

Winery layout and movements: past and present

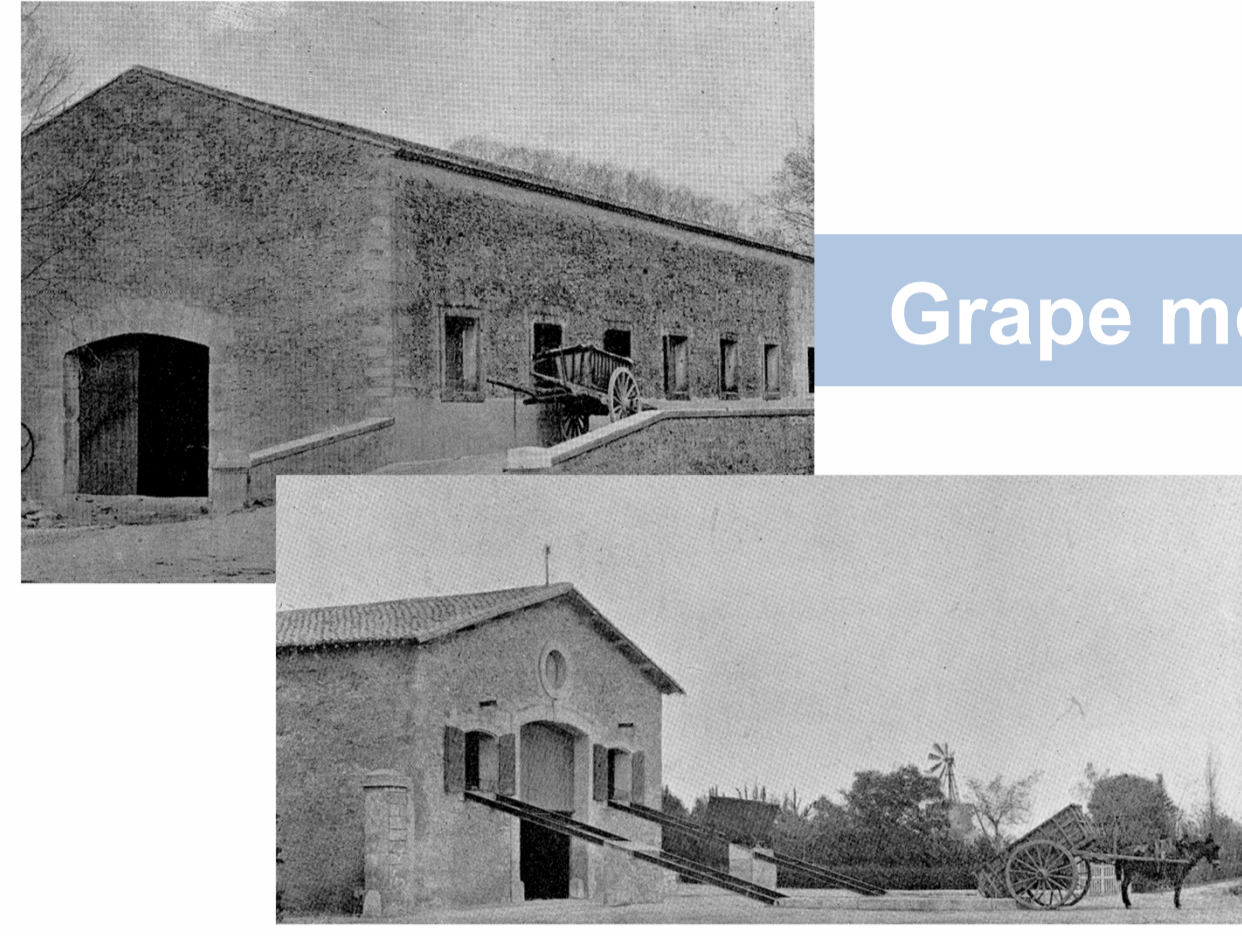


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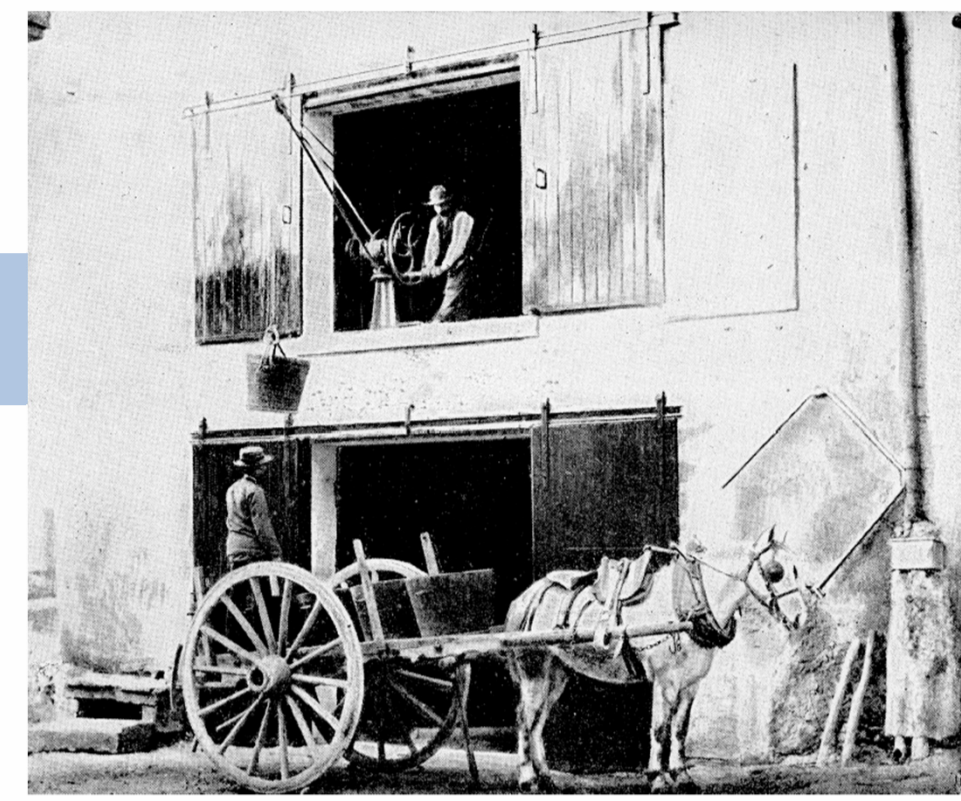
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Ramp and horse-drawn wagon

