

Remembering Dr. Edward S. Hyman and his “Trough” Bubble Oxygenator

Introduction

In 1946, Ed Hyman followed in his father’s footsteps and became a doctor. Born in New Orleans, Ed exuded confidence as a teenager and prided himself a genuine problem solver. His medical training included residencies at Stanford University and Harvard’s Peter Bent Brigham Hospital. He served in the U.S. Naval Reserves from 1943-1952, and returned to New Orleans in 1953 to establish a private practice in Internal Medicine. Tireless in his pursuits, Ed joined the Louisiana State University Medical School as a clinical instructor. He also was named director of the kidney unit at Charity Hospital where he introduced the newly-developed dialysis machine. Ed’s true passions, hearkening back to his youth, were research and innovation. Consequently, he built and funded a laboratory in 1954 within the confines of Charity Hospital to study diseases and seek answers to medical problems.

Heart-Lung Device

One of Ed’s first projects was to build an artificial heart-lung apparatus to aid in open-heart surgery. It’s unclear why Ed chose this particular endeavor. No doubt he’d heard of Gibbon’s sensational solitary success the year prior in Philadelphia – everybody had. Whatever the impetus, Ed devised a novel plastic cone-shaped bubble oxygenator (see Figure 1) with tubing limbs attached such that it functioned as a complete one-time-use disposable circuit. The venous side limb was long enough to fit through a Sigmamotor finger pump. The cone-shaped reservoir, designed to be hung on an IV pole several feet above the operating table, collected and filtered arterialized blood prior to its return by gravity to the patient. The reservoir was impregnated with Dow-Corning Silicone Antifoam A. In addition, a baffle or “trough” was fashioned along the inner walls of the reservoir to prevent channeling of blood directly into the outlet limb (a phenomenon we know today as “vortexing”). A most unique feature of Ed’s “trough” oxygenator was the integral cardiotomy port for the direct return of coronary suction blood. The priming volume was 600-800 mL and the top-end flow rate approached 4 liters per minute.



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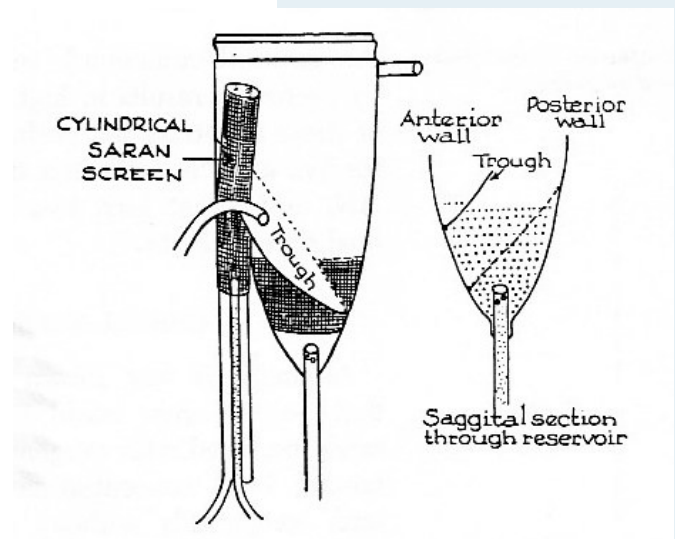


Figure 1– Hyman’s original sketch of his “trough” bubble oxygenator (circa 1954).

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Ed filed a patent for his device on January 11, 1956 (see Figure 2). On the same day, the New Orleans Times-Picayune newspaper ran a story about Ed's research entitled, "Two-Dollar Device Used in Keeping Dog Alive for 27 Minutes". When asked about production, Ed stated "... it can be stamped out commercially like a beach ball or any plastic toy ...". Several months later, a complete description of Ed's oxygenator appeared in the Journal of the Louisiana State Medical Society along with a reported 100% survival rate in 11 consecutive dogs subjected to total cardiopulmonary bypass for up to sixty minutes.

