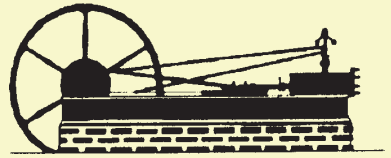


INTERNATIONAL  
STATIONARY STEAM  
ENGINE SOCIETY



# BULLETIN



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## The Next Chapter - The President Pumping Engine, Lehigh County, Pennsylvania, USA

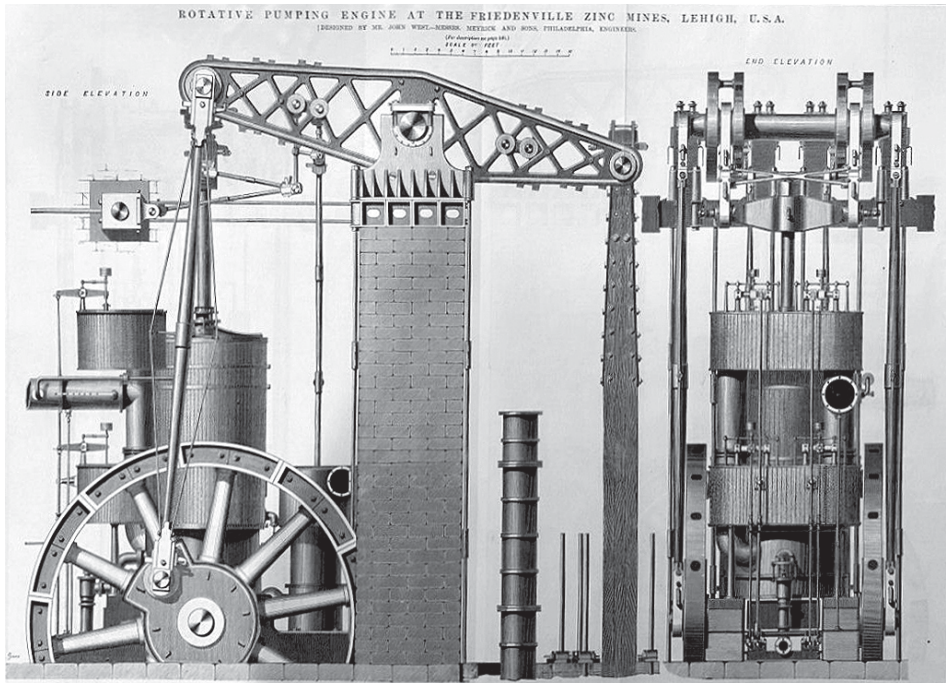
Mark Connor

In October 2013, Damian Nance wrote an article for the ISSES Bulletin (34.4, pp46-55) on '*The President: North America's Largest Beam Engine*'.<sup>1</sup> Damian became aware of the engine and its surviving engine house through a presentation made by Nadine Miller Peterson, then a consultant with CHRS, at the 1997 Society for Industrial Archeology annual conference at Houghton, Michigan. Ms Miller Peterson was part of a team that prepared a Cultural Resource Study required in advance of new roadway construction, now known as Center Valley Parkway, in Upper Saucon Township, Lehigh County, Pennsylvania. The roadway's path is on the edge of a 19<sup>th</sup> century zinc mine property that contains the water filled Ueberroth Mine pit. The President engine house ruins and pump shaft survive on the edge of the mine pit. CHRS's work resulted in the Pennsylvania's recordation of the Ueberroth Zinc Mine Historic District in 1999 and, subsequently, an article published in Canal History and Technology Proceedings.<sup>2</sup>

