The Riveting Machine

MARIAUD CONSULTING

Our PROGRAM

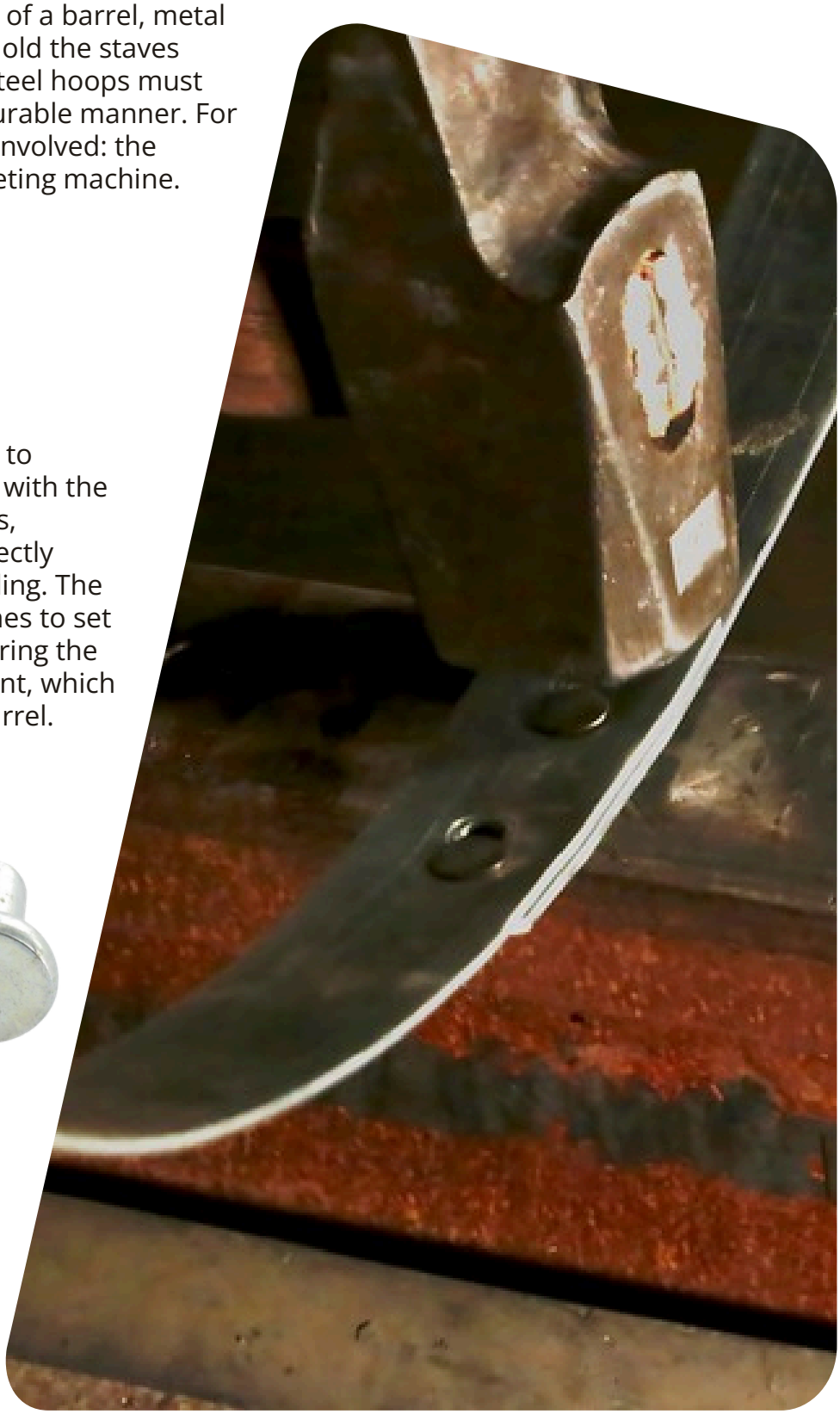
The Riveting Machine

01 Presentation

The Riveting Machine

In the artisanal manufacturing of a barrel, metal hooping is essential to firmly hold the staves (wooden slats) together. The steel hoops must be assembled in a solid and durable manner. For this, two specialized tools are involved: the punching machine and the riveting machine.

