

AGES 8+

LEONARDO DA VINCI

Genius is Timeless

Paddleboat



Instruction manual

LEONARDO DA VINCI

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Leonardo Da Vinci

(April 15, 1452 - May 2, 1519)

*“Iron rusts from disuse; stagnant water
loses its purity and in cold weather becomes frozen;
even so does inaction sap the vigor of the mind.”*

Leonardo

Leonardo da Vinci was born April 15, 1452 in Vinci, Italy. Da Vinci was an artist, scientist, mathematician, engineer, inventor, anatomist, sculptor, architect, botanist, musician and writer. He has often been described as a perfect example of a Renaissance man, a man whose unquenchable curiosity was equaled only by his powers of invention and observation. Da Vinci is widely considered to be one of the greatest painters of all time and perhaps the most diversely talented person to have ever lived.

At an early age, Da Vinci's talent for drawing became evident, and his father apprenticed his young son to a noted period artist, Andrea del Verrocchio. Through the coming years, the young Leonardo learned much from his mentor and at the age of thirty, Da Vinci left Florence and settled in Milan and established a workshop of his own. During the following years, he earned his living painting commissioned pieces. He soon came to the conclusion that it was not possible for him to earn steady income doing this and began his search for employment. He began by writing a letter to the Duchy of Milan, Duke Ludovico Sforza, known by the nickname, the Moor. In this correspondence, Da Vinci stated that he had studied machines of war and had come up with improvements that would

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strengthen the Moor's position in battles. The letter hinted at inventions that included portable lightweight bridges and improved designs for bombards, mortars, catapults, covered assault vehicles and weapons. The Moor eventually became Da Vinci's patron and kept him busy with everything from designing a heating system to painting portraits, to overseeing production of cannons and even decorating the vaulted ceilings in his castle.

It was during this time that Da Vinci began writing and drawing in his journals. These volumes became repositories of the outflow of Leonardo's gifted mind. He was a voracious student of the universe and his observations led to magnificent plans and concepts. Da Vinci's notebooks consist of more than 20,000 sketches, copious notes and detailed drawings. Some of his conceptual designs led to the greatest inventions of his day, while others came to fruition hundreds of years after his initial concepts were penned, simply because the machinery needed to build and power them were not yet invented. Leonardo's notebooks clearly illustrate his genius of not only improving upon existing inventions, but also conceiving a myriad of new ideas and designs.

Ultimately, the Moor was captured by the French and Da Vinci left Milan in search of a new patron. He traveled through Italy for more than a decade, working for several Dukes and rulers, including Cesare Borgia, a General intent on conquering central Italy. Leonardo traveled with Borgia as a military engineer, designing weapons, fortresses and artillery, but became disillusioned and quickly left his service with the General. It seems that despite Da Vinci's design for artillery and weaponry, he was actually a pacifist and detested war and its destruction.



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Da Vinci later took positions with King Louis XII and Pope Leo X and ultimately with the King of France, Francis I. It was the King who offered Da Vinci the title, Premier Painter and Engineer and Architect of the King. Francis I valued Da Vinci's great mind and his sole function was to engage in conversations about Renaissance culture and art with the benevolent royal.

ARTISTIC MASTERPIECES OF LEONARDO DA VINCI

It is important to remember that Da Vinci is not only and great inventor, but is considered to be one of the most acclaimed artists to ever have lived, creating such masterpieces as The Last Supper (c.1498) and the Mona Lisa (c.1503). Leonardo's drawing of the Vitruvian Man is also regarded as a masterpiece. Unfortunately, only a small number of Da Vinci's paintings have survived. Leonardo experimented with new techniques, most of which did not yield



Vitruvian Man (circa 1487)

long-lasting results. The master painter was also somewhat of a perfectionist with fastidious attention to detail. It is believed that when painting the Mona Lisa, the artist spent ten years perfecting the lips of this masterpiece.



The Mona Lisa (circa 1503)



The Last Supper (circa 1498)

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Da Vinci's Notebooks

Da Vinci's notebooks are now more than 500 years old. They are not bound the way a typical book would be today, but rather comprised of loose sheets of paper gathered into collections and wrapped with fabric. Paper was scarce in Da Vinci's time, so he used every available space in a page for drawings, observations, even recipes and shopping lists, making them somewhat difficult to interpret. Adding to the difficulty in deciphering his works was the fact that Da Vinci's scripted notes were written backwards, or in a mirror image, and read from right to left. His reason for this remains a mystery, but it is thought that Leonardo's theories sometimes went against church teachings and his secret writing could have been a way to avoid scrutiny. Da Vinci also might have feared that someone would steal his designs and publish them under their own name. Ironically, Da Vinci addressed an imaginary readership in the margins of his notebooks urging the reader to make sure his work was printed into a proper book. It is presumed that he meant for the notebooks to be published after his death.



