

# Richard Dudgeon

## And His Flying Machine

In 1877 a brilliant Locust Valley engineer who had already developed the portable hydraulic jack and a steam powered automobile envisioned a steam-powered flying machine.

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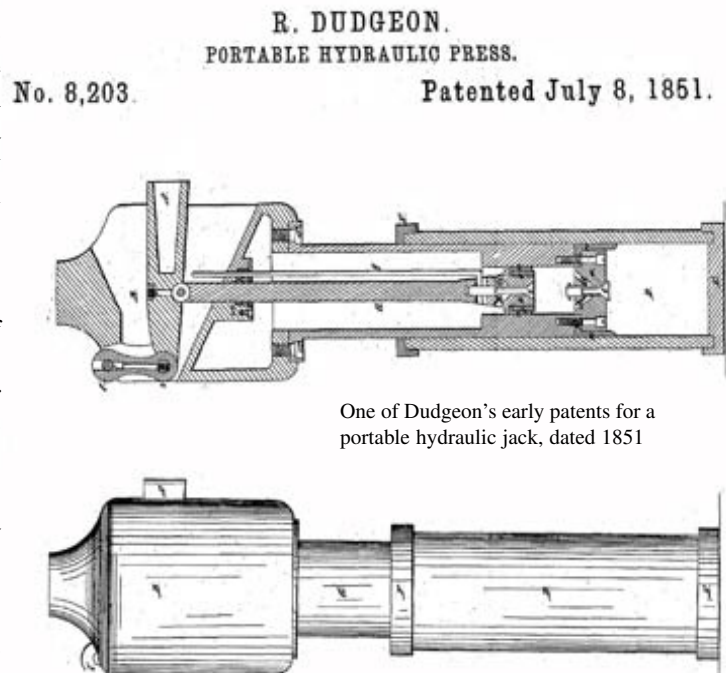
Richard Dudgeon was born about 1820 in Tain, a small town in the northern highlands of Scotland. He emigrated to the United States with his parents while he was a child, settling near Utica, New York. As a young man, he worked in the machine shops of the Allaire Iron Works on Cherry Street in Manhattan, one of the leading manufacturers of steam engines for steamboats, which provided an excellent practical education in mechanical engineering. He set out on his own in 1849, opening his own machine shop near the East River shipyards of New York City.

Dudgeon invented a number of useful devices during his lifetime. One of the earliest – and probably the most profitable – was the portable hydraulic jack, which he patented on 8 July 1851 (US Patent 8,203). In an era where clumsy, inefficient screw jacks were the mainstay of heavy lifting, the Dudgeon hydraulic jack was small and efficient, making them popular in heavy industry.

Another of his creations was the roller tube expander. The boilers used to power steam engines for locomotives and steamboats in the era were basically large barrels of water through which snaked hundreds, and sometimes thousands, of feet of iron tubes filled with superheated air from the firebox. This maximized the surface area of water that was heated to steam. It was critical that the joints in the tubes, where they connected to outlets in the boiler, be perfectly water-tight, since any leakage could cause a steam explosion. Previously the prevailing practice was to beat the boiler tube into submission with hammer. Dudgeon's hand-powered roller was much simpler, less labor intensive and considerably more precise. (It is possible that the Dudgeon tube expander, being a little more delicate than a hammer and swage, produced fewer micro

fractures in the iron tubes, resulting in fewer boiler explosions.) He obtained a patent on this device in 1867 (US Patent 61,815).

Sometime between 1853 and 1857, Dudgeon designed and constructed a “steam carriage” or “street locomotive” – a self propelled, steam powered vehicle. The precursor of the modern automobile, the vehicle was powered by a two cylinder steam engine connected to a horizontal boiler, a firebox, and a smoke-stack. The body was designed similar to a farm wagon with long bench seats on the right and left side, allow-



While the first steam carriage was destroyed in the Crystal Palace fire in Manhattan in 1858, Dudgeon constructed a second one in 1866. Dudgeon's steam carriage never caught on with investors or the public... it was just too far ahead of its time. The 1866 operating prototype is today preserved in the Smithsonian Institute.

