



# **de Laval High Efficiency Centrifugal Pumps; Single-Stage and Multi-Stage Types for All Capacities and for All Heads Their Characteristics, Design, Man**

*De Laval Steam Turbine Company*

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This historic book may have numerous typos and missing text. Purchasers can download a free scanned copy of the original book (without typos) from the publisher. Not indexed. Not illustrated. 1914 Excerpt: ...feet per second, and  $g$  is the acceleration of gravity, or 32.16 feet per second per second. The spouting velocity of steam expanded from boiler pressure to a high vacuum is in the neighborhood of 4000 feet per second, or when expanding to atmosphere, a little less than 3000 feet per second. In a reaction turbine, the buckets move, for the best efficiency, at the velocity of the steam and in an impulse turbine at one-half of the velocity of the steam. If the pump impeller were of the same diameter as the wheel of an impulse turbine, the head generated would be 35,000 feet for 1500 feet per second bucket speed, which is approximately the velocity of the buckets in commercial single-stage turbines. These figures bring out vividly the necessity of some means of speed reduction between the steam turbine and the pump. The simplest method is to make the diameter of the pump impeller less than that of the turbine wheel. If the turbine wheel, for instance, is 3 feet in diameter and the pump wheel is 8 inches in diameter, the peripheral velocities will be in the same ratio, i.e., with a peripheral speed of the turbine wheel of 1500 feet per second, the periphery of the pump impeller would run at 334 feet per second, and the head generated would be some 1730 feet. This is still a much higher head than is commonly required or than is suitable to a single-stage pump and it is obviously necessary to reduce the turbine bucket velocity or to incorporate some mechanical speed reduction between the turbine and the pump. Aside from having the turbine wheel run at some speed slower than the theoretically most efficient speed, there are two methods of reducing turbine speeds, viz., velocity staging and pressurestaging. Velocity staging is exemplified by the De Laval Class &quot;...

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