Medical and Biological Engineering

From Ideas to Successful Medical Products

Content

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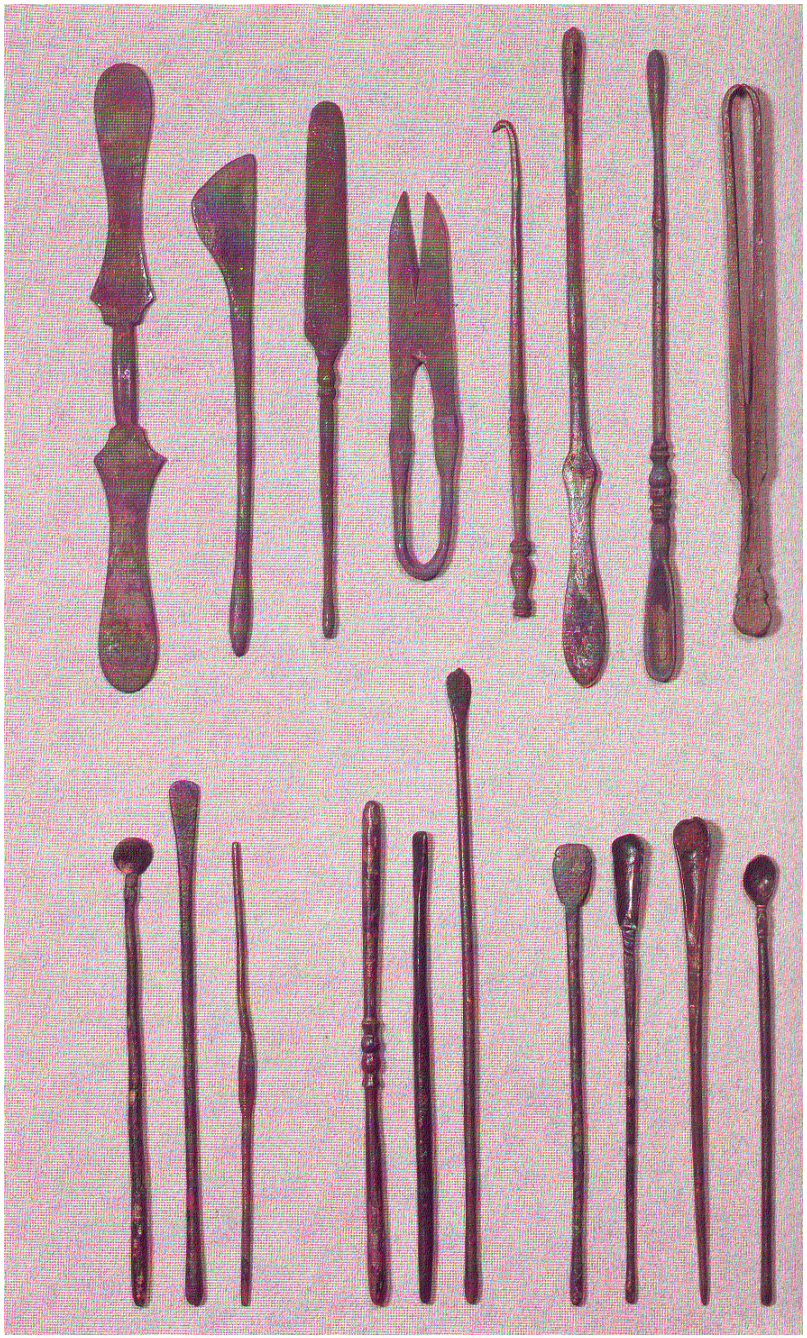
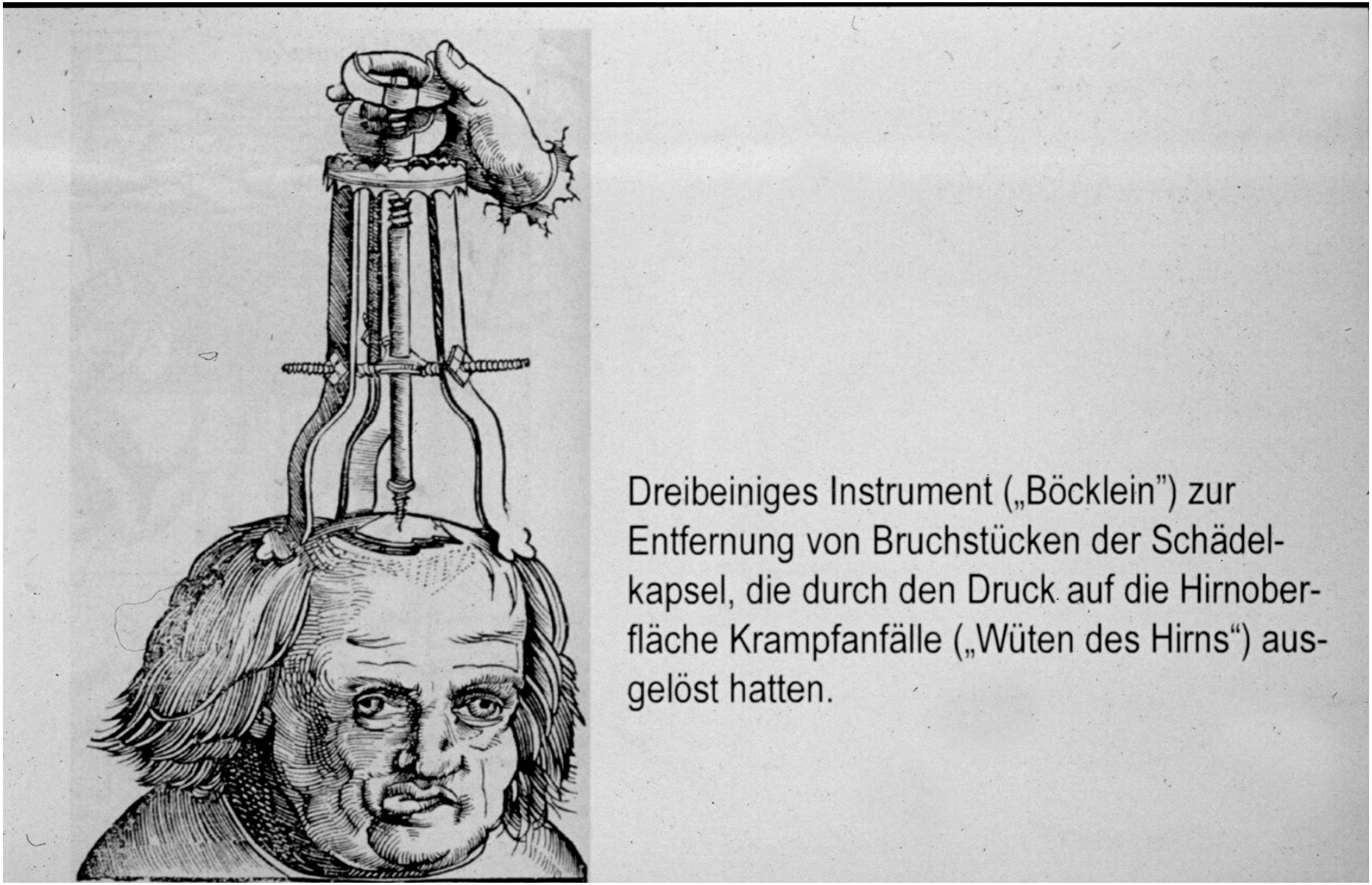
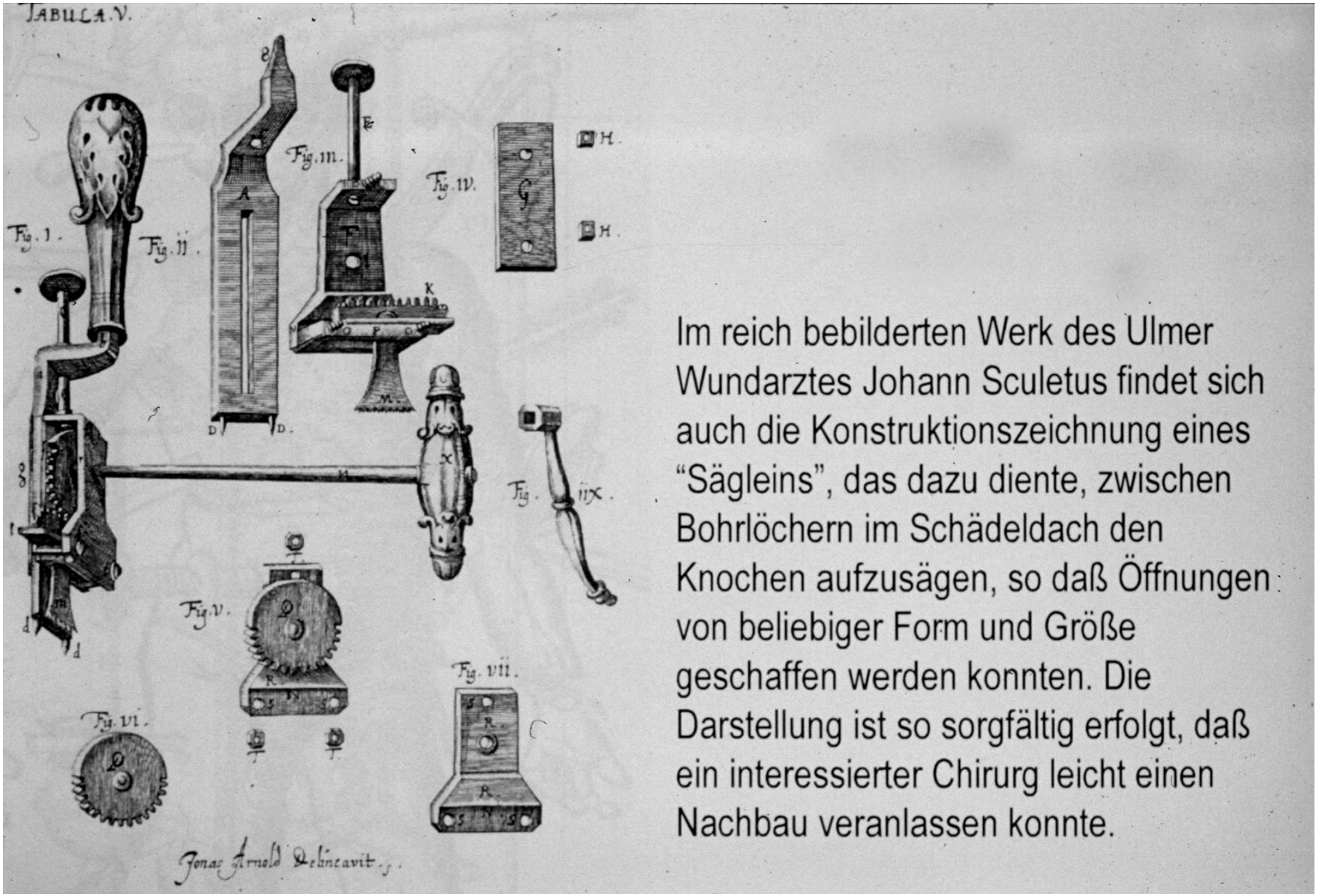


Tools for surgery (1st century A.C.)



Special tool for the removal of skull bone fragments and the lowering of elevated intracranial pressure (published 1517)



Special saw and saw blade for skull surgery (published 1666)

FARBTAFEL 69
Unbekannter Künstler, *Beinamputation,* Mitte 18. Jahrhundert. Farbe auf Holz. Reproduced by permission of the President and Council of the Royal College of Surgeons of England, London. *Der Farbige im Auditorium ist gewiß kein Sklave oder Diener. Ein Forscher glaubt ihn als Omai identifizieren zu können, »ein berühmter Mann aus Polynesien«, der von 1774 bis 1776 in London lebte und mit Captain Cook wieder in seine Heimat zurückkehrte. Britische philanthropische Gesellschaften übernahmen für viele Schwarzafrikaner die Finanzierung einer Arztausbildung.*

Operating theater and surgery (about 1774): Amputation of a leg

Dentist‘s chair (about 1850)

Pedal-driven drill for dentistry by JB Morrison (patented 1871)

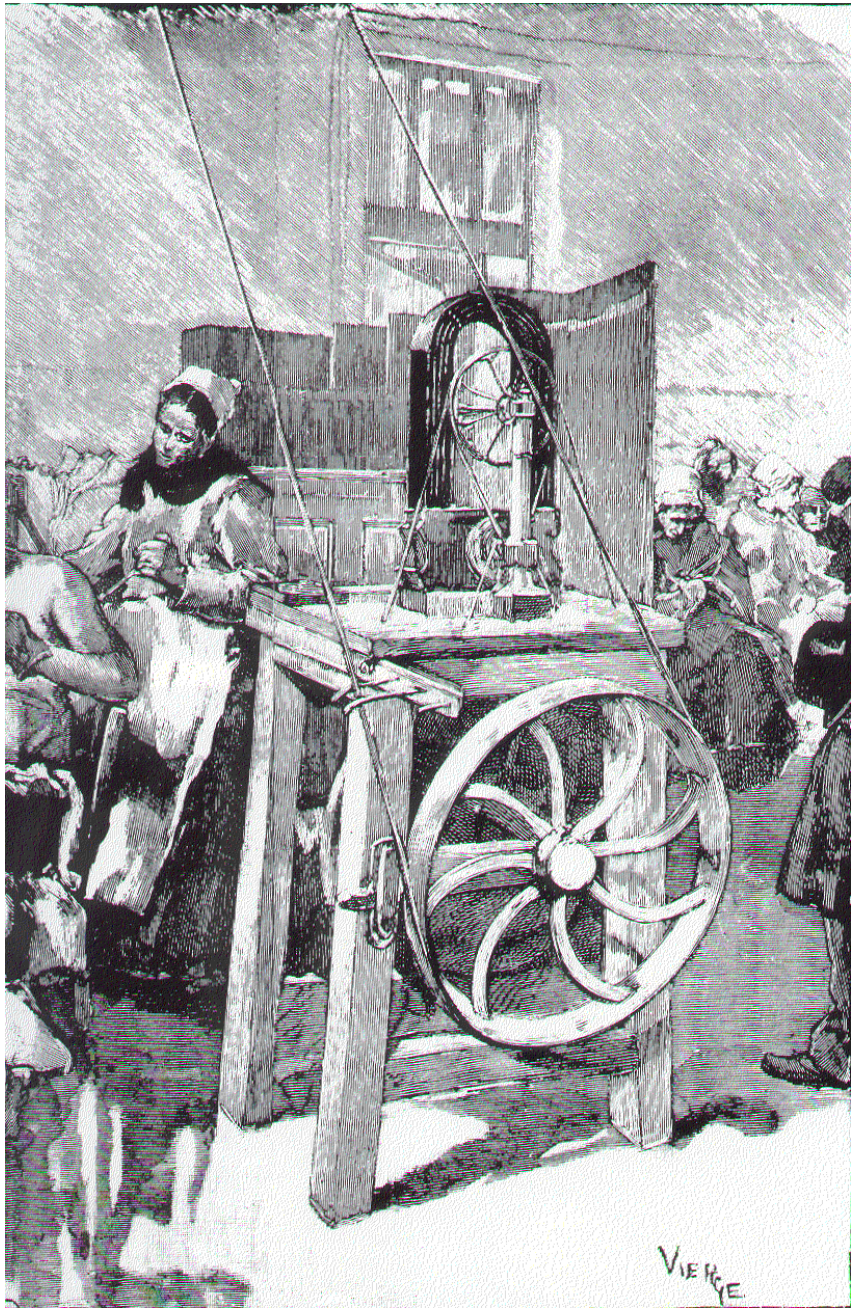
Modern dental treatment chair

Thermokauter, angegeben 1876 von Claude André Paquelin (1836-1905). Es handelt sich um einen Platinbrenner, der durch ein über ein Gebläse zugeführtes Benzin-Luftgemisch glühend gehalten werden kann. Dieses Gerät, das vorwiegend zur Stillung kapillarer Blutungen benutzt wurde, war bis zur Mitte des 20. Jahrhunderts in Gebrauch.

Tool for the thermal cutting of tissue or the stopping of bleeding (described 1876 and used until about 1950). The heat is generated by the burning of petrol.

Electrosurgery control system (Alsa 1990)

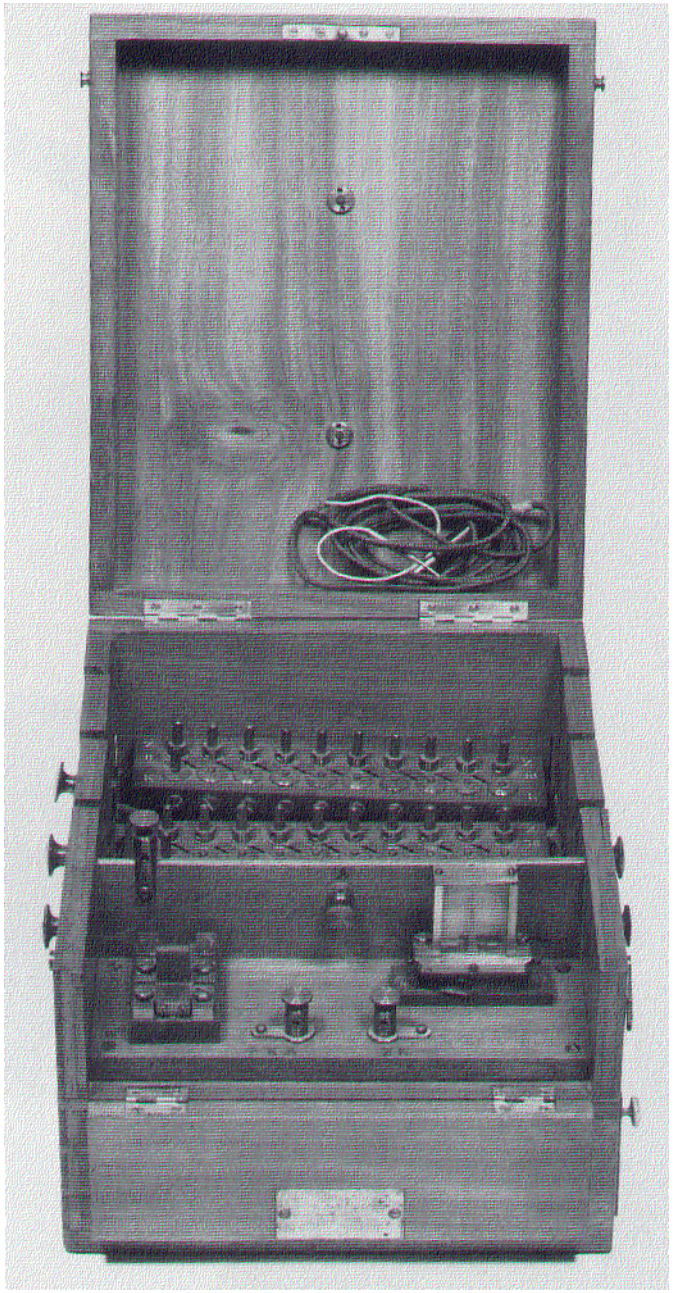
Apparatus for HF-surgery (i.e. cutting, coagulation, 400 Watt)



