

## Heritage Artifacts: Duplex Pumps



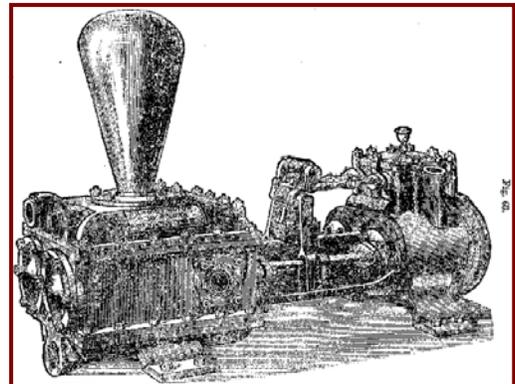
**Worthington Duplex Pump, Building 47**



**Northey Duplex Pump, Lobby Building 9**

Duplex pumps – double-chambered fluid pumps – are the unsung heroes of moving liquids around the Victorian and post-Victorian distillery site. Developed in the 1840s and '50s by New York mechanical engineer [Henry Rossiter Worthington](#), the duplex pump had a huge impact on waterworks, navigation, oil pipelines ... and Gooderham & Worts' distillery operations.

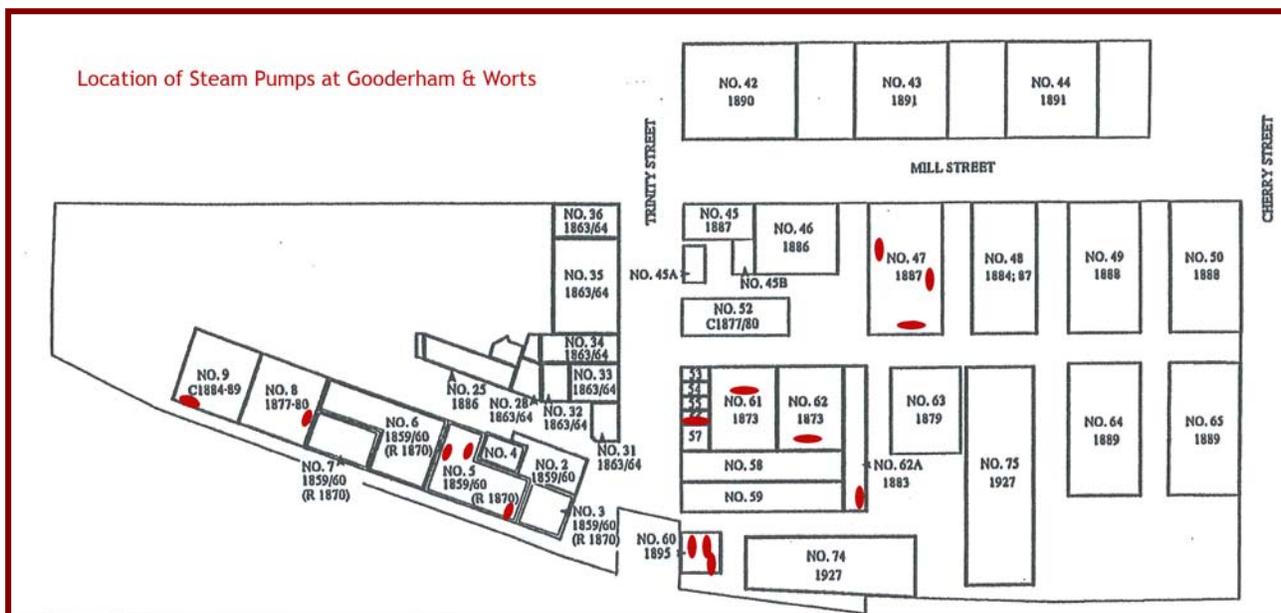
Worthington's new "direct acting reciprocating steam pump" – later dubbed a duplex pump – essentially paired two high-pressure, simplex steam pumps, each with a piston moving back-and-forth between a steam chamber and a water (or liquid) chamber to propel the liquid onward. The two engines were coordinated so that one piston was always under force of steam, and the flow of liquid continuous. For its day, the duplex pump proved remarkably efficient and durable.