The punching machine is used to precisely drill the metal hoops with the locations planned for the rivets, guaranteeing a clean and perfectly aligned bore on the steel banding. The riveting machine then intervenes to set and head the rivets, thus ensuring the definitive fixing of the hoop joint, which closes the circle around the barrel.



The Riveting Machine

02 Terminology

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1. The Frame

In a single steel block, it integrates the die, the hydraulic cylinder and the pillar, guaranteeing robustness and stability to the assembly.

2. The Upsetting Head

This is the moving part of the riveting machine. It is a heavy mass, actuated vertically, which comes to crush the rivet to head it.
When this head reproduces the shape of the rivet head, it is then called a snap.

Creep (fluage) refers to the slow and progressive deformation of a material subjected to a constant stress, maintained over time.

A riveting machine applies, for example, pressure on the rivet, which deforms gradually.

The rivet metal thus "flows" to form the rivet head, ensuring a solid assembly without a sudden impact.

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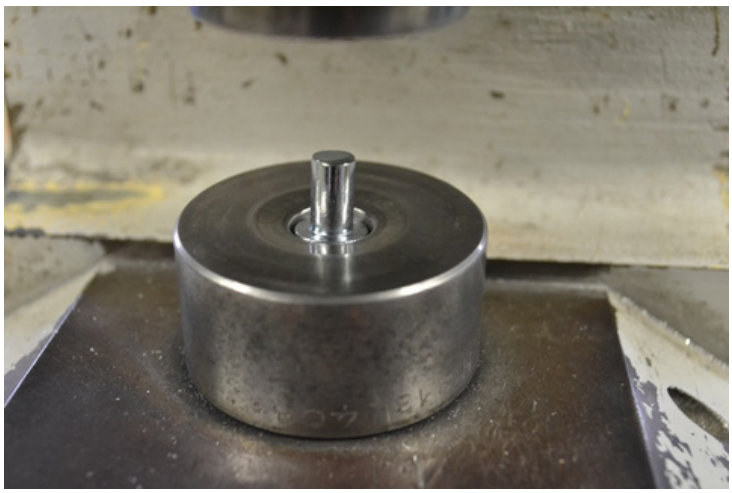
3. The die

The die is a fixed support placed under the rivet. It acts as a counter-form during riveting. Its surface is often shaped to the form of the rivet head, particularly when the upsetting head is flat.



Die (Matrice)	Snap (Bouterolle)
Fixed tool (*anvil*), generally below.	**Moving tool** (*forming tool*), generally above.
Gives the **final shape** by receiving and **supporting** the rivet during crushing.	Applies **pressure** and/or performs the **forming movement** on the rivet.
Used in **impact riveters** (*die press*).	Used in **upsetting riveters** (*radial/orbital*).
The **internal shape** of the die determines the **shape of the rivet head**.	The **shape of the snap** and its **progressive movement** deform the rivet to obtain the **final head**.
Suitable for **round head rivets**.	Suitable for **flat rivets**.

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4. The rivet

In our trade, the following are referred to interchangeably:

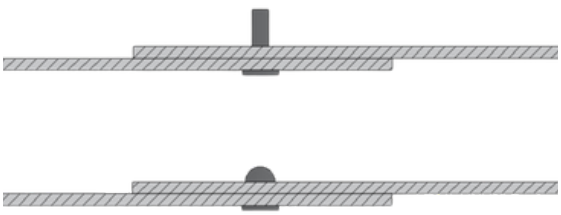
- Solid rivet (rivet plein)
- Rivet to be headed (rivet à mater)
- Rivet to be struck (rivet à frapper)
- Rivet to be set (rivet à sertir)

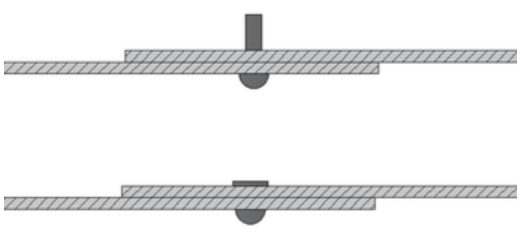
The material used is white zinc-plated steel, because:
✅It allows for cold working (the rivet is malleable without thermal treatment)
✅It crushes cleanly during riveting without cracking
✅It offers protection against corrosion, which is essential in cooperage (humid environment + contact with liquids).
White zinc rivets are therefore perfectly suited for the setting of metal hoops on barrels.

