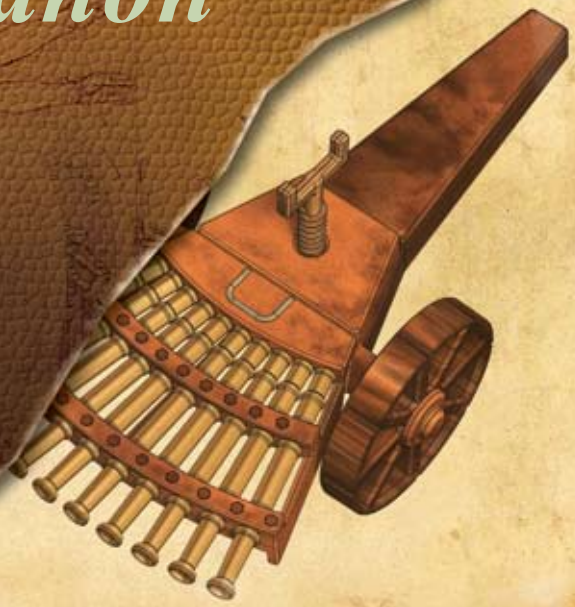
AGES 8+

LEONARDO DA VINCI

Genius is Timeless

Multi-barreled Canon



DEVELOPING 500 YEARS OF DREAMS
DA VINCI

Instruction manual

Contents

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

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.

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 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.

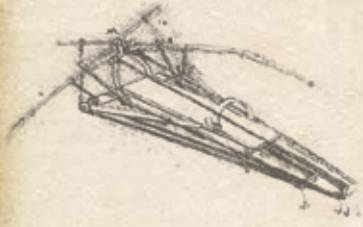
Virtruvian Man (circa 1487)

The Mona Lisa (circa 1503)

The Last Supper (circa 1498)

Leonardo Da Vinci

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.

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.

Leonardo da Vinci's design: Multi-barreled Cannon

Da Vinci developed the Multi-Barreled Cannon in 1480. The 12-barreled gun carriage was a vast improvement over traditional cannons of the fifteenth century. Leonardo's design called for a fan-like shape that widened the firepower and made it a potentially more effective weapon against a line of advancing troops. It also featured a clever aiming and loading mechanism that made replenishing ammunition faster and easier for soldiers engaged in battle. By mounting this ingenious device on wheels, the cannon easily was also made portable and maneuverable on the battlefield.

It is somewhat puzzling to present-day scholars that Da Vinci made obvious mistakes in artillery and weaponry designs. Why would one with such a gift for engineering make drawings that would not work? Upon studying his notebooks, it seems that Da Vinci did this intentionally because he was a pacifist who disdained war. Although he had enticed Warlords and Generals to employ him to improve their position in battle, Leonardo could not bring himself to create weapons that would surely bring death and destruction. Although Da Vinci's notes indicate to scholars that he knew precisely how to make his artillery and weapons operate efficiently, he cast a silent resistance with non-functional drawings.

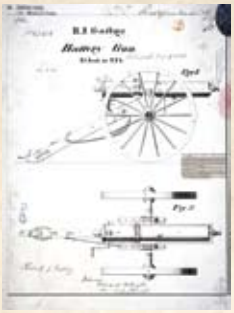
THE MULTI-BARRELED CANNON CONCEPT WAS A PRECURSOR TO THE MODERN DAY MACHINE GUN

Pioneers of the modern day machine gun

Dr. Richard Jordan Gatling
(September 12, 1818 - February 26, 1903)

***Dr. Richard Jordan Gatling** developed a working prototype for the Gatling Gunin 1862, hundreds of years after Da Vinci invented the Multi-Barreled Cannon. Gatling created a rapid-fire weapon that was a forerunner of the modern machine gun. The Gatling gun is considered a machine gun because it shoots a large number of bullets in a short time span, but unlike modern machine guns, the gun was not fully automatic. A crank had to be turned manually if the gun was to continue shooting. The first fully automatic machine gun is credited to **Hiram Maxim**. Maxim's gun could shoot more than 500 rounds per minute, giving it the firepower of about 100 rifles. The mechanism of the Maxim gun used the energy from the recoil to eject each spent cartridge and insert the next one. This made it vastly more efficient than previous machine guns.*

A British 1865 Gatling gun at Firepower - The Royal Artillery Museum



Patent drawing for R.J. Gatling's Battery Gun, 9 May 1865.

HOW DO MACHINE GUNS WORK?