In due course, Damian was able to visit the location and recorded his visit and observations in the above article. He described the engine, designed by John West, a Cornish engineer émigré, as the technical resolution of how to remove massive quantities of water so that mining could continue. In Damian's words, the engine was gargantuan. It was a condensing, double-acting rotative engine weighing 675 tons with a single 110 inch cylinder and two latticework walking beams. The engine worked both pump rods in the shaft and a pair of massive 30-foot diameter flywheels inside the engine house. Built by Merrick & Sons at their Southwark Foundry in Philadelphia, the engine was set to work in January 1872 and operated continuously until late 1876, when the mine was closed for a period and subsequently flooded. It was used intermittently thereafter and remained in place until 1900. In addition to the engine designer, the erection superintendent and operating engineers were from Cornwall (as was the mine captain). The engine house is of typical three-story Cornish beam engine pattern save for accommodation made for internally set flywheels. The engine itself is unique, but recognizably a classic Cornish pumping engine save for the flywheels on the power train and double acting steam injection. It is believed that these unique features were introduced to generate the power necessary to remove a design basis of 12,000 gallons/minute from a relatively shallow mine expected to reach a depth of 300 feet. It is believed that the engine could remove up to 17,000 gallons/minute but was rarely called upon for such a severe service. Damian concluded his report as follows:

*The engine house is now all that remains of West's extraordinary engine and is a rare record of beam engines in North America. But, as yet, there has been no attempt at stabilization, although the house is in good condition. Hopefully, this will change as the site's importance gains wider recognition as indicated by Peterson and Zagorski's excellent article.....*

In addition to his article written for ISSES, Damian also published a similar article the same year in the Trevithick Society newsletter.<sup>3</sup>



*Side and Front Views of The President Engine from 1876 issue of The Engineer*

Damian's newsletter articles accurately suggested that the engine and the existence of its engine house were not widely known and lacked stewardship. During its operating period (1872-1900), the engine was reported on in both popular and technical literature, however, interest fell off rapidly once the engine was scrapped by new mine owners in 1900. The new mining company, New Jersey Zinc Company, was interested in holding the zinc ore deposit in reserve and did not redevelop mines in the district until after the Second World War. In the 20<sup>th</sup> century, the new mine, which operated from 1958 until 1984, was entirely underground and at a nearby but different location to that of the 19<sup>th</sup> century Ueberroth Mine pit. During this period, the engine house served no secondary purpose, but the mine pit became a popular summer swimming hole in the years prior to the mine reopening. Once the water level fell following the mine's reopening in the 20<sup>th</sup> century, the engine house and mine pit became background features of a heavy equipment yard for the mining company and subsequent property developer who purchased the mines in 1984. During this period, access to the engine house and property was restricted by fencing, no trespassing signs, etc. Apart from the reporting by Damian Nance and Nadine Miller Peterson, no technical and very few popular articles were published on The President or the engine house. A local newspaper had a short piece in 1987 suggesting the owner of the development company had an interest in restoring the engine house.<sup>4</sup> At the time of the roadway construction in 1998, another brief article was published in a different local newspaper noting that the roadway would bypass the engine house ruins.<sup>5</sup>





*Engine House Ruins and Ueberroth Mine Pit from 1937  
(photo courtesy of Lehigh Special Collections)*

Despite the excellent research by Miller Peterson and Nance, there was little progress made on broadening recognition of the engine and the engine house ruins until 2016. General appreciation of industrial history is improving in the United States but remains less advanced than in the United Kingdom. Public funding for heritage projects is often a challenge. The engine house did not have the benefit of a local township historical society which would have acted as a logical sponsor for the historic district once it was established by the State. The private ownership of the mine property by businesses with other priorities was also a factor in keeping the engine house in obscurity. For safety reasons, opening the property to the public in an unrestricted manner was not an option.

I also think The President Engine, on a local level, had a bit of a reputational problem. It did its job so well that farmers for miles around were finding their wells gone dry. As a largely agrarian economy at the time, the engine's demise was welcomed by many Township residents. Even its initial start-up had a bit of a dark cloud over it as legend had it that President Grant was supposed to show up to pull the lever and start the engine but was too hung over from the prior night's festivities. This legendary tale has no foundation, but still was repeated numerous times. In the 20<sup>th</sup> century, the New Jersey Zinc company had similar issues with the local populace concerning sinkholes and the lowering of the water table to support mining activities.



