



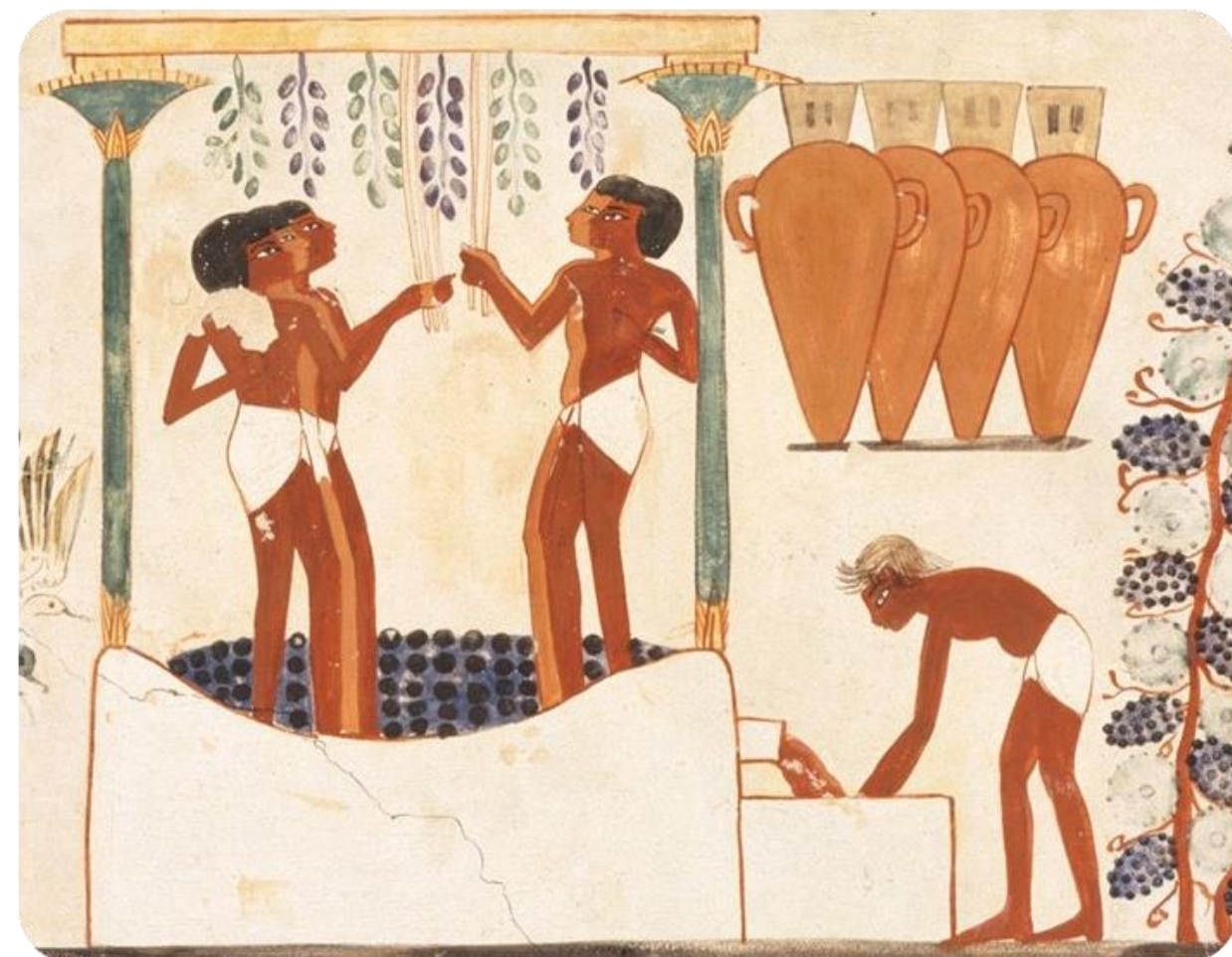
AWRI

Equipment evolution: Crushing

Simon Nordestgaard

The Australian Wine Research Institute, PO Box 197, Glen Osmond (Adelaide) SA 5064, Australia