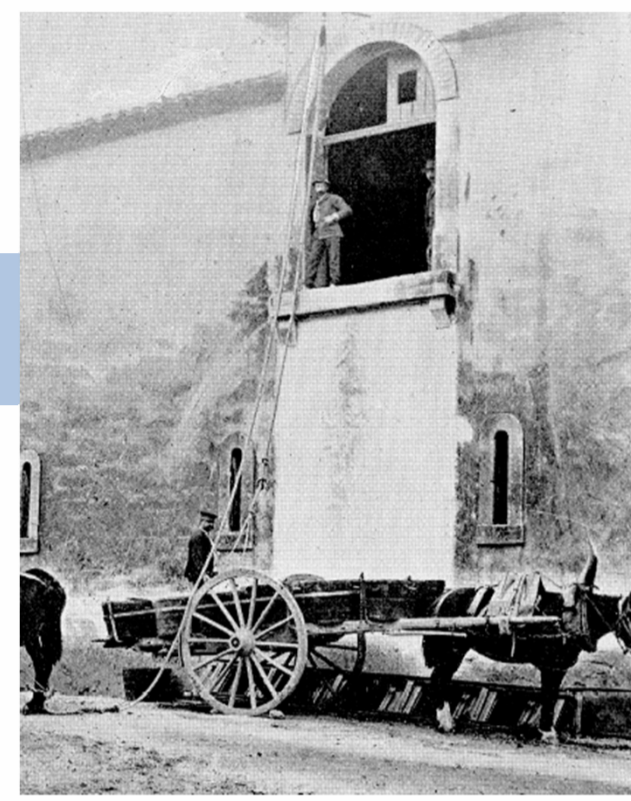


Grape movement

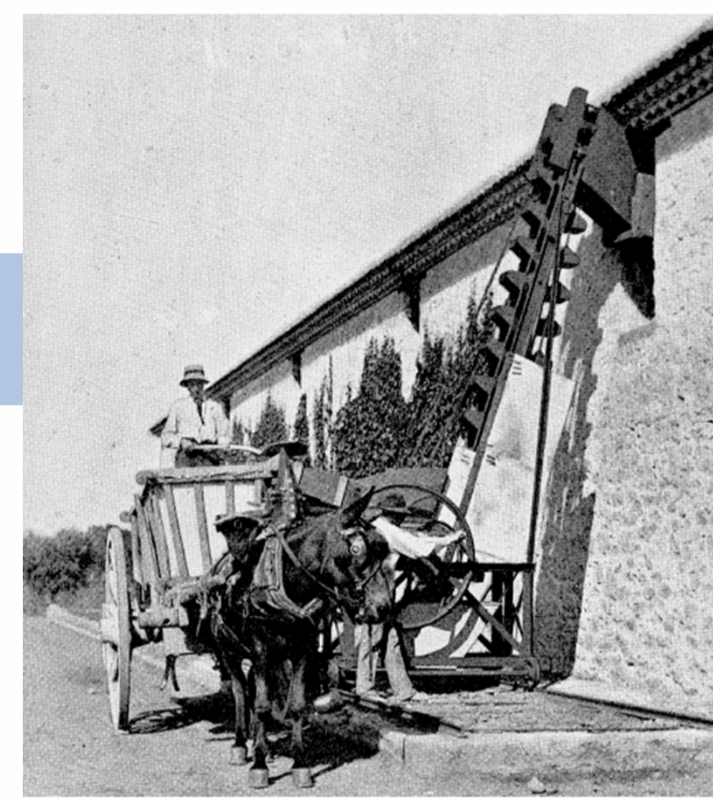