*Engine House Today (photo courtesy of Mark Connor)*

I became involved early in 2016 based on the personal need to find a worthy project. Having retired in late 2014 from a 40-year business career with an engineering oriented industrial gas company, the engine house, seasonally visible from the road, captured my imagination. Living nearby, I have known of the structure since childhood. Looking a great deal like a medieval tower keep, the structure is unlike anything else that I have seen in the United States. On a visit to the site, I noticed that the “no trespassing” sign indicated that the property was now owned by Lehigh University. Lehigh University is an internationally known Bethlehem, Pennsylvania higher educational institute. Having decided to jump in, the first order of business was to understand the location’s history and significance. By the end of 2016, I was comfortable that I knew enough to approach Lehigh University and the local Upper Saucon Township officials with a draft research paper highlighting the property’s significance and recommending a project be initiated to study the preservation and repair of the engine house and surrounding property. In the interim, I was able to make initial contact with Damian and to study the work of CHRS. About the same time, I was able to connect with L Michael Kaas, a mine historian, who had recently written a study of the Friedensville Mines and on one of its Cornish mine captains, both journal articles were written for the Mining History Association.<sup>6</sup> The initial feedback from both Lehigh University and Township officials was encouraging. Lehigh University had acquired the property in 2012 as part of a 755-acre gift from the estate of an alumnus who was a very active benefactor to the University. During 2017, research and outreach efforts accelerated (what was originally a 20-page report is now 170 pages and still unpublished).

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There are plenty of old stone buildings in southeastern Pennsylvania. As such, I understood early on that proving significance would be critical to success in this endeavour. At the time of its start-up, The President was widely reported to be “the largest stationary engine in the world”. The Engineer, The New York Times, The Mining Journal, The Mining and Engineering Journal, Scientific American, and many other publications made this statement. Is this statement broadly, correct? What qualifying statements need to be added to make it correct? With respect to its engine house, do other similar structures exist in the United States? Were there other house-built pumping engines in the United States? Our research group was now a team including both Nance and Kaas. We soon added to the group Dr Gerard (Jerry) Lennon, a Lehigh University civil engineering professor, who assisted us in seeking opportunities to engage Lehigh University students in our efforts. Robert (Bob) Lanning, a hydrogeologist now living in Springfield, Missouri, joined our group. Bob knows the property inside and out as he explored it as a teenager when his father was chief engineer at the New Jersey Zinc mines. Using historic maps and on-site investigations, the team was able to confirm the locations of various site features described and shown on original documents. Erin Kintzer, Lehigh University's Real Estate Director, provides overall support and encouragement for our efforts as the University seeks a beneficial use for this hard to develop property. Lastly, but importantly, we connected our efforts with the National Museum of Industrial History (NMIH) in Bethlehem, located in what was once an electrical repair shop on the expansive former Bethlehem Steel mill property. This Smithsonian Affiliate Museum opened its doors in 2016 and telling the history of The President Engine fit perfectly within its mission.

So, with the above as background, what has happened since Damian first reported on The President in 2013?

