

3D Modeling of Byrd Park Pump House Machinery

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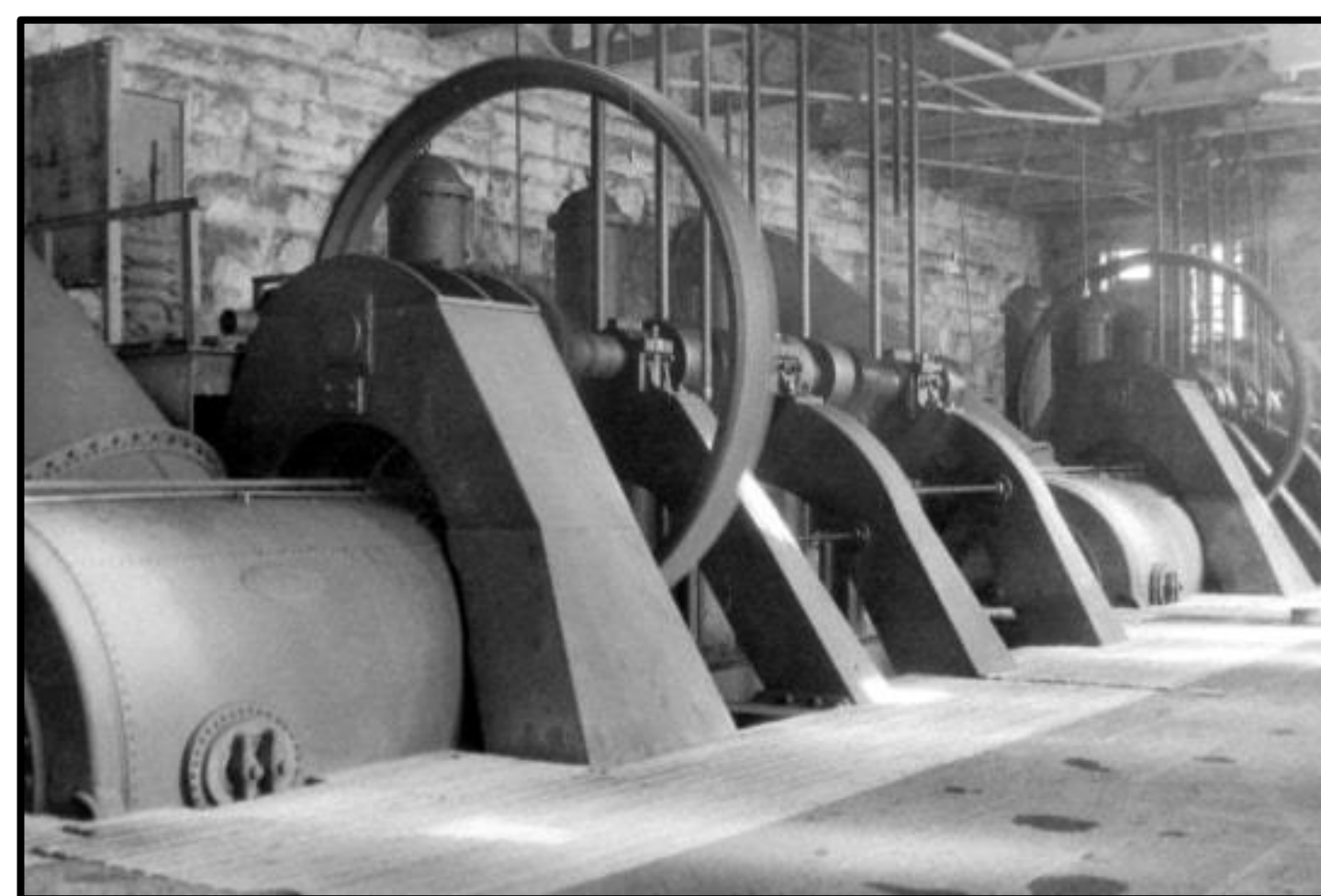
Introduction

At the time of its construction in 1883, the Byrd Park Pump House in Richmond, Virginia was a marvel of Victorian-era engineering. Rather than using steam engines like most pumping stations of the time, the Pump House used water-driven pumps to lift water from the James River and Kanawha Canal to the city reservoir.