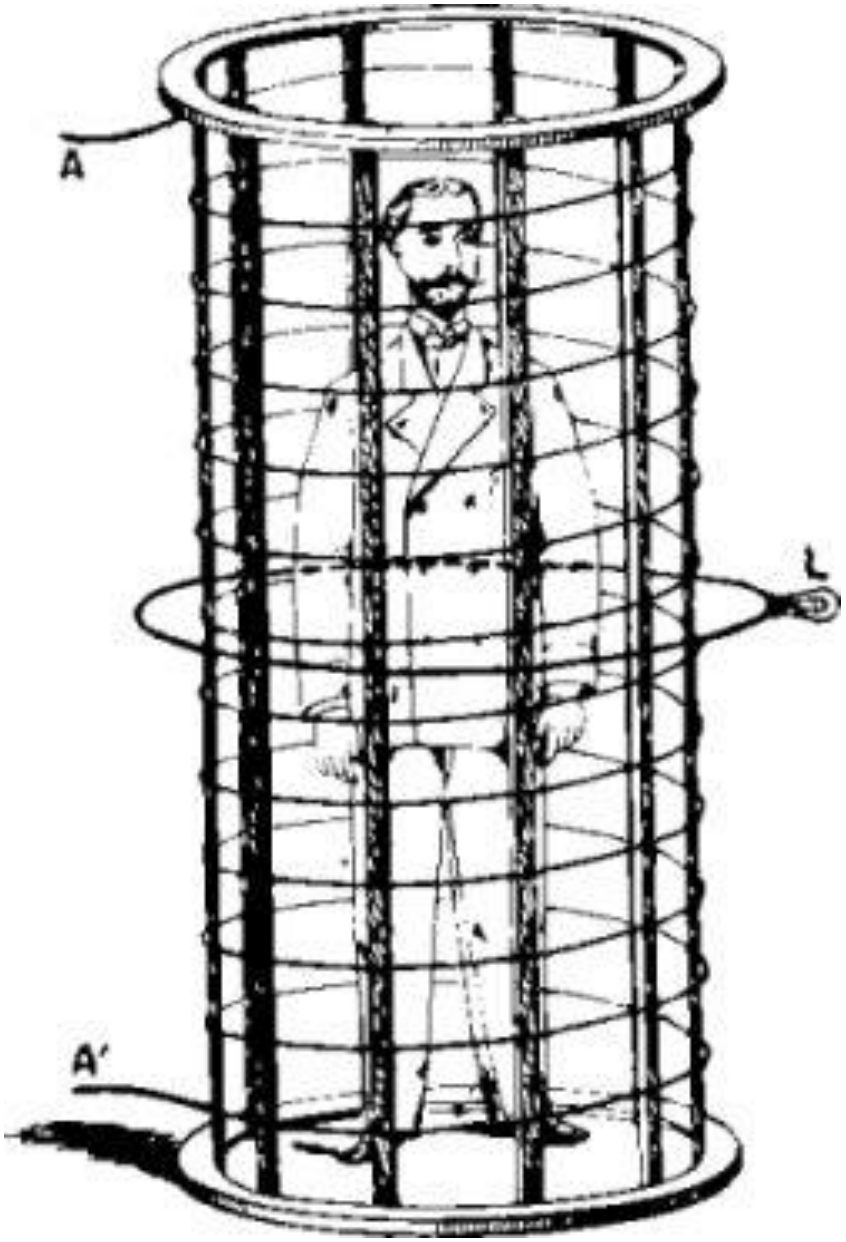
Induction generator for electrotherapy (1880)

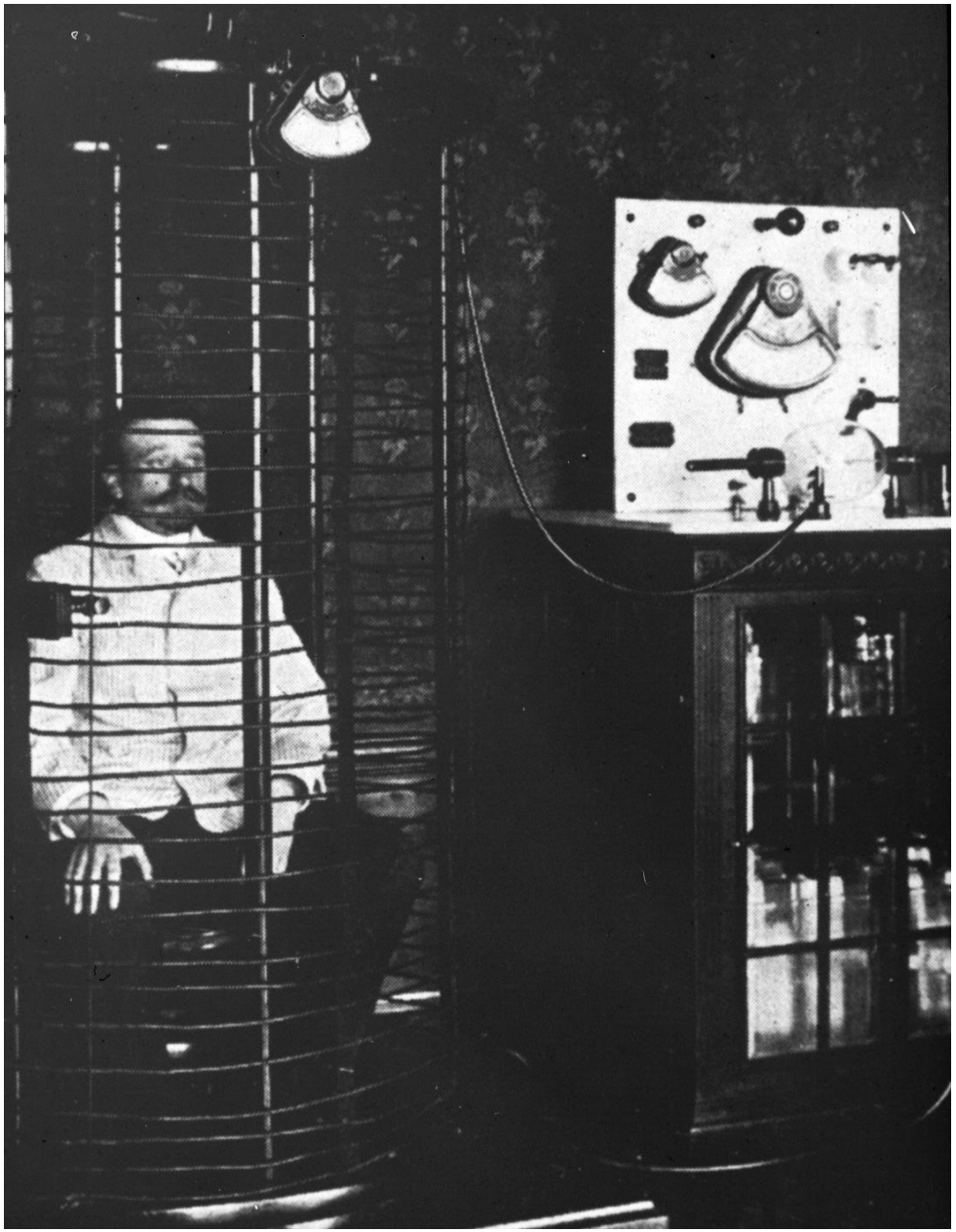
Influenz-Elektrisiermaschine vom Typ Eulenburg-Hirschmann, beliebte Stromquelle für die Elektrodiagnostik und -therapie gegen Ende des 19. Jahrhunderts.

Induction generator for electromedical diagnostic and therapeutic applications (about 1890)



Battery-powered generator for electrotherapy (1890)

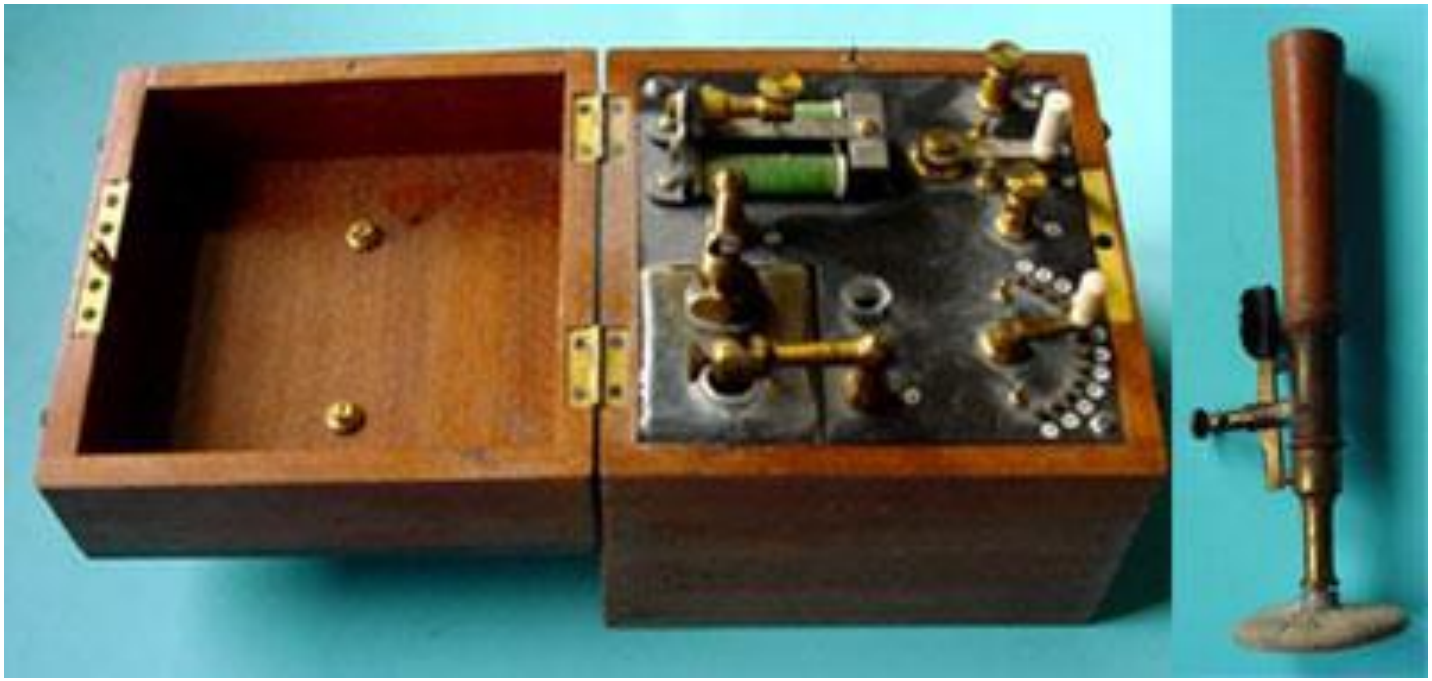




Solenoid for magnetic stimulation: Schematic and experimental arrangement (J-A. D'Arsonval himself?, 1893, based on research work by N. Tesla)

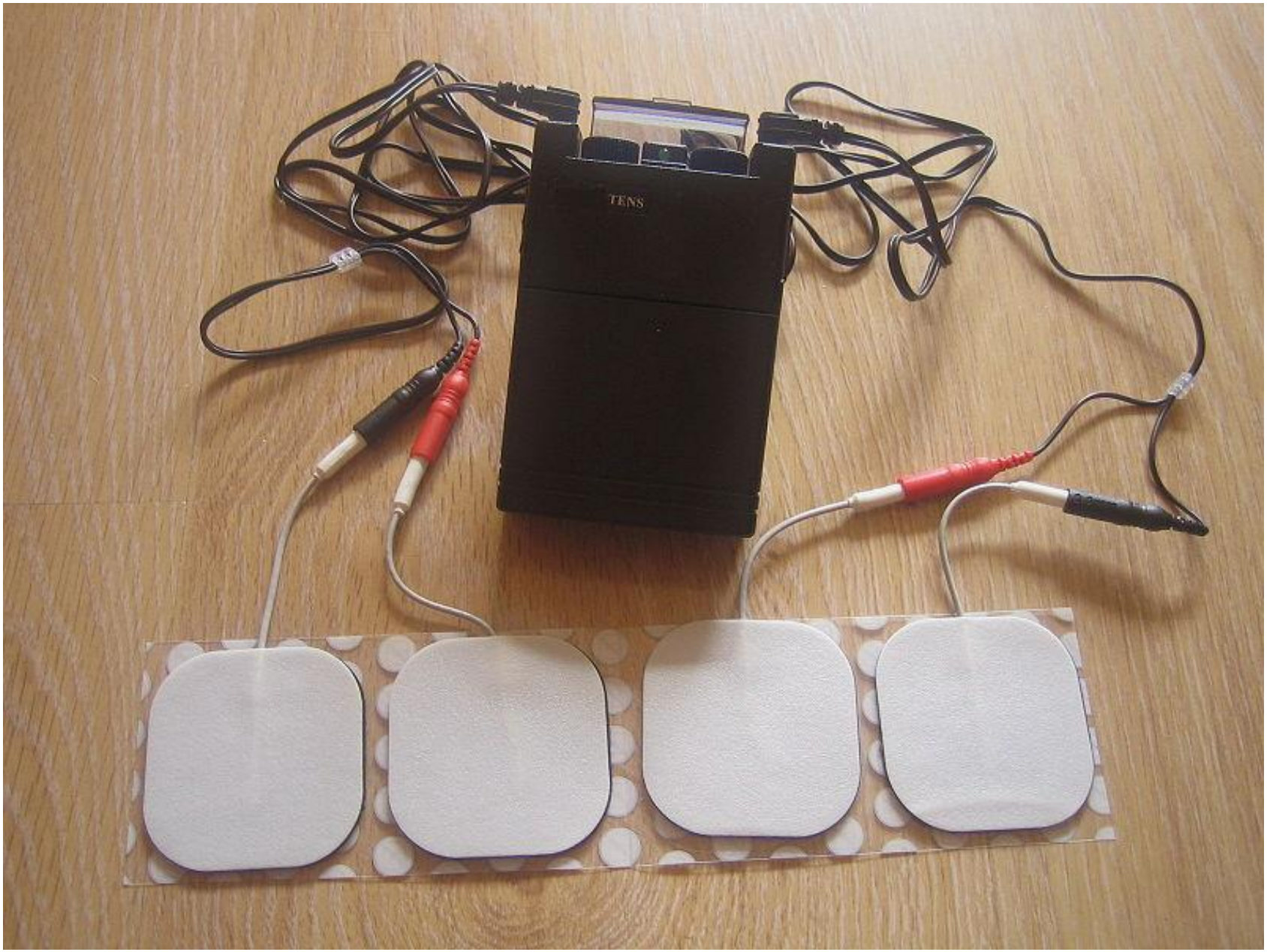
Apparatus for electrotherapy (d‘Arsonvalisation, diathermy)

(J-A. D‘Arsonval, 1892)

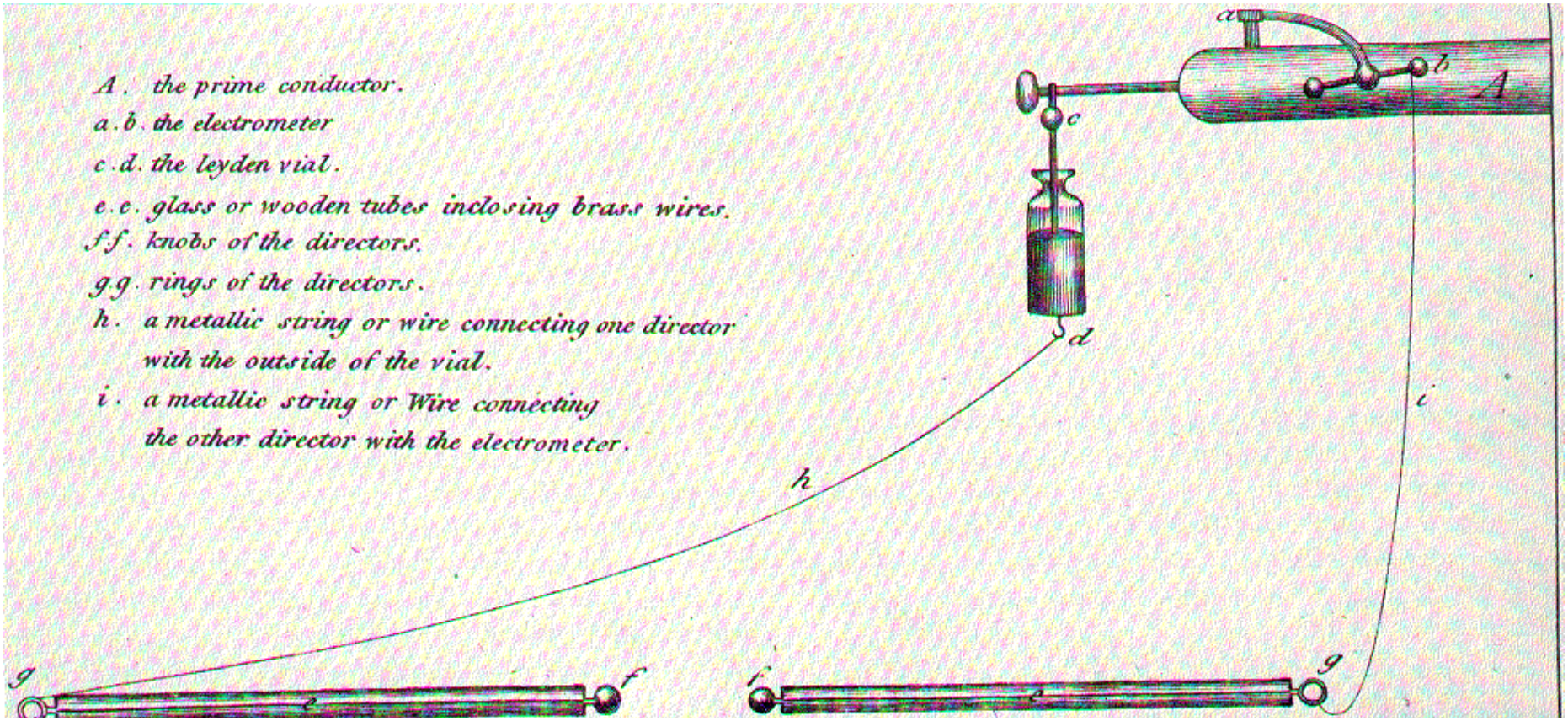


Apparatus for electrotherapy (1920)

Electro-therapy apparatus with antenna applicator (about 1960)

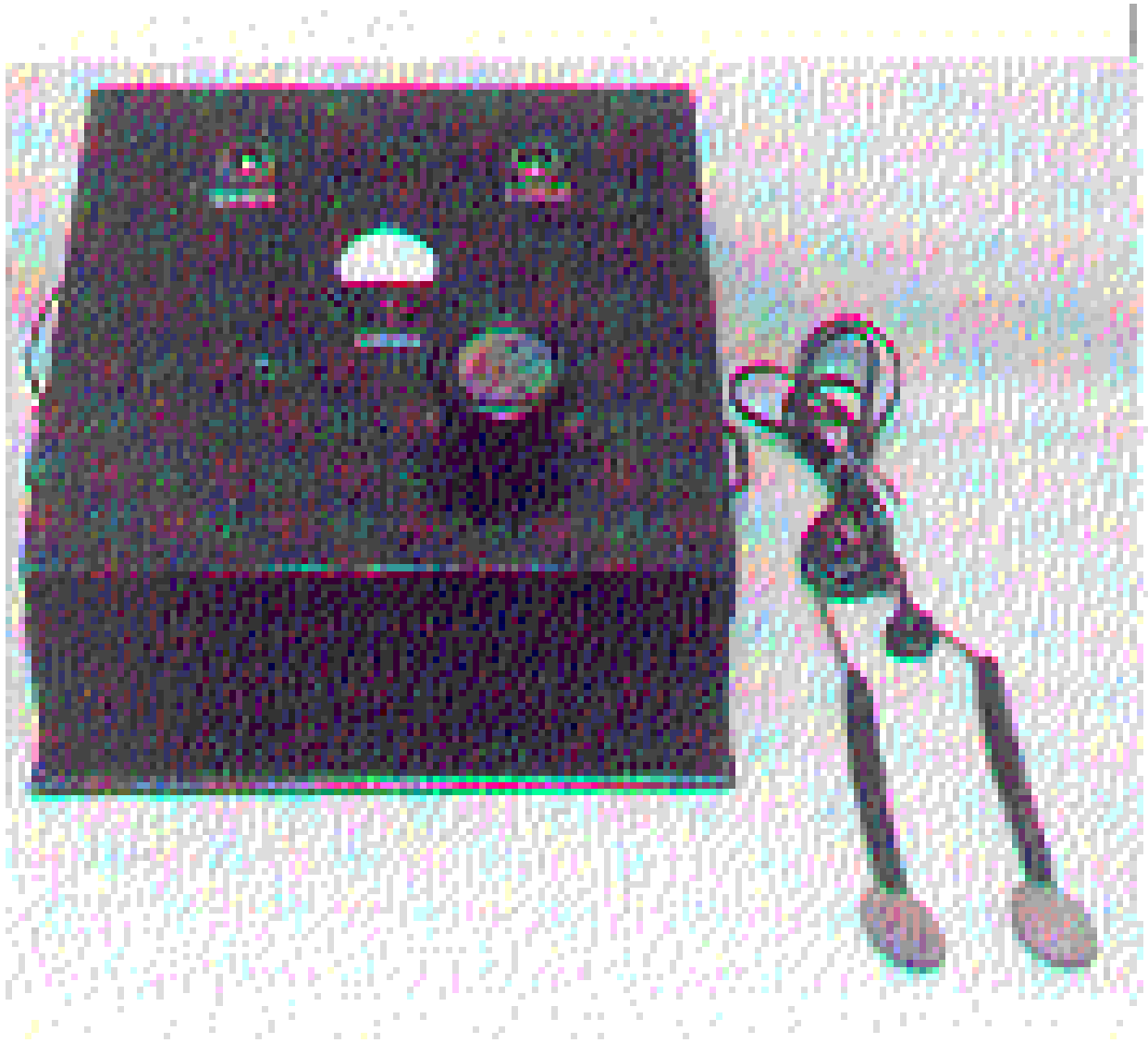


Transcutaneous Nerve Stimulation TENS (method used since the 1970s)