Cart pulled up temporary ramp



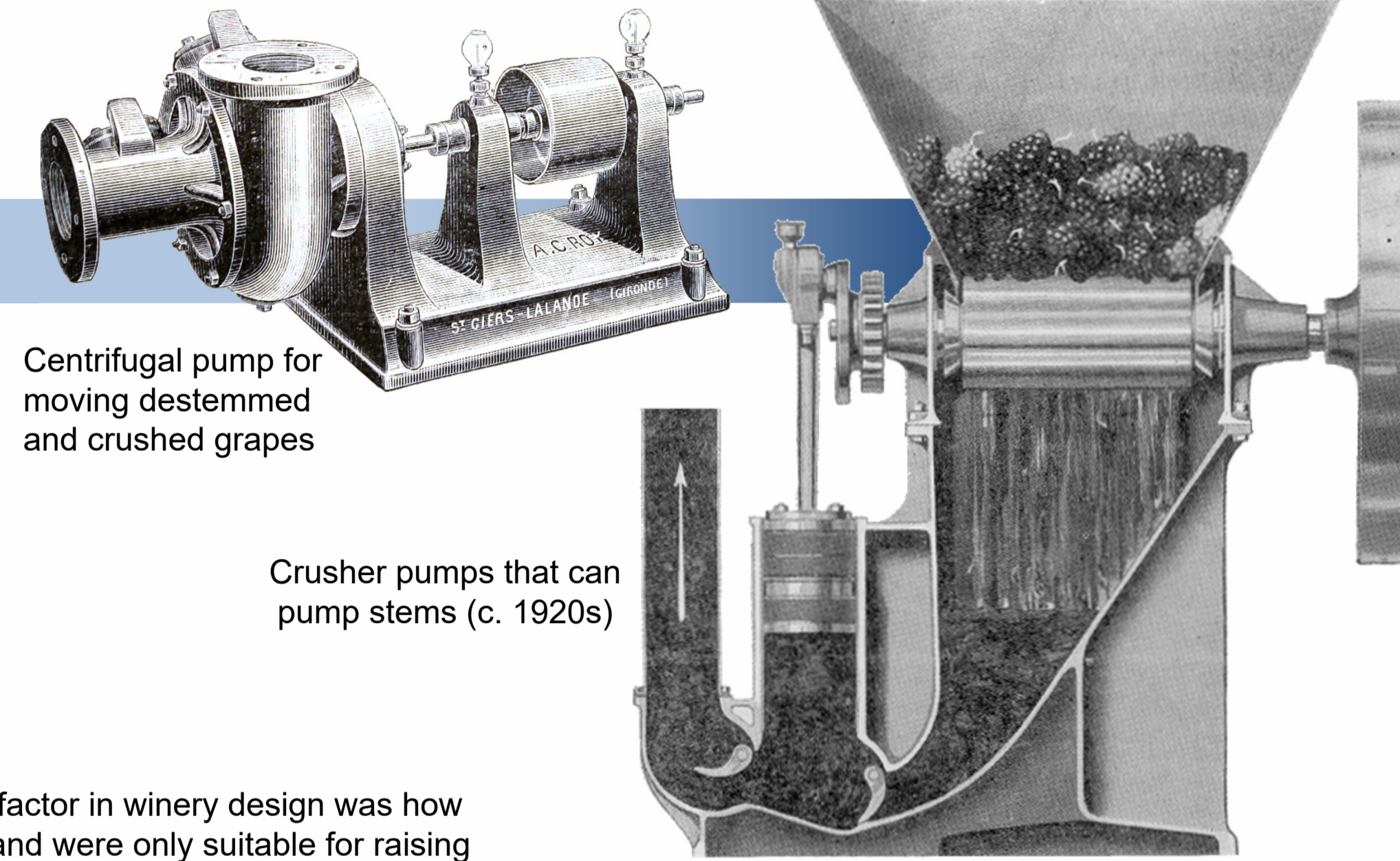
Crane



Pulley



Bucket elevator (Noria)

