

## Medieval Europe

## Iron &amp; Mills

## Colonial America

**Early Middle Ages**

Early Middle Ages-New iron mines and smelting sites are established

- The first literature on mining and metallurgy appears.
- The furnace gains a small chimney of clay and sandstone; gas exit and two openings, one for introduction of the ore and one aperture near the bottom to allow extraction of the “bloom” of iron.
- The introduction of a draft supplied by a pair of bellows.
- The hinged flail, although invented in the fourth century, slowly begins to displace the simple stick for threshing grain.
- Iron use increases (plowshares, harrows, sickles, billhooks, church bells, long swords, battle axes, chain mail).
- The lathe is diffused more widely (2 types, pole lathe and bow lathe)
- Swords, axes, agricultural and household implements are sharpened with a rotary grindstone, as opposed to the earlier whetstone. The rotary grindstone employs a crank.
- The Roman Vitruvian mill and windmill, not generally used in Mediterranean world, are widely disseminated throughout the medieval world and technologically developed, advancing from a mere 3 horsepower yield to 40-60 horsepower.

Medieval Europe	Iron & Mills	Colonial America
<b>10<sup>th</sup> century</b>		
	<p>10<sup>th</sup> century-The shortage of charcoal begins as a result of deforestation; laws limiting its production appear. Efforts to adapt coal for metallurgical purposes are intensified.</p> <p>-Invention of the drawplate aids blacksmiths in fabricating wire for chain mail, until then painstakingly hammered out at the forge.</p>	
<b>11<sup>th</sup> century</b>		
	<p>11<sup>th</sup> century-Water-driven bellows and hammers appear in the eastern Alps and Silesia.</p>	
<b>12<sup>th</sup> century</b>		
	<p>Early 12<sup>th</sup> century-Guilds of craftsmen, including metalworkers, join guilds of merchants.</p> <p>-The blacksmith's work is in higher demand as building and commerce increase. Carpenters required nails, saws and hammers; masons, mallets, picks, wedges and chisels; carters and wagoners, iron axles and parts; millers, iron components of mill machinery; shipbuilders, nails and fittings.</p> <p>-Surface deposits of iron ore no longer suffice; pits, trenches and tunnels are driven into the earth.</p> <p>-The long-handled scythe, developed in the Roman Empire, gains a short bar-handle projecting from its long haft.</p>	
	<p>1122-23-Theophilus Presbyter writes <i>De diversis artibus</i>.</p>	
	<p>Mid 12<sup>th</sup> century-The blacksmith moves from the castle as armorer to the village, as the demand for his services to agriculture grow.</p>	

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	1185-The earliest surviving written record of a post-mill is a rental note in Weedly, Yorkshire.	
	1195-Post-mills become popular enough to have the Pope levy a tithe on them.	

### 13<sup>th</sup> century

	Early 13 <sup>th</sup> century-The windmill becomes the prime-mover on the plains of eastern England, the Low Countries and northern Germany.	
	<p>Mid 13<sup>th</sup> century-Coal is used for the primary stages of iron smelting, although charcoal still predominates.</p> <ul style="list-style-type: none"> <li>-Water mill construction rapidly increases, as mill function becomes more specialized.</li> <li>-The combination of mills and weirs appears, to measure the flow of water to the millrace.</li> <li>-The technique of raising the carbon-content of iron to produce cast iron is discovered</li> <li>-Threshing begins to be done under cover, far into the winter in great barns, usually on monastic estates.</li> </ul>	
	Late 13 <sup>th</sup> century-The use of wheelbarrow reduces the number of necessary laborers by half, particularly for mining ore.	