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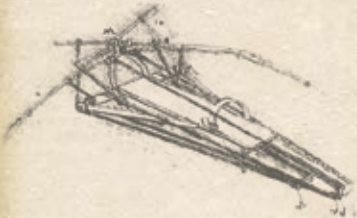
Da Vinci's Notebooks

Several common themes recur in the now fragile notebooks: Nature, Technology (including gears, cogwheels, screws and pulleys), aviation and vision, to name a few. Upon the death of Leonardo Da Vinci, the notebooks were given to his long-time friend, Count Francesco Melzi. Melzi did not fully comprehend the value of the information and published only a portion of the volumes. He placed the notebooks in his home where they were viewed by guests who sometimes took pages with them as souvenirs. After Melzi's death, an additional 13 Da Vinci notebooks disappeared and soon pages were scattered across Europe. Da Vinci's notebook



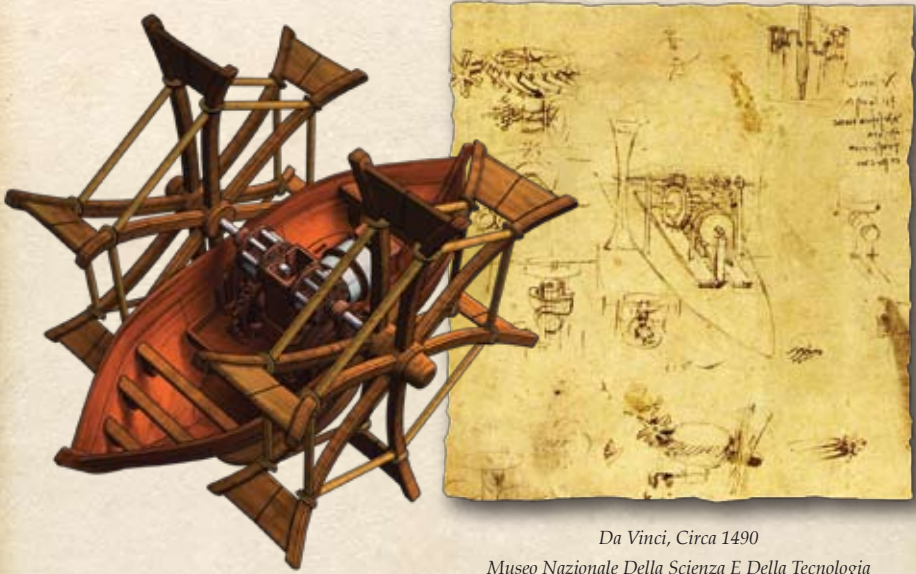
extracts were published in 1883 and about half of them have not yet resurfaced so far. It is easy to imagine that had the notebooks been published earlier, the history of science might have been completely changed.

In his drawings, Leonardo strived for *saper vedere* or "knowing how to see." Da Vinci's illustrations are unparalleled and some experts believe that no one has since been better.



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❧ Paddle Propulsion Boat ❧



Da Vinci, Circa 1490

Museo Nazionale Della Scienza E Della Tecnologia

In the fifteenth century, nautical expedition was the most expedient method of travel. Leonardo Da Vinci perfected early versions of paddled propelled vessels and brought forth improved plans. Leonardo's paddleboat used large wheel-shaped paddles that propelled it through water. In his design, sailors worked foot pedals to rotate the paddles. To increase the power of the rowers, cog-wheels and gears were used to multiply the number of revolutions of the paddles. It is important to remember that Da Vinci was an astute observer of the natural world and when designing the hull he took inspiration from the shape and movement of fish, thus modeling his paddleboat with a tapered bow. This made maneuvering easier than it had been with square-hulled boats that had previously been the norm. Da Vinci's paddleboat was easier to navigate and moved at a higher rate of speed than existing boats of his time.