To understand how machine guns work, it helps to know something about firearms in general. Almost any gun is based on one simple concept: Apply explosive pressure behind a projectile to launch it down a ***barrel****. The earliest, and simplest, application of this idea is the* ***cannon****. A cannon is a metal tube with a closed end and an open end. The closed end has a small fuse hole. The gunpowder and cannonball are positioned in the* ***breech****, the rear part of* ***bore****, which is the open space in the cannon. To prepare the gun for firing, a fuse is lit. The flame travels along the fuse, and finally reaches the gunpowder. When gunpowder is ignited, it burns extremely rapidly and produces a hot gas. The hot gas applies much greater pressure on the powder side of the cannonball than the air in the on the other side. This reaction rapidly propels the cannonball out of the gun.*

Glossary Words

Barrel *– the discharging tube of a gun*

Bore *– the inside of a gun's barrel, through which a projectile travels when fired.*

Breech *– the part of a firearm at the rear of the barrel*

Breach Bolt *– A mechanism that opens and closes the breech in a machine gun and designed to push a cartridge into the chamber using a sliding action.*

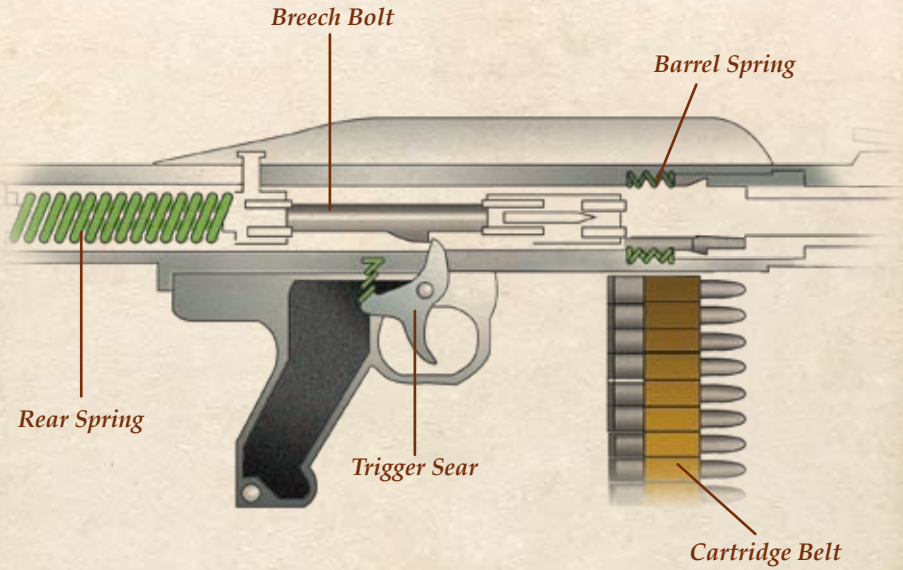
Cannon *– a large heavy gun usually mounted on a carriage*

Cartridge Belt *– a device used to retain and feed cartridges into a firearm*

Hammer *– a part of the action of a gun that strikes the firing pin to ignite the cartridge*

Sear *– the part of the trigger mechanism which holds the hammer or striker back until the correct amount of pressure has been applied to the trigger; at which point the hammer or striker is released to discharge the weapon.*

The Recoil System



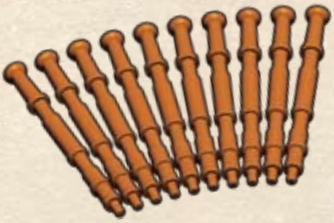
FUN FACT

WWII fighter pilots used the term "the whole 9 yards." Their .50 caliber machine gun ammunition belts measured exactly 27 feet, before being loaded into the fuselage. If the pilots fired all their ammo at a target, they used "the whole 9 yards."

