

Richard Dudgeon, Forgotten American Inventor, 2: From Road Engines to Moving an Obelisk

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In the first part of this account of the life and work of Richard Dudgeon, we followed a young immigrant boy from Scotland who learned the machinist's trade and invented a portable hydraulic jack that made him wealthy. His unusual steam-driven carriage, an ancestor of the modern automobile, had been exhibited in New York's Crystal Palace and was destroyed by fire in 1858.

Two years after the fire, Dudgeon moved his shops and forges from Goerck Street to even larger quarters at 24 Columbia Street in lower Manhattan. The move was just in time to ride the breaking wave of industrialization that accompanied the Civil War. After the portable hydraulic jack and a practical steam carriage (which he never bothered to patent), other inventions joined the Dudgeon product line, some inspired by his work on the steam carriage. These included a roller tube-expander for the ends of boiler tubes, pulling jacks (jacks that closed rather than opened), small hydraulic hand punches, large hydraulic punches for making holes in railroad rails and fish plates (the metal plates bolted to the ends of railroad rails to connect them).

The *Great Eastern*

Other new products included rotary steam engines and pumps, and specialized devices, ranging from ingenious little squirting oilcans to giant steam forging hammers. According to Dudgeon family legend, Dudgeon hydraulic rams may have been among the hundreds used in the several attempts to launch Isambard Kingdom Brunel's giant British steamship, the *Great Eastern* in 1858. Designed to sail to the East Indies and back carrying her own supply of coal, this behemoth was 692 feet long and had a beam of 120 feet, with designer Brunel's remarkable innovations: a flat-bottomed double hull and extensive internal bulkheads. Bulkheads in the Titanic launched 54 years later extended only ten feet above the water line; in the *Great Eastern* they rose 30 feet above the waterline. For almost half a century, no other ship would exceed the size and displacement of the *Great Eastern*. Not until the 704-foot White Star liner *Oceanic* was there a longer vessel. And not until the ill-fated Cunard liner *Lusitania* was launched in 1906 was there a heavier vessel.

Dudgeon hydraulic punches were used in making repairs to the *Great Eastern* in 1862. Because the giant steamer had too much draft for the shallow waters of New York harbor, her captain brought her into Long Island Sound, where she stove an 83-foot gash in the outer skin of her double-bottomed hull on an uncharted rock (still called "Great Eastern Rock" to this day) as she rounded Montauk Point. In no great danger, thanks to the safety features Brunel had designed into her, the *Great Eastern* was moored at Flushing, N.Y., where engineers inspected the damage. Henry B. Renwick and his younger brother, Edward S. Renwick, later Dudgeon's patent attorney, made underwater repairs to the hull. Still another Renwick brother, James, had supervised the construction of the

Distributing Reservoir at 42nd Street and Fifth Avenue, as an assistant engineer on the Croton Aqueduct. Later he would achieve fame as the architect of St. Patrick's Cathedral.

No drydock was large enough to take the monster vessel, so the two Renwick brothers attached a giant cofferdam to the *Great Eastern's* curving hull, pumped out the water between her two hulls and riveted new plates to replace the damaged plates--all done without drydocking the giant ship.

Another Dudgeon family legend has it that Dudgeon jacks were used in successful the laying of the Atlantic cable in 1866, a project for which the prodigious size and carrying capacity of the *Great Eastern*, not to mention its stability, were ideally suited.

A Second Steam Carriage

At the end of the Civil War, Dudgeon began work on a new and improved steam vehicle to replace the one destroyed in the Crystal Palace conflagration. He completed it in 1866, and we know exactly what it looked like. In addition to its original plans still in existence (dated September 30, 1865, and signed by Richard Dudgeon), there are contemporary photographs of the vehicle, which has also survived in virtually original condition.

