and then placed in on top of one of the other sides (imagine stacking wedges) he would have a small regular rectangular shaft. If you do this with the two remaining sides, you can calculate the number of cubic palms in the irregular pieces. Next Fontana approximated the cubic palms in the pyramidion at the top of the obelisk and added all the cubic palms together (rectangular internal shaft + four wedge-shaped sides + pyramidion), multiplied by eighty-six pounds (the weight of the sample cubic palm he had cut) and came to a total weight of 963,587 pounds, which in modern units is 337,255 tons – just about right. Fontana's calculation of the weight of the obelisk is an important contribution to the moving of obelisks, but we should point out that Fontana was not inventing the technique, but rather applying it to an engineering problem. He realized that it would be good to know the weight of the object he was moving.

About a century after Fontana moved the Vatican Obelisk, Leibniz and Newton somewhat independently invented the calculus. While their work does not directly impact on the moving of obelisks, it championed the idea of quantifying functions that previously had been mere estimations. This gave great impetus to engineering in the 18th century. Now things that had been left to trial and error were being calculated. Concerns such as coefficients of friction and tensile strength entered the picture before the project was attempted. To some extent, the element of drama was removed from projects, but that is just what the engineer wanted. With careful calculations one could be reasonably sure of success. It is with this attitude that Apollinaire Lebas approached the project of bringing France her obelisk.

A few years before Lebas became involved in moving the Luxor obelisk, France had actually been given three obelisks. Mohamed Ali Pasha, eager to gain favor with European powers, was quite happy to give away obelisks. Consequently, in 1829 he agreed to give France both obelisks at Luxor Temple and the standing obelisk at Alexandria. Soon after the gift of the three obelisks, France began designing and then building a special ship to transport the two Luxor obelisks. Named *Luxor*, the ship had unique specifications. Because of the shape and density of its cargo, the usual length-to-width ratio was not possible. Also, the *Luxor*, in addition to being sea worthy, had to be capable of sailing on shallow rivers (the Nile and Seine) and it also had to be narrow and low enough to pass under the bridges of the Seine. Further, it had to be able to land on a beach to permit the obelisk to be loaded into its hull. It was a very special ship.