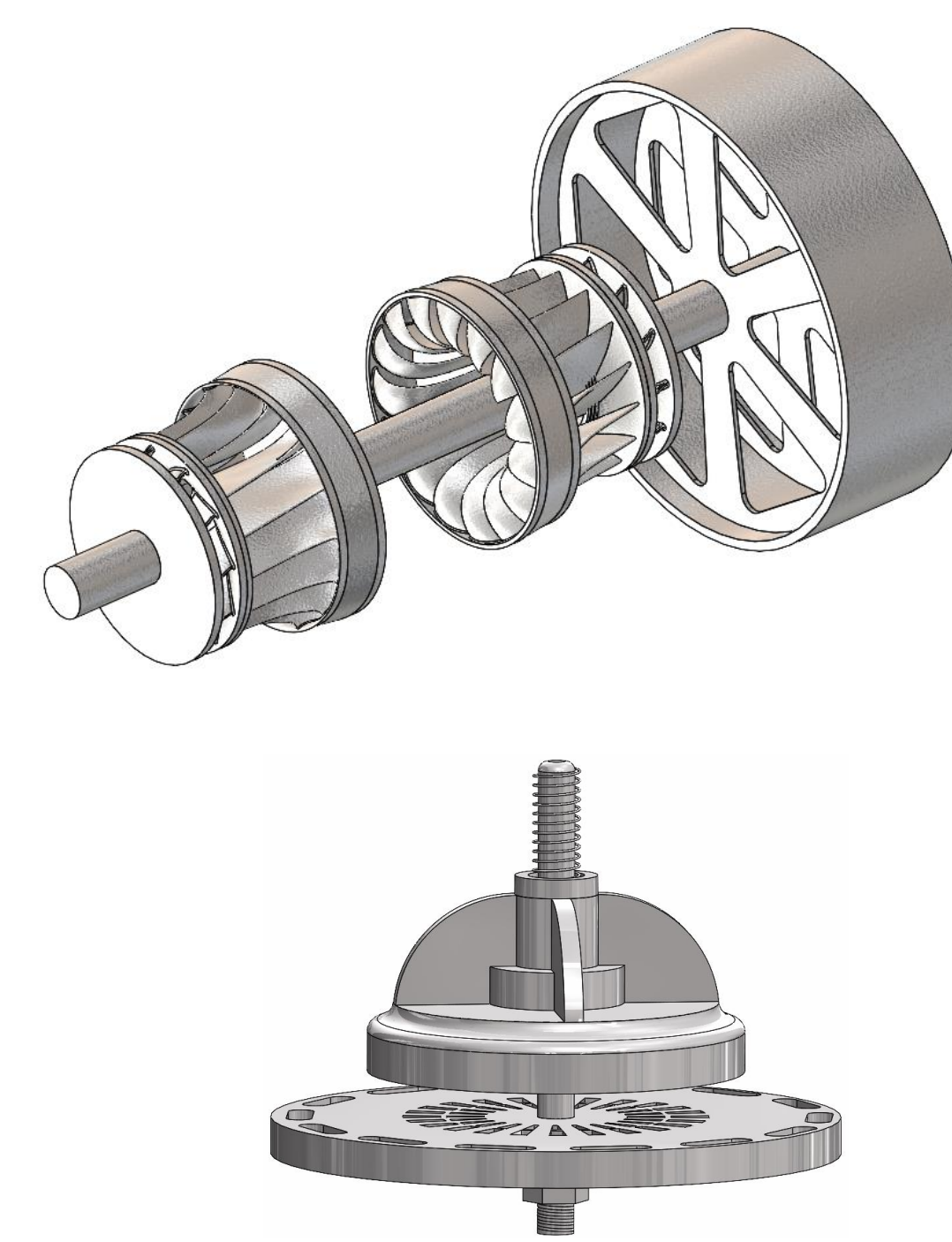
Because none of the machinery remains in the building, visitors find it difficult to understand how it worked. The Friends of Pump House, a volunteer organization dedicated to preserving and restoring the building, asked a team of senior mechanical engineering students to develop 3D models of the pumping equipment, which could then be displayed and used to educate visitors about the building's unique history and function.