### 14<sup>th</sup> century

<p>1309-1377-The Papacy is at Avignon.</p> <p>1314-At the Battle of Bannockburn, Scotland regains independence under Robert the Bruce.</p> <p>1321-Death of Dante.</p> <p>1325-The Renaissance begins in Italy.</p> <ul style="list-style-type: none"> <li>-Muslim culture in Spain reaches its peak.</li> <li>-The small cannon is in use.</li> </ul>	<p>Early 14<sup>th</sup> century-Water-powered stamping mills appear in the Saar.</p> <p>c1325-Forged iron firearms appear in Germany.</p>	
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<p>1331-Nicaea falls to the Ottomans.            1337-1453-During the Hundred Years' War, English and French kings fight for control of France.            1340-Edward III, King of England assumes the French crown.            1347-1351-At least 25 million people die in Europe's "Black Death" (bubonic plague). The Plague reaches Genoa from Crimea.            -Calais is sieged and captured by Edward III.</p>		
<p>1353-Boccaccio's <i>Decameron</i> is written.            1354-Turks invade Gallipoli.            1358-Peasants rise up in France.            1360-Edward III renounces the French crown.            1361-The second wave of the Plague.            c1370-1444-Life of Leonardo Bruni.            1374-Petrarch dies.            1376-1382-John Wycliffe, pre-Reformation religious reformer, and followers translate the Bible from Latin into English.            1377-1446-Life of Filippo Brunelleschi.            1378-1455-Life of Lorenzo Ghiberti.            1378-1417-The Great Schism has rival popes in Rome and Avignon fighting for control of the Roman Catholic Church. The papacy returns to Rome later that year from Avignon.            1386-1466-Life of Donatello.            c1387-Chaucer's <i>Canterbury Tales</i> is written.            1395-1441-Life of Jan van Eyck.            1397-Norway, Denmark and Sweden are united by the Union of Kalmar.            -Medici bank is founded.</p> <p>1397-1475-Life of Paolo Uccello.</p>	<p>c1350-The first cast iron cannons appear.            -The earliest known blast furnace is built in Europe, at Lapphytten, Sweden.            1351-The application of water-power to wire-drawing in Augsburg.            Late 14<sup>th</sup> century-The shortage of labor leads to a severe decline in the production of metals.            -The price of iron and charcoal rises.            1370-Iron needles (with no eye but a closed hook) are produced at Nuremberg.</p>	

### 15<sup>th</sup> century

<p>1400-Chaucer dies.            1404-The University of Turin is founded.            1406-Florence conquers Pisa.            1407-Casa di San Giorgio, one of the first public banks, is founded in Genoa.            1409-The University of Leipzig is founded.</p>	<p>Early 15<sup>th</sup> century-Casting directly from the furnace into the mould is achieved.            1430-The Dutch invent the "wipmolen" or hollow post-mill.</p>	
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<p>1412-31-Life of Joan of Arc.            1415-Henry V defeats the French at the Battle of Agincourt.            Jan Hus, Bohemian preacher and follower of Wycliffe, is burned at the stake in Constance as a heretic.            1418-1460-Portugal's Prince Henry the Navigator sponsors exploration of Africa's coast.            1420-Brunelleschi begins work on the Duomo in Florence.            1428-Joan of Arc leads the French against the English, is captured by the Burgundians (1430) and turned over to the English, and burned at the stake as a witch after an ecclesiastical trial (1431).</p>		
<p>1434-Cosimo de Medici begins his 30-year domination of Florence.            1435-1488-Life of Andrea del Verrocchio.            1442-Naples and Sicily come under the rule of the Spanish House of Aragon.            c1444-1510-Life of Sandro Botticelli.            1444-1514-Life of Donato Bramante.            1447-The Vatican Library is founded.            c1450-Gutenberg invents the moveable type printing press.            1450-Florence becomes the center of Renaissance arts and learning under the Medicis.            -Francesco Sforza conquers Milan.            1452-1519-Life of Leonardo da Vinci.            1453-Constantinople falls to the Turks, under Mehmed II, ending the Byzantine Empire and beginning the Ottoman Empire.            1455-The Wars of the Roses, civil wars between rival noble factions, begin in England (to 1485).            -Johann Gutenberg completes first printed Bible.            1456-Ottoman Turks capture Athens.            1462-The Platonic Academy is founded. Ivan the Great rules Russia until 1505 as the first czar and ends payment of tribute to the Mongols.</p>	<p>Mid 15<sup>th</sup> century-Eyed iron needles are produced in Low Countries.            - More attention is paid to the legal aspects of mining, smelting and raw material consumption because the manufacture of bronze and iron contributed powerfully to a state's warlike potential. Wars subsequently increase the demand for and price of iron.            -The scythe replaces the sickle as the primary tool for harvesting grain.            -Attempts are made to make milling simpler and more efficient.            -Post-mills begin to be built to drive two pairs of stones placed fore-and-aft in the mill, rather than only one pair of stones, as before.            c1450-Saigerhuetten are first erected.            1460-1530-The iron industry booms.</p>	
<p>1463-Venice begins a 16-year war with the Turks.            1469-1522-Life of Nicolo Machiavelli.            1471-The University of Genoa is founded.            1473-1543-Life of Nicolaus Copernicus.            1475-1564-Life of Michelangelo Buonarroti.            1478-Pope Sixtus IV authorizes the Spanish Inquisition.</p>	<p>Late 15<sup>th</sup> century-<i>Kriegsbuecher</i> and <i>Ruestungsbuecher</i>, describing metalworking in terms of warfare and armament, and <i>Bergwerkbuechlein</i> and <i>Proberbuechlein</i>, essays on mining and assaying, become</p>	<p>1485-1509-Reign of Henry VII in England.            1492-Christopher Columbus seeks a western sea route to Asia, funded by Spain.</p>