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Later Use of Paddle Boats



19th Century Steam Boat

In the 19th Century paddle steamers were driven by steam engines that also employed one or more paddle wheels. The wheels were large and fitted with paddle blades called floats or buckets upon the outer edge. Rotation of the paddle wheel produced thrust to move the boat forward or backward as required. The lower quarter of the wheel operates under water and the upper section was normally enclosed in a paddle box to minimize splashing.

Types of Paddle Steamers

There are two basic ways to mount paddle wheels on a ship. One is as a single wheel on the rear of a boat, known as a stern-wheeler. The other mount has a paddle wheel on each side of the hull and is known as a side-wheeler.

Stern-wheelers had generally been used as riverboats, while side-wheelers were sometimes used as riverboats, but also as coastal craft. While wider than a stern-wheeler, due to the extra width of the paddle wheels and their enclosing sponsons, side-wheelers have extra maneuverability.

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At one time, the paddle wheel was the only practical form of mechanical propulsion applied to a boat, but the screw propeller and other modern techniques have superseded the paddle wheel. Few original paddle steamers remain in existence, and those that are still functioning are mainly run for historical purposes and tourism. Some paddle steamers still operate on the Mississippi River and Willamette Rivers in the US and in the Murray-Darling system in Australia, as do a few in the United Kingdom and elsewhere in Europe.

❧ Vocabulary Words ❧

Astern – behind the boat

Bow – The front section of a boat or ship

Propel - To impel, drive, or cause to move forward

Screw Propeller – a propeller with several angled blades that rotates to push against water or air

Sponson – Triangular platforms in front of, and behind, the paddle boxes of a steamboat.

Stem – the forward most part of the bow of a ship

Stern – the back end of a boat

Thrust – A driving force, that can be produced by a paddle wheel or propeller

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Components

(A)



(B)



(C)



(D)



(E)



(F)



(G)



(H)



(I)



(J)



(K)

(L)



(M)



(N)



(O)