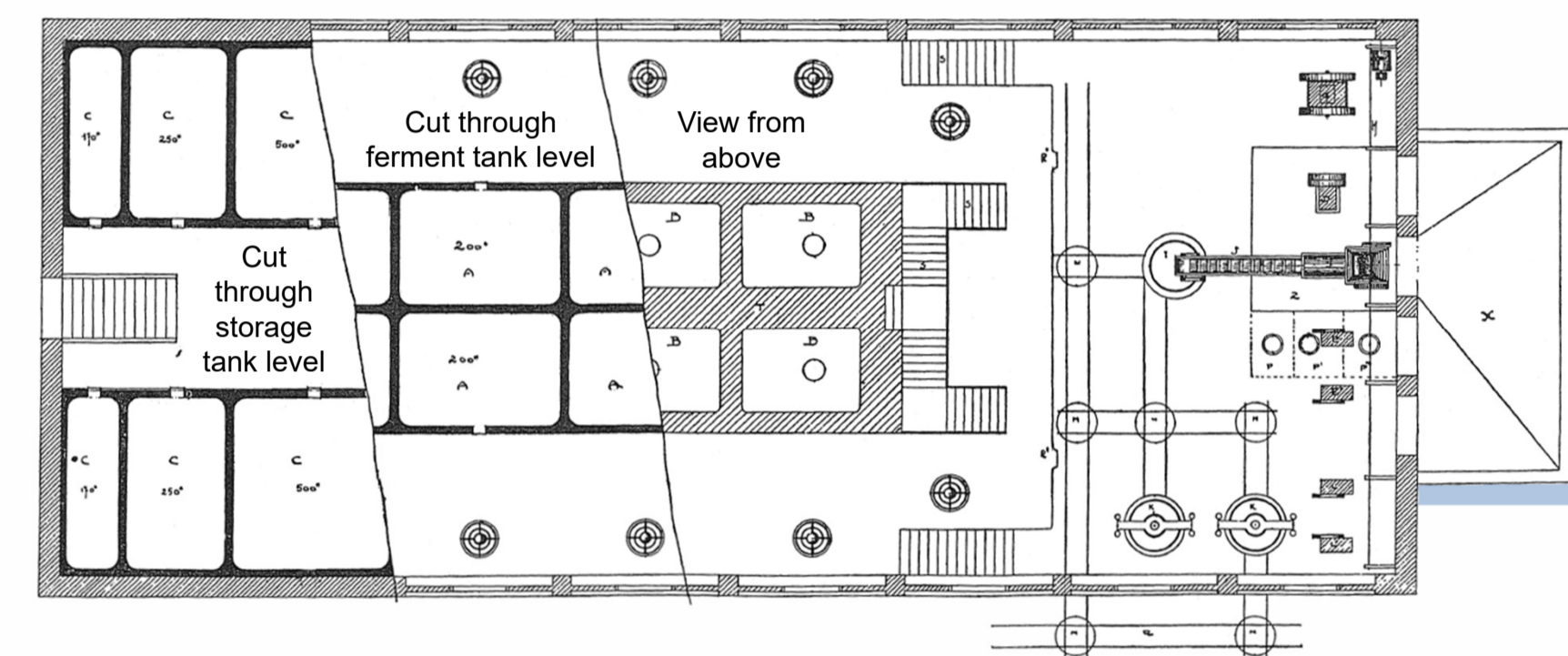


Centrifugal pump for moving destemmed and crushed grapes