Components

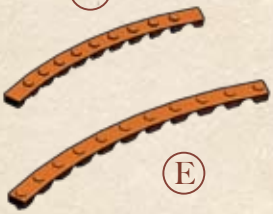
A

B



C

D



E

F

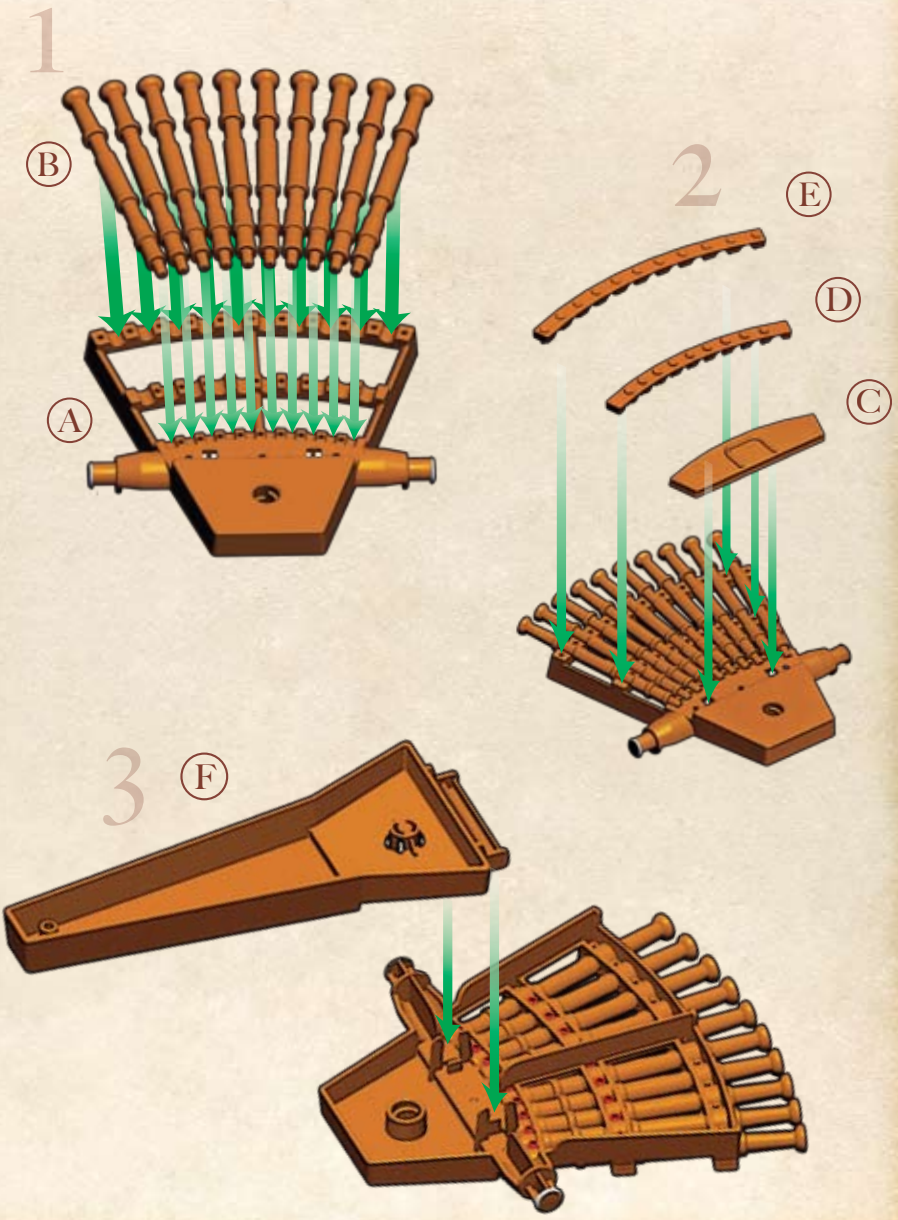
G

H x 2

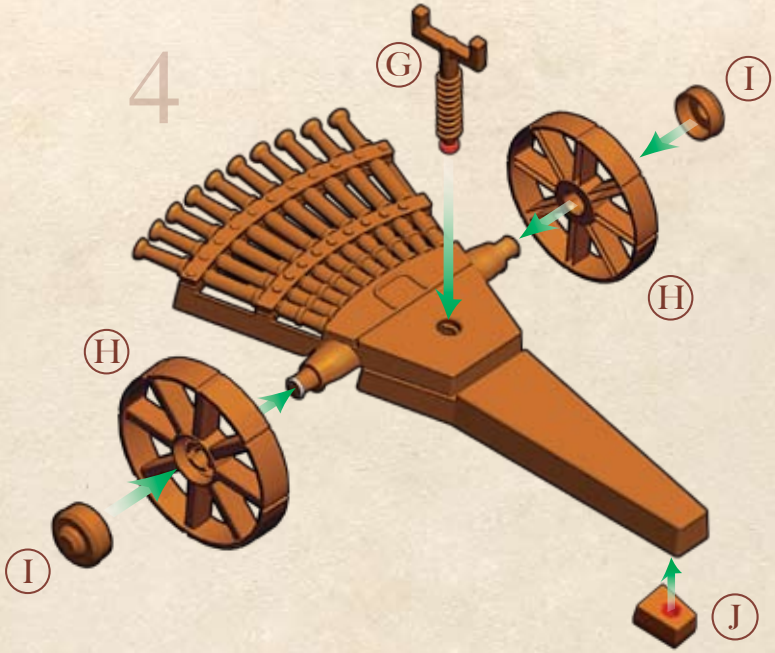
I x 2

J

How to Assemble



How to Assemble



How to Operate the Multi-barreled Cannon

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

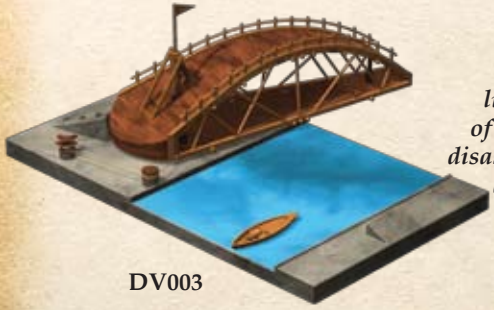
Mechanical Drum

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



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

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

DV010

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.

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

Note

LEONARDO DA VINCI

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

EDU-TOYS

0-3

CE

REUSE · RECYCLE

P38-DV006-81001000 Printed in China