The inventor later outlined the specifications of his second steam carriage: "It has a plain horizontal boiler. The furnace, four feet long and 17 inches wide; tubes, 16 inches long; shell, or diameter, 20 inches; cylinders, four inches in diameter, with a 16-inch stroke. They are hung on the smoke box at an angle and operate the cranked back axle. The wheels are three feet in diameter; link motion works the slide valves. Without any patents about it, it will go all day on any good wagon road, carrying ten people at 14 miles an hour, with 70 pounds of steam, the pump and fire door open, if desired. One barrel of anthracite coal is required to run at this speed for four hours. It weighs 3,700 pounds with water and fire to run an hour. It will go 20 miles in an hour on any good road. It is perfectly manageable in the most crowded streets."

According to an expert who examined the vehicle, the cylinders of Dudgeon's second steam carriage are fixed in saddles and have crossheads, connecting rods and Stephenson links (valve locks) that allow turning and reversing. Its ingenious and flexible steering mechanism is a double-threaded screw shaft set in a swiveling ball joint in the sprung front axle. It differed only slightly from his first steam vehicle. Instead of the spoked carriage wheels of the first version, its wheels were solid sections of cedar fitted with iron rims. Another new feature was the sixty gallons of water stored under the longitudinal "park bench" seats in flat tanks. The boiler was covered with shredded cocoa matting as insulation.

Dudgeon had used his first steam carriage to travel between his home on East Broadway and his works at Goerck Street. Newspaper accounts were derogatory: "The running of the wagon is accompanied by a great deal of vibration and noise, for there are four exhausts, as in a locomotive, and the solid wooden disks that serve for wheels pound the road heavily." Yet when the commissioners of New York City's Central Park imported a stream roller from England for road construction--the first of its kind to be put in use in America--they asked Dudgeon to observe its operation.

Built by the firm of Aveling & Porter, of Rochester in England, the huge machine weighed 15 tons and had a maximum speed of four miles per hour. According to the

Journal of the Franklin Institute in Philadelphia, the roller had been tested thoroughly in England before being shipped across the Atlantic.

The engine was purposely tested under the most disadvantageous circumstances, with a view of fully developing its power." It easily ascended Star Hill, the steepest incline in Rochester, with a rise of one in twelve (an 8.5 percent grade). The surface had previously been covered with the stones used in macadamized roads. "The steam roller commenced its work soon after 10 o'clock, and notwithstanding the increased difficulties it had to surmount," the *Journal* continued, "by 4 o'clock in the afternoon, it had made repeated ascents and descents of the hill, the entire surface of which was rolled completely smooth and fit for the passage over it of the lightest of vehicles."

On June 4, 1869, Richard Dudgeon and the commissioners watched it operate successfully at 115th Street and Sixth Avenue (now Lenox Avenue). They were impressed by the roller's short turning radius on flat ground. The June 19th issue of *Scientific American* described the steam roller, which had four rollers: "Two of the rollers perform the office of drivers, being turned by an endless chain and rag wheel; the others are made to turn like the forewheels of a waggon [sic] to guide the machine. The engine runs with a quick stroke and is speeded down (i.e., geared) so that great traction is achieved." Ever the enterprising entrepreneur, the canny Scot took advantage of the demonstration to sell the builders of the steamroller one of his jacks and some of his tube expanders.

Richard Dudgeon did not construct steam carriages merely to demonstrate his mechanical ingenuity; they were built to be sold. He advertised himself in an 1867 directory as "Richard Dudgeon, maker and patentee of hydraulic jacks, punches, roller tube-expanders, direct-acting steam hammers and steam carriages for good hard roads." He was obviously well ahead of his time. But with no customers for self-propelled vehicles, he completed only the two versions of his steam carriage. In his 1870 catalog, he acknowledged, "After 17 years of effort and conviction of its utility, I have learned that it is not fashionable, or that people are not ready for it."

Writing in this same catalog 137 years ago, this remarkable inventor foresaw the development of motor trucks: "Let no one suppose I intend to do without railways where there is business to sustain them. But this is not the case with most short lines and branches, and in such places I would use what would be far better--steam carriages."

Always generous toward his workers, Dudgeon introduced the eight-hour day in his shop at a time when most employers required ten hours of labor. To show their appreciation, his grateful employees presented him with a large testimonial certificate in elegant calligraphy. It thanked him for his encouragement of "real union and fellowship among us, wholly irrespective of creed, class and habit," and expressed the wish that he would have "honor, love, obedience and troops of friends."

