



Self Contained Breathing Apparatus

Even without the scorching heat and flames, a fire can still be deadly due to the smoke and toxic fumes it produces. Early firefighters had no protection against smoke inhalation although there is a tale that some firefighters used to grow long beards, soak them in water, and then bite down on their beard to use it as a smoke filter. Whether or not this is true, by the 1820s the need for some protection against smoke had become very apparent. A variety of strange devices were invented for this purpose, such as an asbestos mask created by Italian scientist Giovanni Aldini which included an additional mask of woven iron wire placed over the first to provide heat protection and fresh air. Even without taking into consideration the toxic materials from which the mask was produced, it was largely ineffective as it only provided heat protection if the gap between the asbestos mask and the iron mask was maintained, and the fresh air probably only consisted of the small amount of air already inside the mask. Aldini was joined by several other inventors including John Roberts and Charles Anthony Deane. While all these men and others invented various types of smoke masks and filters, Aldini's invention was considered revolutionary as he actually tested his invention under fire conditions.

Several decades later, James Braidwood, Chief of the London Fire Engine Establishment, tested and equipped his crew with his own strange breathing invention consisting of a mask with tubes connecting to an air pump attached to the fire engine outside the burning building. The device was completed with a heavy leather dress and a hood with glazed eyeholes to protect the wearer. Braidwood's invention was deemed a success as it was actually used to rescue three children from a burning building in London. Yet, even though the mask was functional, the firefighter's mobility was limited by his connection to the engine outside the building.

The problem of mobility was solved in 1863 with A. Lacour's "improved respiring apparatus," which was effectively the first Self Contained Breathing Apparatus (SCBA). This device consisted of an airtight bag made of canvas and rubber which the firefighter carried on his back, attached by a belt and shoulder straps. The bag was pre-inflated with a bellows and came in different sizes allowing for either 10 minute or 30 minute increments of air. Two rubber tubes connected the bag to a mouthpiece which the firefighter had to bite down on in order to hold it in place. This mouthpiece was sealed with corks while the bag was being inflated but once the corks were removed, the firefighter was ready to breathe the air. Lacour's device was tested by various fire departments as well as the U.S. Navy and determined to be somewhat functional.

SCBA's were still not readily used by firefighters as they were expensive and heavy, often making firefighting more difficult. It was not until World War II that technology became available to aid in the advancement of the mask. During the war, Scott Aviation was commissioned to create breathing equipment to allow pilots to breathe at extreme altitudes. One story says that the manufacturers at Scott Aviation noticed a fire being fought nearby and were amazed by the horrid smoke-filled conditions the firefighters had to work in. After a year of field testing alongside the New York City and Boston Fire Departments, they introduced AirPac in 1945.

Like the AirPac, the SCBA shown here was made for other purposes besides firefighting and was manufactured by the Mine Safety Appliance Company. The device includes a black mask with a glazed visor similar to the gas masks seen today. It attaches with a rubber hose to the green air tank which has a pressure gauge at the bottom to tell the wearer when it is close to becoming empty. The whole apparatus is strapped to the wearer's back using a black and gray harness which crisscrosses over the shoulders and waist as well as a gray and white belt to go around the waist.

The dawn of the space age also helped improve the SCBA. New technology allowed the original AirPac design to carry more air with less weight. In the 1970s, SCBA took another leap forward with positive pressure technology, meaning that the SCBAs maintain a small amount of pure oxygen in the mask at all times. The pressure created by the oxygen keeps toxic fumes and smoke from entering into the mask and being inhaled by the wearer. In 1981, NFPA standards insisted on positive pressure for all SCBAs along with a minimum supply of 30 minutes of air. Today's SCBA can sustain high pressure and often come with integrated alarm devices called PASS systems to alert other firefighters in case the wearer faints or is otherwise incapacitated.

The featured podcast is an interview with retired Denver Fire Department Division Chief Eldon Buller regarding the lack of breathing apparatus used when he joined the fire department and why that changed later on.