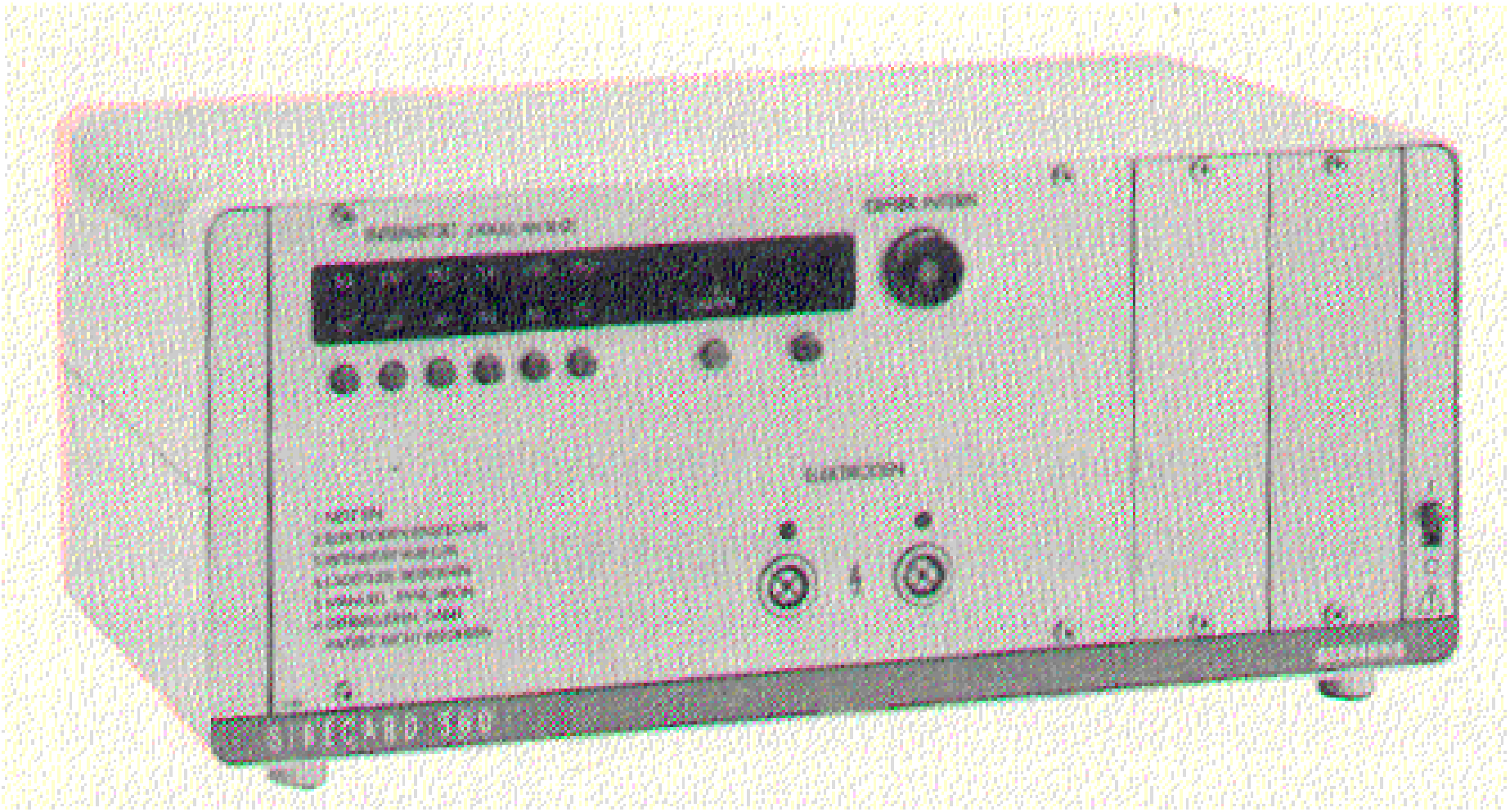


Apparatus for the recovery of apparently dead persons (i.e. by „defibrillation),

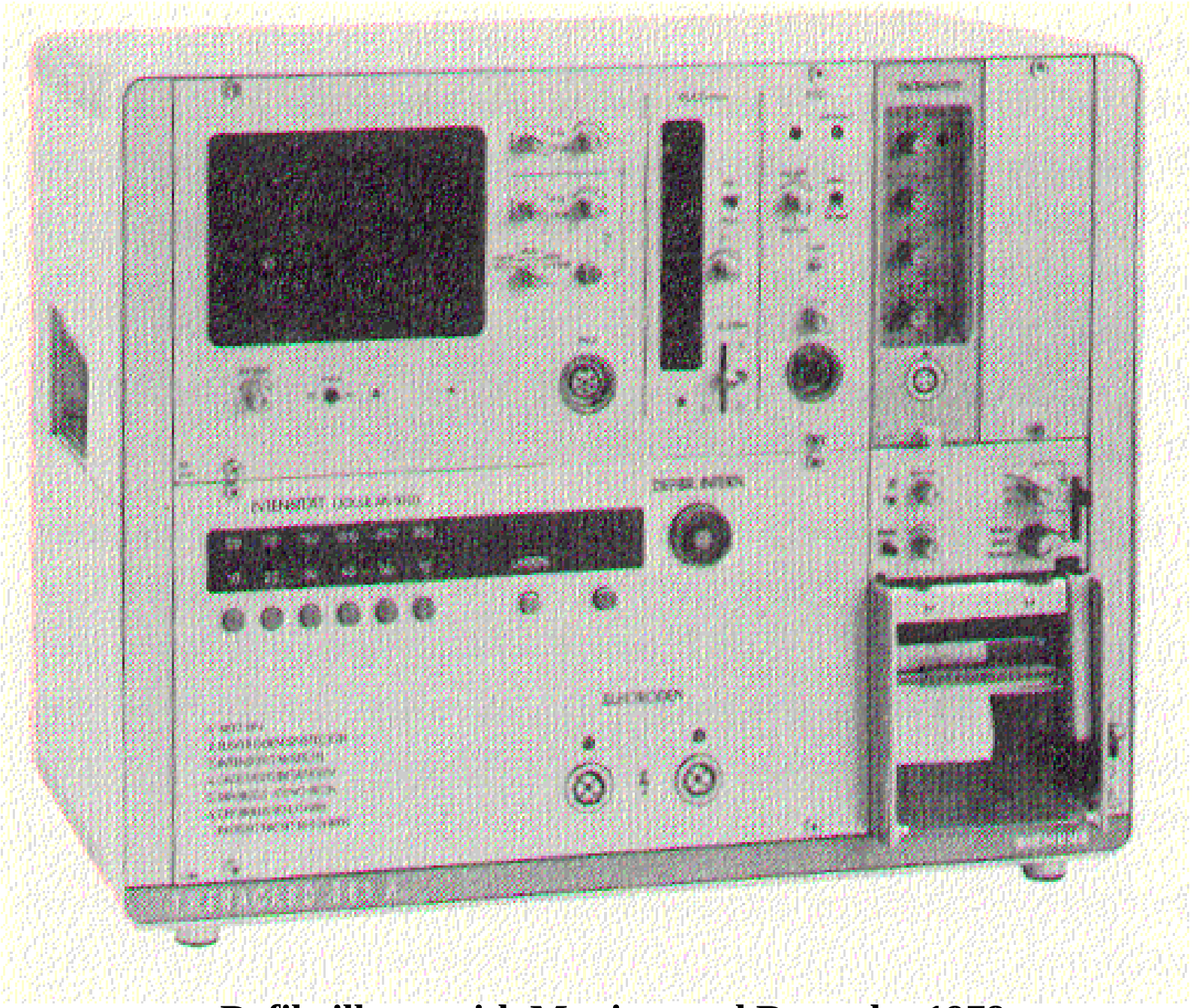
Ch. Kite (1788)



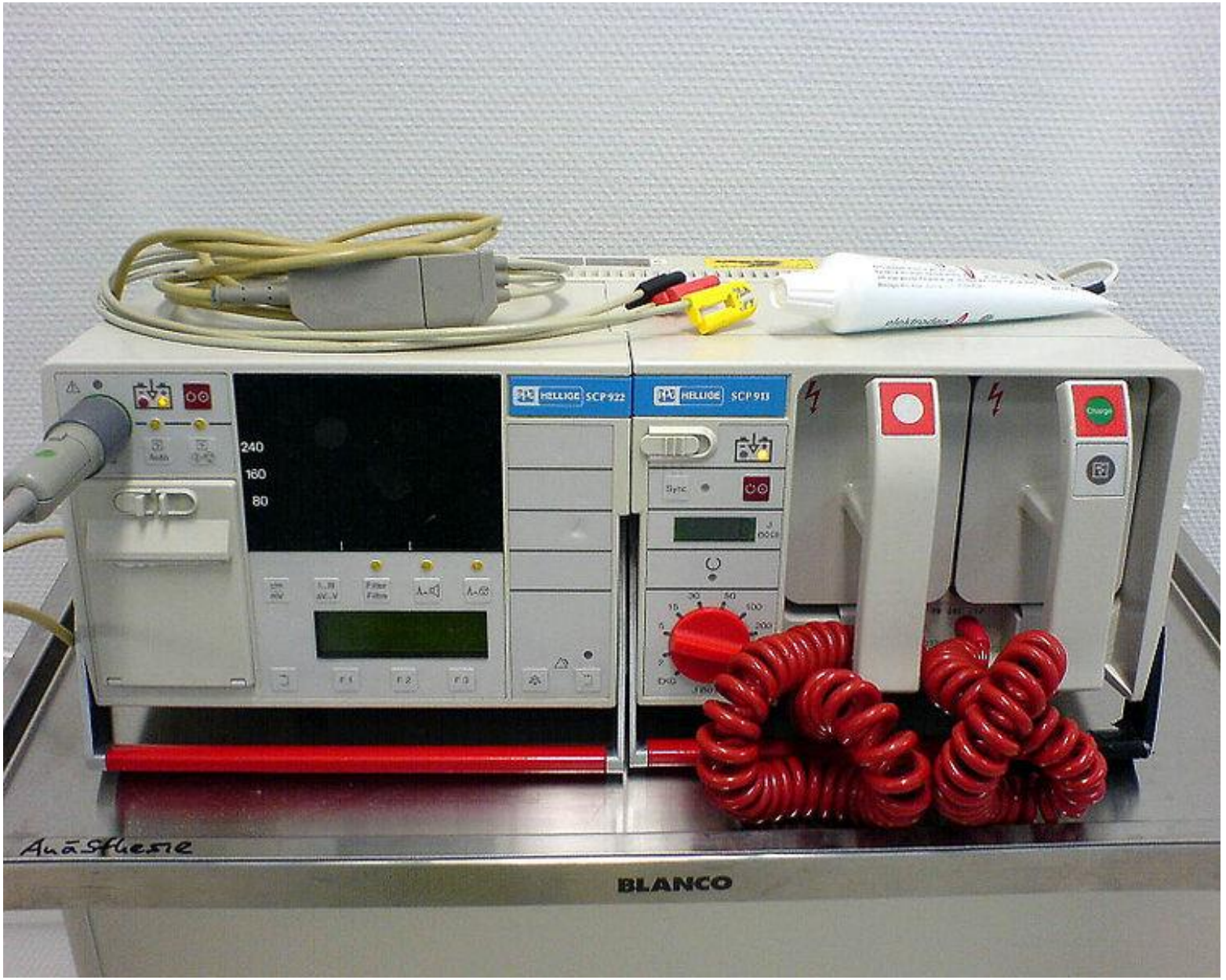
First extracorporeal defibrillator applied (1947)



Extracorporeal defibrillator (1978)



Defibrillator with Monitor and Recorder 1978

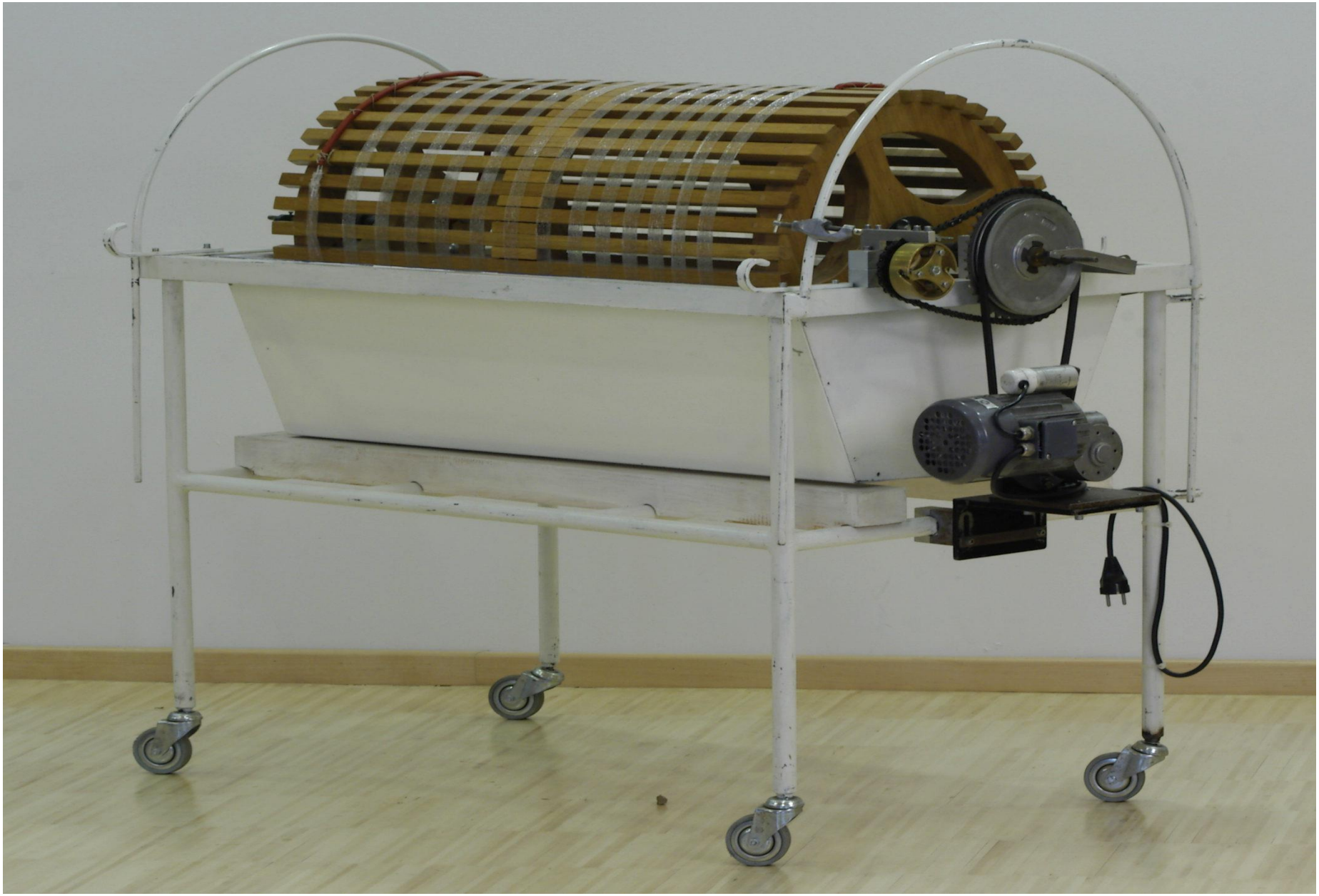


Defibrillator for extracorporeal application

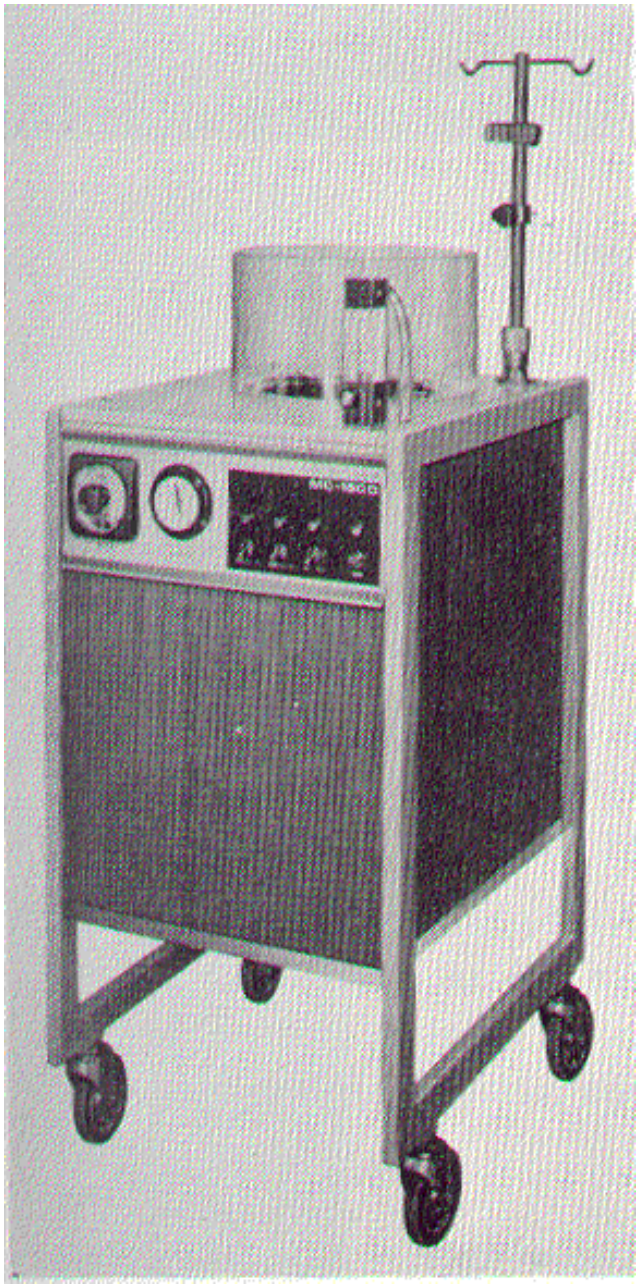
Portable defibrillator (Hellige 1994)

Implantable defibrillator (dimension scale: inches)

Drum kidney 1943 (William Kolff, died Feb. 14, 2009)