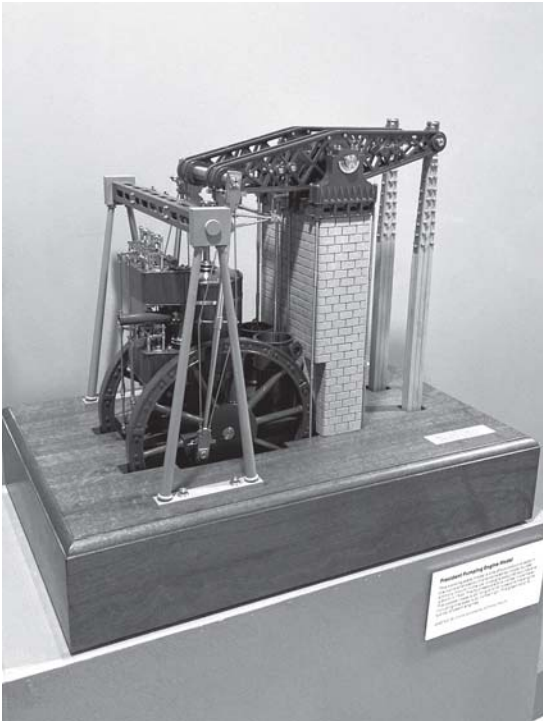
The President was large, but was it the largest? Our research efforts have concluded that it was the largest and most powerful single cylinder, rotative stationary steam engine ever constructed. The single cylinder qualifier is important because, for example, the Cruquius Engine in the Netherlands was larger, but it is a compound cylinder design. There was a Bull engine in Belgium built shortly after The President which had a larger cylinder (130 inches versus 110 inches), but it was a single-acting, non-rotative engine and, thus, smaller in terms of power generation and water removed. The classic Cornish pumping engine at the Battersea waterworks in London had a 112 inch cylinder, but again, as a non-rotative, single-acting machine it generated less power and moved less water. Damian's conclusion that The President was the largest beam engine in the Americas remains a true statement, the next largest single cylinder engines in terms of cylinder size were 100 inch diameter in municipal water service in Cincinnati, Ohio and Providence, Rhode Island. Putting the various comparisons aside for the moment, we were able to conclude that it was indeed a landmark engine whose existence was worthy of recognition.

To rebuild the engine was a non-starter for many reasons, but we believed that we had sufficient information to recreate the engine in various media. Although the engine was long gone, it was a house-built engine, and the engine house never found another purpose. So, it was possible to get a good sense of the engine and its attaching members from the surviving stone walls of the house. While original engineering drawings were known to exist as recently as the 1980s, they have subsequently been lost. This aside,

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The Engineer and Scientific American both produced high quality, detailed engravings of the engine in 1876. Engineering students in the 19<sup>th</sup> century were expected to submit a thesis to graduate from university and, in this regard, several students at Lehigh University and neighboring Lafayette College wrote their school ending reports on the mines and The President engine. These documents were instructive; one Lafayette student drew excellent drawings of the engine including details not available from the engravings published in the technical journals.<sup>7</sup> We also had a good collection of historical photographs of the exterior of the engine house and the mine during and after its operating period. We have not found any photographs of the engine itself and the details surrounding the boiler/steam system are incomplete. Armed with this research collection, all we needed were talented artists to realize our vision of recreating The President.

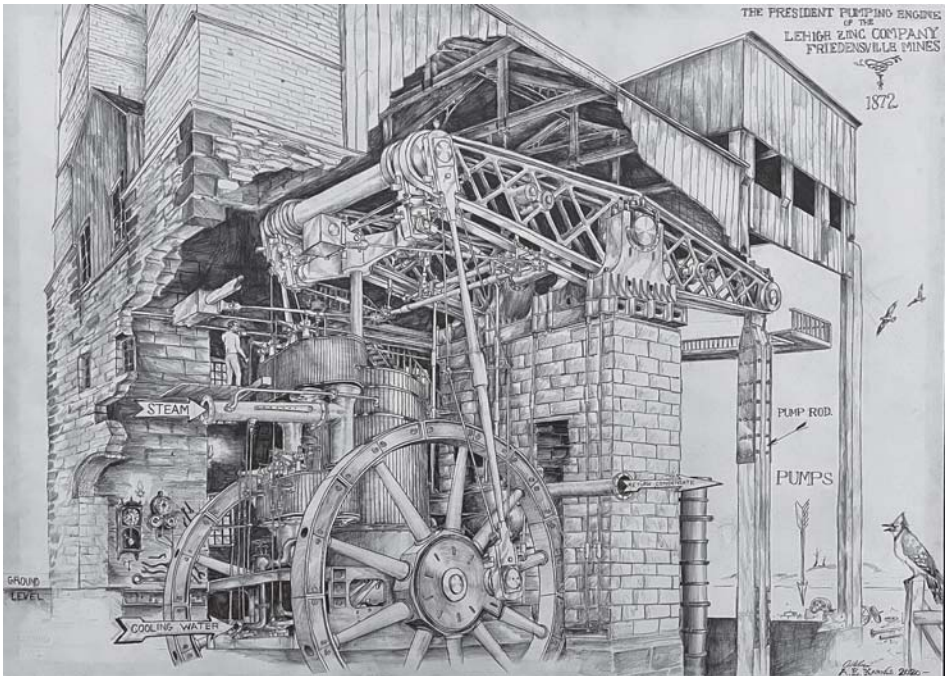
In 2017, Damian was contacted by Anthony Mount of Bampton, near Tiverton, Devon. Tony is an award-winning model engineer of steam engines and the author of two books on the subject.<sup>8</sup> Tony, having learned about The President in the Trevithick newsletter, was eager to produce a scale model of the engine and, of course, we were excited by that prospect. From 2017 until the model was completed in 2022, we worked with Tony to provide information for the model's design and construction. In the meantime, we secured a commitment from the NMIH to host a display of The President once the scale model was completed. An American-based Cornish heritage organization, The Cornish Cousins of the Southeast, provided partial funding to build the display. Tony's model arrived in America in April 2022, and it is indeed a magnificent and generous donation on his part. The model is built to a scale of 8mm to 1 foot and is made primarily from brass, mild steel and cast iron. The wooden base is sapele (African) mahogany. The pump rods are beech to match the grain and colour of the original Georgia pine pump rods. The model is equipped to run on compressed air, and, in the final display, the model can be run by a docent using a push button connected to a compressor installed in the base of the display case. Tony painted the model green as was often used in the 19<sup>th</sup> century, but the actual paint colour (if any) is not known.