Although bitterly disappointed that the steam carriage was not a commercial success, Dudgeon continued to produce inventions of practical utility. As an offshoot of his hydraulic jack designs, he produced a series of large and small hydraulic punches. At the 1865 American Institute Fair in New York City, he won premiums for his Double-acting Steam Hammer.

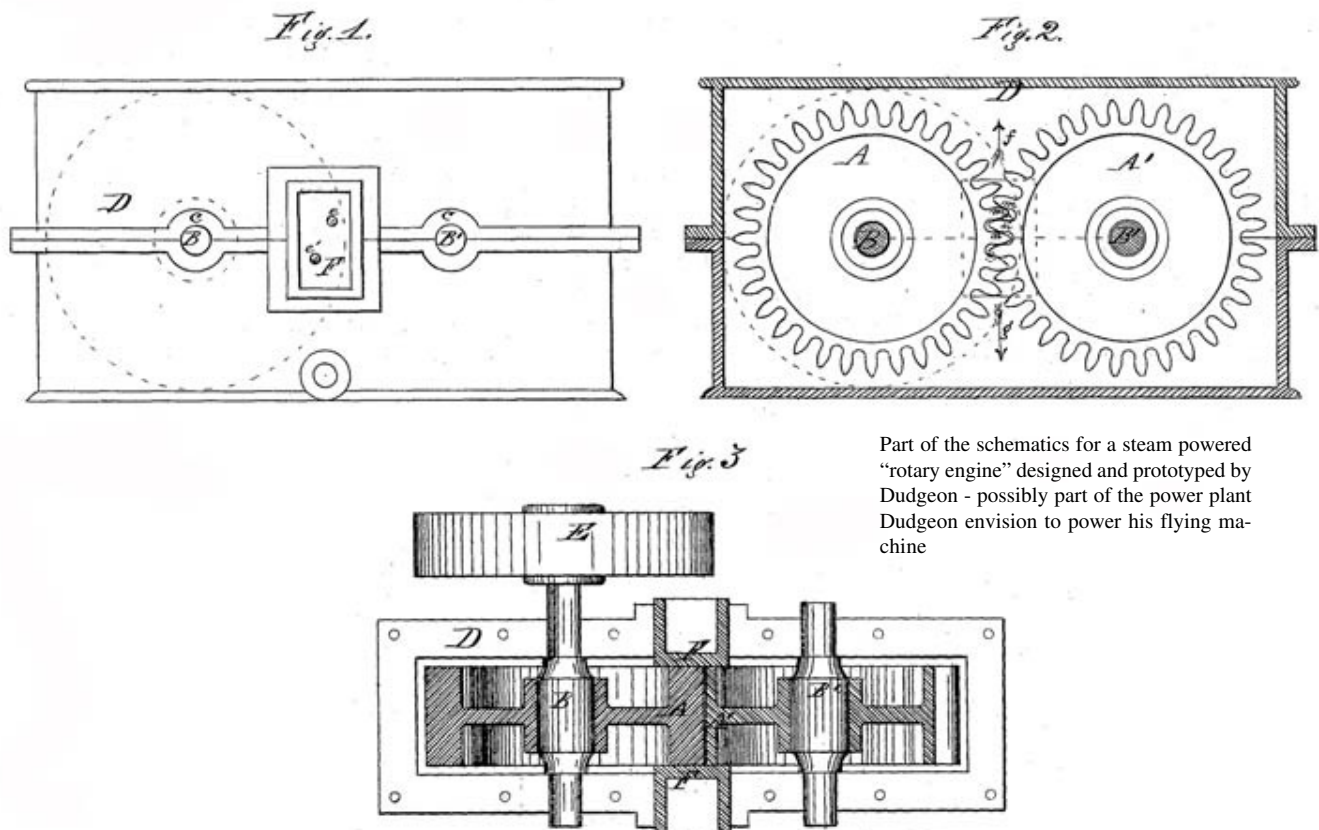
Certainly one of the more novel concepts to come from Dudgeon's innovative mind was a steam powered flying machine, which he described to a local journalist in 1877. In the August 24<sup>th</sup> edition of that year, the Brooklyn Daily Eagle announced "Mr Dudgeon, of Peacock Point, in the town of Oyster Bay, Long Island, is constructing a flying machine, which he thinks will be the most remarkable invention of the age."