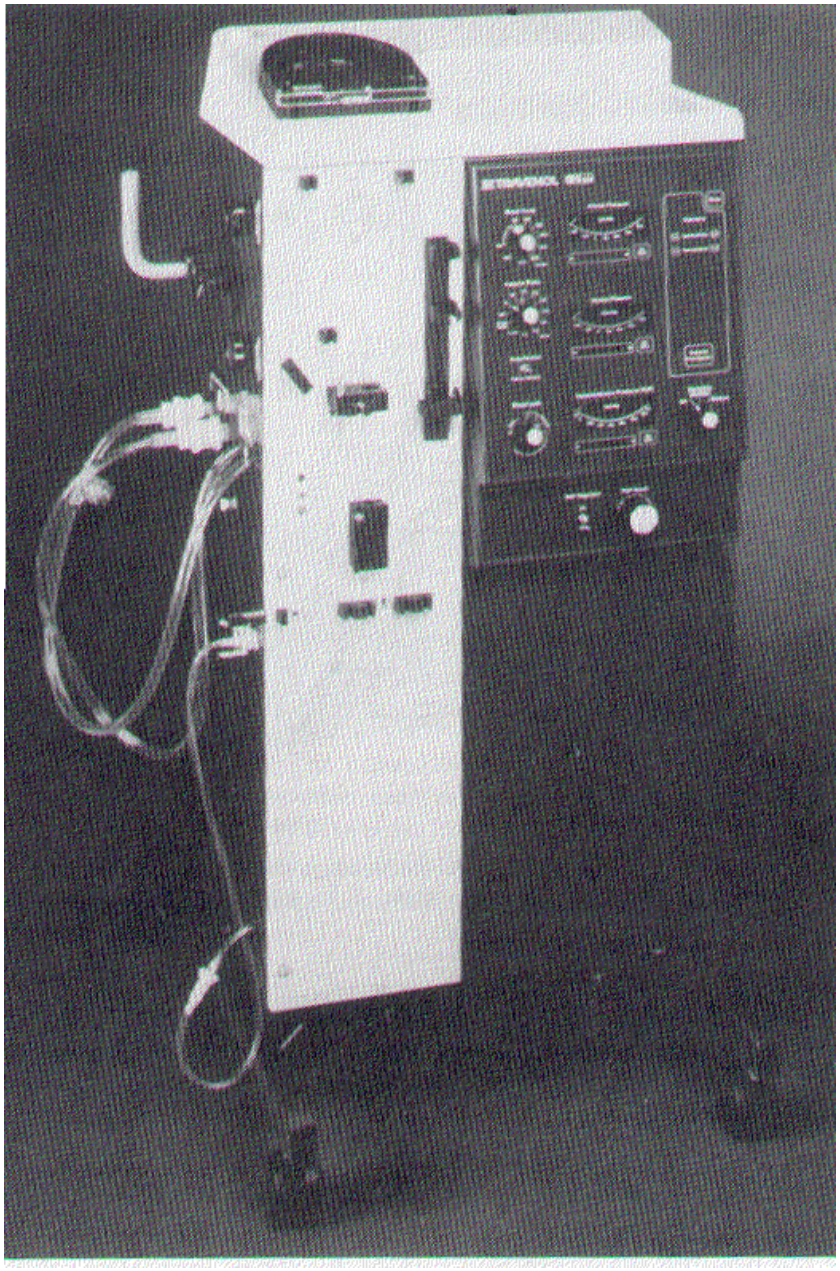


Reconstruction of the Kolff drum kidney

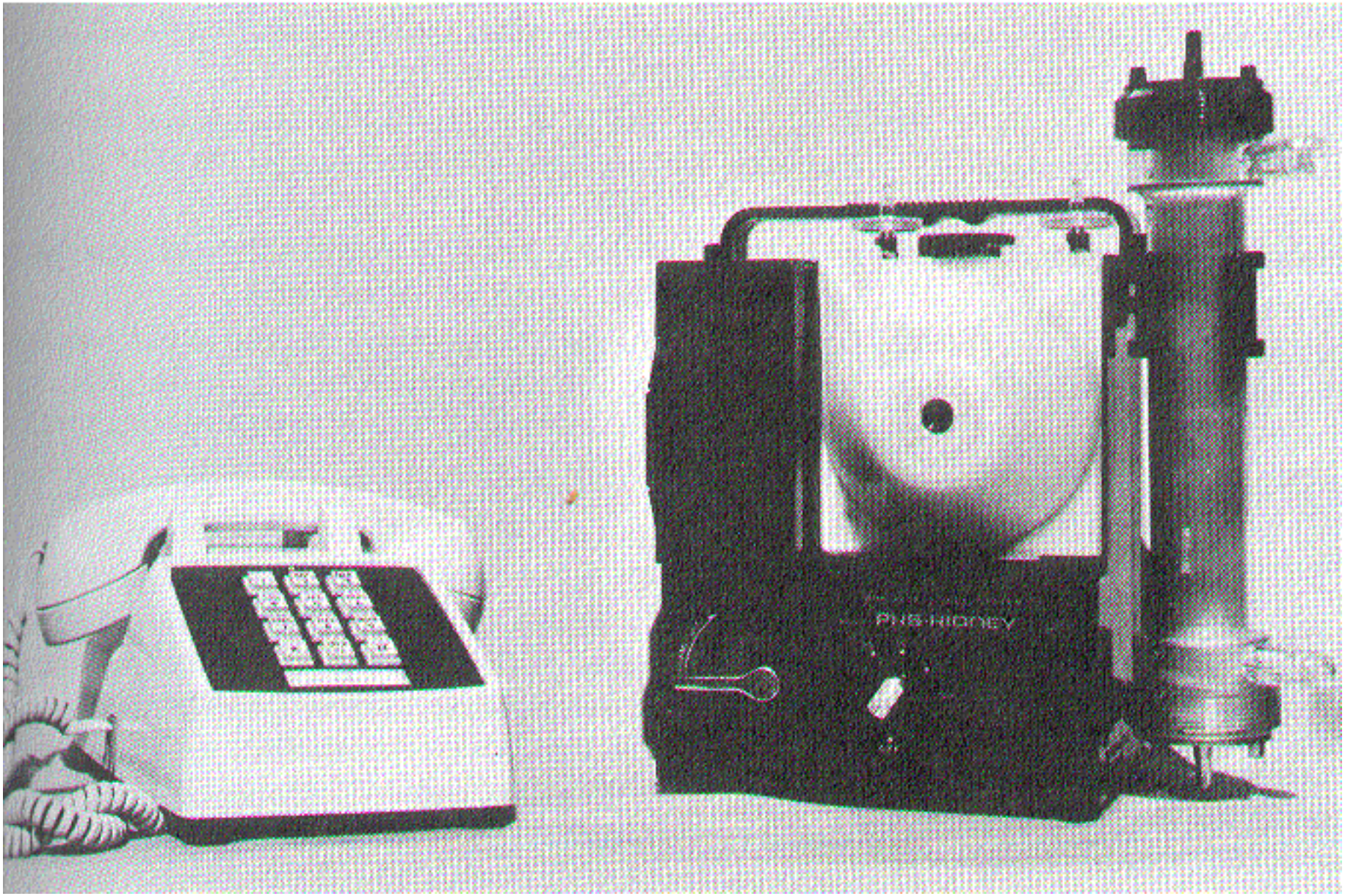


a.

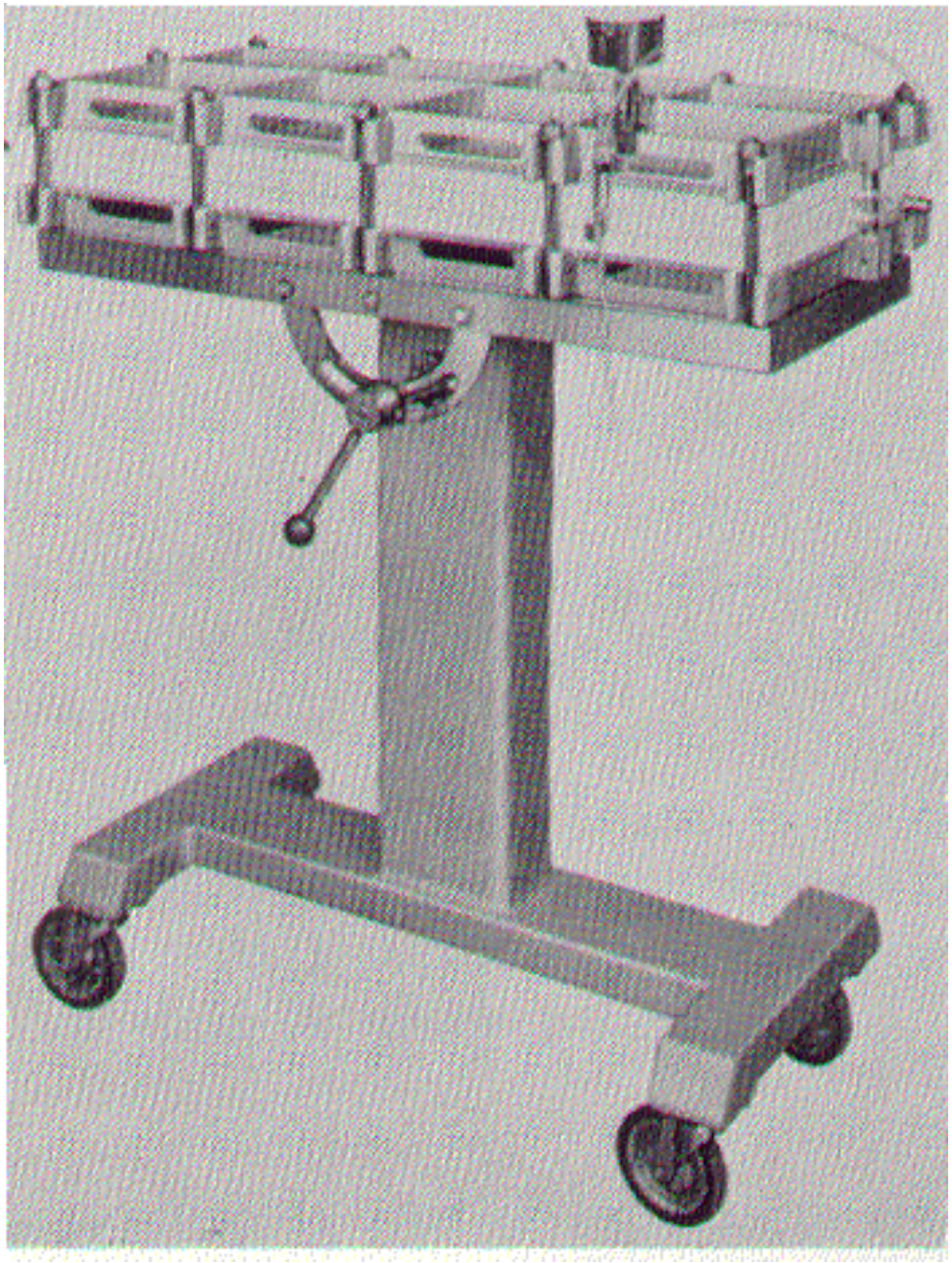
b.



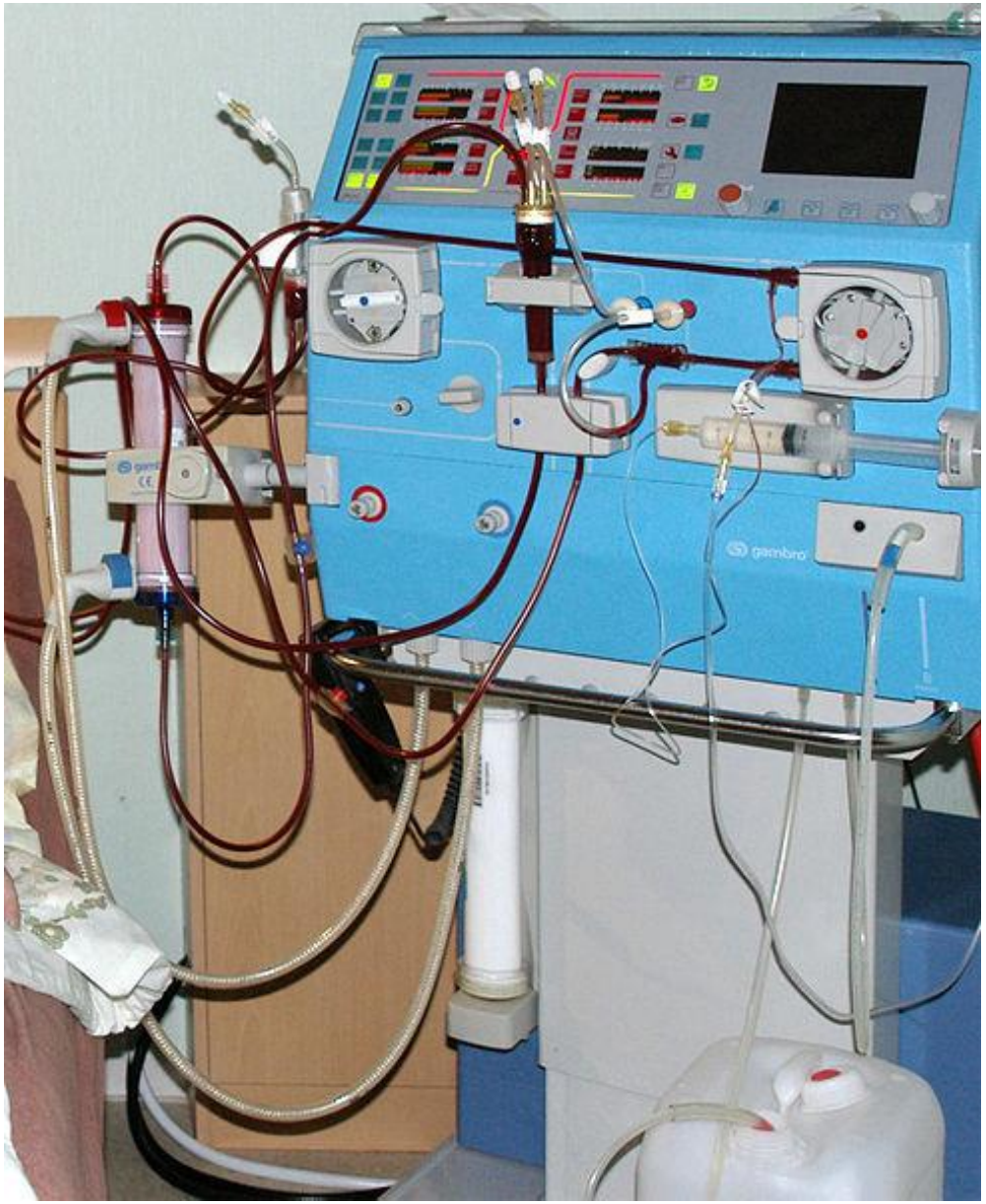
Artificial kidney – Kolff type (a. 1973, b. 1988)



Wearable artificial kidney Kolff type (Utah University, 1988)



Artificial kidney – Kill type (1973)

