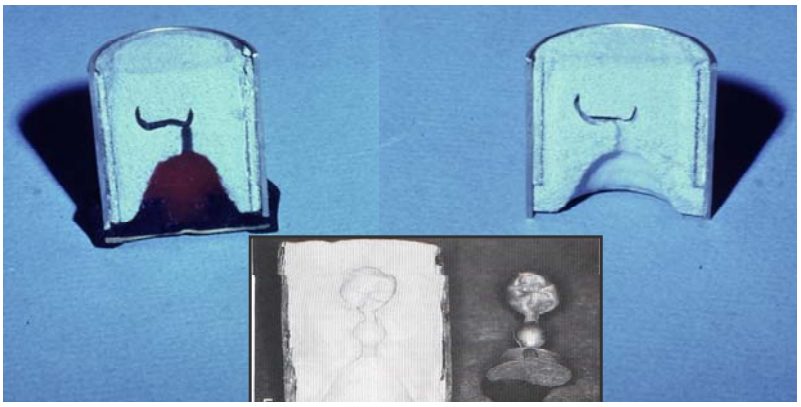
Burnout & Casting

Burnout Procedure:

It is the heating of the invested ring (casting ring) in a thermostatically controlled oven until the traces of wax are vaporized so that a mold cavity is created into which the molten metal can enter.

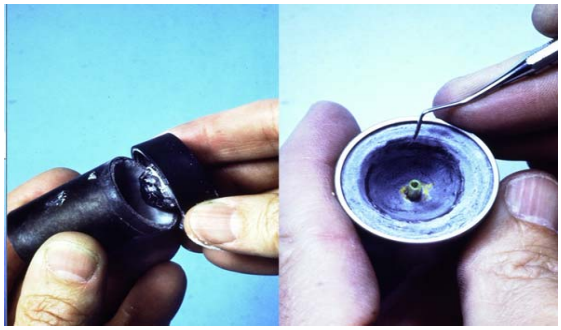


Advantages of the burnout procedure:

1. Elimination of the wax and plastic material from the mold cavity of the investing ring.
2. Elimination of moisture or water from the ring.
3. To produce the necessary expansion in the investment to compensate for the solidification shrinkage of the alloy after casting procedure.
4. To raise the temperature of the mold to the proper point that permits the flow of the molten metal into the mold cavity.

Burnout procedure (step by step):

1. After we separate the ring from the crucible former we place the casting ring inside the oven and increase the temperature to 200 C and hold for 30 minutes. The wax and water vaporize from the mold cavity.



2. The ring is heated to 480-650 C for the final burnout procedure and leave it for 45 minutes.
3. The position of the ring should be in the center of the oven so that the atmosphere surrounding the ring is the same as that recorded on the thermal indicator.
4. A too rapid increase of the burnout temperature may cause cracking of the investment and distortion of the mold cavity so the ring should never be placed in an overheated oven.

Casting:

It is defined as introducing the molten metal into the mold cavity in the investing ring.

Metal alloys used in the construction of cast crown restorations:

1. Precious alloys: these consist of at least 75% by weight noble elements. They involve gold alloys. According to ADA specification No.5, we have four types of gold alloys:
Type I: soft.
Type II: moderate.
Type III: hard.
Type IV: extra hard.

Precious elements are gold, platinium, and paladium.

2. Semiprecious alloys: *Because* of the high cost of gold we can use these alloys such as silver-palladium alloy (60% Pd, 30% Ag).

3. Non-precious alloys: There are two main alloys which are nickel-chromium alloy (75% Ni, 15% Cr) and cobalt-chromium alloy (60% Co, 25% Cr). The phosphate bonded investment is used with these alloys to withstand their high melting temperature.

Casting Equipment (Casting Machine):

The casting machine requires:
1. Heat source to melt the alloy.
2. Casting force to force the molten alloy to the mold cavity.

1. Heat source:

The heat source can be either the reducing part of the flame produced from a pipe torch, or electricity.