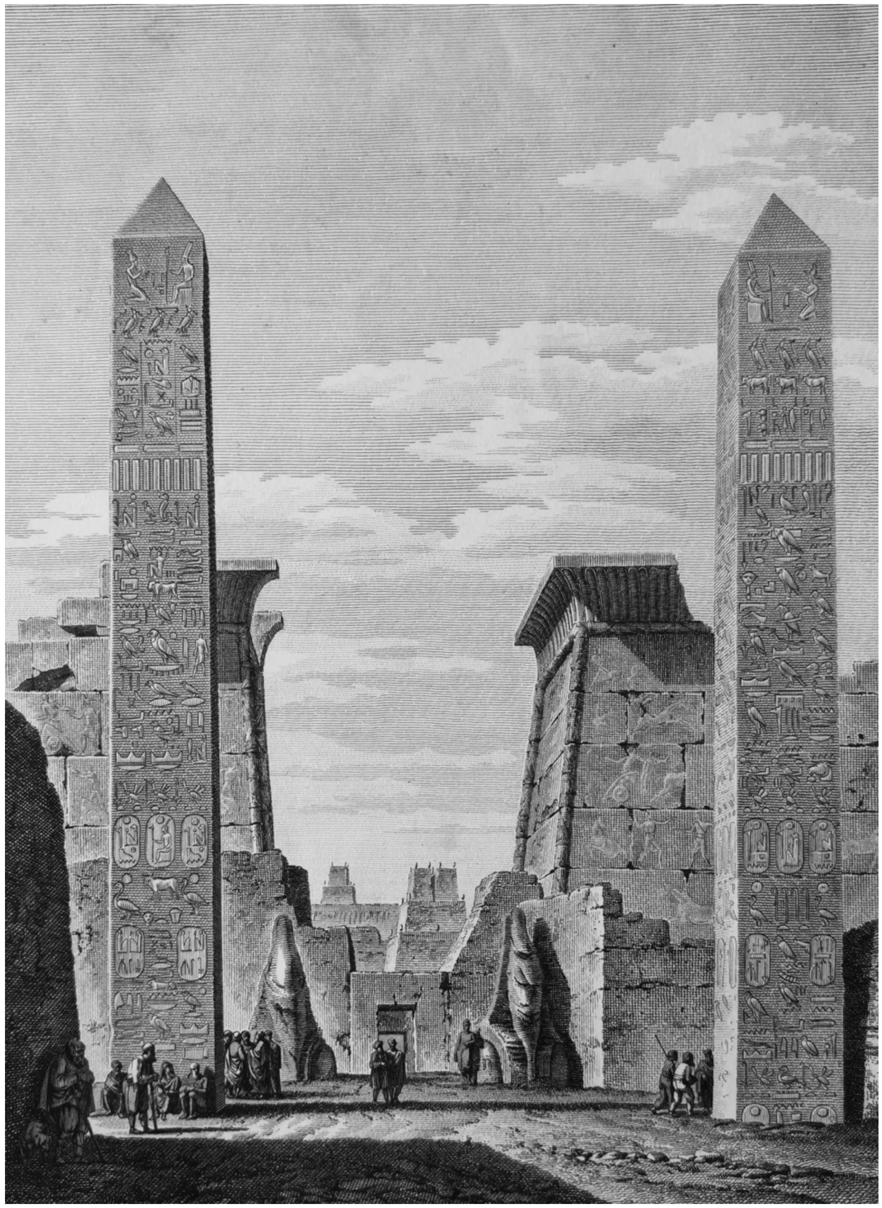

Figure 1: Luxor Temple circa 1798 with both obelisks. Champollion suggested taking the one on the right because the one on the left was cracked.

As the *Luxor* was being constructed, the French sent another ship, the *Dromadaire* to bring back the obelisk standing on the Alexandrian coast. This was not a specially constructed ship and could not sail up the Nile, so the only obelisk it could return with was the one standing at Alexandria. In their hurry to retrieve an obelisk, the French had not realized that timber was not readily available in Egypt. When *Dromadaire* arrived at Alexandria, the French discovered that there was not enough wood for the scaffolding needed to take down a standing obelisk. Consequently, the *Dromadaire* returned to France with its hold empty. Now French hopes for an obelisk rested on the *Luxor,* which on April 15 1831 sailed from Toulon for Egypt, just as Bonaparte had done three decades earlier.

When the *Luxor* arrived at Alexandria, it was unable to go up the Nile because of unfavorable winds. The Nile flows from south to north, so to go south the *Luxor* needed the north wind. Because it looked as if it could be quite a while before the winds were favorable, Lebas decided to transfer his equipment from the *Luxor* to smaller boats called "djermes" that could tack into the wind. On June 19th 1831 Lebas headed south for his meeting with the obelisk he was to bring back to France. On his way south, he visited the pyramids and was greatly impressed by the organizational skills that must have been necessary to complete such a vast project successfully.

The trip south took more than a month, with harrowing weather, several stops along the way to pay courtesy calls on various Ottoman officials, and a visit to Denderah Temple. When his boats finally docked at Luxor Temple, Lebas went immediately to examine the obelisk.

Over the course of the four years that it would take Lebas to lower, transport and then erect the obelisk, he experienced several setbacks. None affected him more than the one he received when he first encountered the obelisk. It was cracked! Lebas had been instructed to take the western obelisk – the one closer to the Nile – because the eastern one was cracked (figure 1). This information came from no less an authority than the great Champollion, Lebas' hero. Champollion had said nothing about a crack in the western obelisk. Lebas was stunned. He later said:

> I returned to the boat, tired, deep in thought, embarrassed at having examined nothing, not even the road we followed to return on board. I was walking like a drunken man, incessantly repeating, there was a crack that not a single book on Egypt had mentioned. A thousand contradictory thoughts assailed me at once, full of turmoil and agitation. I was at the same time in Toulon, Paris, and Thebes. The thought alone that one could accuse me of shattering the obelisk while taking it down from its base, or while taking it on board, was absorbing all my faculties.[8]

[8] Lebas, *L'Obelisque*, 45-6, author's translation.