**Worthington duplex pump in 1856**

Just when Gooderham & Worts installed its first duplex pump isn't known. But, given the company's habit of installing "the best," it may have been close to the time that Worthington patented his "[improvement in pumping-engines](#)" in July 1859 ... just in time for installation in the [new Stone Distillery](#). No doubt, many changes occurred over the years, with older pumps being replaced by newer ones, and new pumps being added for new purposes.

The oldest surviving duplex pumps date from the 1890s. By the time Gooderham & Worts closed down in 1990, there were over a dozen duplex pumps - most still in operation - at various locations on the site, and a few single-stage, simplex pumps. The location map shows where many of the historic steam pumps were stationed prior to the redevelopment of the site. Note, for example, that there used to be three duplex pumps in the old fire pump house (Building 60); only two of these have survived and are located elsewhere on site. (The other was donated in the 1980s to the Hamilton Museum of Steam & Technology.)



**Location of steam pumps known to have been in use at G&W**

Duplex pumps came in many sizes, and were put to many uses, such as drawing water from the Lake; moving molasses, mash and other components of the distilling process from point to point; transferring alcohol around the site through [an overhead piping network](#); and pumping water for fire protection. In the distant past, they were also probably used to transfer “slop” from the Stone Distillery across the Don River to be used as feed for livestock housed at G&W’s [farm in Riverdale](#).

A representative group of steam pumps is currently on display, some at or near their original places of use and others in new locations. They are all worth a visit, perhaps in the following order:



This **Worthington Duplex Pump (47-1-5)** was one of three pumps used in Building 47 during the denaturing process when chemicals were added to alcohol to render it unpalatable, untaxable, but still good for industrial alcohol purposes. It was probably created in the 1890s and is located near its original position.



Now located in the lobby of Building 59, this single-cylinder **Burnham Simplex Pump (60-1-6)** was originally located in Building 60, the fire Pump House, to pump alcohol to and from railway cars stopped just south of the building. It also pumped antifreeze back and forth between tank cars and the Cannery scale tank loft. Patented in 1893, it probably dates from the 1890s.



Now located in the Lobby of Building 5 in the Stone Distillery, this **Smart Turner Duplex Pump (56-1-3)** was originally located in Building 56 of the Pure Spirits complex to pump liquids during distilling operations. The red paint, however, may indicate that it was used to pump water for fire protection. The pump was manufactured in Hamilton, Ontario during the late nineteenth century.



This little **Worthington Duplex Pump** is the smallest pump on display. Originally located in Building 47 and used to pump alcohol to the scale house in the Denaturing Building, the pump is now in a niche on the second floor of Building 5 in the Stone Distillery.