According to the melting temperature of the casting alloy we have 2 types of pipe torches:

i. Gas-air blow torch or pipe: it is used for melting casting alloys of low melting temperature (gold alloys II, III).

ii. Oxygen-acetylene torch or pipe: it has either a single orifice or multiorifices. It is used to melt alloys of high melting temperature such as porcelain fused to metal. The single orifice torch is used for melting sliver- palladium alloy. The multiorifices torch is used to melt base metal alloys (nickel-chromium).

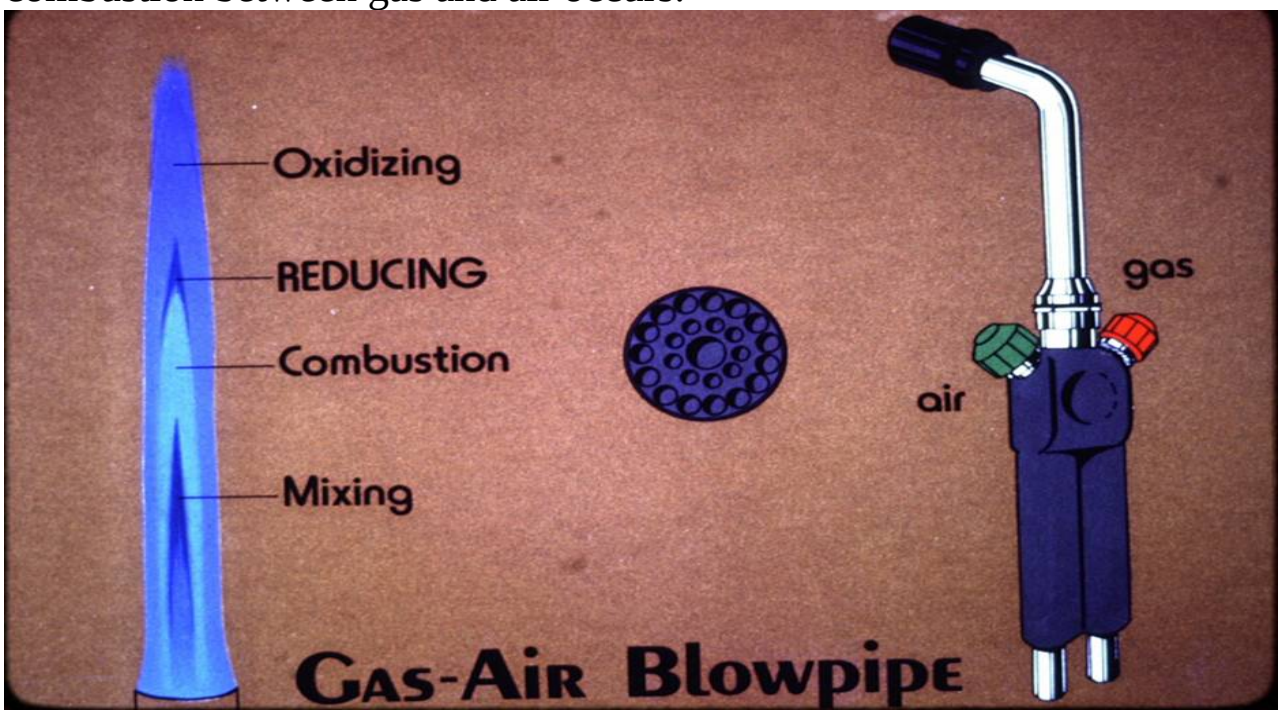
The parts of the flame can be identified by the conical area and it consists of the following zones:

1. Mixing zone: It is a zone of air- gas mixture. It is cool colorless zone. There is no heat in this zone.

2. Combustion zone: It surrounds the first zone. It is greyish-yellow in color. It is an oxidizing zone & should be kept away from the metal.

3. Reducing zone: it surrounds the second zone. It is bluish in color and is the hottest zone or area in the flame and it is the only zone that must come in contact with the metal during melting.