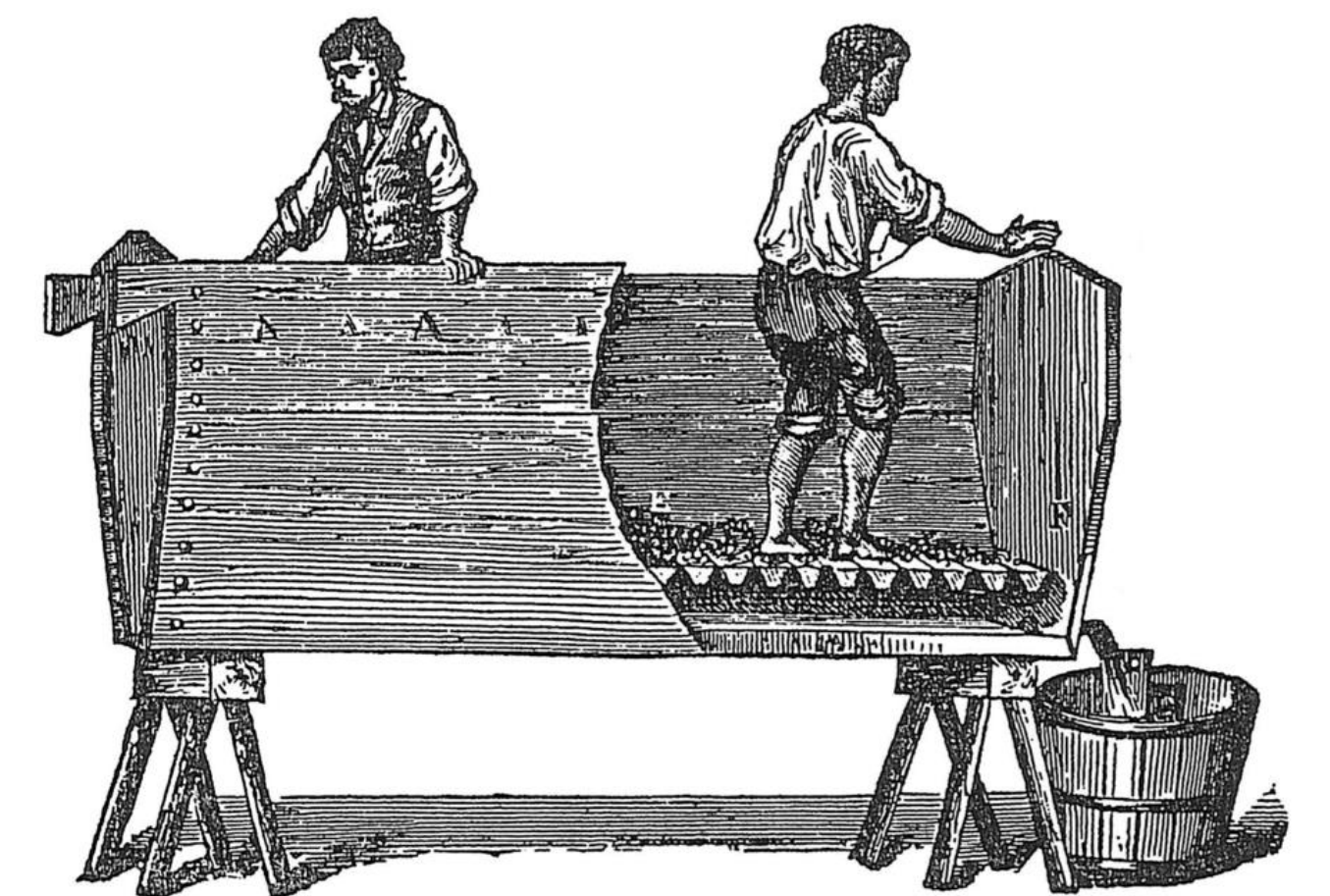
Corresponding author's email: simon.nordestgaard@awri.com.au



Treading grapes in Ancient Egypt

Image from Nakht's tomb at Thebes c. 1428 BC.

"The instruments nature provided for the purpose"



Treading grapes in 19th century France

Treading was long seen as the best means of crushing. The foot crushes the pulp, while not excessively damaging seeds or stems.