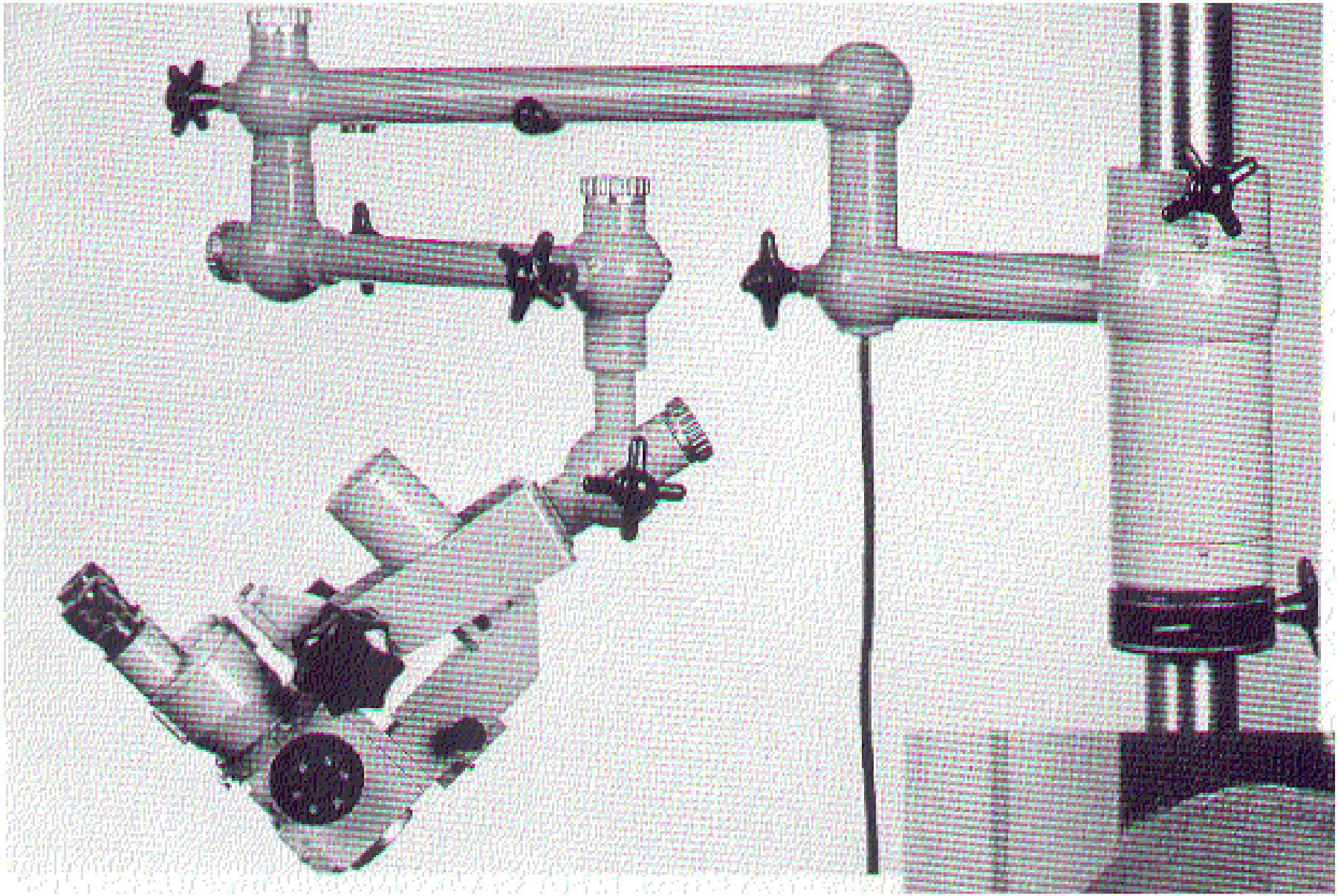


Artificial kidney

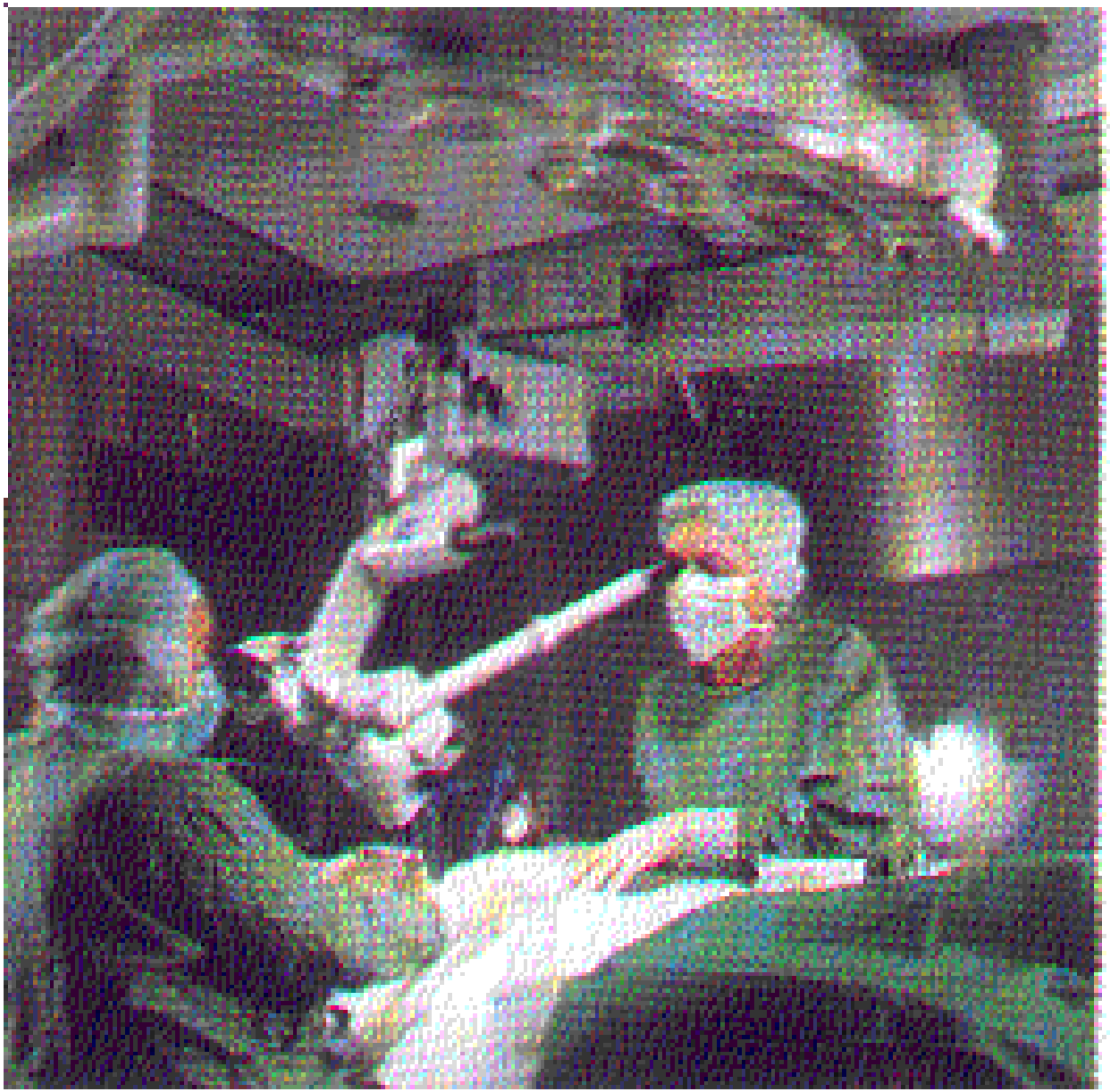
Dialysis treatment place

2 separate viewing hoods for assistance

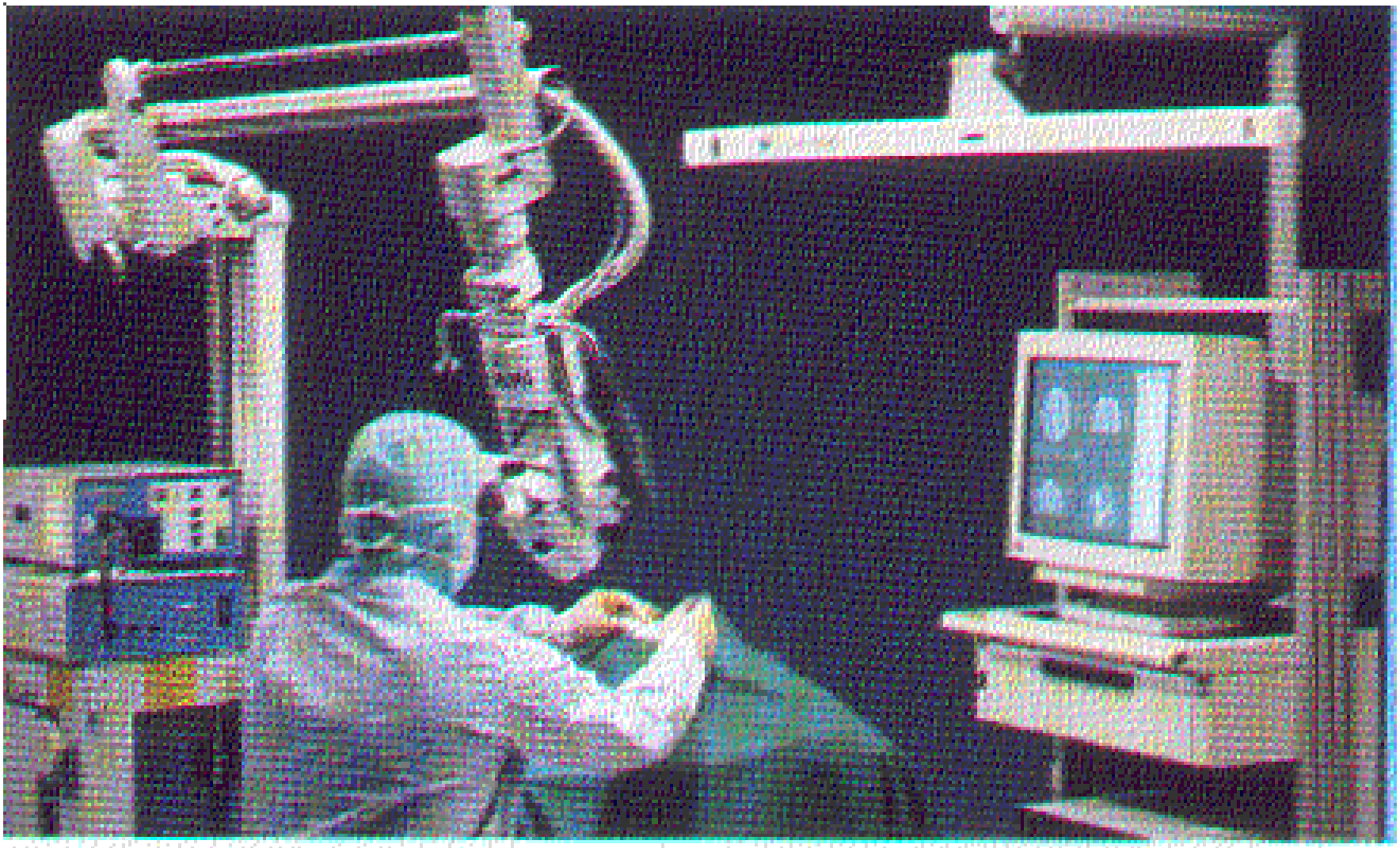
Special microscope for microsurgery and used by two persons



First microscope-based microsurgery equipment (Zeiss, 1953)



Microscope based microsurgery equipment for ophthalmology with speech control (Zeiss, 1988)



Navigation-system for microscope-based microsurgery (Zeiss, 1996)

a. eye surgery **b. general surgery**

Operating microscopes (2008)

Surgical microscope (Zeiss, 2009)

Surgical dental microscope (ZUMAX, 2009)

a. Zeiss

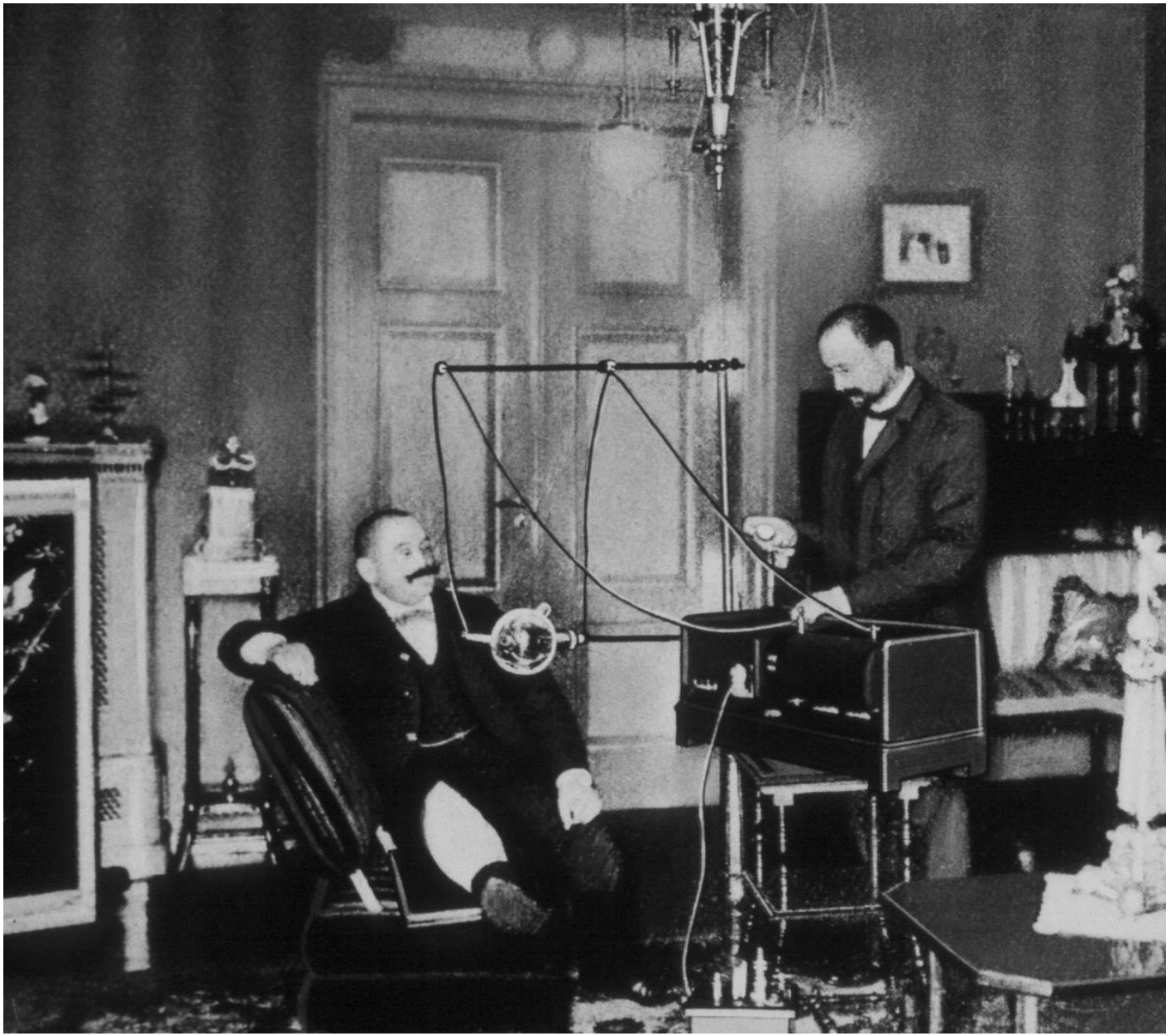
b. Leitz

Surgical microscopes (2009)

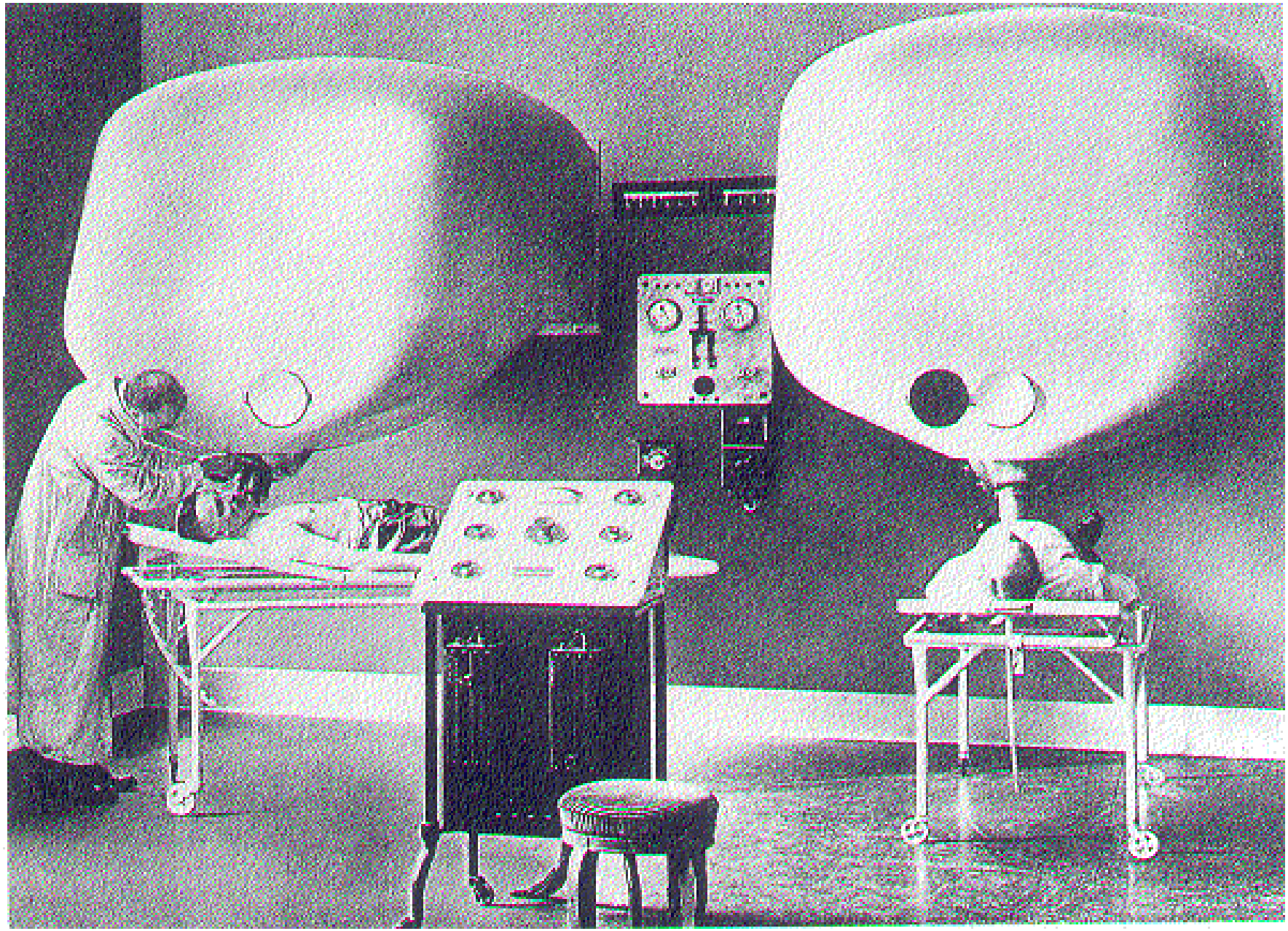
a. fully motorized

b. manually operated

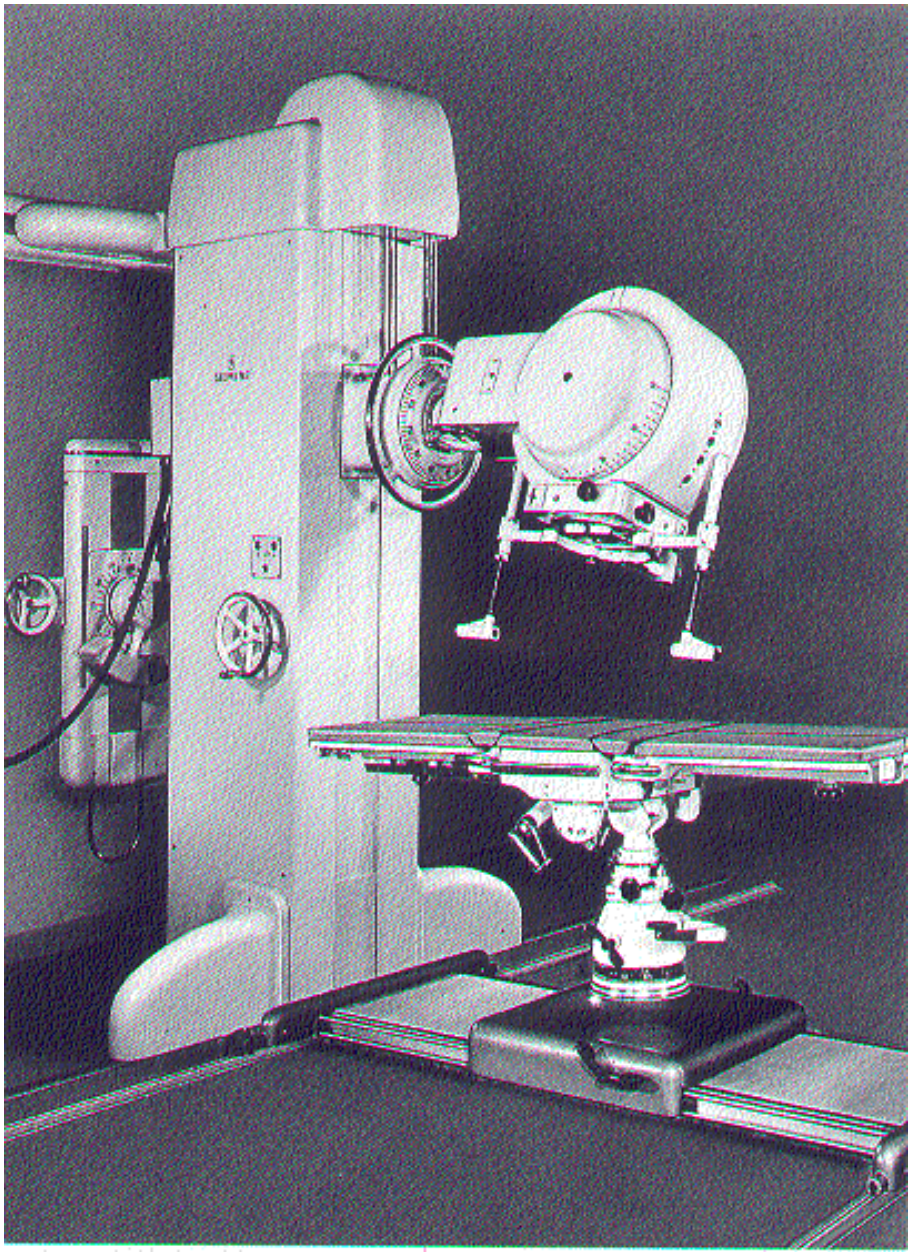
Dental microscopes (Zeiss, 2009)



Radiation therapy (about 1905)

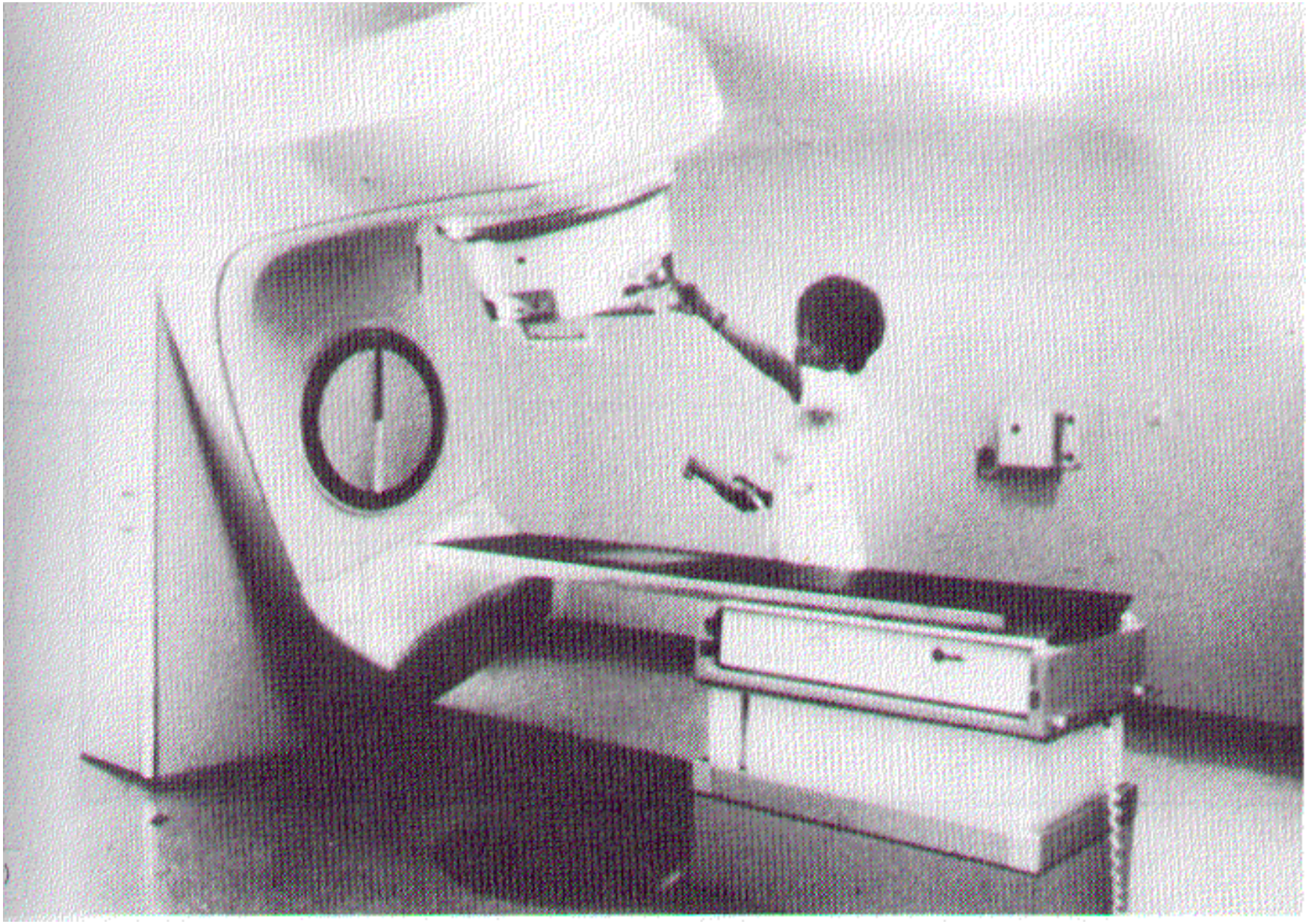


HV-based X-ray generator (Siemens 1919)