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<p>1479-Venice is defeated by the Turks.            1483-1520-Life of Raphael.            c1488-1576-Life of Titian.            1492-The troops of Ferdinand and Isabella conquer the Moors in Spain.            -Columbus becomes the first European to encounter the Caribbean islands, and returns to Spain (1493). His second voyage is to Dominica, Jamaica, Puerto Rico (1493-1496). His third voyage is to Orinoco (1498). His fourth voyage is to Honduras and Panama (1502-1504).            1494-Charles VIII invades Italy; Medici is driven from Florence.            1494-1534-Life of Corregio.            1497-Vasco da Gama sails around Africa and discovers a sea route to India (1498). He establishes a Portuguese colony in India (1502). John Cabot, employed by England, reaches and explores the Canadian coast.            -Michelangelo sculpts the <i>Bacchus</i>.</p>	<p>widespread with the use of the printing press            -The most agriculturally advanced region in Europe, Flanders, develops a scythe with a small half-circle of bent withy attached near the base of the handle, to gather together the cut grain stems.            1489-94-Durer's paints his watercolor of a wire mill.</p>	<p>1499-Amerigo Vespucci, an Italian navigator, sights the coast of South America on an exploratory voyage for Spain.</p>

## 16<sup>th</sup> century

<p>1503-1566-Life of Nostradamus.            c1503-Leonardo da Vinci paints the <i>Mona Lisa</i>.            1504-Spain conquers the Kingdom of Naples. Michelangelo sculpts the <i>David</i>.            1506-1626-St. Peter's Church in Rome is constructed, designed and decorated by such artists and architects as Bramante, Michelangelo, da Vinci, Raphael, and Bernini.            1509-Michelangelo paints the ceiling of the Sistine Chapel.            -Erasmus' <i>Praise of Folly</i> is written.            1512-Medici power is restored in Florence.            1513-Balboa becomes the first European to encounter the Pacific Ocean.            -Machiavelli writes <i>The Prince</i>.            1515-Sir Thomas More writes <i>Utopia</i>.</p>	<p>1502-Boller proposes using mill-power to shake sieves, thus beginning the mechanization of bolting in milling.            1530-J.A. Pantheus writes <i>Voarchadumia contra alchimiam</i>, a book of alchemical nature, concerned with the metallurgy of the more precious metals and materials.</p>	<p>1507-The New World is first termed "America" by a German mapmaker who falsely credits Amerigo Vespucci with its discovery.            1509-1547-Reign of Henry VIII.            1513-Juan Ponce de Leon, sailing for Spain, explores Florida.            1524-Giovanni da Verrazano, funded by France, lands in the Carolinas, then sails north and discovers the Hudson River, and continues into Narragansett Bay and Nova Scotia.</p>
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<p>1517-Martin Luther posts his 95 theses denouncing church abuses in Wittenberg, starting the Reformation in Germany.</p> <p>1519-Ulrich Zwingli begins the Reformation in Switzerland.</p> <p>-Hernando Cortes conquers Mexico for Spain.</p> <p>-Charles I of Spain is chosen as Holy Roman Emperor.</p> <p>-Portuguese explorer Ferdinand Magellan sets out to circumnavigate the globe.</p> <p>1520-Luther is excommunicated by Pope Leo X. Suleiman I (“the Magnificent”) becomes Sultan of Turkey, invades Hungary (1521), Rhodes (1522), attacks Austria (1529), annexes Hungary (1541), Tripoli (1551), makes peace with Persia (1553), destroys Spanish fleet (1560), dies (1566).</p> <p>Magellan reaches the Pacific and is killed by Philippine natives (1521). One of his ships under Juan Sebastián del Cano continues around the world and reaches Spain (1522).</p> <p>1522-Magellan’s ship returns from circumnavigation of the globe.</p>		
<p>1527-Troops of the Holy Roman Empire attack Rome, imprison Pope Clement VII, ending the Italian Renaissance.</p> <p>-Castiglione writes <i>The Courtier</i>.</p> <p>-The Medici family is expelled from Florence.</p> <p>1530-Medici is restored.</p> <p>1532-Machiavelli's <i>The Prince</i> is published posthumously.</p> <p>1535-Reformation begins as Henry VIII makes himself head of English Church after being excommunicated by the pope.</p> <p>Sir Thomas More is executed as a traitor for his refusal to acknowledge the king's religious authority.</p>	<p>1540-Italian metallurgical engineer, Vannoccio Biringuccio, writes about water-powered wire-drawing mills in his <i>Pirotechnia</i>.</p>	<p>1535-Jacques Cartier sails up the St. Lawrence River, the basis of French claims to Canada.</p> <p>1539-Hernando de Soto of Spain explores what is today the southeast United States.</p> <p>1540-Francisco Vasquez de Coronado of Spain explores what is today the southwest United States.</p> <p>1541-Hernando de Soto of Spain discovers the Mississippi River.</p> <p>1547-1553-Reign of Edward VI.</p>

