From Gunpowder to Bullet

The Firearms Revolution (1350–1650)

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Early wheellock mechanisms (c. 1520) represented horological artistry applied to destruction. A mainspring of tempered brass (0.8mm thick) stored energy by rotating a serrated steel wheel against a pyrite crystal, generating 1,100°C sparks. The complexity lay in the chain drive: a 20-link miniature transmission that delayed ignition by 0.3 seconds after trigger pull—just enough for the shooter to brace. But reliability depended on absolute cleanliness: a single grain of sand in the pan could jam the wheel.

Maximilian I's 1537 edict required armorers to assemble locks in sealed rooms with waxed floors and filtered air—the first "clean rooms" in industrial history. Ballistic breakthroughs came with bullet aerodynamics. Spanish arquebusiers in the Netherlands discovered that wrapping lead balls in greased linen "cartouches" not only sped loading but imparted spin: the fabric shreds acted as rifling, stabilizing flight to 150m.

When Galileo analyzed captured rounds in 1612, he noted their 5% longer range than smoothbore equivalents—a revelation leading to true rifled barrels. The matchlock's final evolution came with humidity-resistant "slow match." By soaking hemp cords in potassium nitrate saturated with deer urine (rich in urea crystals), Dutch chemists created matches that burned at 3cm/hour even at 95% humidity. This innovation won the Siege of Breda (1624): Spanish troops could maintain watch-fires during torrential rains while their French opponents' weapons fell silent. The