Objectives

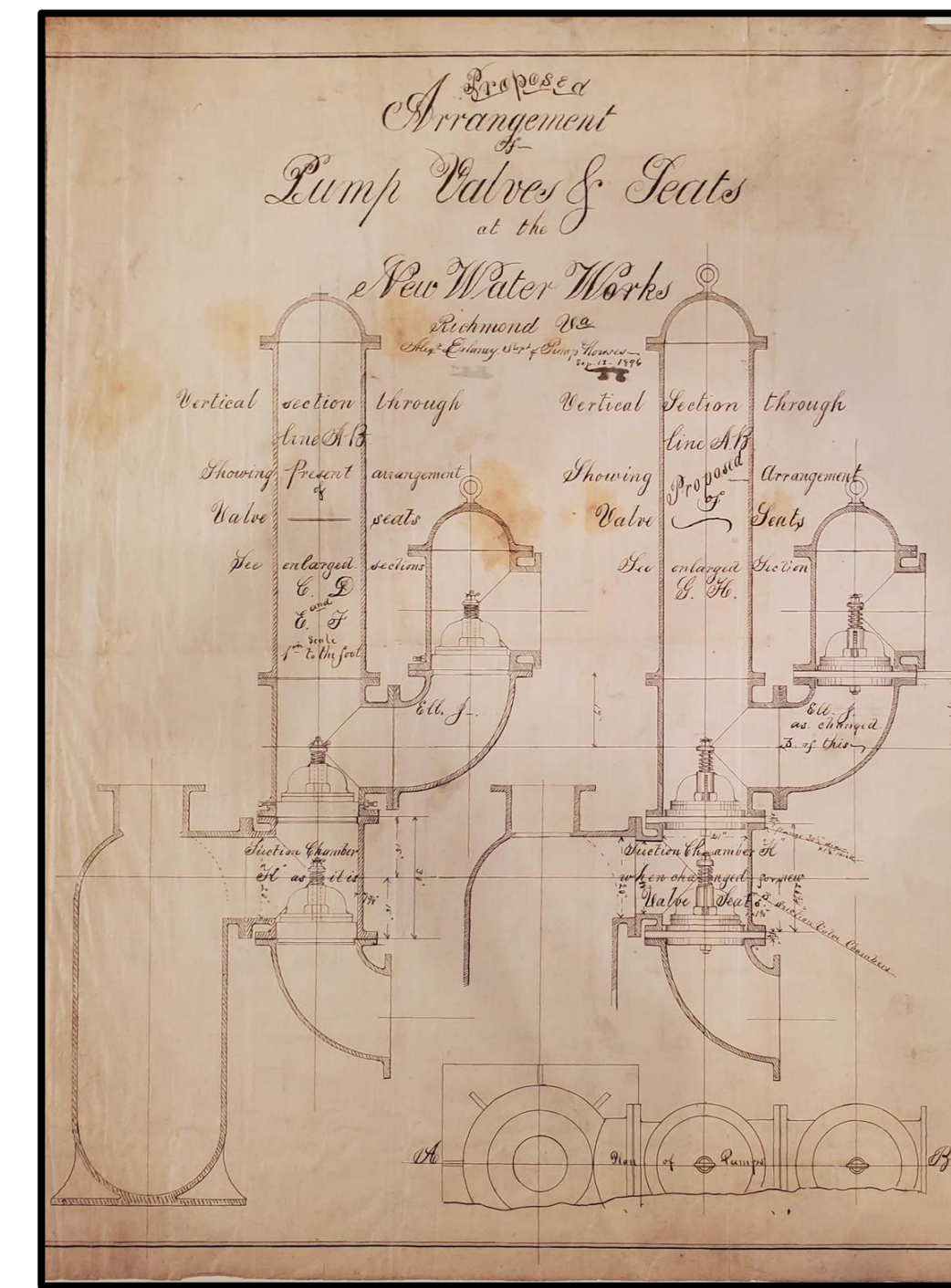
- Develop a digital model of the pumping machinery as it existed when the building was abandoned in 1924 using extant drawings, photographs, and field surveys.
- Print a 3D scaled model of the assembly.
- Create a video series featuring key components of the machine.
- Develop an immersive Augmented Reality (AR) experience.