4. Oxidizing zone: it is located behind the reducing zone in which final combustion between gas and air occurs.



Neither the combustion zone nor the oxidizing zone should be used for heating or melting metal because:

1. They are not so hot as the reducing zone.
2. The alloy should not be molten in an oxidizing atmosphere because this might lead to:

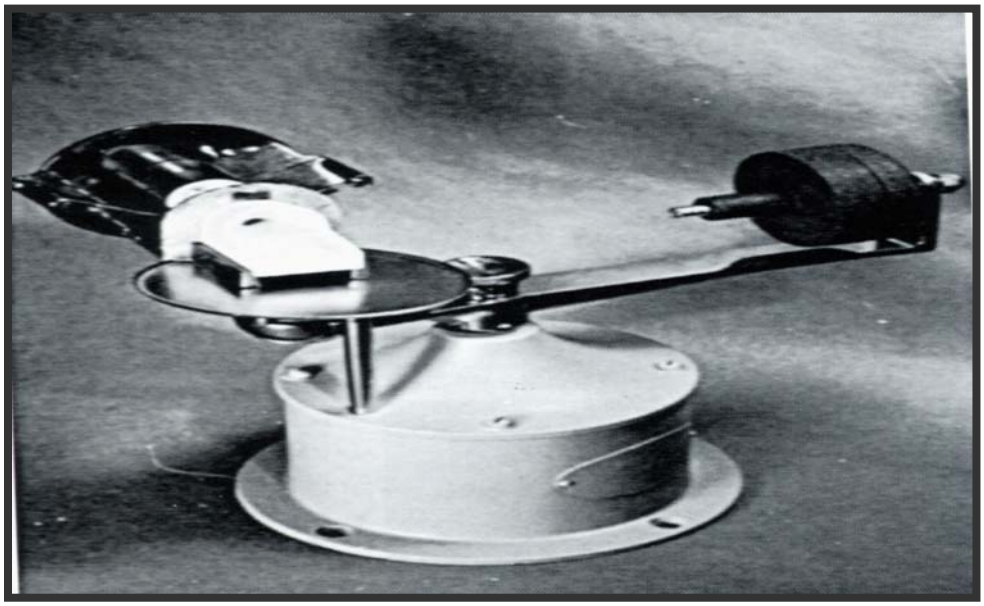
i. Formation of non-metallic impurities.
ii. Subsequent change in the strength.
iii. Alteration in the shrinkage.
iv. Increase in corrosion of the cast restoration.

2. Casting force:

The casting force should be enough to overcome:

i. The high surface tension of the molten alloy.
ii. The resistance of gas within the mold.

The most common casting machine is the centrifugal casting machine which consists of a device for melting the casting alloy (crucible), and another part for throwing the molten alloy quickly by the centrifugal action into the mold cavity.



Casting procedure :

1. The casting machine is given three clockwise turns (four if metal ceramic alloys) and locked in position with the pin.
2. Adapt a wet asbestos liner to the bottom of the crucible of the casting machine. Then start to heat the liner in place using the flame obtained by pipe torch (the liner will prolong the life of the crucible and protect the metal from contamination).
3. Place the casting alloy on asbestos liner and heat the gold alloy with the reducing part of the flame (which is the hottest part of the flame and doesn't

produce any contamination) until it flows up and appears yellowish with mirror-like surface.

4. Add small amount of flux to the alloy (flux: it is a deoxidizing agent used to prevent oxidation of the alloy and to increase the fluidity of the molten alloy).
5. Remove the ring from the oven and place it on the cradle of casting machine.
6. Slide the platform against the ring.
7. Release the machine (pin), and allow the machine to spin until it stops.

Differences in casting between alloys of high and low melting temperature:

1. The single orifice torch is used to melt gold platinum, and silver palladium alloy, and the multiorifices torch is used to melt base metal alloys.
2. A quartz made crucible is used in melting high melting alloys. The asbestos liner is not used here because the high temperature decomposes the asbestos and cause contamination to the molten alloy.
3. No flux is added to the porcelain fused to metal alloys during melting because it will upset the balance of the alloy and interfere with bonding later.
4. It needs extra winding of the arm of the casting machine to complete casting of the high melting temperature alloy.
5. Casting temperature for the gold-platinum (1300 F), base metal alloy (1500 F) which differ from casting temperature of gold alloy (1200 F).