According to Dudgeon, the core power plant of the "flying machine" was a steam-powered rotary engine which he had developed "eight years ago" (circa 1869). Dudgeon described the engine as being "an iron box in which are a couple of cog wheels. The steam rushes into the cogs, and drives the wheels always in the same direction. It gives great power in a very small compass." He added that the engine "never stops, needs no repairs, and is not complicated." It is probably that this engine is the same as documented in US Patent 110,022, dated 13 December 1870.

Dudgeon expressed his intent to attach his rotary engine to a "kite" made of linen stiffened by a "back made of sticks strengthened with wire". The kite was to measure a remarkable 60 by 120 feet in size, which he calculated would be able to provide 500 pounds of lift. The rotary engine would drive two "fans" (propellers), each twelve feet in diameter. (While he mentions that there would be a "receptacle for coal" the engine would also require a steam boiler.) He added

Below the engine will be a place for two men and provisions. After the machine is lifted, there will be no difficulty in going in any direction except against the wind. We can beat and tack just as a yacht does, and by turning the kite can steer as we please. If there should be no wind, the rapid motion of the fans will give breeze enough to sustain the kite. (Brooklyn Eagle, 1877)

The description which Dudgeon offers of his "flying machine" seems remarkable similar to a modern powered ultralight aircraft – albeit, with steam boiler, coal supply, and iron-encased rotary engine, an ultraheavy ultralight. In point of fact, the weight-to-horsepower ratio of the steam engines that existed in that era – even in the case of innovative designs like Dudgeon's – doomed these pioneering efforts to failure. Steam engines, and all the appurtenances required to make them function, were simply too heavy and yielded insufficient power per pound to make powered flight viable.



Part of the schematics for a steam powered "rotary engine" designed and prototyped by Dudgeon - possibly part of the power plant Dudgeon envision to power his flying machine

Whether Dudgeon ever constructed an operational prototype of his steam powered flying machine is uncertain. A 1913 article suggests that his work progressed beyond the drawing board stage:

His experiments also in aerial navigation are among the first recorded, and if the gasoline motor had been in use at that time, he would have developed the flying machine, as nothing but the weight of the steam engine used in his experiment precluded the sustained flight of his machine. (Anon 1913)

This suggests that Dudgeon had indeed developed some form of experimental prototype.

Pioneer aviator Octave Chanute, writing in the early 1890's on 19<sup>th</sup> Century experiments using "rotating screws" – odd looking propellers, often shaped like an Archimedes' Screw, which were positioned on top of a flying machine much like the blades of a modern helicopter – indicates that Dudgeon's "kite with rotary engine" design may not have been the only "flying machine" design to have reached prototype stage.

After relating the failures suffered by the famous inventor Thomas Edison, Chanute adds

It is understood that somewhat similar experiments were tried by Mr. Dudgeon, the celebrated

maker of hydraulic jacks. He tested the lifting effect of various forms of screws when rotated by steam power, and, like Mr. Edison, he stopped in disgust when he found how small was the lift in proportion to the power expended. (Chanute, 1894)

**Postscript:**

In April, 2010 the author contacted the the National Air and Space Museum at the Smithsonian Institute to ask whether their collection contained any additional information on Dudgeon's flying machine. Dr Peter Jakob, Associate Director for Collections, wrote back:

I searched both our aircraft and biographical files and was not able to find any reference to Richard Dudgeon or his aircraft experiments. I am sorry I could not be of assistance, but I am afraid we have nothing on Dudgeon.

Good luck in your research, and thank you for sharing what you have found.

Sincerely,

Dr. Peter L. Jakob

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