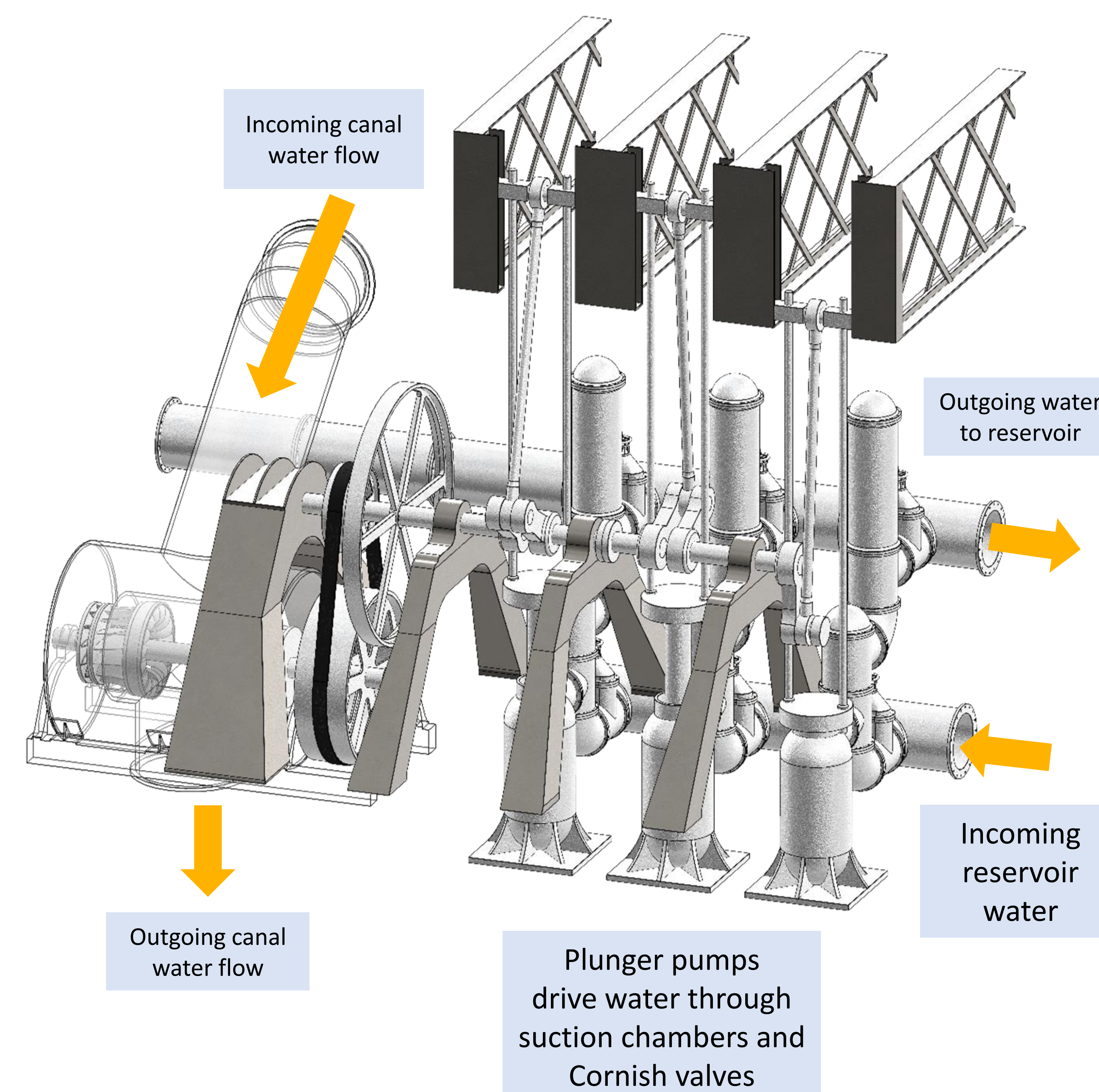
Only known image of the pumping machinery. Photo by Harris Stilson.



