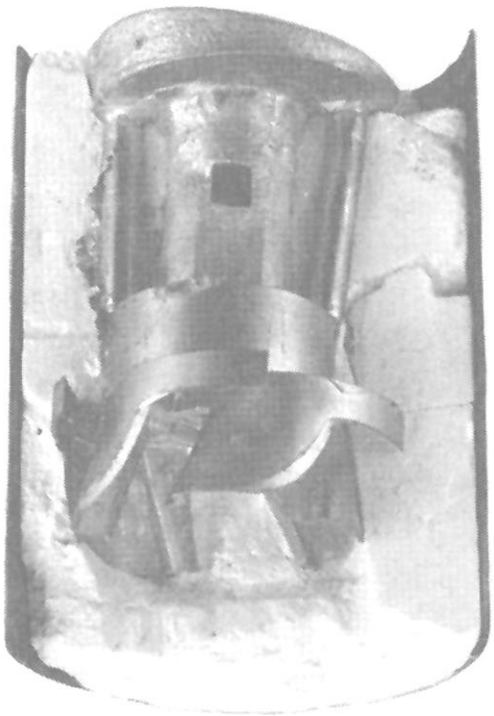
Plaster-mold casting

The mold is made by mixing gypsum plaster of paris (CaSO4) with talc and silica flour; this is a fine white powder, which, when mixed with water gets a clay-like consistency and can be shaped around the pattern (it is the same material used to make casts for people if they fracture a bone). The plaster cast can be finished to yield very good surface finish and dimensional accuracy. The mold is dried in a low temperature oven, then remove pattern, backed by clay (strength), cast the metal and lastly break the mold to obtaining the cast part.

However, it is relatively soft and not strong enough at temperature above 1200°C, so this method is mainly limited to used to make castings from non-ferrous metals of lower-melting-point like zinc, copper, aluminum, and magnesium.



Since plaster has lower thermal conductivity, the casting cools slowly, and therefore has more uniform grain structure (i.e. less warpage, less residual stresses). The other characteristics of the process are:

- Not permeable
- Parts with relatively intricate geometry
- Better surface finish and dimensional accuracy

- Capability to make thinner sections

Ceramic mold casting

Similar to plaster-mold casting, except that ceramic material is used (e.g. silica or powdered Zircon $ZrSiO_4$). Ceramics are refractory (e.g. the clay hotpot used in Chinese restaurants to cook some dishes), and also have higher strength that plaster, as follows:

1 The ceramic slurry forms a shell over the pattern;
2 It is dried in a low temperature oven, and the pattern is removed
3 Then it is backed by clay for strength, and baked in a high temperature oven to burn off any volatile substances.
4 The metal is cast same as in plaster casting.

This process can be used to make very good quality castings of steel or even stainless steel; it is used for parts such as impellor blades (for turbines, pumps, or rotors for motor-boats).