*Anthony Mount model of The President Engine at NMIH (photo courtesy of Mark Connor)*



To accompany Tony's model, we wanted to show how the engine would have appeared in the engine house. Since The President was a house-built engine, we thought that a cut-away view which included both the engine and the house would provide a good orientation to museum visitors. One of the talented individuals who has helped the NMIH set up its collection of steam engines is Alexander Karnes of Hanover, Massachusetts. Alex has travelled extensively in the United States, United Kingdom, India and beyond to work on vintage steam engines, and is well known in the community. At the NMIH, he worked closely with historian Mike Piersa on the return to service of its largest display, a 1915 Snow horizontal cross-compound pumping engine which could move over 5,500 gpm of municipal water supply when in service at the York, Pennsylvania waterworks.<sup>9</sup> The engine is now on display and runs periodically on steam. In addition to being a talented mechanic, Alex is an accomplished graphic designer. The NMIH connection led us to Alex and he was commissioned to show The President as the engine would have appeared in the engine house. Using the historical documentation that we provided him, Alex worked throughout 2020 to create an 18" x 24" pencil sketch that is now on display next to Tony's scale model.



*Alexander Karnes pencil sketch of The President at NMIH  
(photo courtesy of Mark Connor)*

The 150<sup>th</sup> anniversary of the start-up of The President was 2022. By the end of the year, we had a completed display on The President at the NMIH. The display is in an alcove leading from the museum entrance to the main exhibition hall. In addition to the scale model and pencil sketch, the display includes a framed set of original engravings



from the 1876 article in *The Engineer*. A quotation above the model was extracted from an 1872 article in *The Mining Journal* (London) and describes the events on the January day when the engine was ceremoniously placed into service: *"When the engine had got well underway, President Webster broke a bottle of wine on one of the walking beams, and christened it "The President" in honour of the chief magistrate of our country, and as a fitting name for an engine which is chief of all engines in power."*<sup>10</sup> This quotation is the earliest known reference to the engine as *The President* and is the first written connection to Ulysses S Grant who was then the sitting President of the United States.