It took a day for Lebas to recover from his shock. When the crack was discovered, the Italian stonemason on the team began tapping the east side of the obelisk with his hammer to hear the sound it emitted. What he heard was reassuring. His conclusion was that the obelisk was "cracked but not broken". If it were lowered slowly and gently, it could be moved. It took a while for Lebas to fully understand this, but when he did, his spirits rose and he was once again ready for action.

When Lebas returned to the site, he realized that there was lots to be done that he had not anticipated. For one thing, there was a small village of huts around the obelisk, blocking its path to the Nile. The houses had to be bought and torn down and then thousands of years of debris upon which the village had been built had to be removed and the path graded. Lebas was also extremely concerned about the apparatus he was going to build to lower the obelisk, and it is here that his great contribution to moving obelisks begins. He says,

> I thus had to write down a new plan to adjust the procedure to the new circumstances to carefully combine all the parts of the apparatus that because of the nature of its function one could fear to see destroyed instantaneously by the rupture of one of its parts. One had then to decide definitively the givens of the problem, deduce from it the equations, trace exact measurements, and submit the whole to the rigorous test of calculations to guarantee results.[9]

For the first time in the long history of obelisk moving, the forces on the obelisk and the machinery that was going to be moving it would be quantified. This was a great step forward and Lebas was aware of its significance. He added an appendix to his book on how he moved the Paris obelisk and in it gave all the equations that future obelisk movers would require.

Lebas' calculations relied heavily on the recent work of his countryman Charles Coulomb, who is most remembered for his work on electro-magnetism that resulted in "Coulomb's law". Before his electro-magnetic work, Coulomb was an engineer and worked out equations for determine friction on axels, tension in ropes and metals, etc. Building on Coulombs' work on applied mechanics, Lebas presents all the calculations he used to determining friction on the axels of the pulleys he would use, tensions on vulnerable parts of his apparatus, strength of his ropes, etc. He makes the point very

[9] Lebas, *L'Obelisque*, 46, author's translation.

clearly that it is better to know what your apparatus will do *before* you lower the obelisk. He allowed no uncertainty.

The power for the apparatus would be supplied by men turning capstans, just as Fontana had done more than two centuries earlier when he moved the Vatican obelisk. With his new ability to calculate forces, Lebas was able to determine that more than half the force generated by Fontana's men and horses turning the capstans was lost to friction and stiffness in the ropes. Lebas designed his apparatus to be more efficient so that fewer capstans and men were need. He brought to the endeavor of moving his obelisk a precision never seen before. His calculations gave him confidence in both the procedure and equipment, but that does not mean that he didn't have his difficulties.

Lebas began by preparing his worksite for the lowering of the obelisk and hired hundreds of locals to take down the village and remove thousands of cubic meters of rubble, all under the blistering, relentless summer sun. Then disaster struck. A ship from Upper Egypt arrived, bringing with it a cholera epidemic. By September, dozens of his workers were dying on the job. The eight carpenters, two blacksmiths and the stonecutter he had brought from France were also stricken and incapacitated, but eventually recovered.

With a greatly reduced workforce and his own men unable to work, things proceeded slowly and adjustments had to be made. Lebas was well aware of the lack of strong wood in Egypt and had brought his own supply on the *Luxor* in the form of oak logs that were to be sawn to specifications as needed. With his carpenters incapacitated, he set four Arabs to practice using the ripsaws on date palms. After weeks of intense practice they were skilled enough to work on the oak logs. Under them a squad of 30 workers and 20 apprentices took over the carpentry work.