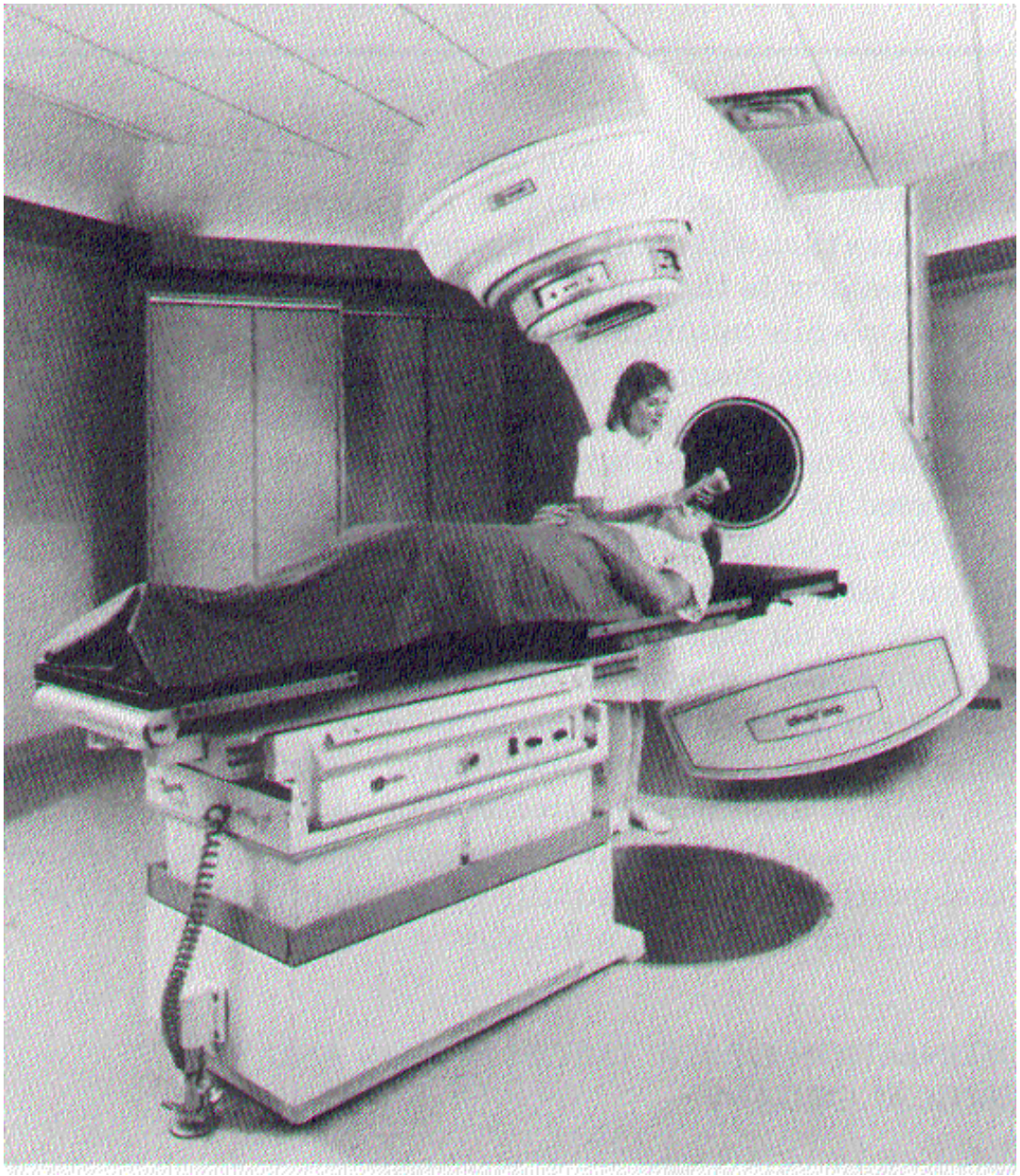


Cobalt-60 and caesium-137 γ-radiation generator for tumor treatment

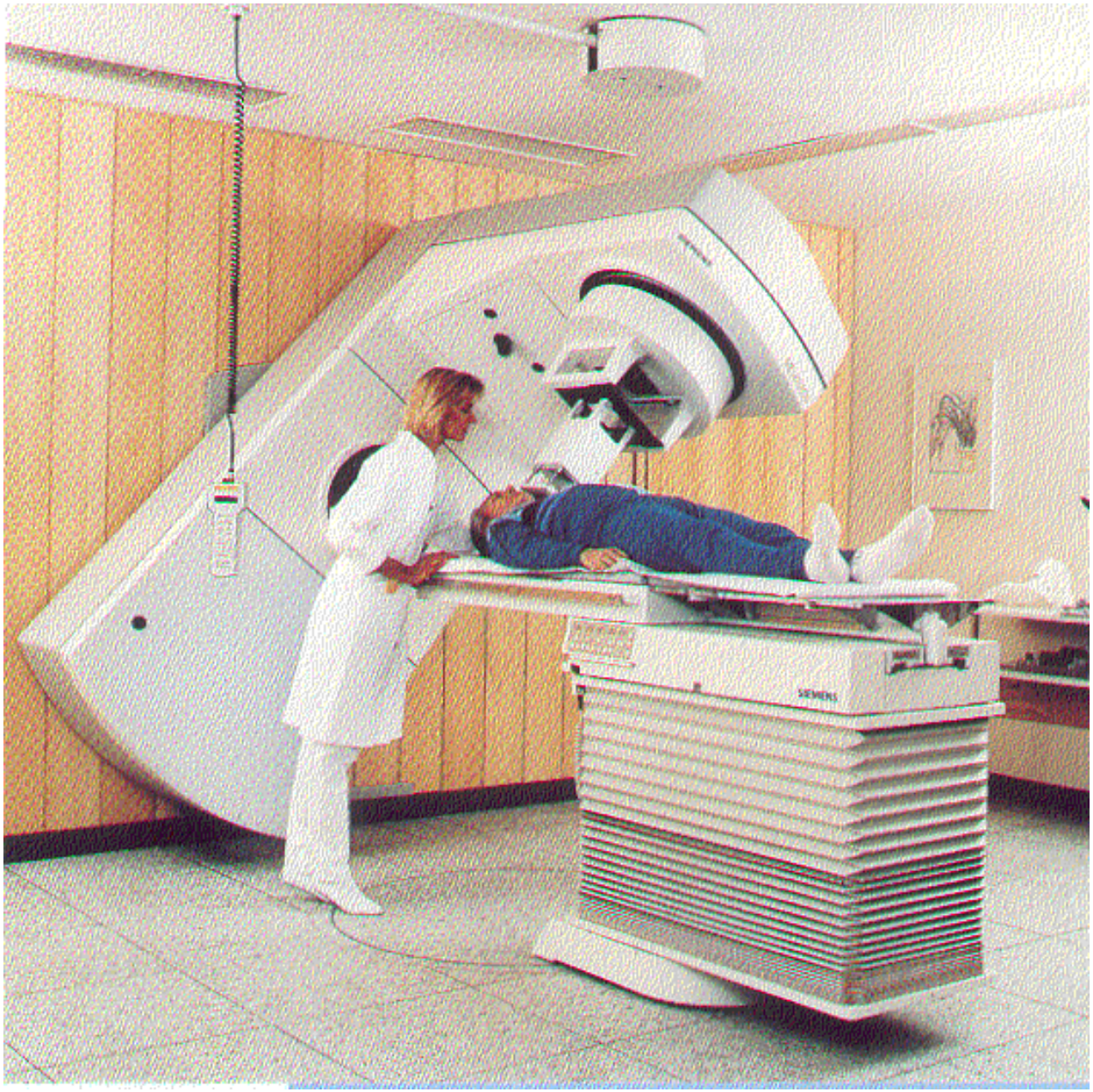
(Siemens 1956)



Linear accelerometer type standing waves (Varian, 1968)



Linear accelerometer (Varian, 1988)

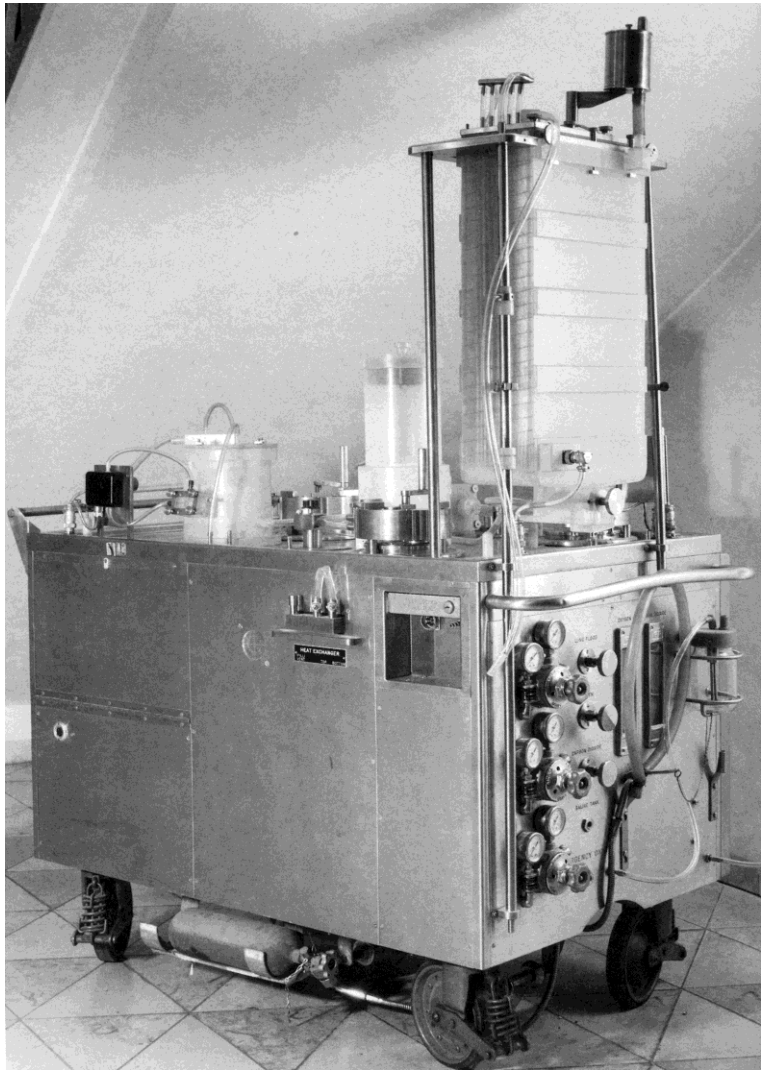


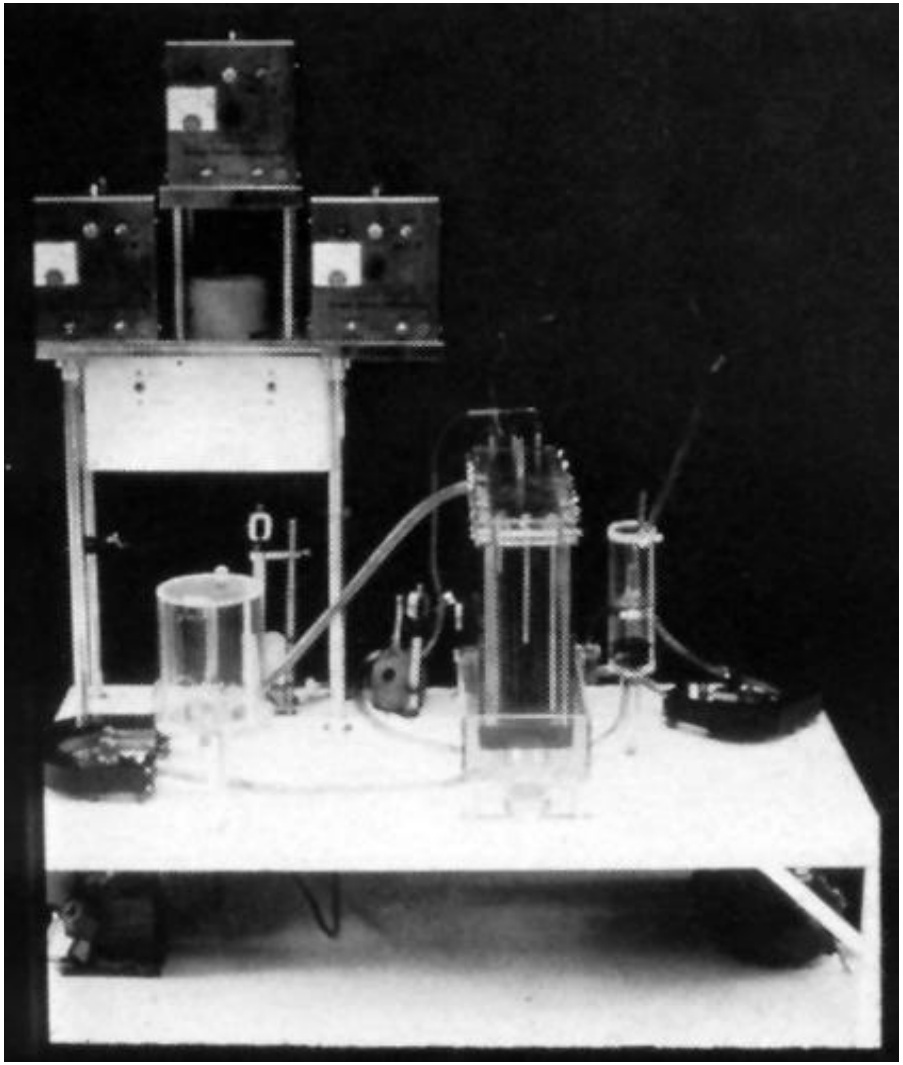
Accelerator for radiation therapy using electron and photon generation

(Siemens 1995)