The Flat Rivet

The Round Head Rivet

The head is **flat** or very slightly **domed**.	The head is **well domed** (**semi-sphere**).
Gives a **discreet**, almost **flush** appearance.	Gives a **traditional**, **aesthetic** appearance (classic in cooperage).
Less material, easier to crush quickly.	More material, requires more precise forming to obtain a **nice head**.
Less protection against shearing (*more fragile*).	Excellent **mechanical resistance** (the round shape better distributes stresses).
Faster to rivet.	More **robust** and neat.





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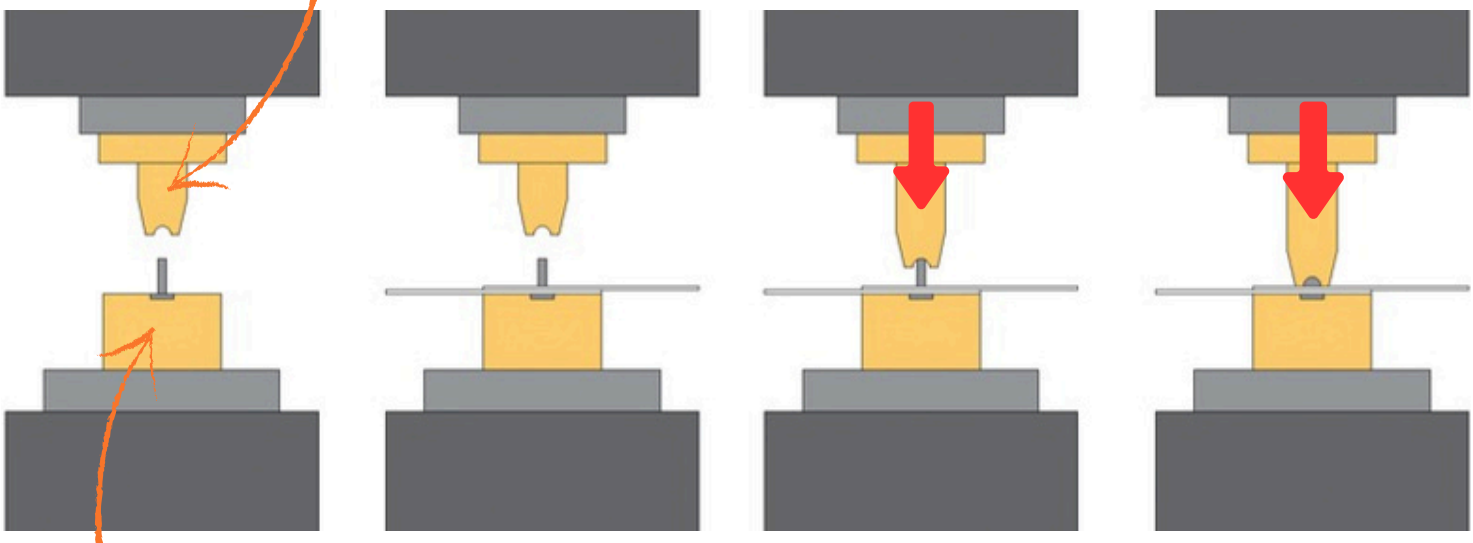
For flat rivets, the die is designed with an imprint adapted to the base of the rivet to hold it perfectly in place.

The upsetting head, equipped with a specific snap, then comes to progressively crush and shape the end of the rivet to obtain the desired head.