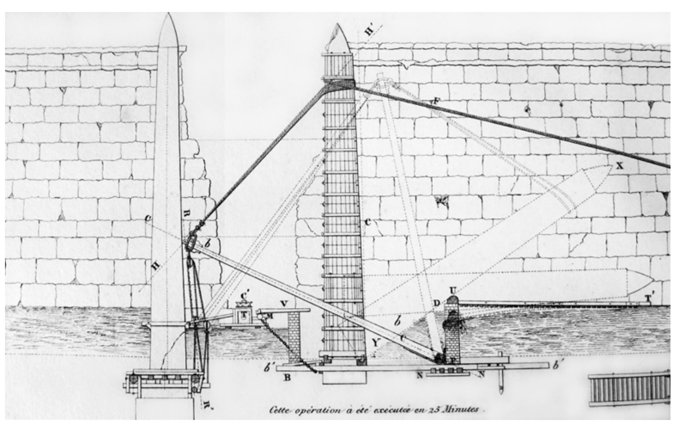

Figure 2: The apparatus designed by Lebas for lowering the obelisk

By October 1, 1831 Lebas was preparing to lower his obelisk. First the obelisk was clad in wood to protect it during the operations, and then the derricks, pulleys and capstans were constructed in accordance with his calculations (figure 2). By October 23 everything was in place to lower the obelisk. After all the difficulties Lebas had encountered, the lowering was an anticlimax. The capstans delivered the calculated force, the derricks and pulleys withstood their heavy load, and within twenty-five minutes the obelisk was down. It was a major triumph for Lebas and applied mathematics, but the difficulties were not over.

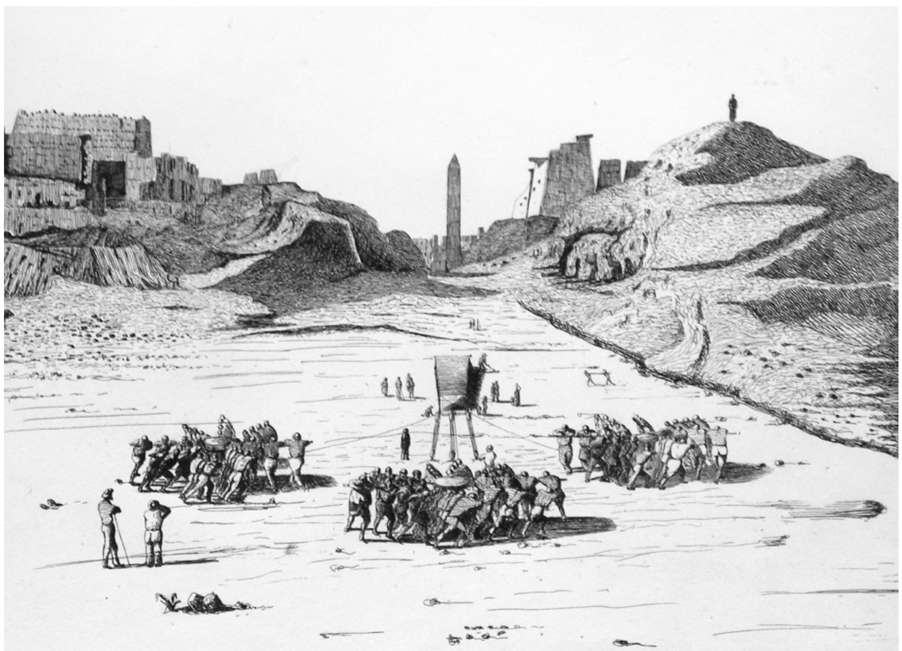

Figure 3: The path cleared to bring the obelisk from the temple to the ship

Because of the cholera epidemic, ships from Alexandria were not sailing south so Lebas' requests for the back-up supplies he had left behind went unanswered and now he was out of wood. He had planned to make a wooden slipway from Luxor Temple to the *Luxor*, a quarter of a mile away, but there wasn't enough wood. The obelisk couldn't be dragged through the sand; it would sink in. Palm logs were too soft for the slipway and would compress and deform under the immense weight of the obelisk. Lebas' new plan was to use the few planks they had left to make a portable slipway comprised of sections about twenty-five feet long so that the whole wood path would be about one hundred feet, slightly longer than the obelisk. Once the obelisk was on the slipway, it could be winched along by the capstans. When it had moved about twenty feet, the trailing section of the slipway would be removed and placed at the front, and the process repeated. It was tedious, but it had a chance of working, although it was far from certain. Lebas' master carpenter explained the seriousness of the situation:

> I have nothing left, not even a piece of wood to make a tongue or bracket of which we will probably have need during the operation. It was as you fear, if the planks should break, it will be impossible for us to fix them.[10]

Lebas and his team were fortunate; the movable slipway didn't break and the monolith moved towards the *Luxor* in fits of twenty feet at a time (figure 3). With each movement, the ground ahead had to be smoothed, the capstans pulling the obelisk repositioned, and the slipway rebuilt from the front. It was slow, painful work, but it was successful. However, Lebas had an even larger problem a quarter of a mile ahead of him.

Figure 4: The *Luxor*, intentionally run aground, so the obelisk could be loaded into its hull

As planned, the *Luxor* had been run aground on the east back of the Nile, right in line with the obelisk (figure 4). The original idea was to haul the obelisk along a slipway

[10] Lebas, *L'Obelisque*, 84, author's translation.

from the temple to the Nile and then open the hull of the *Luxor* and haul the obelisk up a gangway leading into the ship's hold. The problem was that now there wasn't enough wood for the gangway, and opening the hull and then repairing it would use still more wood. So, as the obelisk slowly moved towards the ship, Lebas' carpenters prepared the ship to receive its precious cargo in a totally different way.

The ship had been run aground at right angles to the bank of the Nile, so the prow was right on the bank. The carpenters now sawed off the prow of the ship, leaving the front open to receive the obelisk. Once the obelisk was in, the prow would be refitted to the front and the Luxor could begin the long journey to France. On December 19, 1831 the obelisk finally reached the *Luxor* and was hauled inside. Once the prow was reattached, Lebas' work in Egypt was over. It was time for a vacation.

Lebas was able to take a vacation because the *Luxor* now had to wait for the Nile to rise so it could be floated off the riverbank. Lebas intended to go south to see temples rarely visited in the 1830s. He would be gone for months and was afraid that the unrelenting Egyptian sun combined with Luxor's low humidity might crack the planks of the *Luxor*. So, before he left, he packed the *Luxor* in mud from the river, covered the artificial mound with reed mats and gave instructions to his men to water it daily, like a plant (figure 5). Lebas then went on his adventure.

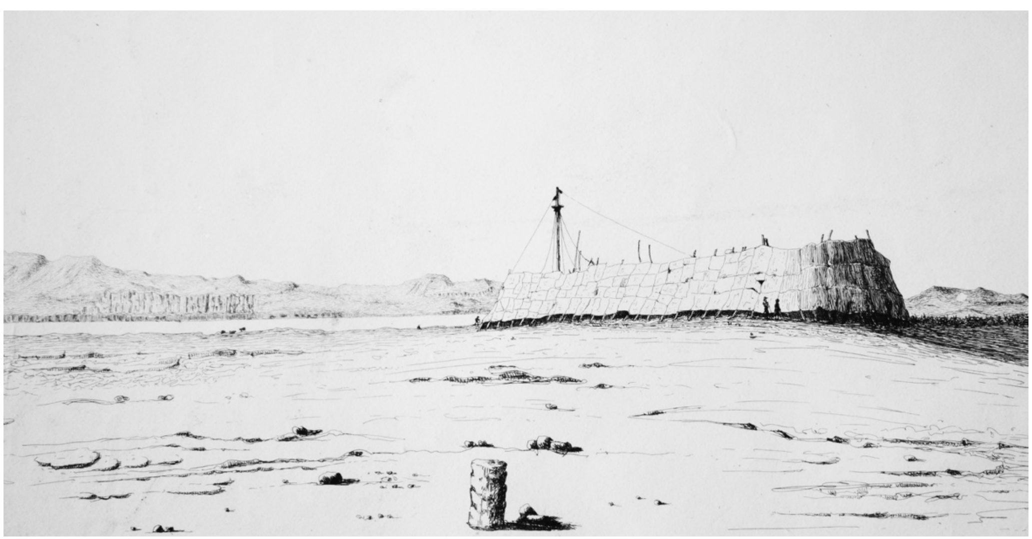

Figure 5: The *Luxor*, packed in mud and covered with reed mats to protect it from the sun