(P) x 2

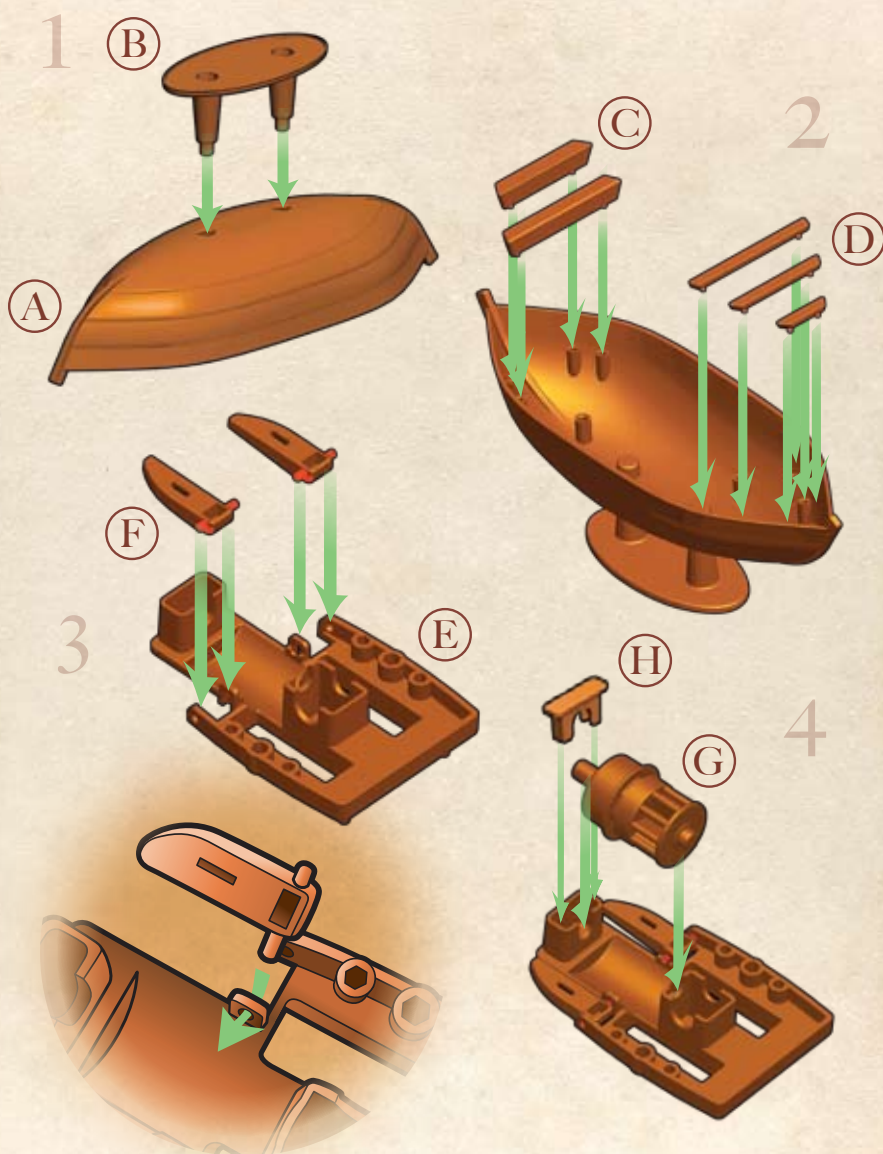


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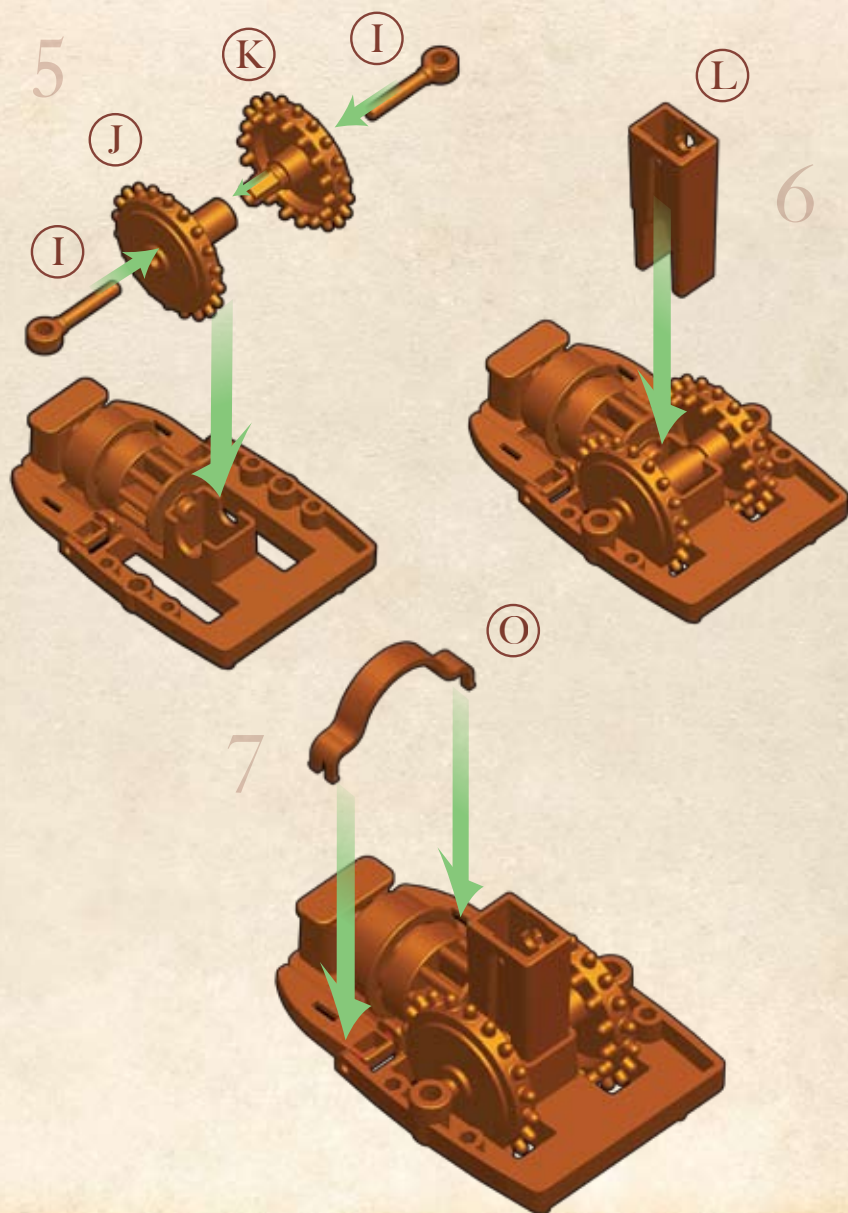
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How to Assemble