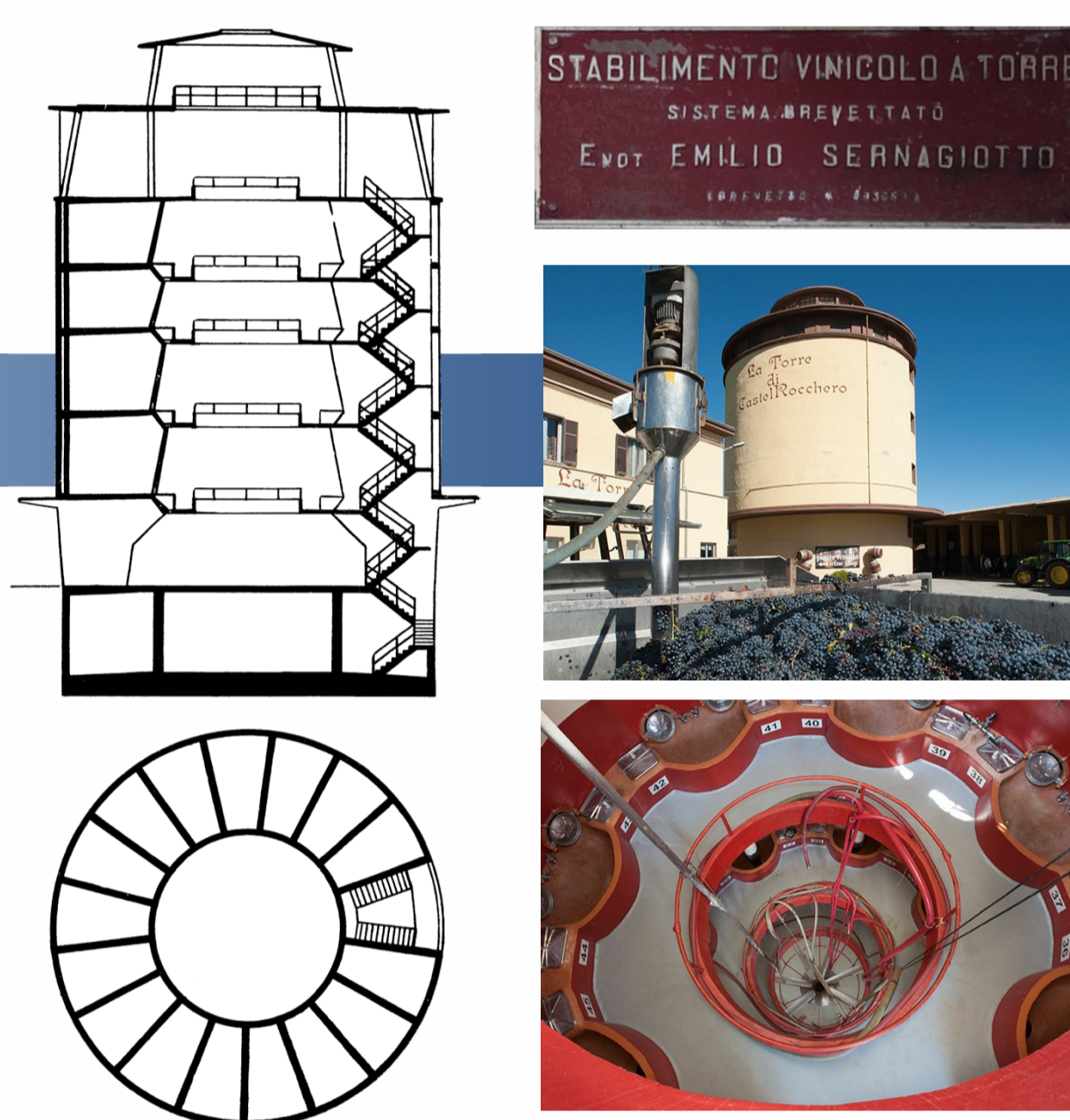
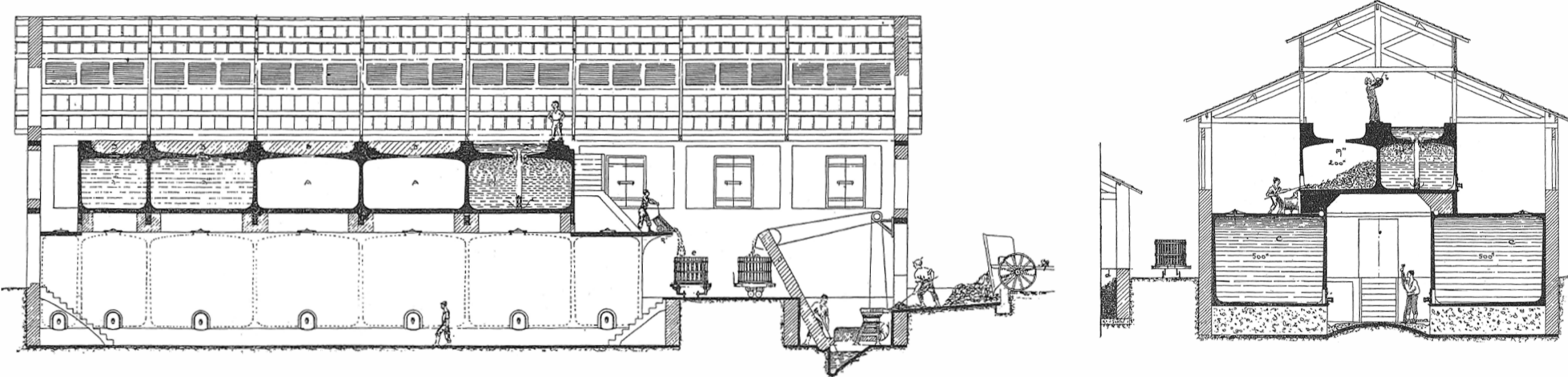
Crusher pumps that can pump stems (c. 1920s)