First he visited Edfu, Kom Ombo, and Philae, spending several days exploring Philae. He next navigated the first cataract and entered Nubia going as far south as Abu Simbel, which made a great impression on him. On his return trip he stopped to visit smaller temples that he had passed on his way south. Upon his return to Luxor, he removed the mats and mud that encapsulated the *Luxor* and was relieved to find it in excellent condition. Now he just needed the Nile to rise so he could float it off and bring France her obelisk.

At the end of June the Nile gave its first indication that it was going to rise – the water turned dark, from the rich African silt suspended in the water. Later the river would turn green when the slower moving vegetation floating on top reached Luxor. Finally, at the end of July the Nile began to rise in earnest and on August 25, 1832 the *Luxor*, with its precious cargo in its hold departed for Alexandria and the open sea.

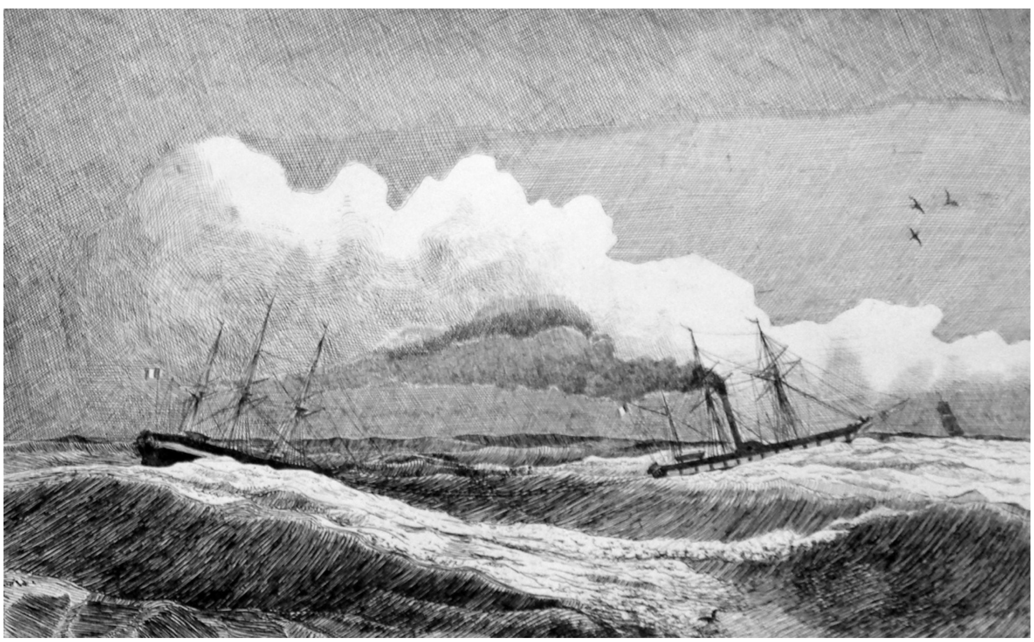

Figure 6: The *Luxor* being towed by the *Sphinx* through high seas

It was a slow trip on the Nile, carefully avoiding sandbanks, and docking every night, but on January 1, 1833 the *Luxor* reached Alexandria where the steamer *Sphinx* was waiting to tow her into open waters. Once again, there was a long wait, this time because of contrary winds and it was not until three months later, on April 1, that the *Luxor* and the *Sphinx* left Egyptian shores. The journey was not an easy one with high seas and strong headwinds all the way. The ships were forced into port at Rhodes, Marmara, Milos, Navarin, Zantes, and Corfu, both because of high seas and to replenish their supply of coal depleted fighting the winds (figure 6). Finally on May 2 the ships left Corfu and reached Toloun on May 11. The obelisk was finally in French territory.