bouterolle spécifique



la matrice

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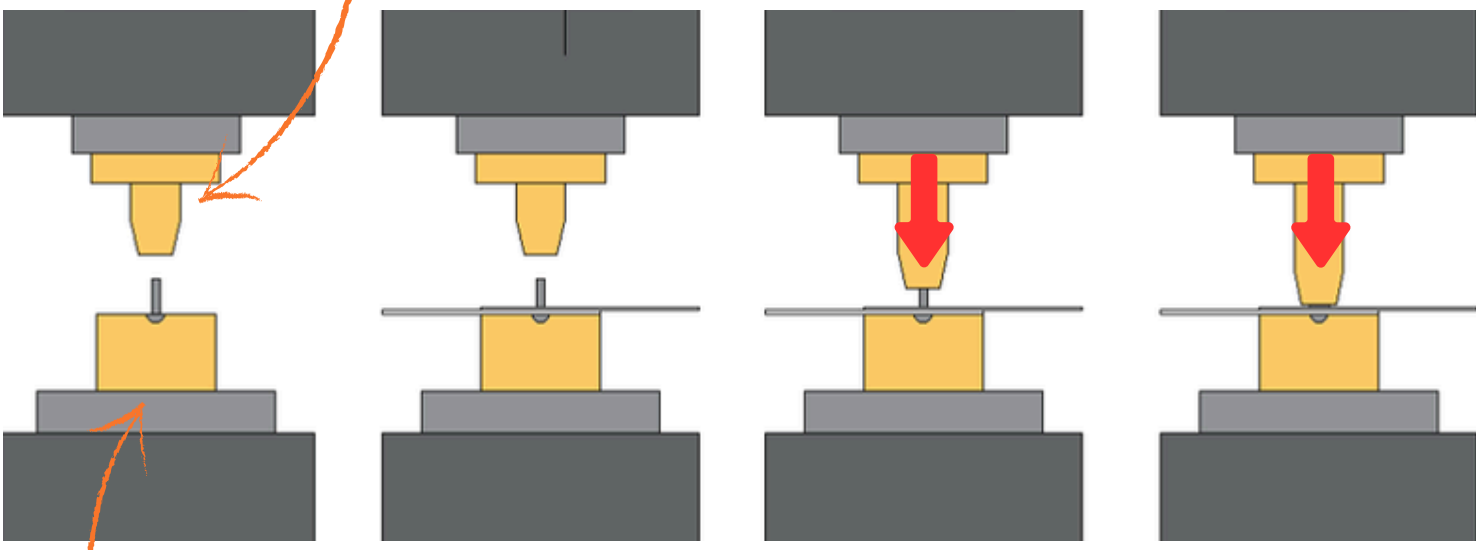
For round head rivets, the die is designed with an imprint reproducing the domed shape of the rivet head.

The upsetting head, for its part, remains straight and applies the necessary pressure to head the rivet into the die.

The Upsetting Head



the domed shape die

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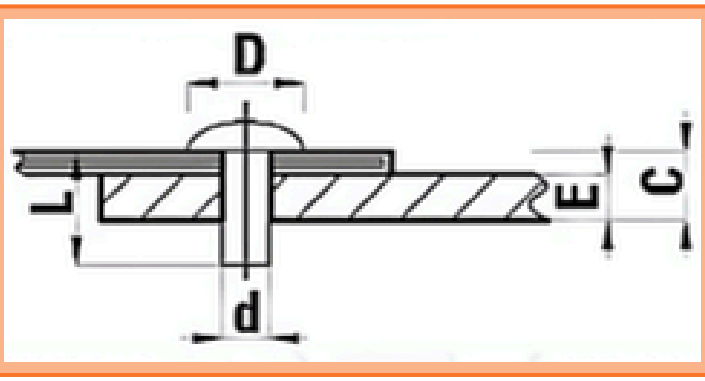
03 Settings

Determining the Right Rivet

Reminder

E = thickest piece to be assembled

C= total thickness to be assembled



Calculation of the Rivet Body Diameter (d)

Formula :

$d = 2 \times E + 2$

For 2.5 mm hoop thickness

Result :

$d = 2 \times 2{,}5mm + 2$

$d = 7$ mm

Calculation of the Bore Diameter (d_0)

Formula :

$d_0 = d + 1$

For 2.5 mm hoop thickness

Result :

$d_0 = 7 + 1$

$d_0 = 8$ mm

Determination of the Rivet Length (L)

Setting Method	Round Riveting Finish
Cold - manual	$L = C + 1{,}5 \times d_0$
Cold - hydraulic	$L = C + 1{,}0 \times d_0$

For 2.5 mm hoop thickness

Result :

L = 5 + 1,5 x 8 = 17 mm

L = 5 + 1,0 x 8 = 13 mm

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Calculation of the Grip Length (P)
The grip length is the useful length of the rivet used to hold the pieces tightly:

Formula :
$P = 1,5 \times d_0 + 3$

For 2.5 mm hoop thickness

Result :
P= 1,5 x 8 + 3 = 15 mm

👉 But it must never be less than 10 mm.

Choice of Riveting Pitch (B)
The riveting pitch corresponds to the distance between two successive rivets.