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<p>1536-Henry VIII executes his second wife, Anne Boleyn.            -John Calvin establishes the Reformed and Presbyterian forms of Protestantism in Switzerland and writes his <i>Institutes of the Christian Religion</i>.            -Danish and Norwegian Reformations take place.            -Michelangelo completes his <i>Last Judgment</i>.            -Guicciardini writes <i>The History of Italy</i>.            1541-John Knox leads the Reformation in Scotland and establishes the Presbyterian church there (1560).            1543- <i>On the Revolution of Heavenly Bodies</i> by Polish scholar Nicolaus Copernicus is published, giving his theory that the earth revolves around the sun.            -Vesalius writes <i>The Fabric of the Human Body</i>.            1545-The Council of Trent meets intermittently until 1563 to define Catholic dogma and doctrine and reiterate papal authority.            1547-Ivan IV (“the Terrible”) is crowned as czar of Russia, begins the conquest of Astrakhan and Kazan (1552), battles nobles (boyars) for power (1564), kills his son (1580), dies, and is succeeded by his son, Fyodor I.</p>		
<p>1553-Roman Catholicism is restored in England by Queen Mary I.            1548-The University of Messina is founded.            1556-Akbar the Great becomes Mogul emperor of India, conquers Afghanistan (1581), and continues wars of conquest (until 1605).            1558-Queen Elizabeth I restores Protestantism and establishes the state Church of England (Anglicanism).            -The Renaissance will reach its height in England—Shakespeare, Marlowe, Spenser.            1561-The Edict of Orleans attempts to end persecution of the Huguenots in France. French religious wars begin again with</p>	<p>1550-Wooden box-bellows are invented by Hans Lobsinger of Nuremberg, displacing the older leather ones.            c1550-Blast furnaces reach sizes of around twelve to sixteen feet high and four-and-a-half feet wide.            1556-Georgius Agricola (Georg Bauer) writes the <i>De re metallica</i>, the great textbook on every aspect of mining.            Late 16<sup>th</sup> century-The production of iron by the indirect process, using moulds, or pigs, comes into widespread use, particularly in northern</p>	<p>1553-1558-Reign of Mary I.            1558-1603-Reign of Elizabeth I.            1565-The first permanent European colony in North America is founded at St. Augustine (Florida) by the Spanish.</p>