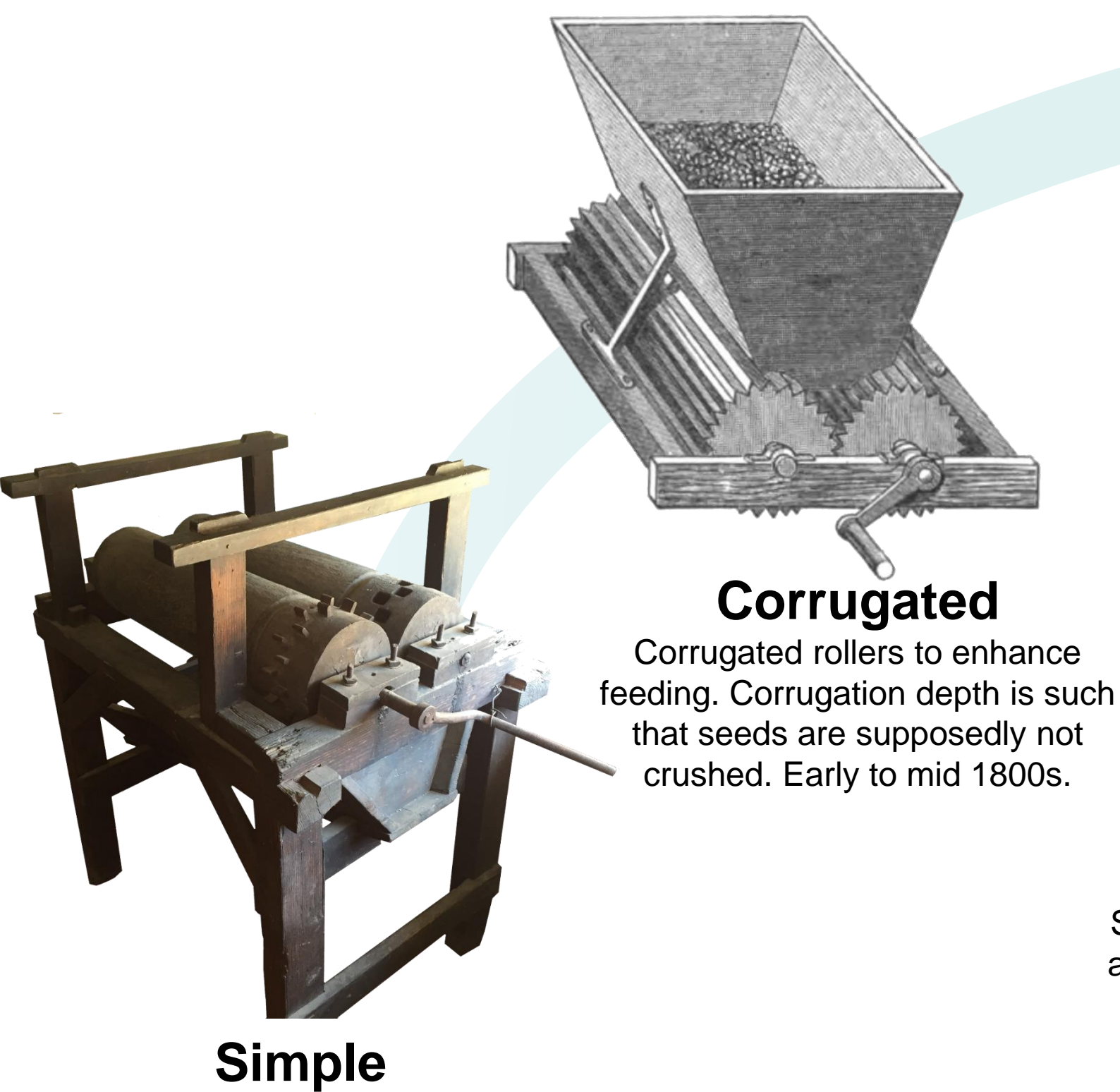
- Hugh Johnson (1989)

✗ Crushing

- Produces more lees
- Can cause astringency if crushing is excessive (tannin increases proportionally more than colour)
- Prevents (possibly desirable) sensory characters from partial intracellular fermentation