Options for raising the harvest in late 19th century France

Before electrification, at a time when juice and wine movements would typically be performed using gravity/bellows or manual pumping, a key factor in winery design was how the harvest was raised on first delivery to the winery. Six options used in late 19th century France are shown above. Pumps were not common and were only suitable for raising destemmed and crushed grapes. In the 1920s pumps capable of handling stems were developed to cater for wineries that did not want to destem.



Compact layouts



Novel arrangements to centralise operations

Emilio Sernagiotto's winery tower

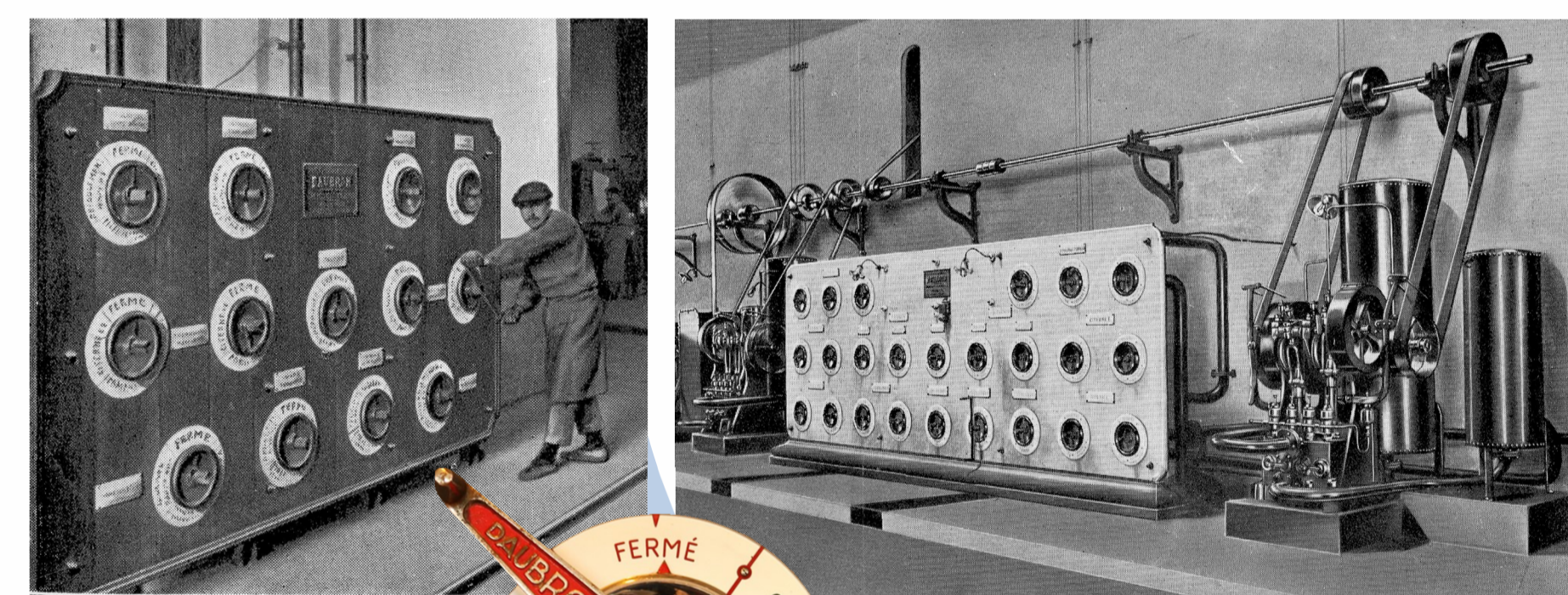
Emilio Sernagiotto invented the winery tower in the 1950s. Fermentation is performed at the top, then wine is drained down to the levels below for malolactic fermentation and then again for storage. Marc from fermenters is raked down into chutes to a central press at the bottom. The design is compact and well suited to regions without much flat land.