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<p>Huguenots in France. French religious wars begin again with the massacre of Huguenots at Vassy. At the St. Bartholomew's Day Massacre, thousands of Huguenots are murdered (1572). Amnesty is granted (1573). Persecution continues periodically until the Edict of Nantes (1598) gives Huguenots religious freedom (until 1685).</p> <p>1568-Protestant Netherlands revolts against Catholic Spain; independence will be acknowledged by Spain in 1648.</p> <p>1570-Queen Elizabeth I is excommunicated by the pope.</p> <p>-Turks attack Cyprus and war on Venice. The Turkish fleet is defeated at the Battle of Lepanto by Spanish and Italian fleets (1571). Peace of Constantinople (1572) ends Turkish attacks on Europe.</p>	<p>into widespread use, particularly in northern Europe, in the Low Countries, in Sweden and in Britain.</p> <p>1574-Lazarus Ecker writes his <i>Treatise describing the foremost kinds of Metallic Ores and Minerals</i>, adding to the previous printed knowledge on assaying.</p>	
<p>1580-Francis Drake returns to England after circumnavigating the globe and is knighted by Queen Elizabeth I (1581).</p> <p>-Montaigne's <i>Essays</i> are published.</p> <p>1582-Pope Gregory XIII implements the Gregorian calendar.</p> <p>1583-William of Orange rules the Netherlands; he is assassinated on orders of Philip II of Spain (1584).</p> <p>1587-Mary, Queen of Scots, is executed for treason by order of Queen Elizabeth I.</p> <p>-Monteverdi composes the <i>First Book of Madrigals</i>.</p> <p>1588-The Spanish Armada is defeated by the English.</p> <p>-Henry, King of Navarre and Protestant leader, is recognized as Henry IV, first Bourbon king of France. He converts to Roman Catholicism in 1593 in attempt to end religious wars.</p> <p>1590-Henry IV enters Paris, wars on Spain (1595), marries Marie de Medici (1600), and is assassinated (1610).</p> <p>-Spenser writes <i>The Faerie Queen</i>.</p> <p>-El Greco paints <i>St. Jerome</i>.</p> <p>-Galileo experiments with falling objects.</p> <p>1598-Boris Godunov becomes the Russian czar.</p> <p>-Tycho Brahe describes his astronomical experiments.</p>	<p>1588-Giambattista della Porta is the first to mention the use of the trompe bellows, invented in Italy.</p> <p>-Agostino Ramelli writes his book on machines, including milling devices, <i>Le diverse et artificiose machine</i>, in Paris.</p> <p>c1595-Verantius writes <i>Machinae novae</i> in Venice.</p>	<p>1585-Sir Walter Raleigh organizes the colonization of Roanoke Island, Virginia (today, North Carolina). The colony lasts for only one year. The second attempt to settle there in 1587 also fails with the colony disappearing sometime before 1590.</p> <p>1587-The first English child to be born in the colonies, Virginia Dare, is born in Roanoke.</p> <p>1588- Spanish influence in the New World declines and English imperial interests widens.</p> <p>1590-Richard Hakluyt publishes an anthology of notable voyages to the New World. A second edition is published 1598, creating English interest in the exploration and colonization of the New World.</p>
<b>17<sup>th</sup> century</b>		
<p>1600-Giordano Bruno is burned as a heretic.</p> <p>-The English East India Company established.</p> <p>1603-Shakespeare writes <i>Hamlet</i>.</p> <p>1605-Cervantes writes <i>Don Quixote de la Mancha</i>, the first modern novel.</p>	<p>Early 17<sup>th</sup> century-Massive deforestation provides a pressing incentive to find a means of smelting iron with coal.</p> <p>1603-Sir Hugh Platt supplies a recipe to the brewing industry for making briquettes of raw</p>	<p>1603-1625-Reign of James I.</p> <p>1604-At the Hampton Court Conference, James I refuses to tolerate Puritans.</p> <p>1606-The London Company sponsors a colonizing expedition to Virginia.</p>