'Cleopatra's Needle'

Hydraulic machinery was the mainstay of Dudgeon's business. His jacks also figured prominently in the construction of the Brooklyn Bridge, which began in 1867. Less well known is the part Dudgeon jacks played in the removal and erection of a beloved New

York City monument--the obelisk popularly known as "Cleopatra's Needle" in Central Park.

In 1878, 38-year-old Henry H. Gorringe arrived in Egypt with specially designed Dudgeon jacks. His task was to remove and transport a huge obelisk standing in Alexandria. Only a few years before, as a Lieutenant Commander in the U.S. Navy's Hydrographic Office, Gorringe had mapped the Egyptian coast and wrote the text of the "pilot"--the descriptive work used by ship captains sailing the coast.

The idea of moving the obelisk to New York City was the brainchild of William Hurlbert, editor of *The New York World*. Railroad magnate William H. Vanderbilt agreed to foot the bill. In Britain, the city of London had already erected a twin of the obelisk along the Thames Embankment.

Using Dudgeon's jacks, Gorringe lowered the 220-ton stone at the rate of three feet a day, a procedure that took two weeks. Next he bought a ship, a decrepit former Egyptian postal steamer named Dessoug. Gorringe removed a portion of the hull at the bow to make a hole through which the giant stone could be slid into the hold. Gorringe also decided to take not only the obelisk but also its 50-ton pedestal and the steps on which it rested.

After traversing the Mediterranean, the Dessoug drifted helplessly in the Atlantic for a week following an engine breakdown and finally the ship arrived at Staten Island in 1880. The steps and pedestal were unloaded at the dock at 51st Street and the Hudson River. On a heavy-duty wagon pulled by 16 pairs of horses, the ponderous load made its way across 51st Street and lumbered up Fifth Avenue to Central Park. Before the cornerstone was laid on Graywacke Knoll behind the recently completed Metropolitan Museum of Art at 82nd Street, various items were sealed in lead containers and placed beneath the pedestal as a sort of time capsule.

In addition to a set of photographs recording the obelisk's removal and journey, the Treasury Department donated a proof set of 1880 U.S. coins, the War Department supplied maps and Anglo-Saxon Lodge No. 137 added silver Masonic emblems. A Dudgeon jack was added for the edification of a future generation. Gorringe dutifully recorded that *New York World* editor Hurlbert had "contributed a small box, the contents of which is known only to himself."

Moving the Obelisk

No dock was available farther up the Hudson, and swift tides made an East River landing impracticable. So the obelisk was towed on pontoons to 96th Street and the Hudson River and offloaded onto a short length of narrow-gauge railroad. Using the anchor chain of Gorringe's ship, a steam winch towed the obelisk forward at the rate of 100 feet a day. It traveled east to The Boulevard (the name formerly applied to Broadway north of 59th Street). After taking six days just to turn the corner, it turned south.

At intervals the workers picked up the ties and tracks behind the slow-moving obelisk and laid them in front of it. Bitter cold weather slowed progress. At 86th Street, the obelisk turned east again, and crossed Central Park to Fifth Avenue, then down to 82nd Street, reaching the site 112 days after being landed. Not until January 22, 1881, was the

obelisk ceremoniously raised to an upright position, an event witnessed by thousands of spectators.

Again, Dudgeon's jacks played a key role. Despite its name, the obelisk has no known connection with the Egyptian empress. Dating from about 1450 B.C., its hieroglyphics tell of Thutmose III, Ramses II and Osarkon I. In 500 B.C. Cambyses the Persian knocked it off its pedestal, and in 12 B.C. the Romans brought the shaft to Alexandria and raised it in front of a temple. Gorringe later paid tribute to the effectiveness of Dudgeon's jacks, remarking that they were fitted with lowering valves "which permitted a descent so gradual that it could not be detected without measurement."