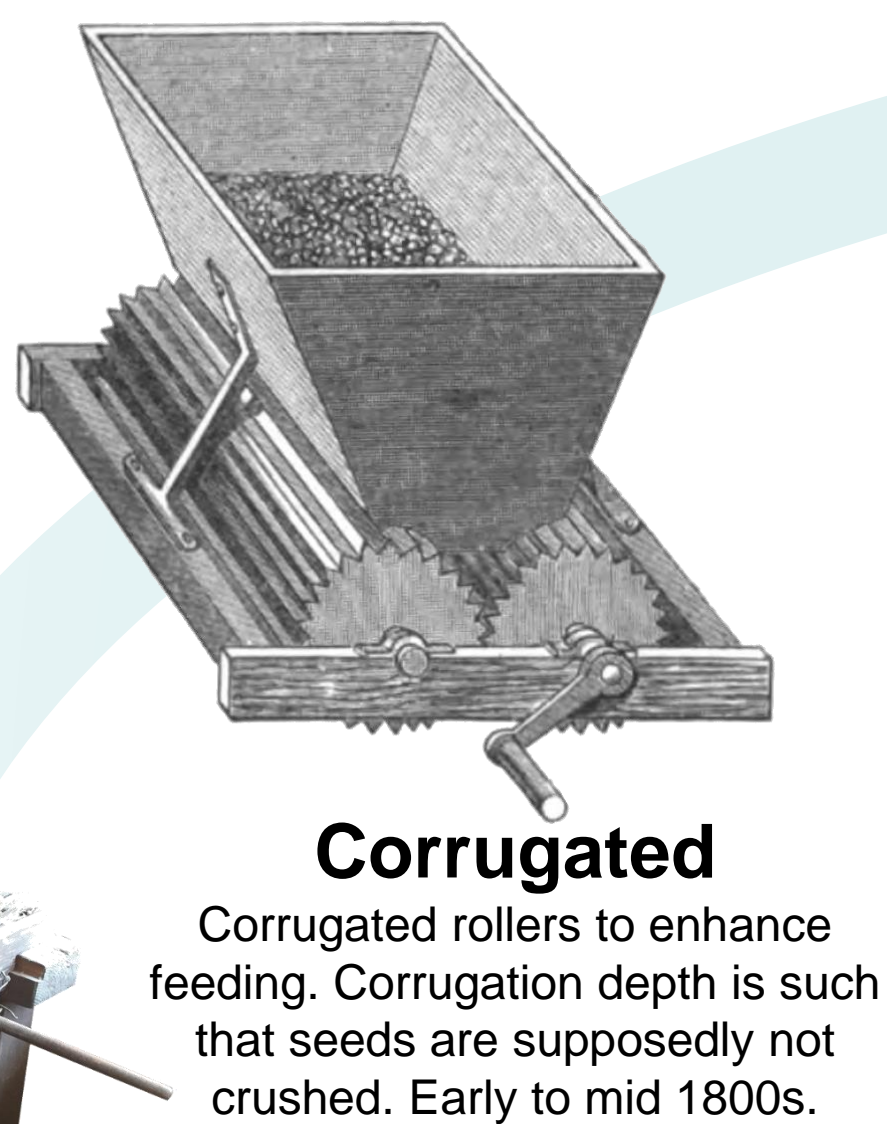
✓ Crushing

- Frees juice quickly
- Enhances extraction
- Facilitates alcoholic fermentation



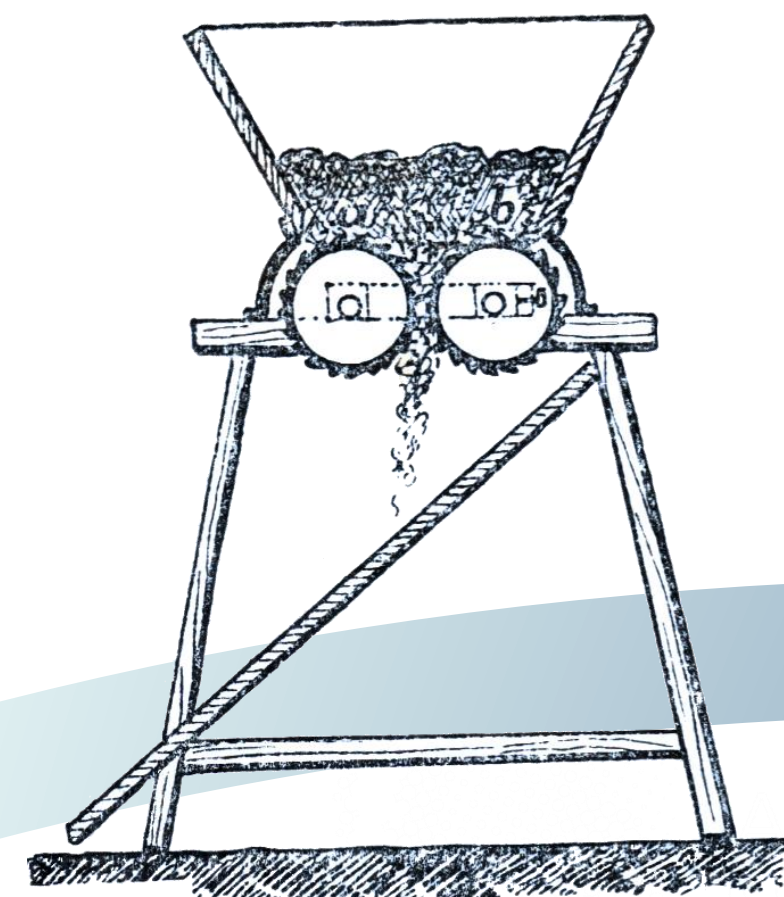
Simple

Plain cylinders. Sometimes with nails to enhance feeding. Early 1800s.