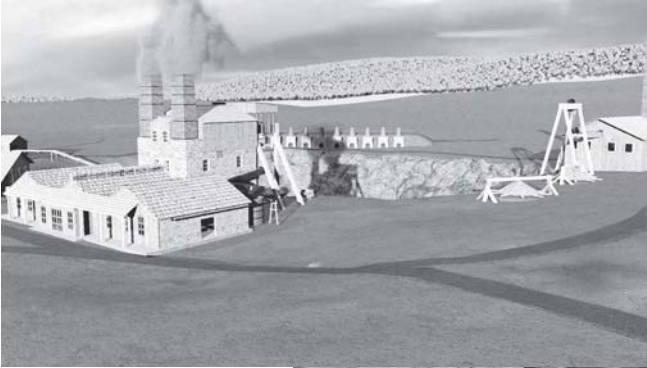


*The President Engine display at NMIH (photo courtesy of Mark Connor)*

With the continual improvement in animation, we were keenly interested in creating an animation of the engine at work in the mine. Starting in 2017 we began to reach out to multiple groups and organisations with presentations on the Friedensville mines and our aspirations for restoring the memory of the engine and stabilizing and repairing the engine house ruins. One of those presentations was made to the Friends of Lehigh University Libraries and this presentation was posted online. Guy Janssen, of Schelle, Belgium, saw this presentation in 2020 and reached out to us with an interest in doing an animation of *The President*. Guy, a retired nuclear engineer, has a passion for historic steam engines and has made several animations starting with Savery's initial invention at the end of the 17<sup>th</sup> century, and proceeding to the Newcomen engine and the

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contributions of Boulton and Watt. Using our collected historical information, we worked with Guy for nearly a year to produce a 27-minute animation that allows the viewer to tour the Ueberroth zinc mine, go into the engine house from the boiler room and then down into the pump shaft. Guy's animation has two versions. The longer version allows the viewer to look inside the cylinder, pumps, and other equipment to see the process at work. Guy's animations are accessible on YouTube, and we have used his recreation of The President extensively in our presentations.<sup>11</sup>



*Still shot from  
Guy Janssen  
movie on The  
President  
showing  
engine and  
boiler houses  
with mine pit in  
background  
(courtesy of  
Guy Janssen)*

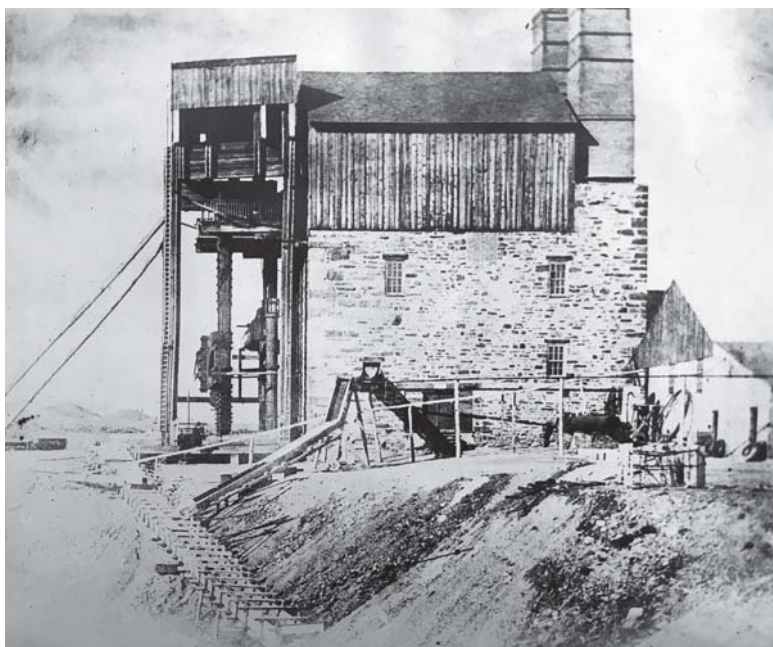
*Still shot from  
Guy Janssen.s  
movie on The  
President  
showing a cut  
away of the  
upper valve  
chest and  
cylinder  
(courtesy of  
Guy Janssen)*



