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RANZCO

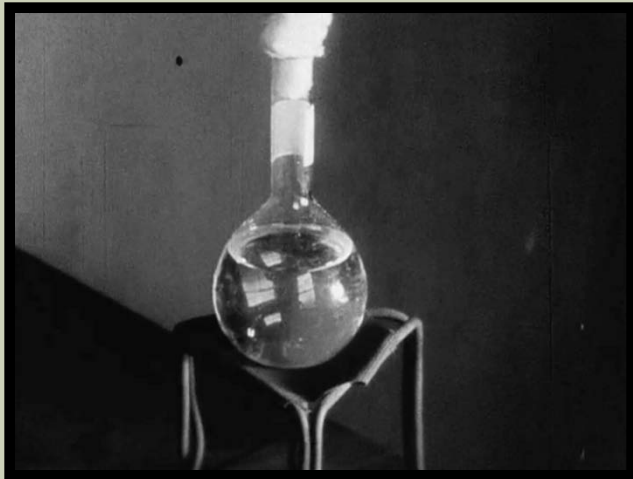
# Ophthalmic instrument sterilization in the early 1900's

# Introduction

- Ophthalmic surgical instruments were prone to the deleterious effects of sterilization in the early 1900's.
- Various methods used in the early 1900's:
  - Boiling
  - Autoclave
  - Dry heat
  - Chemical
- Artifacts shown are from RANZCO Museum

# Boiling

- Boiling water is a simple, cheap and rapid mode of sterilization.
- The addition of sodium carbonate to water improved sterilization.
  - Spores killed in 5 minutes with 2% sodium carbonate.
  - Reduces rust by its alkalinity but knives spoiled in only half a minute of boiling.



Flask on Bunsen burner



Nurse sterilising tools using water bath

# Boiling



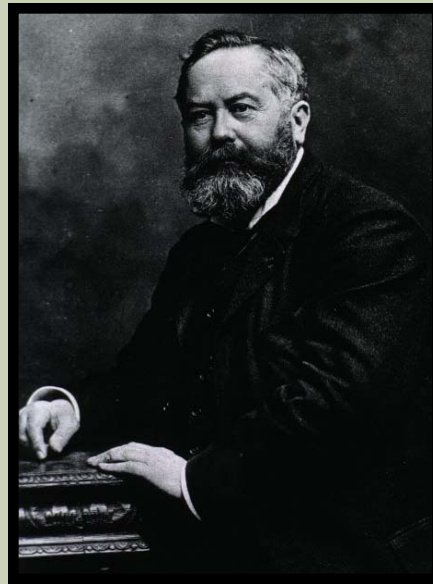
Nurse preparing tools for boiling 1922

# Autoclave

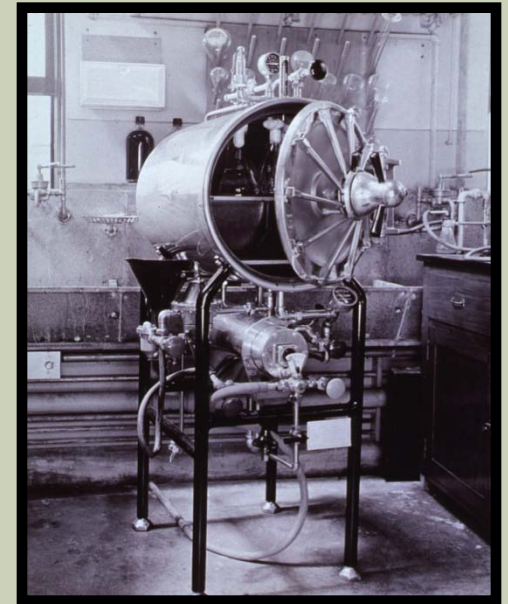
- Invented by Charles Chamberland in 1879. It was preceded by the “steam digester” invented by chef Papin in 1681.
- Steam under pressure reached higher temperatures.