Top: Leffel Turbine
Bottom: Cornish Valve

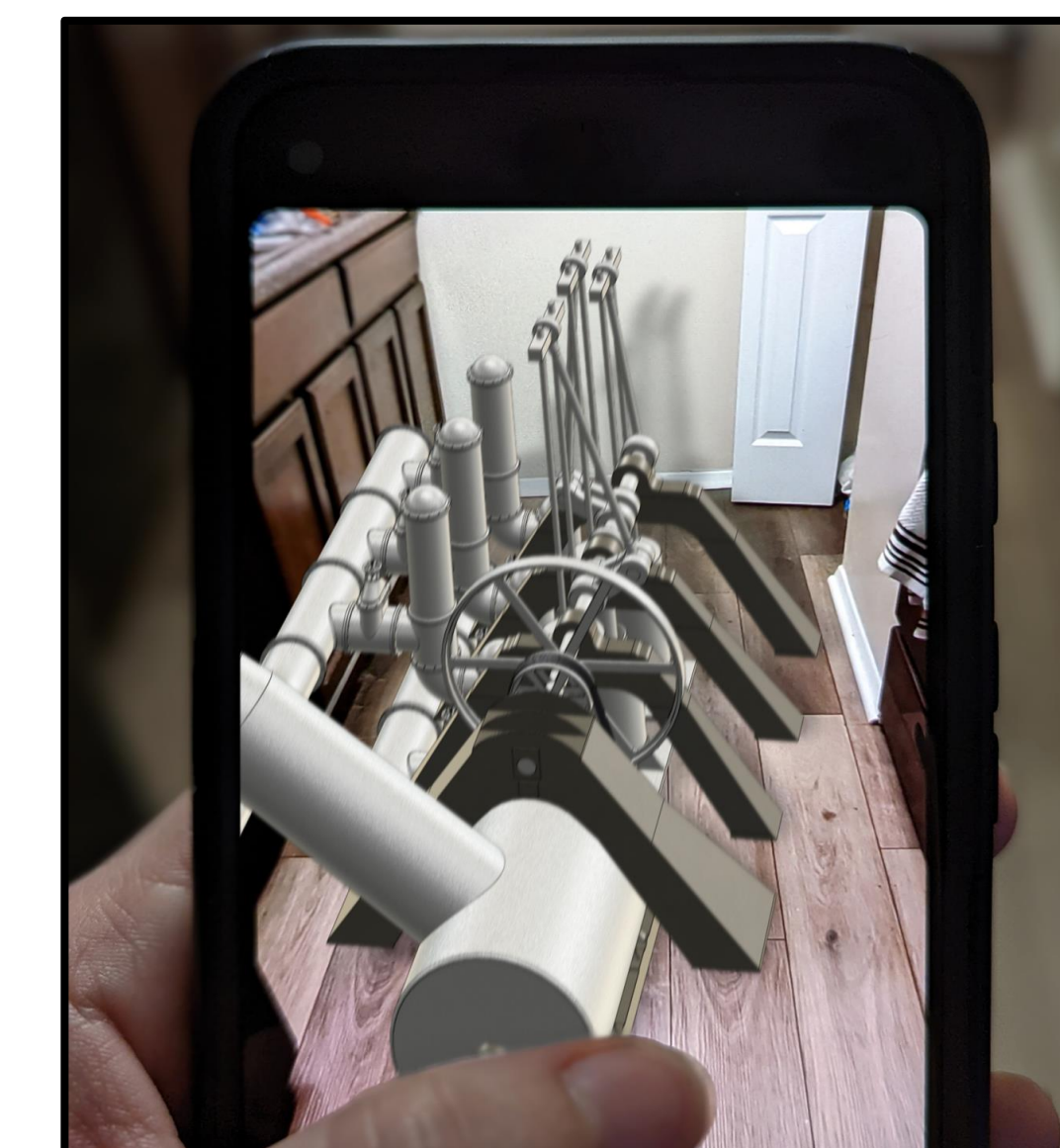


Original drawings of piston pumps.



Results

The pumping machinery's key features, including the Leffel turbine, penstock, and piston pumps, were modeled in Solidworks. Subsequent motion studies were used to create animated renderings of the pumps in operation. A 3D model was printed for display purposes, and an augmented reality experience was also developed.



Augmented reality rendering of pumping machinery

Conclusions

The pumping machinery was constructed and simulated as it existed during its period of operation and is as accurate as described by the historical literature and existing drawings.

This project provides the Friends of Pump House with a model of the pumping machinery and several visual aids to better explain to visitors the operation of the pumping machinery.