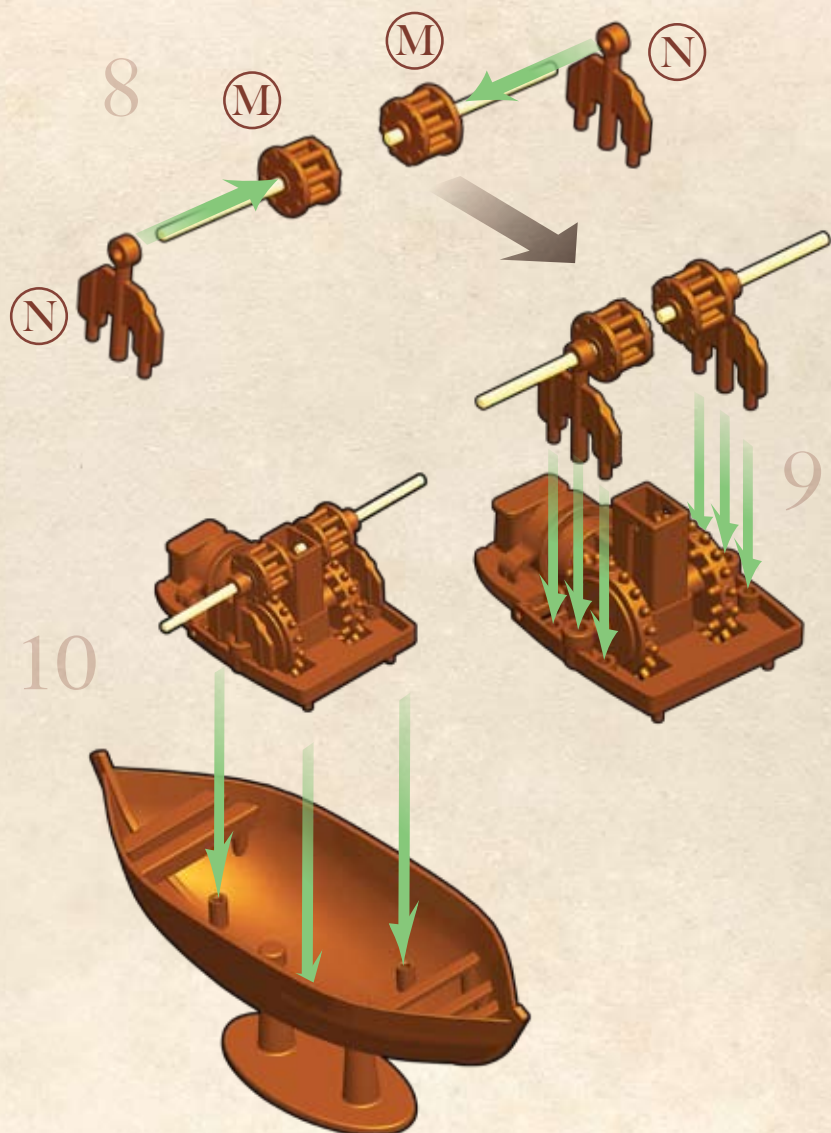
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How to Assemble



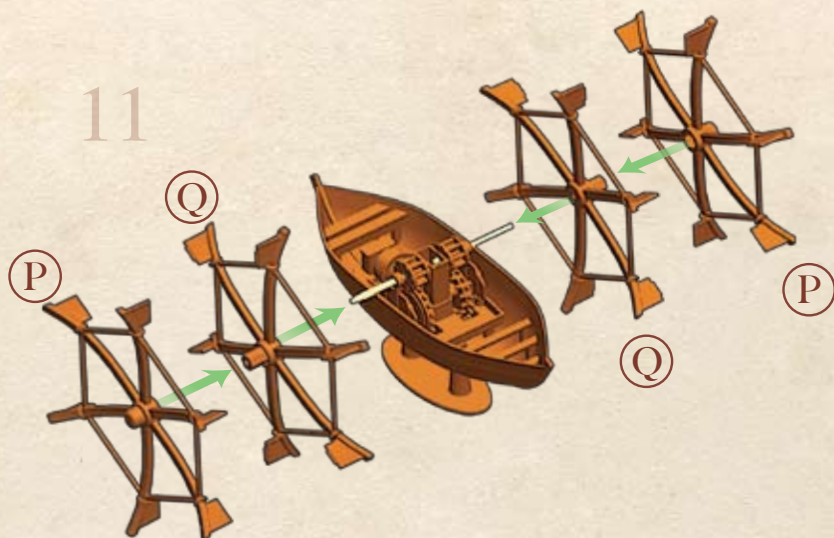
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How to Assemble