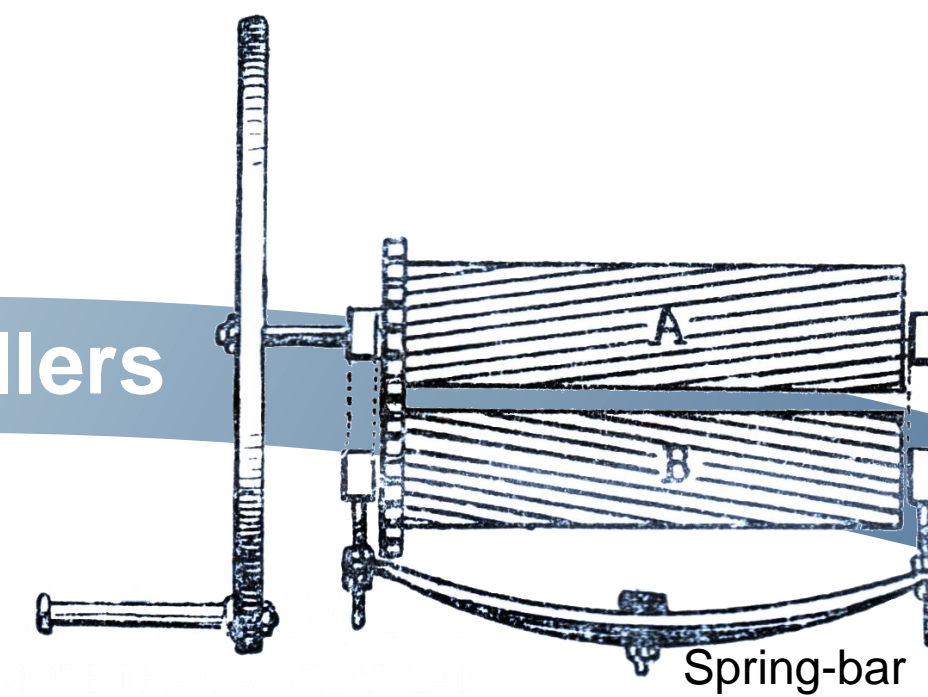
Corrugated

Corrugated rollers to enhance feeding. Corrugation depth is such that seeds are supposedly not crushed. Early to mid 1800s.



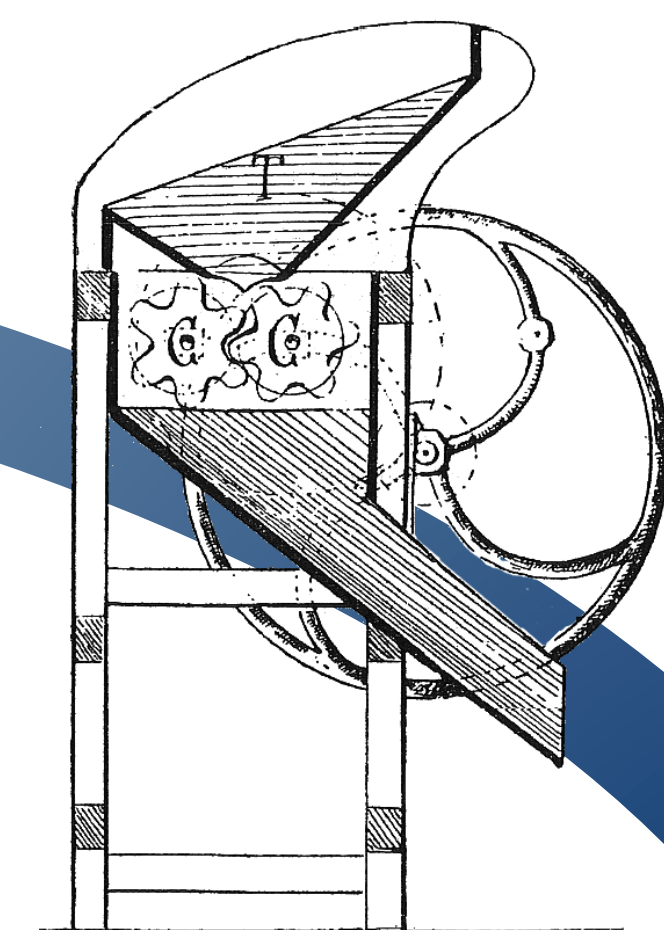
Differential speed and adjustable spacing