Gorringe did not live long to enjoy the fame that came with his achievement. Recklessly trying to board a moving train in Philadelphia, he was seriously injured and died in New York in 1885. A graceful 25-foot-tall obelisk commemorating his successful moving of the obelisk marks his grave in Rockland Cemetery in Sparkhill, New York.

From the start, prosperity had smiled on Richard Dudgeon. He eventually moved to Peacock Point on Long Island, near Locust Valley. The steam carriage, always a curiosity, was operated on his estate as a tractor and occasionally over local roads.

Dudgeon died in New York City in April of 1895 in his 77th year. Two sons and a daughter survived him. For more than a quarter-century after his death, the business was operated as "The Estate of Richard Dudgeon"--until tax lawyers pointed out the advantages of incorporation. It then became Richard Dudgeon, Inc., manufacturing "hydraulic machinery, jacks, hydrostatic test equipment, and pumps" at 789 Bergen Street in Brooklyn.

Dudgeon's Steam Carriage Today

Over the years, the 1866 Dudgeon steam carriage has led a checkered existence. Upon Richard Dudgeon's death, it passed to his son, Franklin P. Dudgeon, who died in 1925 and left it to his son, Henry. The carriage was stored in a shed on a dock in Oyster Bay, Long Island. It later turned up in the hands of Charles W. Ludlam, who claimed he had received it in payment of the debt incurred for its storage. In 1937, Henry Dudgeon's wife sued Ludlam for possession of the carriage. This may have been a family quarrel; records show that Richard Dudgeon's son William Miller Dudgeon had married a Louise Carhart Ludlam in 1893. After two court trials (the first resulted in a hung jury), Mrs. Henry Dudgeon recovered the vehicle in June of 1938. But she was not to keep it for long. During 1939 and 1940, she lent it to the New York World's Fair. Displayed as part of the "Railroads on Parade" exhibit, the steam carriage seemed out of place among trains.

After the fair closed, George H. Waterman, Jr., and Kirkland H. Gibson, of Providence, R.I., two founders of the Veteran Motor Car Club of America, purchased the carriage from Mrs. Dudgeon for \$500. They saw it for what it was--an early motor vehicle for travel over roads. For many years, it was exhibited at the Larz Anderson Auto Museum in Brookline, Massachusetts. It turned up next at Winthrop Rockefeller's automobile museum atop Petit Jean Mountain in Conway County, Arkansas. In 1967, it was in Providence as part of the celebration of the centennial year of the Rhode Island Hospital Trust Company.

Queried about what it was like to drive Dudgeon's steam carriage, co-owner Kirkland Gibson said, "I would say that it is slightly less terrifying than driving a steam roller. On one occasion we parked it on a public macadam road for half an hour or so. When it was finally moved, the macadam under the boiler had melted." Messrs. Waterman and Gibson later presented the Dudgeon steam carriage to the Smithsonian Institution in Washington, and it is now housed in the National Museum of American History.

On New York's Lower East Side, the sites of the successive Dudgeon shops on Willett, Goerck and Columbia streets have all disappeared, swallowed up by the swift march of progress. Towering housing projects in the shadow of the Williamsburg Bridge now cover the streets on which were their former locations. Bryant Park today occupies the site of the former Crystal Palace. In 1911 the New York Public Library's white marble Beaux Arts building replaced the Distributing Reservoir. When Dudgeon workers found one of the original jacks in the company's building in Brooklyn, they took it apart "to see how it worked." Unable to put it together again, and with no sense of its importance in the history of technology, they consigned it to the scrap heap.

After a brief move in Brooklyn from Bergen Street to the Bedford-Stuyvesant section, between 1972 to 1991 Richard Dudgeon, Inc., was located in the Yale & Towne industrial complex in Stamford, Conn. No longer owned exclusively by members of the Dudgeon family, the company today now is at 1565 Railroad Avenue in Bridgeport, Conn., still making hydraulic punches, jacks and specialized lifting devices. The only surviving mementos of the ingenuity of inventor Richard Dudgeon are his steam carriage in the Smithsonian and the hydraulic jack entombed under "Cleopatra's Needle" in Central Park. With a little bit of luck, they both may outlast us all.