Riveting of Barrel Hoops	**Non-sealing (4 à 10 × d_0)**
Decorative or light use (e.g., small barrel, deco)	**Without fatigue (≤ 20 × d_0)**

Result :
B = 4 x 8 = 32 mm à 10 x 8= 80mm

B = 20 x 8 = 160 mm

Conclusion

Hoop Thickness	Ø Rivet	Ø Bore	Rivet Length (manual)	Recommended Pitch
2 mm	6 mm	7 mm	13 mm	~50 mm
2,5 mm	7 mm	8 mm	15 mm	~60 mm

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03 Settings

Check in case of poor quality riveting

Check :

- **Machine settings (stroke, pressure)**
- **Wear or fouling of the snap →** never sharpen or machine
- **Play in the support tool →** the piece must not oscillate under the snap
- **Steel quality of the piece to be riveted →** pay attention to hardness (not steel that is too hard)
- **Perfect centering →** tolerance between spindle axis and rivet axis ≤ 0,1 mm

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04 Maintenance

✅ General Maintenance

- The riveting machine requires little maintenance.
- It is sufficient **to regularly grease the grease fittings**, especially in case of intensive use.

✅ Specific Hydraulic Riveter Maintenance

- **Check the hydraulic oil level regularly.**
- A good oil level guarantees optimal performance of the machine.

✅ Snap Maintenance

- **The snap requires no sharpening or machining → forbidden.**
- **If the snap works on zinc-plated or cadmium-plated parts:**
  - **Clean the tip by polishing with an emery cloth.**
  - **Finish if necessary with diamond paste for fine polishing.**

👉**Attention :** Cadmium is a greenish soot (zinc oxide) that can foul the snap.

✅ Good Snap Practices

- **Never sharpen or machine the snap.**
- **Clean if working on zinc-plated/cadmium-plated parts.**
- **The surface roughness must not exceed Ra 0,2 µm**. he Ra is equal to the arithmetic average.
- Always finish with soft polishing.

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05 Safety

Safety Pedal: Foot Control for Maximum Safety

The safety pedal allows the operator to activate the press only when voluntarily pressing with the foot, while keeping their hands free and out of the working area.

Prevention of accidental starts : The press cannot be triggered without active pressure on the pedal, greatly reducing the risk of crushing or pinching.

Reinforced protection : The pedal is often equipped with a casing or an anti-involuntary start protection (prevents accidental activation by falling object or false movement).

Immediate stop upon release : As soon as the foot leaves the pedal, the machine stops instantly.

This system guarantees optimal and ergonomic safety for the operator, compliant with the requirements of industrial standards while maintaining great precision in the execution of the riveting.

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🎯 Plexiglas Protection: Safety Against the Risk of Crushing

On hydraulic punching machines, there is a risk of crushing linked to the descent of the punch. To limit the danger, a protective screen made of transparent plexiglas is generally installed around the working area.
$\checkmark$ Physical safety barrier : Prevents any accidental intrusion of the hand or objects into the punching area.
$\checkmark$ Maintenance of visibility : The plexiglas allows the operator to maintain optimal visual control while remaining protected.
$\checkmark$ Compliance with safety standards : This device is strongly recommended on riveting and punching equipment in cooperage.

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05 Safety

Safety and Personal Protective Equipment (PPE)

- **Safety shoes** 👠**:** Protect against crushing risks and falling metal objects (hoops, parts).
- **Anti-noise helmet or earplugs** 🎧: Essential to reduce the significant noise generated by the hydraulic riveting machine.
- **Protective gloves** 🧤: Only to be used when handling parts (outside the machine cycle). Never wear gloves during active riveting.
- **Safety glasses** 👓: Mandatory to protect against projections of chips or metallic debris.

Precautions and Adapted Attire

- Use close-fitting gloves, never too loose or made of fabric, to avoid any risk of entanglement by the mechanisms.
- Tie back long hair to avoid any accidental entanglement.
- Avoid loose clothing, jewelry, rings, and bracelets : they can get caught in the moving parts.

Safety Rules in Use

- Always cut the power before any intervention or machine adjustment.
- Never approach hands to the pressing zone during the riveting cycle.
- Respect the pressure and load instructions to avoid any deformation or violent projection of parts.
- Systematically use the integrated safety devices:
  - Emergency stop button
  - Double contact or two-hand pedal
  - Perimeter protections (e.g., plexiglas screen)

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Apply these tips starting now and take control of your machine with confidence and mastery!

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