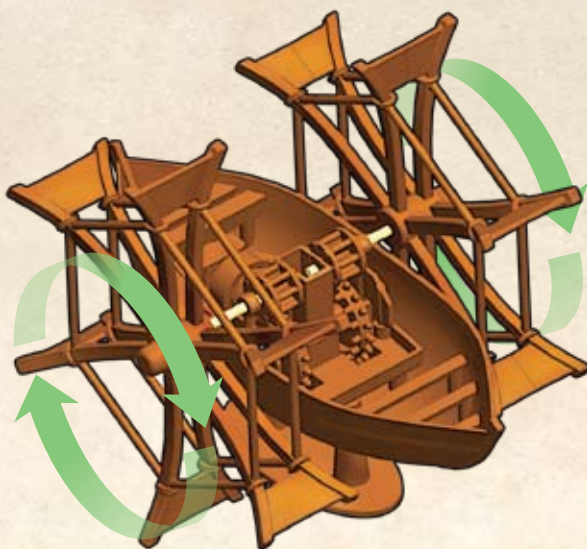


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How to Assemble



How to Operate the Paddleboat



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The scientific genius of Leonardo Da Vinci is brought to life through articulated models offered by Edu-Science. The inventions that inspired these snap-together replicas are taken from the pages of Da Vinci's priceless and awe-inspiring notebooks.

Edu-Science Da Vinci Series Kits



DV001

Mechanical Drum

Leonardo da Vinci's mechanical drum was designed as a cart equipped with an amply sized drum. When pulled by its handle, the gears turn the two lateral drums, which are fitted with pegs. The pegs move a total of ten drumsticks that cause them to beat the large drum.

Aerial Screw

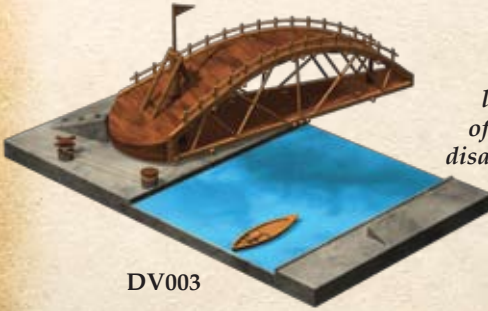
The Aerial Screw design is a precursor of the modern day helicopter.

The drawing of Da Vinci's concept illustrated the compression of air that was intended to lift the device off the ground.



DV002

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DV003

Swing Bridge

The Swing Bridge was a portable, lightweight bridge intended to span a body of water for armies to cross, and then quickly disassemble in order to tow away. Equipped with a rope and wheels, the lightweight bridge was designed for easy transport.

Printing Press

Leonardo da Vinci studied the Guttenberg printing press and finely-tuned it for greater efficiency. In his design, he used a hand press with an automatic system that moved the type-saddle forward and back along a tilted surface, making printing faster and easier.



DV005



DV006

Multi-barreled Canon

The 12-barreled gun carriage was developed to give the traditional canon additional firepower and was a potentially effective weapon against a line of advancing troops.

Armored Car

A precursor to the modern-day tank, the armored car was capable of multi-directional movement and was equipped with cannons arranged in a 360-degree firing range around its circumference.



DV007

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DV008

Paddleboat

In Da Vinci's time, nautical expedition was the most expedient method of communicating with the world and his design for a boat with large wheel-shaped paddles that would propel it through water offered a faster and easier method of water transportation.

Self-Propelled Cart

Da Vinci's self-propelled cart was the first to be capable of moving without being pushed or pulled manually. This precursor to the automobile was one of the many inventions that Leonardo created dealing with locomotion and transportation.



DV009

Catapult

Improvements were made to the age-old military launching device called a catapult.

The new design employed a hand-crank that caused tension on the throw arm.

The spring design produced a large amount of energy in order to propel stone projectiles or incendiary materials over great distances.



DV010

Bombard

This improved cannon was designed to include projectiles that contained a quantity of mini gunpowder shots packed into petal-shaped iron pieces that formed a ball.

The device exploded into fragments that had greater range and impact than a single cannonball.



DV011



WARNING: CHOKING HAZARD-
Small parts. Not for children under 3 years.





Interpretation of the original Leonardo da Vinci's design/
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