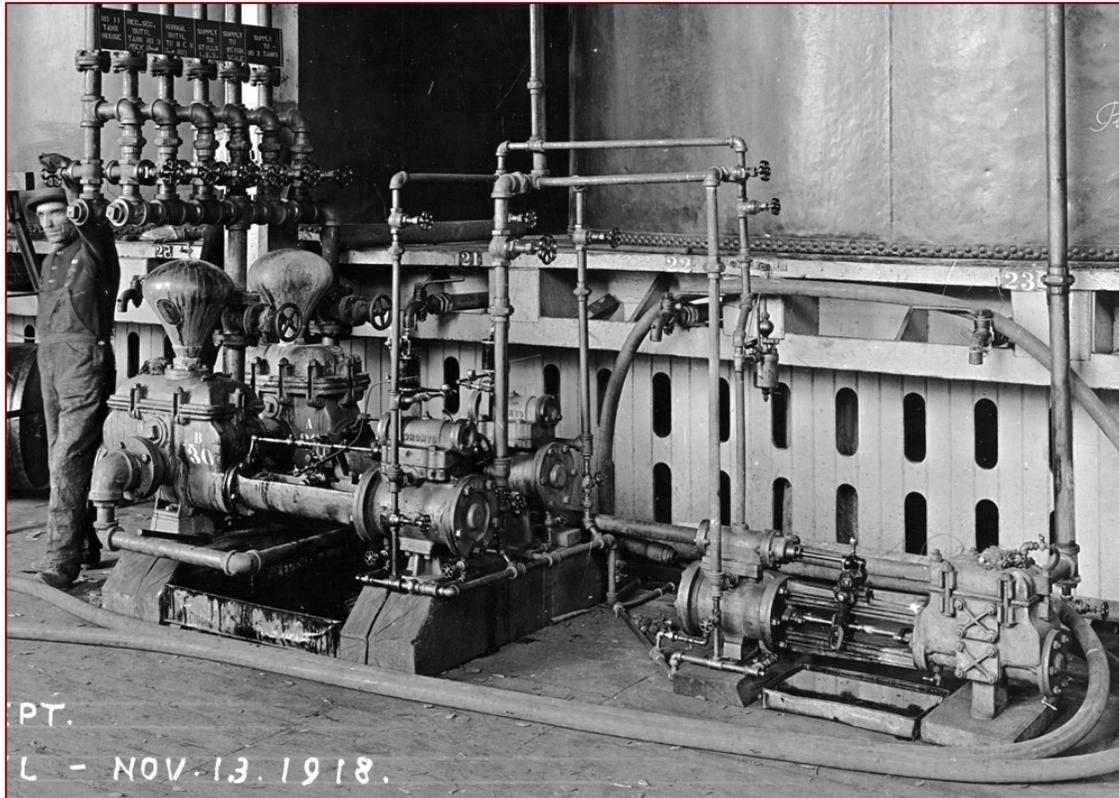


Located in Building 9, this **Dean Duplex Pump (9-1-1)** was used for a variety of purposes. Initially, it pumped molasses from a large exterior storage tank into a smaller storage tank that used to poke through the roof of Building 9. Here, the cold molasses was heated before being transferred to either the yeast tubs in Building 7 or fermenting tuns in Building 6. Later, it pumped antifreeze from rail cars to exterior storage tanks and to the antifreeze operation in the Cannery (Buildings 58 and 59).



The **Northey Duplex Pump** is the largest and most sophisticated pump on display. Probably manufactured around 1890 in Toronto, it was one of a pair of Northey steam pumps located in the fire Pump House (Building 60), capable of pumping 1000 gallons per minute. Because of their importance to fire protection, they were always kept “at the ready” with the boiler under pressure, and staffed 24-7 until 1964 when they were finally deemed obsolete and replaced with gasoline pumps. The Northey is a double-expansion (or compound), double-acting, duplex pump that differs from the other duplex pumps by having extra steam cylinders – two high-pressure and two low-pressure – that improve the efficiency of the machine. As steam expands in a high-pressure cylinder, energy is extracted, and its temperature drops. It then passes to the low-pressure cylinder, where further energy is extracted. By expanding the steam in this two-stage process, the compound pump is far more efficient than the other, single-stage duplex pumps.

Year-after-year, in summer and winter, in war and peace, Gooderham & Worts' duplex pumps did their vital work. Pause for a moment to celebrate the lowly pump.



**World War I steam pumps in front of Building 61 storage tanks, where they returned to pumping distilled water and alcohol until the end of distilling activities around 1990**

Many thanks to Jim White for sharing his knowledge of duplex pumps at Gooderham & Worts, obtained while maintaining them for many years.

For mechanically-minded readers interested in tracing the history of the duplex pump and its inventor, Henry Rossiter Worthington, visit ***In the beginning - the Worthington Steam Pump Co.*** which contains [a gallery](#) and [slide show](#) of 61 images documenting the evolution of the pump. Improvements continued to happen after Worthington's death in 1880, but they were true variations on a theme. Gooderham & Worts had several Worthington pumps.

The 1856 drawing of an early Worthington duplex pump is Figure 63 in John Bourne's 1856 [A Catechism of the Steam Engine](#), available online through Project Gutenberg. The caption to Fig 63 is:

Fig. 63 is a perspective view of H.R. Worthington's Duplex Steam Pump. The prominent peculiarity of this pump is its valve motion. As seen in the cut, two steam pumps are placed side by side (or end to end, if desired). Each pump, by a rock shaft connected with its piston rod, gives a constant and easy motion to the steam valve of the other. Each pump therefore gives steam to and starts its neighbor, and then finishes its own stroke, pausing an instant till its own steam valve, being opened by the other pump, allows it to make the return stroke.

Animations of duplex and other pumps can be found at  
<http://www.animatedsoftware.com/pumpglos/duplexpu.htm>

Please send your comments or questions to Manager of Heritage Services, Sally Gibson,  
[sg@thedistillerydistrict.com](mailto:sg@thedistillerydistrict.com).