Bellot's bottle tower

Bellot developed a tower of metal self-emptying fermenters in the late 1960s. It was fitted with a demountable roof so further layers of fermenters could potentially be retrofitted above.

Efficient Algerian winery with reinforced-concrete tank from the 1920s

Grapes are tipped from wagons into a hopper and manually fed into a crusher-destemmer in a pit. The separated stems are conveyed up into a hydraulic press basket for juice recovery. The crushed grapes are pumped from a sump underneath the crusher-destemmer via an overhead line into the top of red fermenters (fitted with Decailet CO₂-driven skin-mixing systems - see accompanying poster on mixing fermenters with gas). After fermentation, wine is drained into the storage tanks below. The marc is raked from fermenters into wheelbarrows, which are then tipped into baskets and pressed using a hydraulic press.



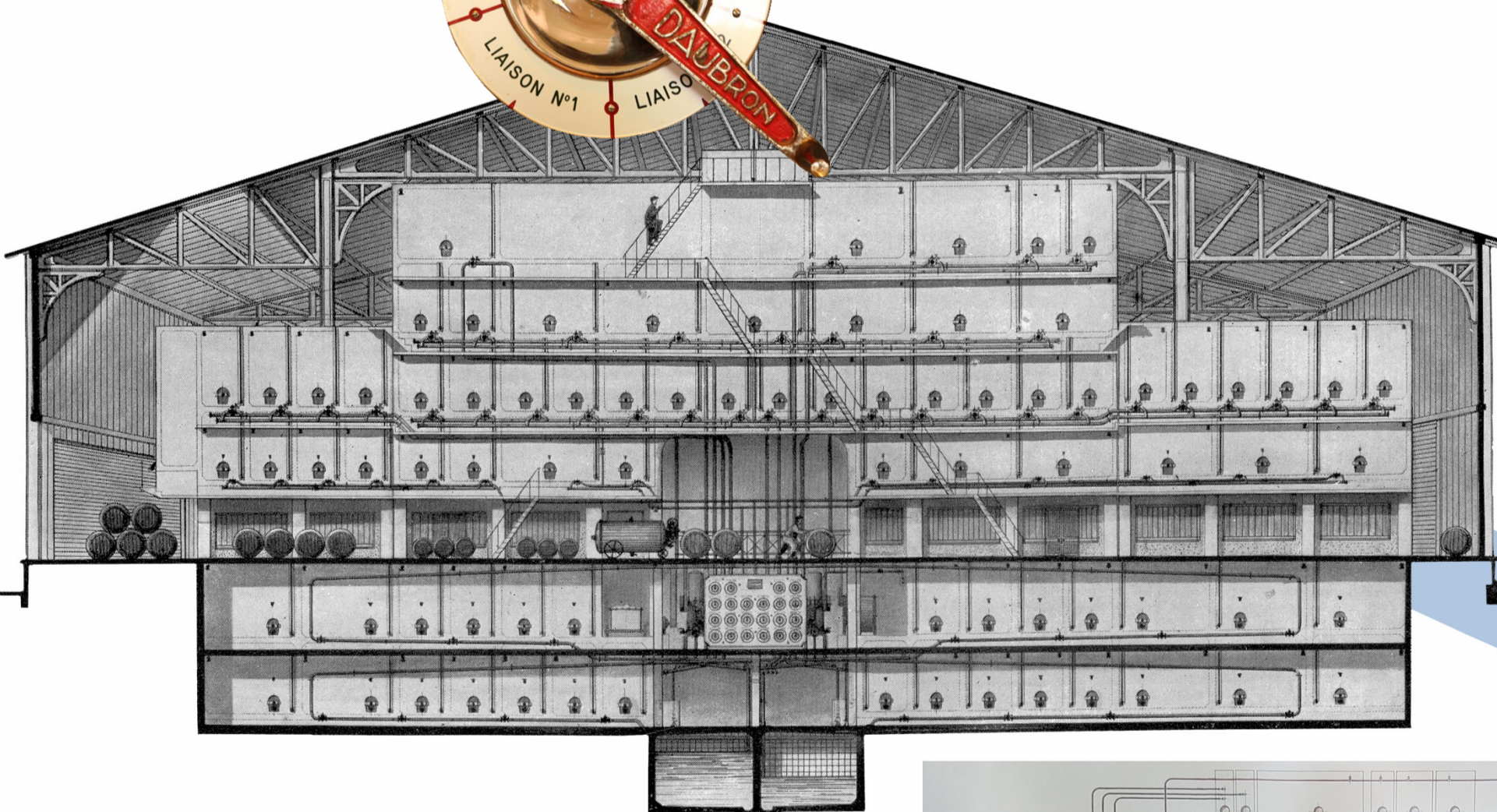
Electrification changed winery design

Electrification and the mobile electric pump removed wineries' reliance on gravity. It would have made winery design simpler and cheaper, as grapes/juice/wine could be easily moved between any level and/or over long distances.

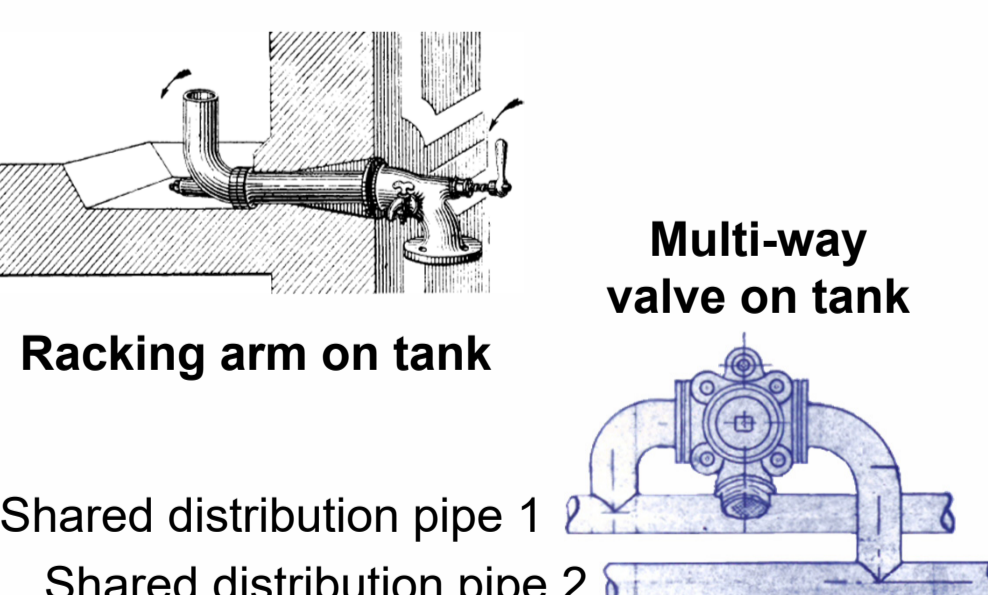


Smart pumps and sensors to automate transfers

In recent years, pumps with sensors have been quite widely adopted to partially automate operations such as barrel filling and emptying, tank topping and blending. Systems to automatically make cut-outs during transfers have also been developed but are still at an earlier stage of adoption.



Hoseless wineries?



Racking arm on tank

Multi-way valve on tank

Shared distribution pipe 1

Shared distribution pipe 2