The *Luxor* and crew remained in quarantine for a month and when Lebas was free to leave, he went to Paris to prepare a landing dock on the Seine for his ship. This was completed in October and on December 23, 1833 the *Luxor* was docked. Now Lebas had to wait until August of 1834 for the water of the Seine to fall so the *Luxor* would be grounded and thus stable enough to remove the obelisk. With the *Luxor* grounded, its hull opened, its anchor chain was wrapped around the obelisk, and then attached to five capstans, each manned by forty-eight men. It took two days to winch the obelisk out of the hold and up the specially constructed ramp, but now the monolith was on French soil.

The pedestal on which the obelisk was to stand had not been prepared and Lebas' next task was to take the *Luxor* to L'Aber-Ildut in Brittany where the granite blocks for the pedestal would be cut. Originally it was planned to make the pedestal out of twenty-seven blocks that fit together, but the quarry master opened a new section of the quarry and was able to supply larger blocks, so the pedestal was made of five massive blocks averaging about fifty tons each. Using his capstans and his by now well-trained crew, the blocks were loaded on board the Luxor in less that a day. Once again, the *Sphinx* towed the *Luxor* to Paris with a very heavy load in her hull.

Things were going well for Lebas, but they were certainly not going quickly. Now he had to wait for the Seine to lower so the *Luxor* would be grounded enough to unload the granite pedestal blocks. In April the blocks were finally off loaded. By August the pedestal blocks were assembled on the Place de la Concorde, complete with a beautiful gilded depiction of the apparatus Lebas had used to lower the obelisk in Luxor.

Lebas built a gently sloping stone ramp up to the top of the pedestal. This was the path the obelisk would take, but Lebas did not intend to use his capstans. Although Lebas' system of capstans and pulleys had served him well in lowering and moving the obelisk, it was not high-tech. Lebas took pride in being on the cutting edge of engineering. His appendix showed the value of applying the new calculating ability to his project, and now he wanted to try another innovation – the steam engine. For years the steam engine had been used in ships, but it hadn't really been applied to use on land (the steam locomotive was still years in the future). Lebas thought that it would be a

fantastic demonstration of this new machine's power if he raised the obelisk without the use of any manpower whatsoever.
He had a steam engine delivered to the Place de la Concorde and tried it out for hauling the obelisk up to the pedestal, but it failed. The manufacturer had not tested the engine; its boiler was defective and did not generate enough power for the job at hand. Lebas fell back on Plan B, his tried and true system of capstans and pulleys; the obelisk would be erected by manpower.
It took three days for the capstans to be assembled and positioned, but then the obelisk, in its cradle, propelled by 120 men and four capstans began slowly moving up the ramp towards the pedestal. In order for the obelisk to come to rest in its proper position on the pedestal, it was crucial that the foot of the obelisk arrive at a precise spot where the ramp met the top of the pedestal. After five hours of capstans turning, the obelisk was at its destination, only two centimeters from its desired position.
For the next two weeks the apparatus for raising the obelisk along with all the rigging and pulleys were set up. The procedure for raising the obelisk would be essentially the reverse of lowering it, with the base of the obelisk pivoting around a roller fixed to the pedestal. On October 24, the day before the scheduled raising, the system was tested and everything worked perfectly - so perfectly that Lebas wanted to continue and set the obelisk on its pedestal! But orders "from above" said no. Lebas would have to wait until the following day.