MEVASIM

Radiation therapy equipment



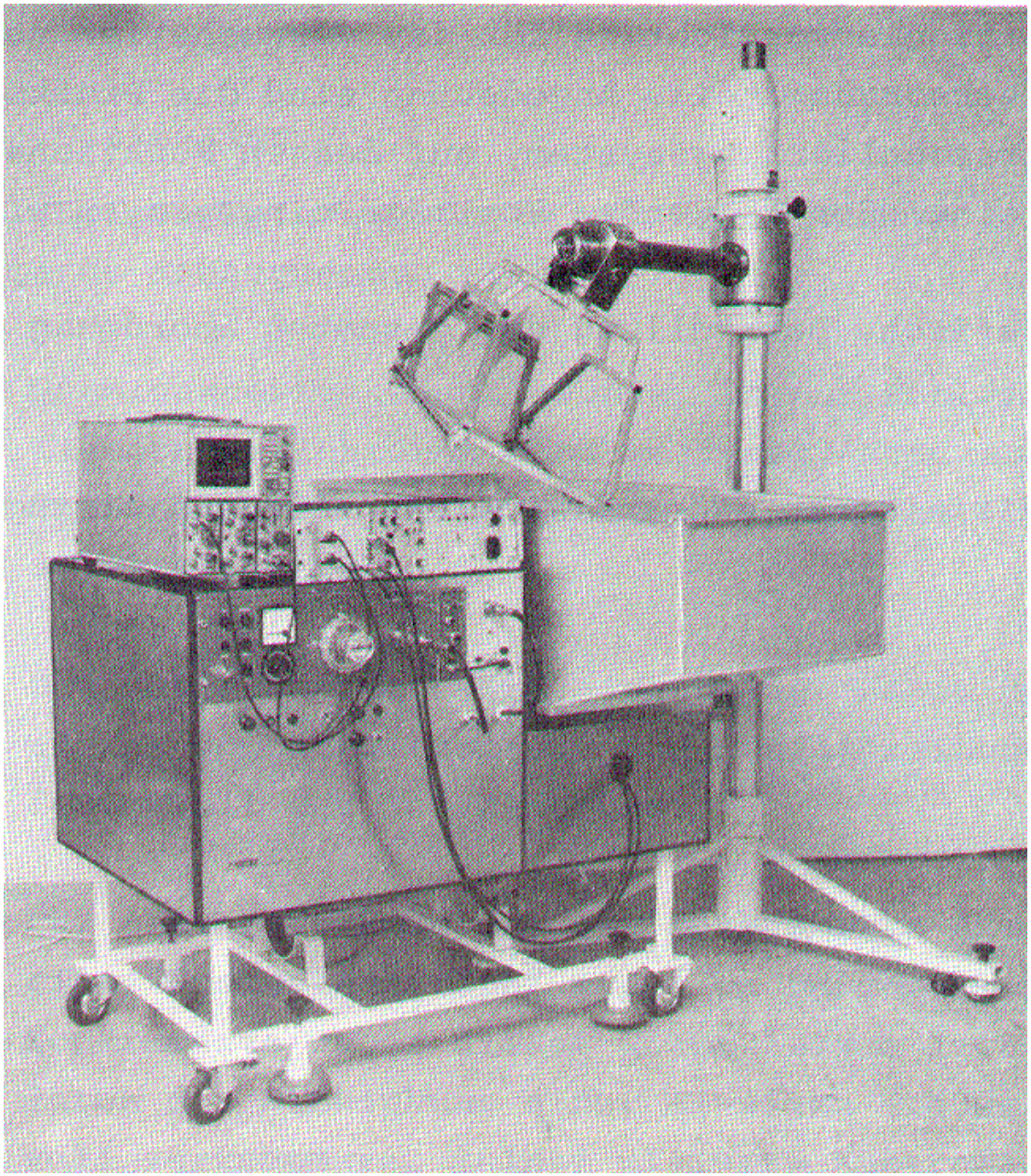


Two different heart-lung machines used in 1958 in Germany

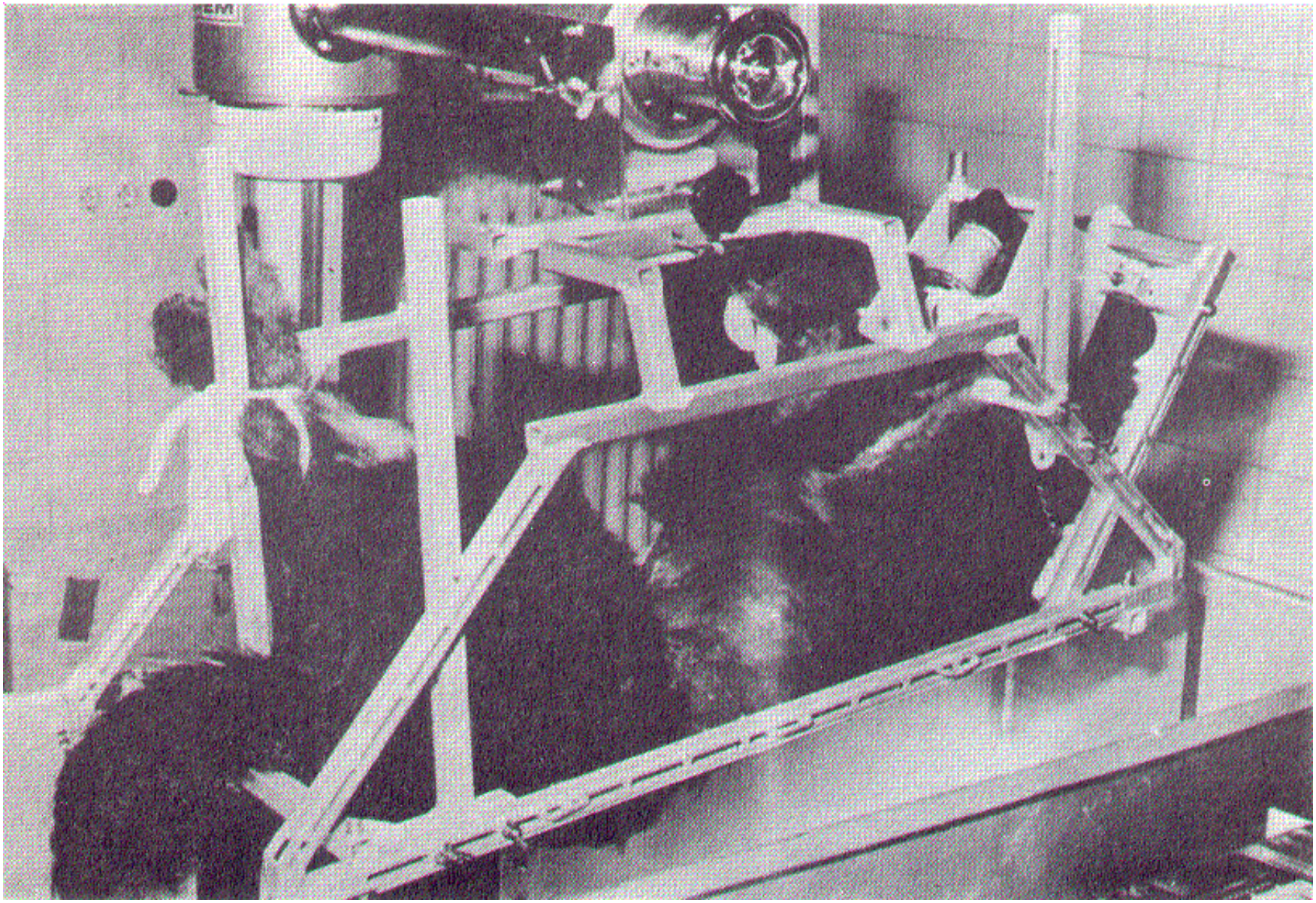
Heart-lung machine

Extracorporeal disintegration of kidney stones – schematics (1975)

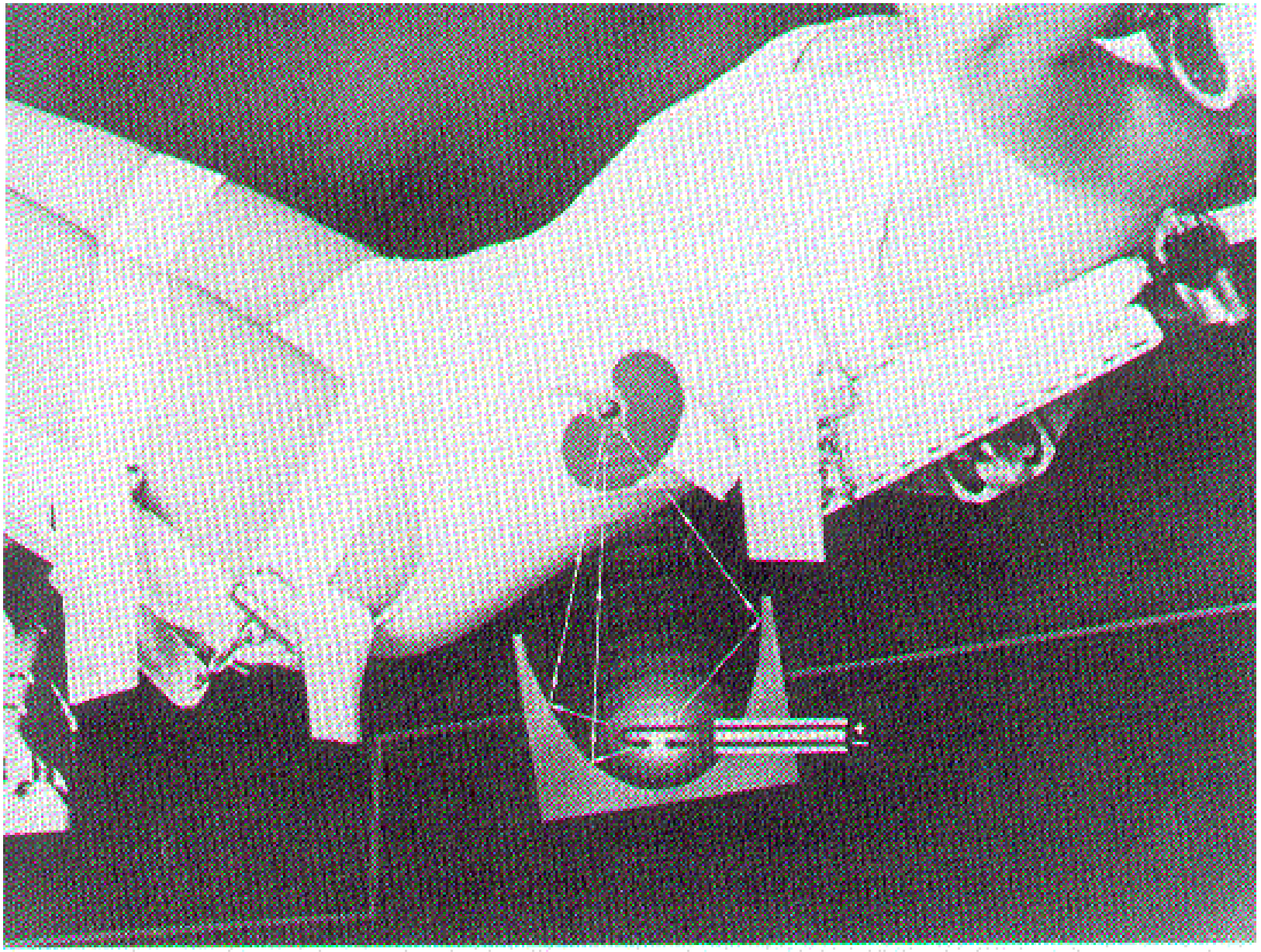
The patient is positioned in a water-filled bathtub („the most expensive bathtub ever built“)



Shockwave generator for animal experiments (Dornier, 1977)



Appliance for the positioning of animals in the bathtub (Dornier, 1978)

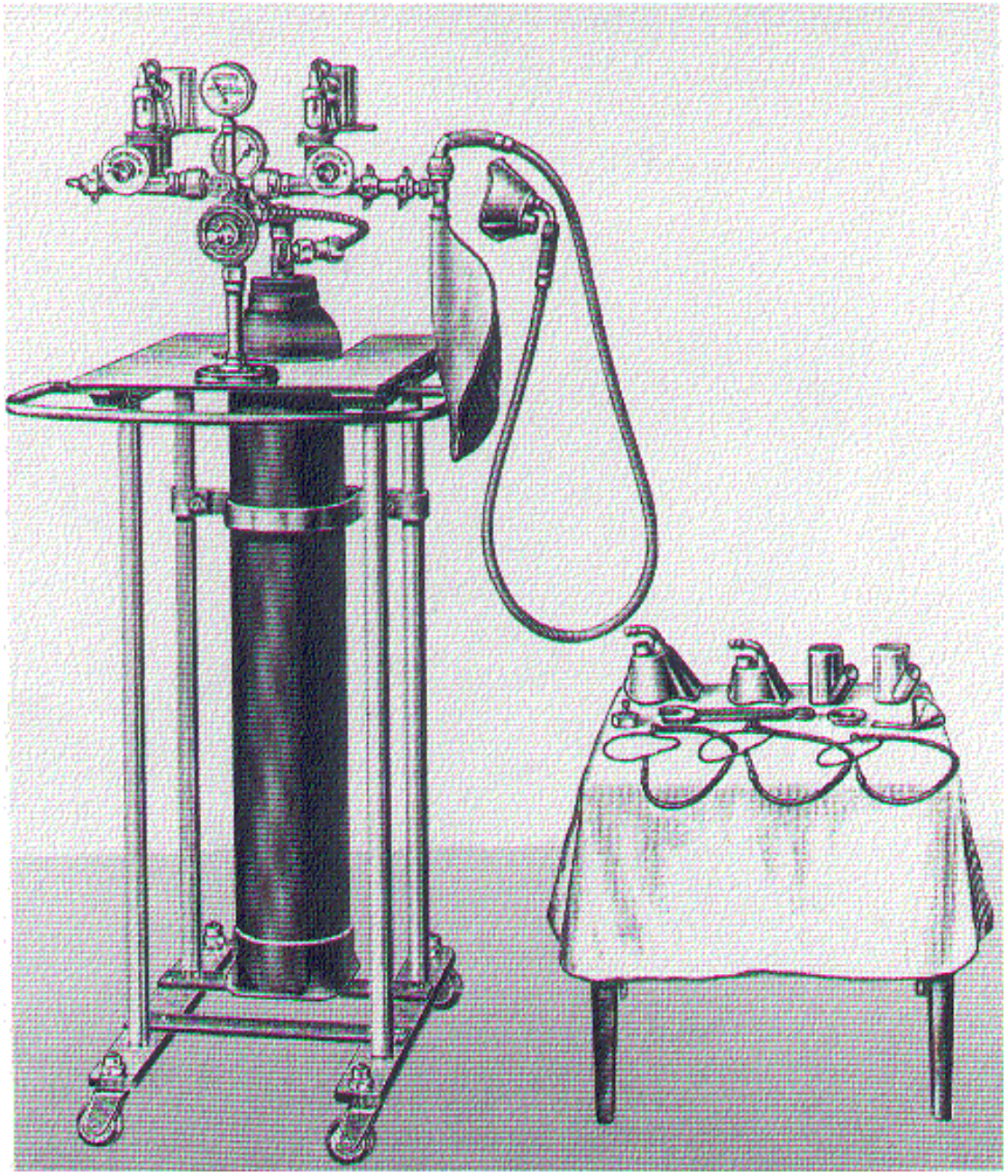


Extracorporeal electro-hydraulic shock wave lithotrispy (Dornier, 1988)
Patient is positioned in a bathtub with the shock wave focused on the kidney stone

Extracorporeal kidney stone lithotriptor 1980

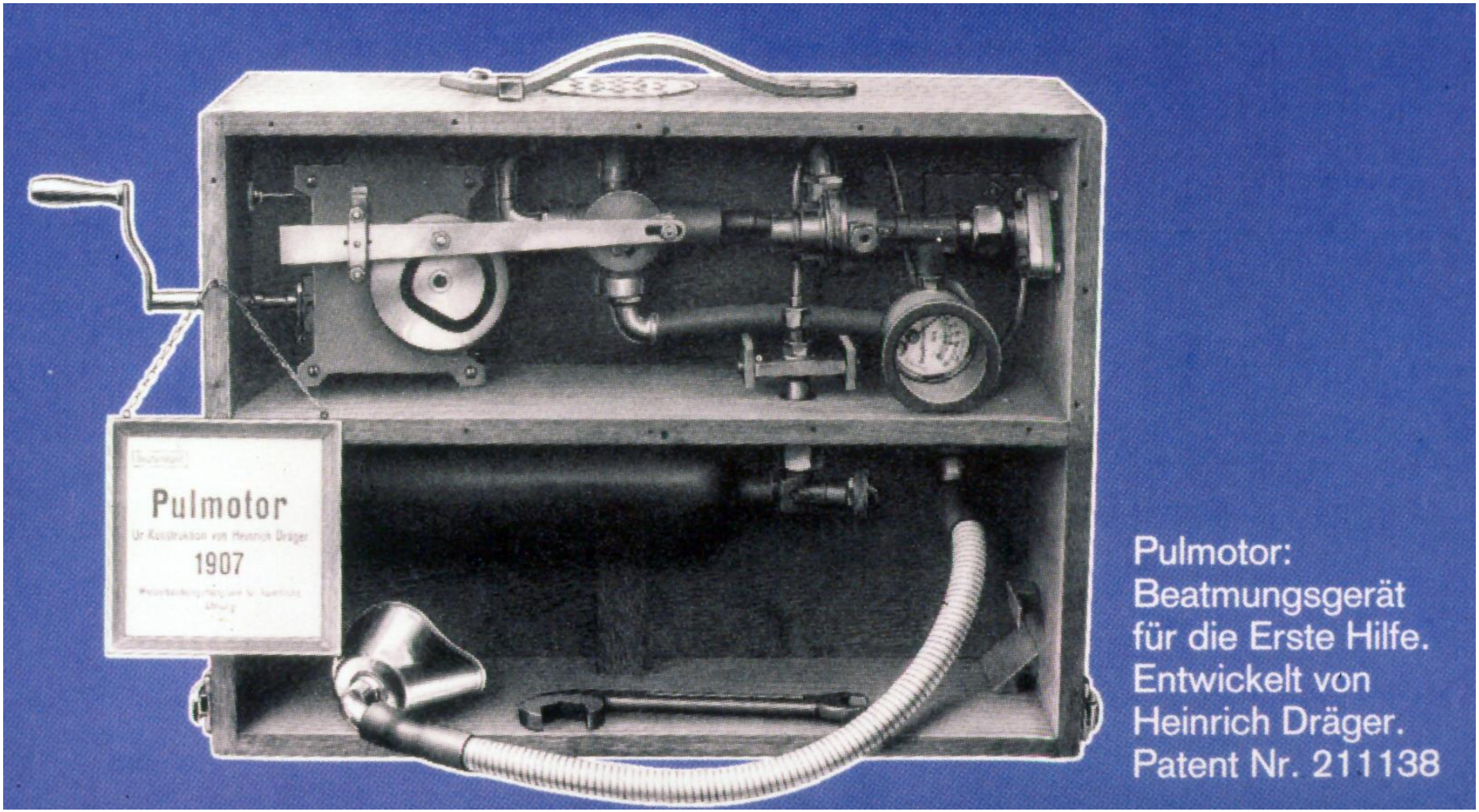
Advanced working place for extracorporeal kidney stone disintegration (2003)

Lithotriptor for the destruction of kidney stones by shock waves (2005)



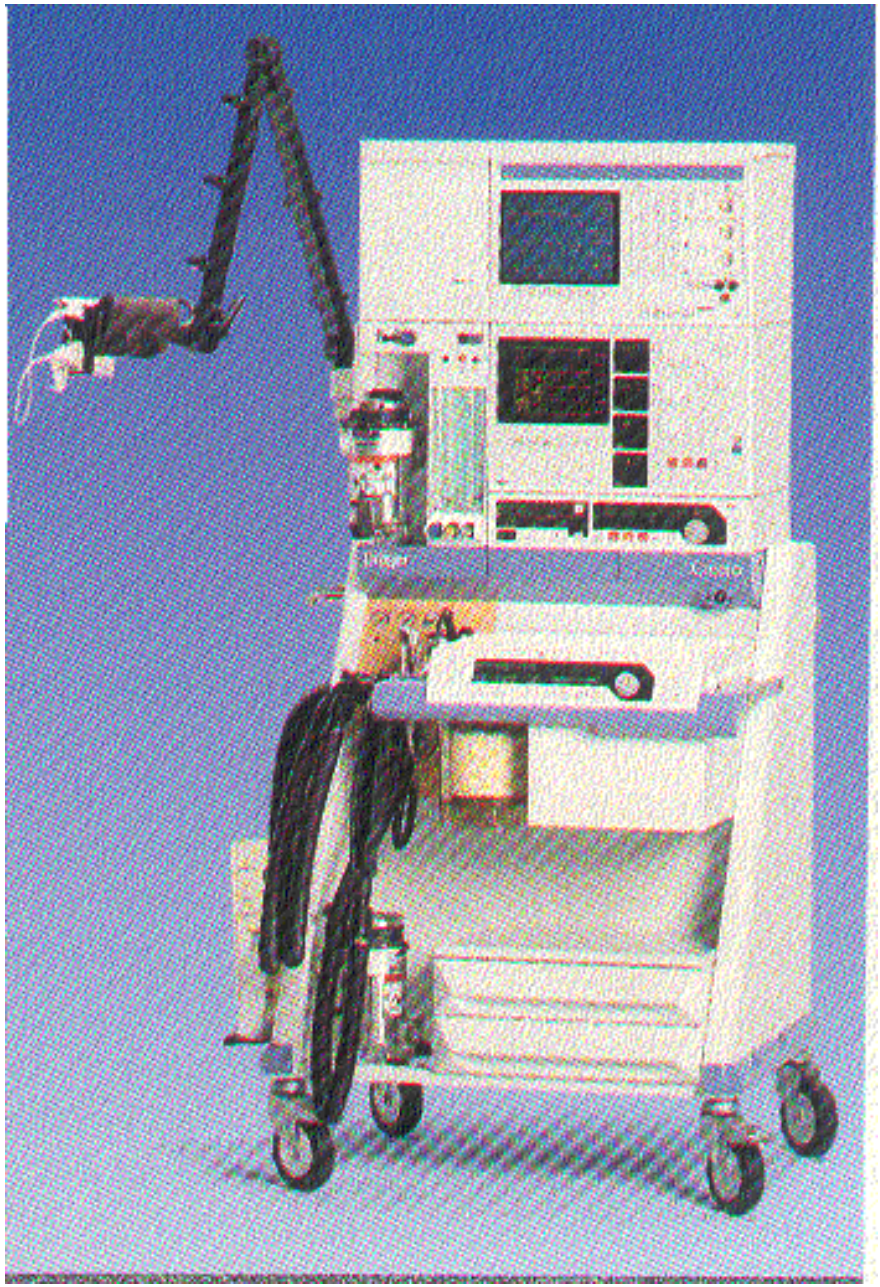
First machine for anesthesia by vaporized ether (Draeger, 1903)

Two different types of iron lungs or cabinet respirators (1920 – 1970)

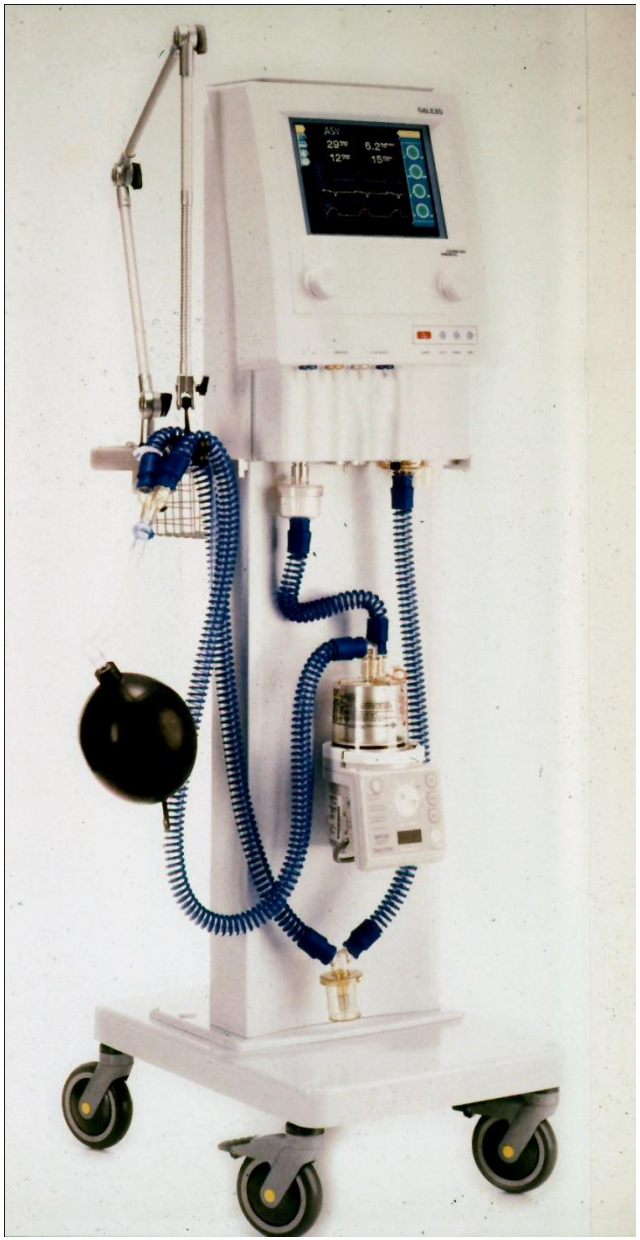


Ventilator driven manually with a crank working on a rotating plate

(H. Draeger, 1907)