Differential roller speed (3:1 – 5:1) provided by external gears enhances tearing of the pulp from the skins. Spacing can be adjusted by screws to control crushing effect. Rollers also sometimes had rubber covers. Mid to late 1800s.



Spring-loaded to avoid damage by stones, etc.

One floating roller is supported by a spring-bar or coil springs. This allows the gap to open and any hard foreign objects to pass. The elasticity also gives a more uniform crushing. Late 1800s.



Lobed with external gears

Lobed rollers greatly enhance feeding. External gears mean that rollers don't actually touch so there is a gap for seeds. Late 1800s.

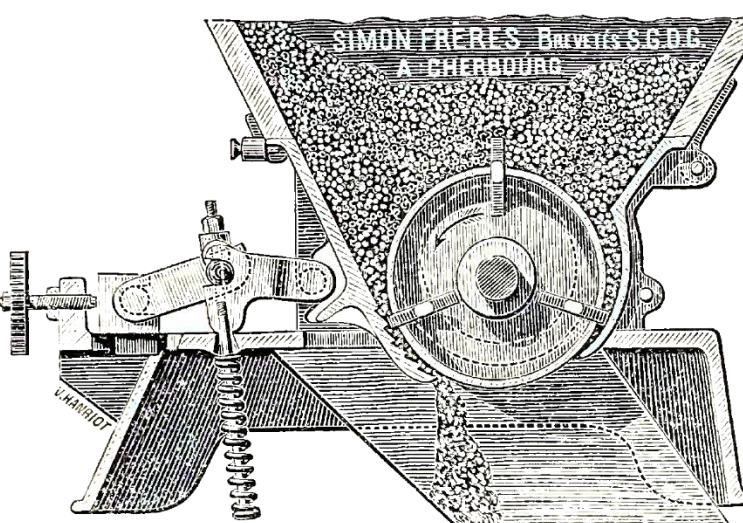


Modern roller crusher

Roller crushers are still the most common crusher style used. Typically they are lobed with elastomer outer and spring-loaded to avoid hard objects. They are also typically integrated underneath a destemmer.

Single rotor with paddles

Sliding paddles in a rotor crush grapes against a grated surface. Tension can be adjusted by a spring that also allows hard foreign objects to pass. Simon Frères c. 1894.



Impressions of old centrifugal crusher performance* from the literature

- High throughputs
- Extensive crushing
- High juice yields
- High aeration
- Evaporative cooling of grapes
- Rough on skins
- High tannin and colour
- Large amounts of lees
- Not as suitable for table wines as roller crushers and not commonly used now

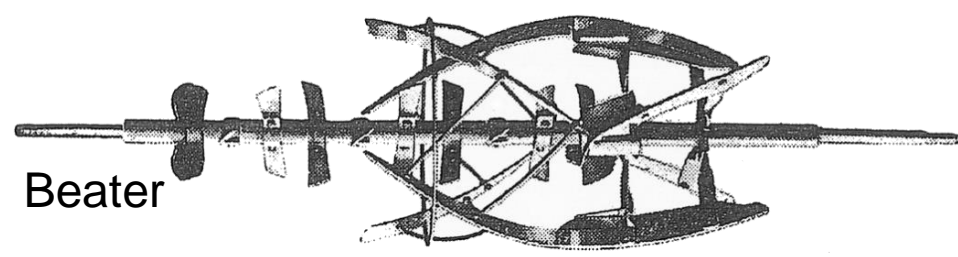
(*performance may be different at slower speeds)