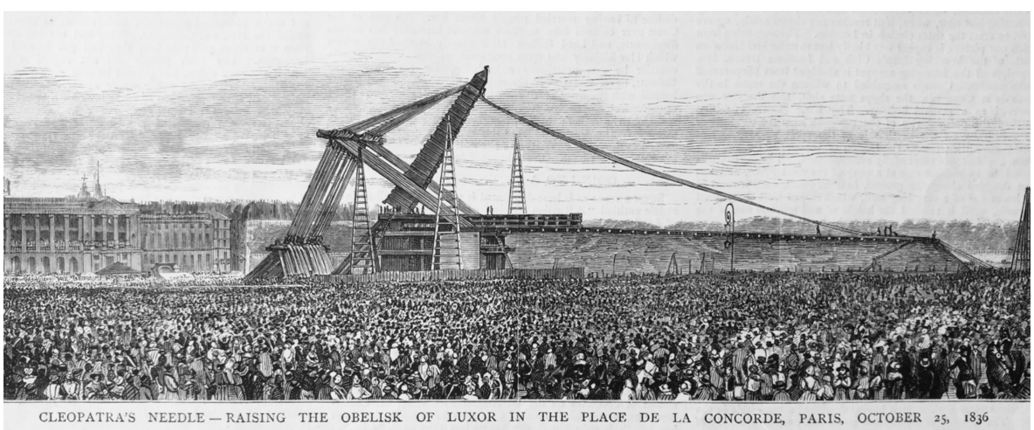

Figure 7: 200,000 Parisians crowded into the Place de la Concorde on October 25, 1836 to see the obelisk erected.

Early the next morning crowds began to fill the Place de la Concorde and by 11:30 more than 200,000 were crowded together to see their obelisk set on its pedestal (figure 7). The day was cloudy and cold, but dry, which was important as rain would affect the ropes and make things slippery. Before beginning the great maneuver, a small cedar box containing French gold and silver coins of 1836 was placed inside a compartment in the pedestal. In addition to the coins there was a commemorative medal bearing the king's portrait on one side and on the other the inscription "Under the reign of Louis-Philippe I, King of the French, M. de Gasparin, Minister of the Interior, the obelisk of Luxor was raised on its pedestal on the 25th of October, 1836 by the care of M. Apollinaire Lebas, Marine Engineer" (figure 8). Lebas' place in history was established. Now he just had to raise the obelisk.

Figure 8: The medal struck by Louis-Philippe to commemorate the raising of the obelisk

At 11:30 Lebas gave the signal, a trumpet blared, and the forty-eight soldiers assigned to each of ten capstans began turning. Ropes from the capstans ran over ten tall masts, five in front of the obelisk and five behind, which continued downward from the masts to chains fixed near the top of the prostrate obelisk. As the obelisk moved slowly towards an upright position the pressure on the wood block around which the 250-ton monolith was pivoting was so great that sap from the fresh timbers squirted out.

The obelisk continued its upward journey when suddenly a loud cracking noise sounded through the cold winter air.

Everything stopped so Lebas could check the apparatus. Lepage, Inspector of Works, shouted, “Nothing has moved. You can continue.”[11] The immense compression of the wood had caused the sound. The turning of the capstans continued and as the obelisk rose, Lebas realized that they had forgotten to adjust the ropes attached to the chains near the top of the obelisk. He had planned to do this as the tension on the ropes changed and the obelisk went upward, but in the excitement of the cracking sound, it was forgotten. Now two marines were called upon to climb up the obelisk and readjust the rigging. This done, the raising continued, but there was a new problem.

Stationed at the base of the obelisk, Lebas discovered that when the carpenters had translated measurements from feet and inches into the new metric system, they had made a mistake. The wooden pivot around which the obelisk was turning was too high for the obelisk to continue its movement. Two hundred thousand amazed spectators looked on as ten strong men with axes in hand hacked a path through the wood so the obelisk could be raised - all this while a band played the “Isis Suite” from Mozart’s *The Magic Flute*.

Finally, with the King and Queen looking on from their decorated balcony at the Ministry of the Marine, the obelisk was erected on its pedestal where it still stands today. The entire operation took three-and-a-half hours, no one was injured, and the obelisk was undamaged. It was a spectacular success. From his royal balcony Louis Philippe applauded and all 200,000 spectators joined him. Lebas was a hero. Later that night, at a dinner hosted by the King, Lebas learned that he would receive a pension of 4,000 francs for his service to his country.

In spite of Lebas’ success in bringing his obelisk to France, it would be more than 40 years before the English and the Americans were bold enough to bring their obelisks home. When they did, they were standing on the shoulders of Apollinaire Lebas.

[11] Lebas, *L’Obelisque*, 162, author’s translation.