Centralisateurs

From the early 1900s Daubron (and then others) designed wineries with fixed lines, racking arms and multi-way valves on tanks and central distribution tables ('Centralisateurs') that allowed fixed steam powered pumps to be shared. Hoses were not required for most operations. Hygiene and metal leaching may have been issues and with the advent of electrification and mobile pumps, these designs appear to have gradually fallen from favour. However, could they provide some inspiration in the design of modern automated wineries, incorporating stainless steel, hygienic pumps, valves, pigging and computers?



Pigging: Pigs are mobile plugs used to clean, inspect or push products through pipelines. They were first used in the oil industry. Their etymology is debated, with some saying that they are called pigs because early pigs made a squealing sound as they scraped through pipelines, while others claim that 'pig' is an acronym of pipeline inspection gauge.

Piggable valve matrix

Piggable transfer board (safety sensor on pipe bend to verify connection path)

Piggable transfer manifold with swivel joints in connection pipes

Automated pigging

Automated pigging systems are already used at some wineries at the very start (on must lines) and very end of the winemaking process (on key transfer lines between winery and bottling tanks and between bottling tanks and bottling lines). However, they are not currently used during most of the winemaking process. While it would be expensive in the short-term, could advanced pigging systems, incorporating loops around tank farms and point-to-point between equipment sheds and tank farms be used to improve winery automation and reduce water use?