Regarding our objective of restoring to current memory The President Engine, we believe that we have made substantial progress. Our initial concern, the deteriorating condition of the surviving engine house ruins, remains. As with the engine itself, our initial focus was to determine the engine house's significance. An "eureka" moment in this regard came with a review of the documents submitted to the UNESCO World Heritage Committee by the United Kingdom on behalf of the Cornwall and West Devon Mining Landscape. Inscribed as a World Heritage Landscape in 2006, the documents describe the substantial contribution Cornwall/Devon made to the industrial revolution and in mining practices around the world. As physical evidence of this impact, the Cornish engine house figures prominently in the narrative with examples highlighted in South Africa, Australia, Central and South America. No examples are cited in the United States or Canada.<sup>12</sup> Given the condition and obscurity at the time of The President's engine house, this oversight is certainly not surprising. Our research indicates that

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there were other house-built pumping engines, largely centred in the southeast counties of Pennsylvania where there was a sizable community of Cornish miners and technicians starting in the late 1840s. Starting as early as the 1860s, this community began to disperse to other more promising mining areas as the local deposits of copper began to be worked out. We do not know precisely how many house-built Cornish pumping engines existed in the United States, but our research and photographic evidence suggests that it was only a handful in places like the Perkiomen Mines (Montgomery County), Gap Nickel Mines (Lancaster County) and the Mid-Lothian colliery near Richmond, Virginia. The President engine house was both the largest and last example.<sup>13</sup> Since our investigations have not uncovered any other examples of a Cornish style pumping engine house in the United States, The President's engine house takes on an added level of significance, especially when one considers its direct connection to a UNESCO World Heritage Landscape, having been designed, erected, and operated by Cornish emigres.



*Side view of  
The Engine  
House, circa  
1874  
(courtesy of  
Lehigh  
University  
Special  
Collections)*

Until Damian began his reporting on the engine in 2013 to the broader UK and Cornish steam technology community, The President engine largely existed as a footnote in D B Barton's classic study *The Cornish Beam Engine*.<sup>14</sup> The survival of the engine house, coupled with the landmark status of the engine, has been a subject of great interest to the Cornish diaspora in the United States and to the Cornish home community. This is of no great surprise given the iconic nature of the engine house in the panoply of Cornish mining heritage. Numerous presentations have been made to heritage societies and both Damian and the writer have been recognized as "Cornish Bards" by the cultural heritage association, Gorsedh Kernow, for our efforts to promote an appreciation of Cornish cultural influence in the United States.



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From the first conversations with Lehigh University and the local Township officials, the focus for the engine house and surrounding property (about 20 acres) has been to make it publicly available as a heritage site, either on a stand-alone basis or as part of a larger recreational purpose. As a former mining site, the property presents challenges with respect to necessary improvements to support safe visitation. Access to the property has improved but is currently restricted to occasional guided tours. Lehigh University has generously funded planning efforts associated with the engine house when matched with grant funding. The first attempt to gain a Keystone Grant from the Pennsylvania Historical and Museum Commission was made early in 2018 and was unsuccessful. However, we learned from this initial effort and returned the following year and were successful in both 2019 and 2020 in obtaining Keystone Grant match funding. A small grant was also obtained from The National Trust (Louis J Appell, Jr, Preservation Fund for Central Pennsylvania) and private contributors. These fund sources were used in the following two years to build out the necessary planning required to stabilize and repair the engine house. Experienced historical resource consultants provided architectural and structural assessments of the engine house. Based on these recommendations, construction quality repair drawings were developed. As part of the assessment effort, drone and ground-based laser scans were performed on the entire structure, from which a model of the building was created that includes 760 million data points, allowing us to measure movements of as little as a  $\frac{1}{16}$  inch. Plans and specifications were developed for the stabilization of the pump shaft. Finally, funding was available to develop architectural plans for improvements in and around the engine house including renderings of the repaired engine house and park area.