Centrifugal w/ destemming



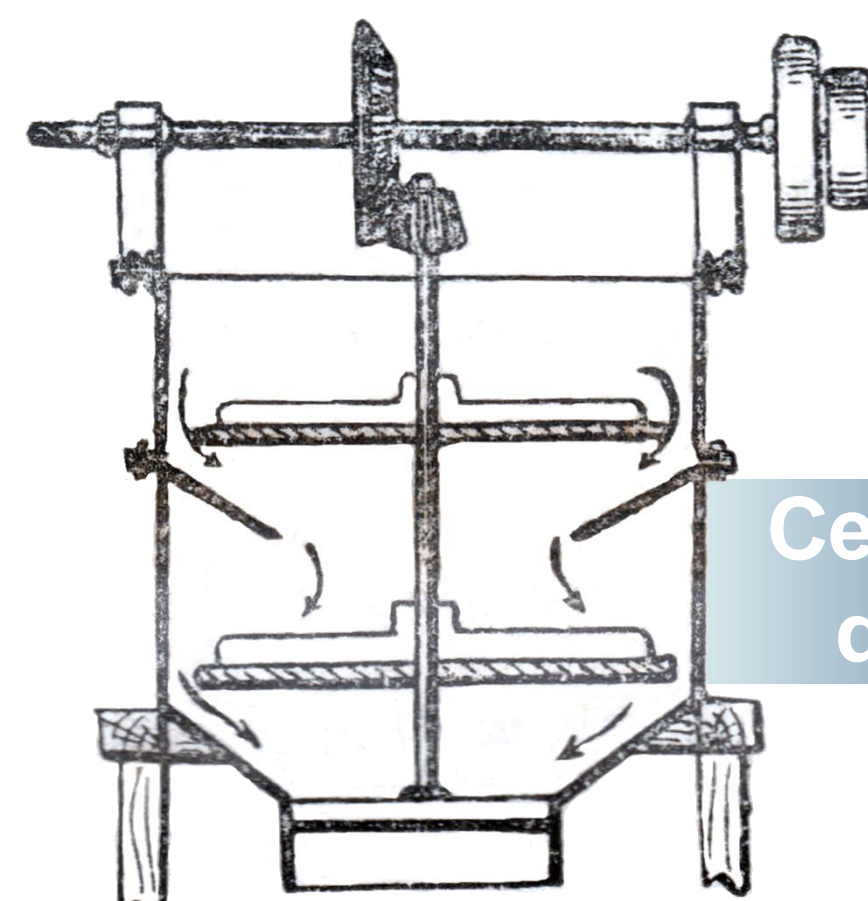
Beater with fixed cage

Rotary beaters both destem and crush in a single fixed cage. Mid to late 1800s.



Beater with twin cages

Twin cages rotate. A beater rotates even faster (~500 rpm). The beater has elements within the inner cage to destem and between the cages to vigorously crush the destemmed grapes. Garolla c. 1890s.



Spinning disc

Grape bunches fall on a fast-moving disc (~700 rpm) and are projected into a wall to crush. Material is funnelled to a second similar stage. Stems and seeds are not damaged. Paul c. 1890s.

Centrifugal w/o destemming



Modern spinning disc

Destemmed grapes or bunches fall onto a single fast moving disc and are projected into a wall to crush in a small device with adjustable speed. Pellenc c. 2012.



- The general trend in crushing has been towards light lobe roller crushing or no crushing at all and this seems unlikely to change.
- Compressed vintages that are now being experienced do create a desire for more rapid white grape juicing and red grape extraction technologies, so there may be some renewed interest in intense mechanical crushing technologies. However, previous experiences with high throughput centrifugal crushers and the move away from these technologies suggest that this will not be widespread.

Reference: Johnson, H. 1989. *Vintage: A history of wine. Episode 1.* Malone Gill Productions.

Other sources include: Bertuzzi (1949), Cazalis (1900), Fontaine (1905), Guyot (1864), Maumené (1890), Ottavi (1893), Ottavi & Strucchi (1929), Pacottet (1915), Peynaud (1981), Rankine (2004), Redding (1860), Roos (1900), Thudichum & Dupré (1872), Troost (1961) and many equipment suppliers.

Disclaimer: Simplified summary only. There are variations with country, region, scale, wine style and between equipment brands. Equipment often co-exists and independent data on relative performance is often limited. Information should not be considered as an endorsement or dis-endorsement of any product or brand by the AWRI.

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