Aug. 20, 1963

E. S. HYMAN

3,101,083

HEART-LUNG DEVICE

Filed Jan. 11, 1956

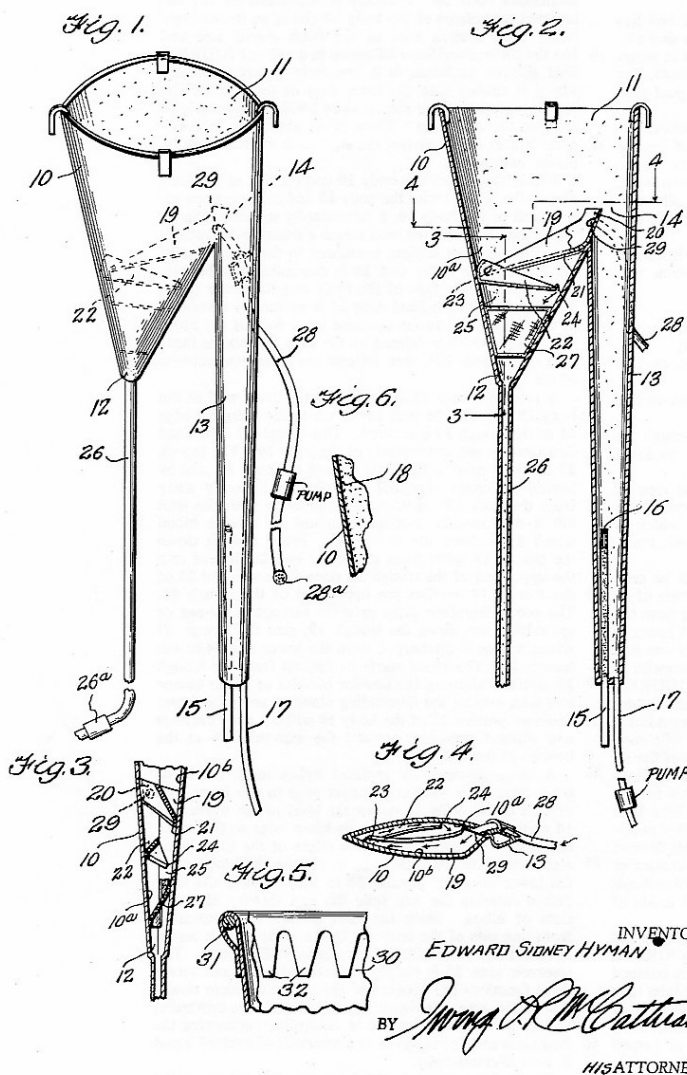


Figure 2- Schematic of Hyman's "trough" bubble oxygenator which accompanied his patent application filed on January 11, 1956.

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Regional Perfusion

In their landmark 1958 publication, Creech and associates describe a method to treat tumor-bearing areas of the body with an oxygenator and extracorporeal circuit. Readily acknowledging the pump-oxygenator's intended role in the correction of intra-cardiac defects, Creech visited Ed's laboratory to explore his cancer-fighting idea. Creech and Ed were colleagues – both having privileges at Charity Hospital in New Orleans. Ed was in the process of licensing his oxygenator to Abbott Laboratories for commercial manufacturing. Creech's groundbreaking studies on regional perfusion of limb, breast, pelvic, and lung cancers employed Ed's oxygenator as the key component. For a brief time, Ed's newly-named Pulmo-Pak® oxygenator was the preferred device for regional perfusion cases worldwide. Interestingly, a young surgeon from Texas named Denton Cooley discovered the Pulmo-Pak® oxygenator and began using it for pediatric heart surgery cases. According to Charlie Reed (Cooley's long-time perfusionist), Abbott was not happy about this from a liability standpoint. Within a few years, Abbott discontinued the product line entirely, and the once popular Pulmo-Pak® was relegated to obscurity.

Conclusion

Ed's medical interests were vast. He studied renal failure, salt and water metabolism, and bacteremia. In 1979, he invented a method for transmitting electrocardiograms via telephone wire. In 1983, he described for the first time a disease which caused anemia – Acquired Iron Deficiency Anemia. In 1997, he conducted a randomized double-blinded placebo-controlled trial to treat Gulf War veterans who suffered from Gulf War Syndrome. His findings demonstrated that most symptoms were bacterial in origin and could be cured with proper antibiotic treatment. Following his death in 2004, one of his closest colleagues deemed him the “Alexander Graham Bell of Clinical Medicine”. Perfusionists should remember him as an early researcher who advanced the then-rudimentary principles of oxygenation and blood handling. For those interested - Galletti's classic 1962 textbook offers additional information about Hyman's “trough” bubble oxygenator including a detailed schematic (pp. 67-68).

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