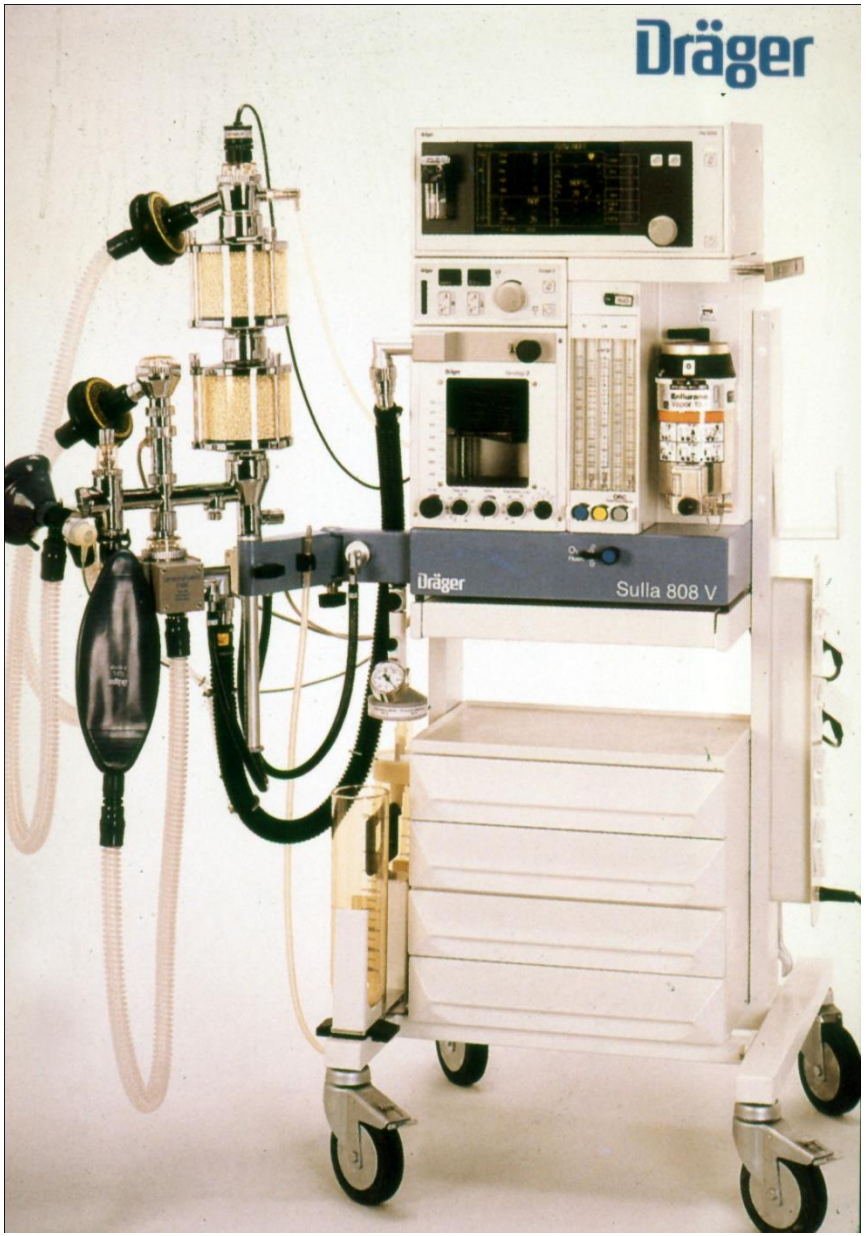


Anaesthesia working station (Draeger, 1990)



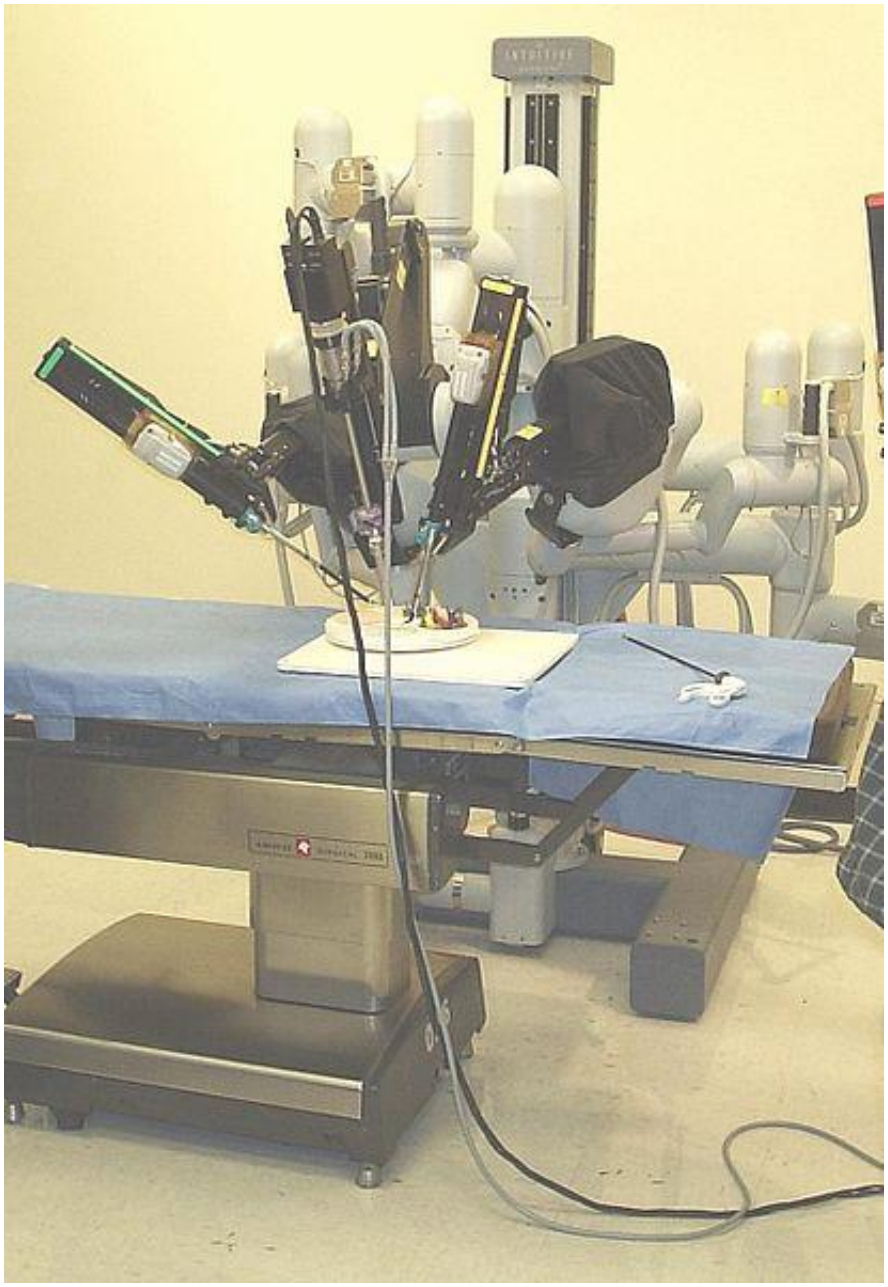
Ventilator with electronic control and monitor

Ventilator for mobile application (e.g. emergency service)



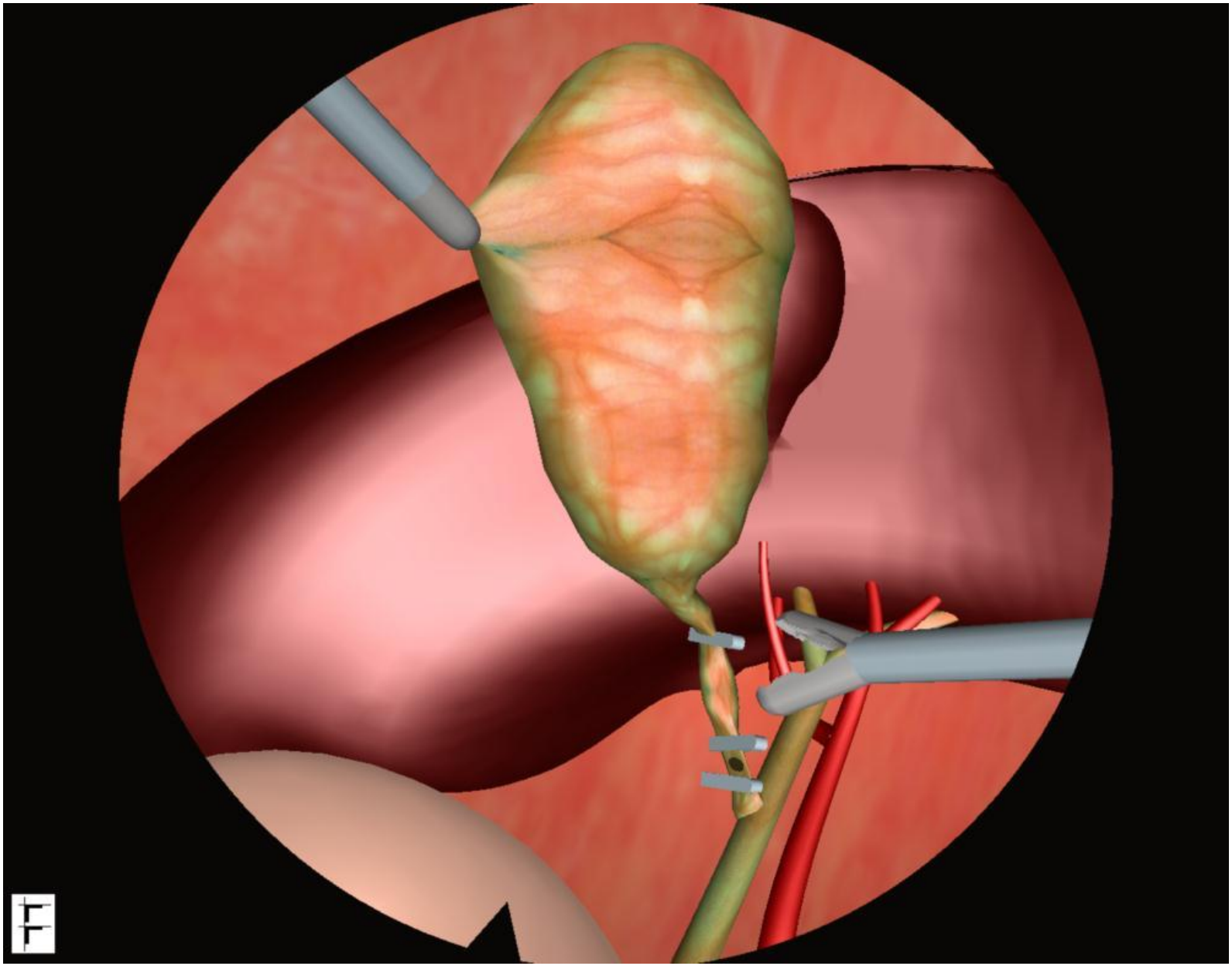
Mobile anaesthesia workstation

Monitor and control unit for anesthesia machine

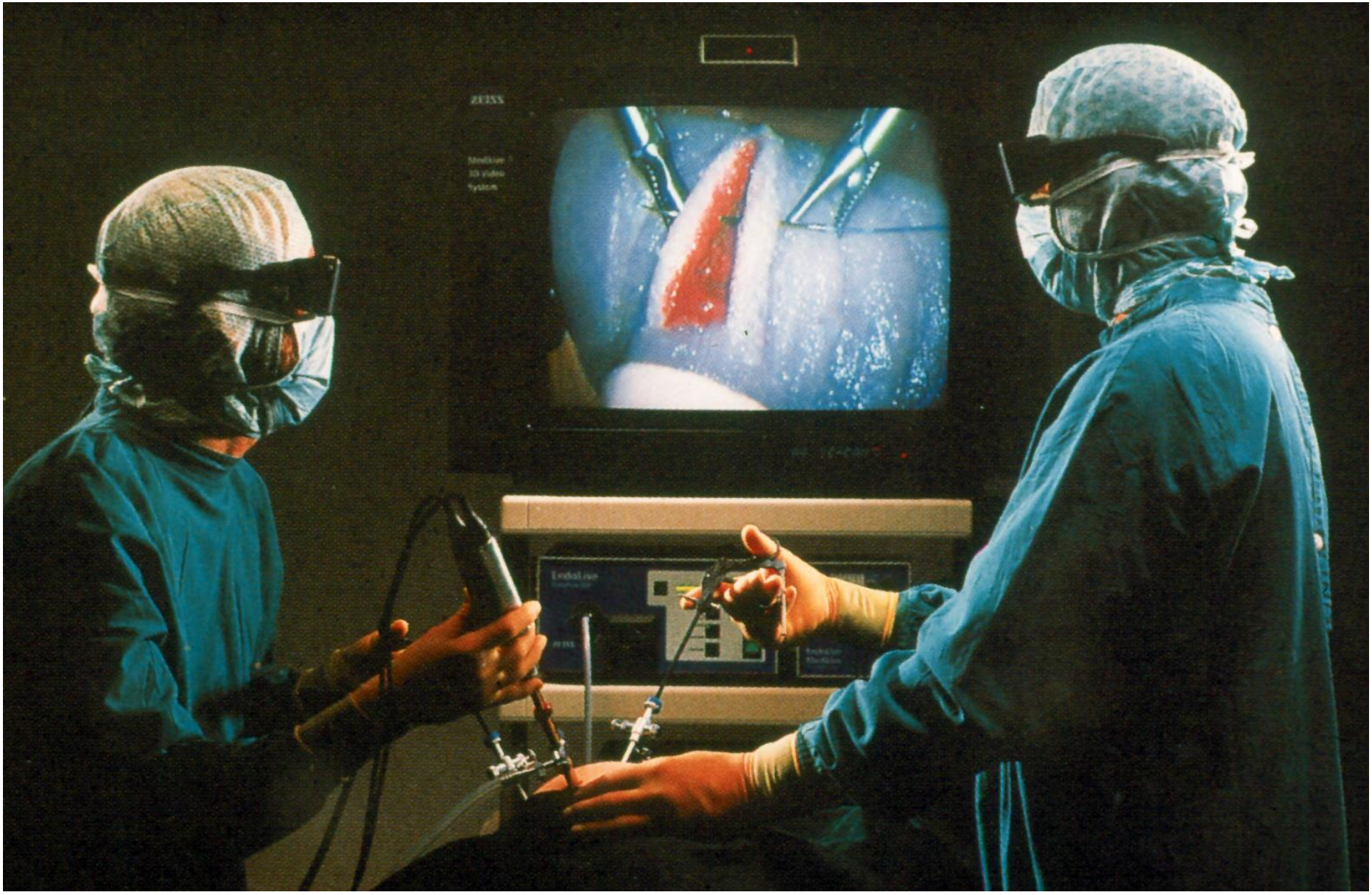


Da Vinci laparoscopic surgical robot (launched 1999, FDA approved 2000)

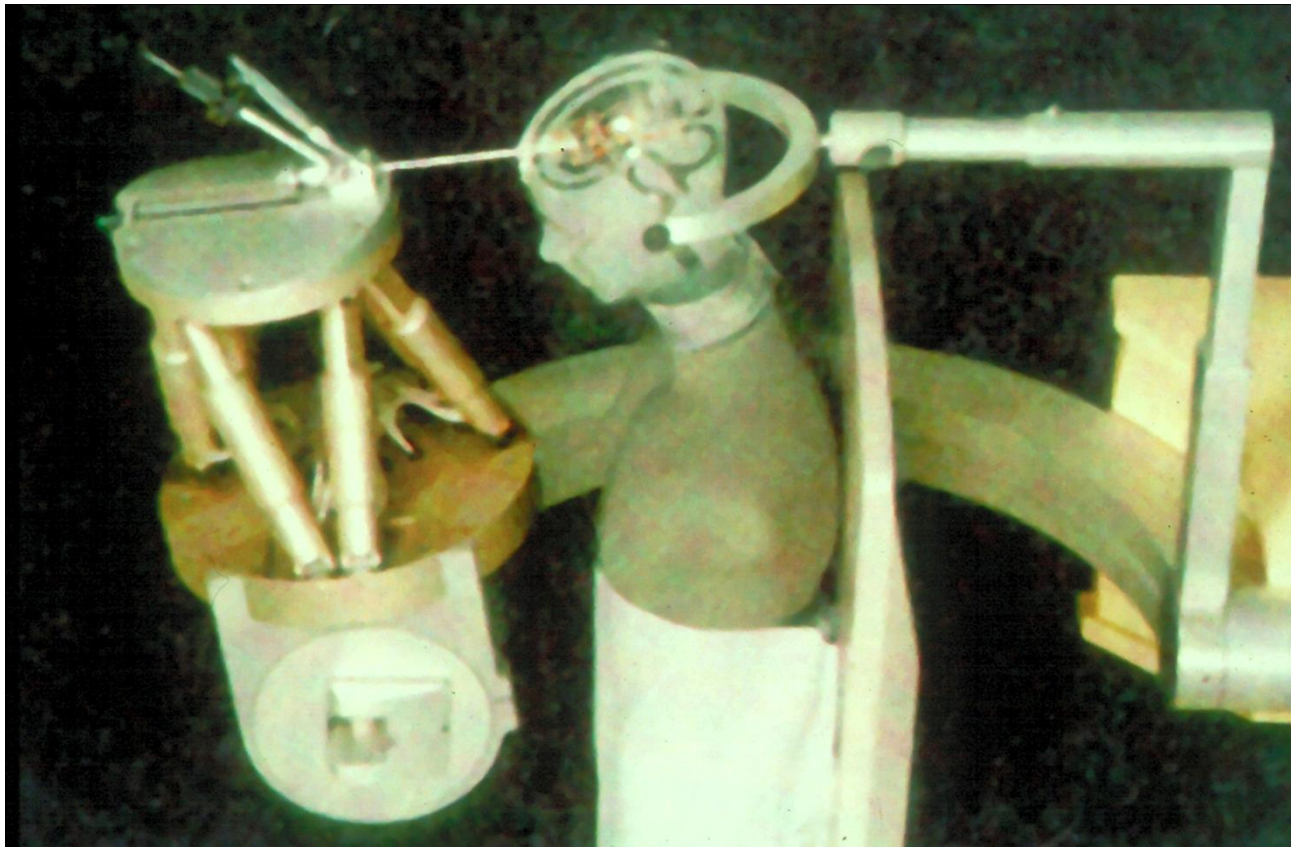
The Karlsruhe Endoscopic Surgery Trainer as an Example for Virtual Reality in Medical Education



The Karlsruhe Endoscopic Surgery Trainer as an Example for Virtual Reality in Medical Education



Minimal-invasive surgery with 3D-imaging



Robotic brain surgery with hexapod-supported actuator platform