Early model Chamberland  
Autoclave 1884



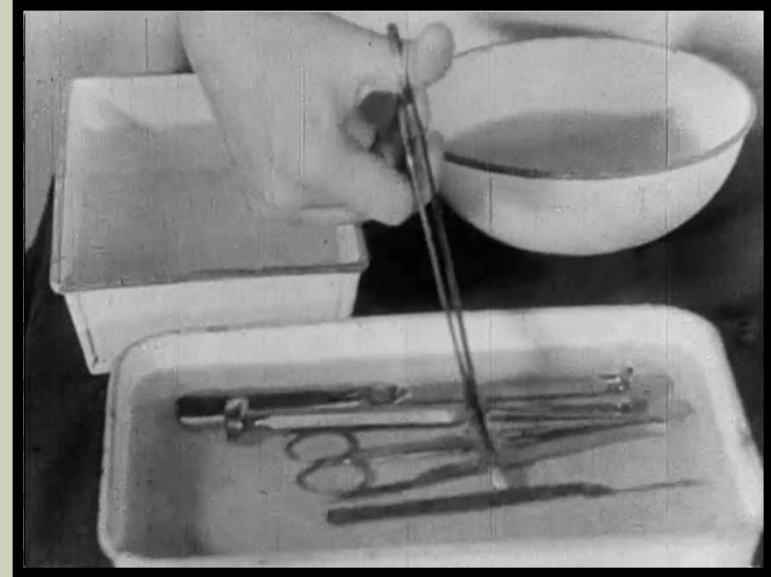
Charles Chamberland  
French Microbiologist  
1851-1908



Autoclave 1942

# Chemical

- Alcohol
  - For very delicate forceps and cutting instruments.
  - 10-30 minutes in 80-90% alcohol, then dip in boiling water with 2% sodium carbonate for 30 seconds.
  - Corrosive due to acetic acid and aldehydes
- Carbolic Acid / Phenol
  - For scissors, and sharps.
  - 30 minutes in 50% carbolic acid, then washed in alcohol and then water.
- Formaldehyde
  - Gas at room temperature. 1 hour
  - Requires pre washing or boiling to remove surface contaminants.
- AC.10 Surgical
  - Anticorrosive chemical – 64% paraffins, 31% naphthenes, 5% aromatics Used prior to boiling



Instruments placed in tray for chemical sterilisation

# Sutures

- Cat gut sterilization
  - Boiling in alcohol – does not kill all bacteria due to low boiling point
  - Dry heat / Boeckmann's method -
    - Soak in ether for 1 week to remove fat.
    - Wrap in paraffin paper to prevent drying
    - 140°C for 3 hours on 2 consecutive days.
  - Chemical / Claudius' method –
    - 1 part iodine, 1 part potassium iodid, 100 parts distilled water.
    - Immerse for at least 1 week
- Braided silk, silkworm gut, cotton and linen thread:
  - Boiling or autoclaving just before an operation.
- Horse hair:
  - Wash in soap and water, then alcohol, and then boil or autoclave.

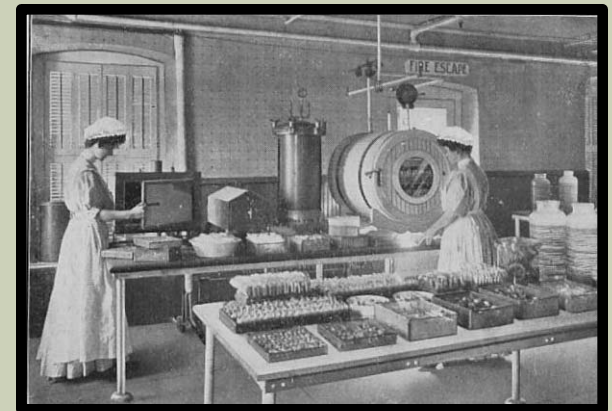


# Sutures

- Pre-sterilized sutures in glass tubes.
  - Boilable
    - Contain xylol and sterilized by heat.
    - The exterior of the glass tubes were sterilized by boiling, autoclaving, or in 80% alcohol for 5 minutes.
  - Non-Boilable
    - Contain a mixture of alcohol and water.
    - The exterior of the glass tubes were submerged in 80% alcohol for 5 minutes.



Pre-sterilised sutures in glass tubes



1917 catgut sterilisation room



# Corrosion

- Ophthalmic surgical instruments were prone to corrosion.
- Repeated exposure to high temperatures at 160°C or higher for prolonged periods would soften steel blades.
- Acidic solutions have a corrosive action on steel.
- Pure alcohol itself has no corrosive effect on steel, but when alcohol comes in contact with air it produces corrosive traces of aldehyde and acetic acid
- Stainless steel instruments are more resistant than carbon steel but still prone to corrosion from halogens such as chlorine and iodine.