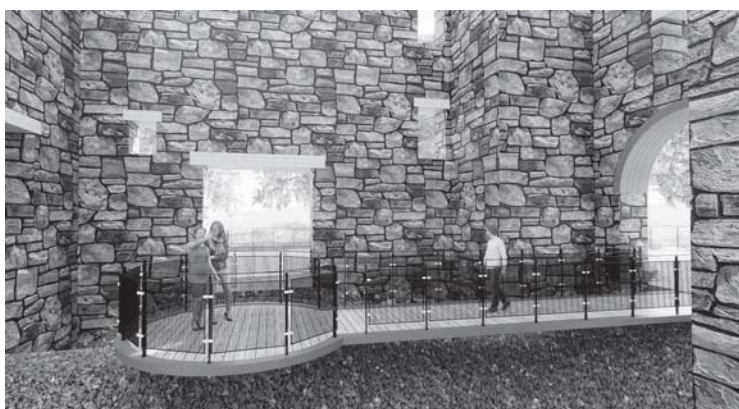
In addition to work done with consultants, Lehigh University engaged students in the process. Starting in 2018, development of a heritage park on the location was the subject of a multi-disciplinary project under the University's Technical Entrepreneurship (TE) Capstone program. Seven students worked together and with the sponsors to develop ideas on what the park could look like, including the creation of a "pitch video". They also created a computer aided design (SolidWorks) working model of the engine and a plastic model using additive manufacturing. It was a great learning experience for the students and provided the team with fresh ideas.

When the engine was scrapped in 1900, the mining company decided to save the twenty-two boilers which operated the engine. These plain cylindrical boilers were obsolete for steam service but were perfect for use as water tanks. One of these boilers survives to this day. In 1901, Gottlieb Buehler was building a new furniture factory along the waterfront in Allentown, Pennsylvania and acquired one of the 30-foot-long riveted boilers, which he placed in the middle of his new factory's basement. For 120 years, the boiler served as a water tank until the utilities were shut off in advance of the building's demolition. The knowledge of the boiler's existence passed down through the generations of family business owners and to local historians. Based on an inquiry made through NMIH, the new building owner, a property development company, was willing to donate the boiler to Lehigh University. In January 2023, we were able to successfully extract it from



*Rendering of the exterior of The Engine House following stabilization and repair in a park setting (courtesy of Spillman Farmer Architects)*

*Rendering of the interior of The Engine House following stabilization and repair in a park setting (courtesy of Spillman Farmer Architects)*



the basement and deliver it to a building owned by the University near The President engine house property. The plan is to have the boiler as a display item in front of the engine house in a location approximating its position when in operation.

Since 1914, Pennsylvania has been placing explanatory markers in front of historic places throughout the State. The program is now managed by the Pennsylvania Historical and Museum Commission



*Damian Nance (left) and Mark Connor in front of The President Engine boiler recovered from factory about to be demolished (courtesy of Lehigh University)*

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(PAHMC). The design of these markers since 1945 has been deep blue cast aluminium with gold trim including the state's coat of arms in the upper centre. Today, there are about 2500 signs throughout the state. Obtaining a marker is a competitive process and we were pleased to learn that The President Engine was awarded a sign in the latest round that was announced in December 2022. With improvements to the property, our plan is to have the sign installed at the entrance gate to the engine house property in 2024. The sign verbiage is word limited and the following is the language proposed in our application. The final wording will be developed in concert with the PAHMC.

*The massive engine once located in this stone building attracted world-wide interest as the largest and most powerful single cylinder rotative steam engine ever constructed. Said to be named for President U.S. Grant, the engine lowered the water level in the Friedensville zinc mines so that mining could continue. Lehigh Zinc Company's Cornish born engineer, John West, designed the engine and pumps, which were manufactured in Philadelphia foundries.*



*View of The President Engine house from the planned location of the state of Pennsylvania Historic Roadside Marker (courtesy of Mark Connor)*

The above is a summary of what has transpired since Damian first reported on The President almost ten years ago. Much progress has been made in restoring the engine to landmark status. Making the engine house publicly available remains aspirational and the engine house continues to suffer from structural failures in the absence of funding to make the necessary repairs. I fervently hope that we can report back, in less than another decade, that we have a public space and a repaired engine house, and that visitors are now enjoying walking around the house and going inside on a walkway to a circular platform located where its massive 110 inch cylinder once stood.



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# HISTORICAL MARKERS



## Footnotes:

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