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<p>1609-The <i>Relation</i>, the first newspaper, debuts in Germany.  1610-Galileo sees the moons of Jupiter through his telescope.  1611-Gustavus Adolphus is elected King of Sweden.  -The King James Version of the Bible published in England.  -Rubens paints his <i>Descent from the Cross</i>.  1614-John Napier discovers logarithms.  1618-The Thirty Years' War begins as Protestants revolt against Catholic oppression; Denmark, Sweden, and France will invade Germany in later phases of the war.  -Kepler proposes the last of the three laws of planetary motion.</p>	<p>coal, known as 'coke;' it would later be applied to metallurgical practices.  1612-1613-Simon Sturtevant and John Rovenzon publish treatises, advocating the adoption of coal-burning blast furnaces.  1617-Georg Engelhard Löhneiss writes on the organization of mining and its employees in the <i>Bericht von Bergwercken</i>.</p>	<p>1607-Jamestown is founded by the Virginia Company.  -Captain John Smith is captured by Chief Powhatan and saved from death by the chief's daughter, Pocahontas.  1609-Henry Hudson explores North America, sponsored by the Dutch East India Company.  1612-Tobacco is introduced in the Virginia colony by John Rolfe.  1613-Dutch colonists form settlements in New Amsterdam and by the 1620s, elsewhere in New Netherlands.  1616-Tobacco becomes an export staple for Virginia.  -A smallpox epidemic decimates the Native American population in New England.  1619-The first session of the first colonial legislative assembly, the Virginia House of Burgesses, convenes in Jamestown.   -Slavery begins in the colonies, as twenty Africans are brought by a Dutch ship to Jamestown for sale as indentured servants.</p>
<p>1633-The inquisition forces Galileo to recant his belief in Copernican theory.</p>	<p>1627-Mathurin Jousse describes the sequence of colors on tempering of steel. He also discusses the recognition of good iron or steel, on the basis of fracture.  1636-Mersenne writes the first serious tests of tensile properties of gold, silver, copper and iron.</p>	<p>1620-The Mayflower ship lands at Cape Cod, Massachusetts, with 101 colonists.  On November 11, the Mayflower Compact is signed, establishing a form of local government at Plymouth.  -The first public library in the colonies is organized in Virginia with books donated by English landowners.  1621- One of the first peace treaties between colonists and Native Americans, specifically the Plymouth pilgrims and the Wampanoag Tribe, is signed with the aid of Squanto, an English-speaking Native American.  1624-Dutch colonists, sponsored by the Dutch West India Company arrive in New York. The Virginia Company charter is revoked in London and Virginia is declared a Royal colony.</p>

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		<p>colony.            1625-1649-Reign of Charles I.            1626-Peter Minuit, a Dutch colonist, purchases Manhattan island from Native Americans and names the island New Amsterdam.            1628-The Puritans are the first to settle the Massachusetts Bay Colony.            1630s-20,000 immigrate to New England area: mostly yeoman families.            1633-The first town government in the colonies is organized in Dorchester, Massachusetts.            1634-Maryland, land granted to Lord Baltimore by Charles I, is first settled.            1635-Boston Latin School, the first public school in the colonies, is established.            1636-Puritan clergyman Thomas Hooker and others leave Massachusetts and found Hartford.            -Harvard College is founded.            -Roger Williams founds Providence and Rhode Island. Providence then becomes a haven for colonists, like Williams, fleeing religious intolerance.            1638-Anne Hutchinson is ex-communicated and banished from Massachusetts for nonconformist religious views. She travels to Rhode Island, where she founds the town of Portsmouth.            -The first colonial printing press is established in Cambridge, Massachusetts.            -Eaton and Davenport establish New Haven.            -Sweden establishes the colony, New Sweden (Delaware).            1639-Puritan settlers, led by John Wheelwright, found New Hampshire.</p>
<p>1642-The English Civil War begins, pitting the Cavaliers, supporters of Charles I, against the Roundheads, parliamentary forces. Oliver Cromwell defeats the Royalists (1646). Parliament demands reforms. Charles I offers concessions, is brought to trial (1648) and beheaded (1649). Cromwell becomes Lord Protector (1653).            -Rembrandt paints his <i>Night Watch</i>.            1644-Descartes writes his <i>Principles of Philosophy</i>.            1648-The Thirty Years' War ends with the German population about half of what it was in 1618 because of war and pestilence.</p>	<p>1640-In the <i>Arte de los Metales</i>, Alvaro Alonzo Barba discusses smelting operations as practiced in the gold and silver mines of the New World, but also contains information on European metallurgy.            1648-Use of the chimney stack to enhance the draught spreads throughout Europe.            1651-Biringuccio mentions a solar furnace, a German mirror capable of melting a gold ducat.            1665-Robert Hooke develops a theory of the building of coral based on the sedimentary</p>	<p>1646-In Massachusetts, the general court approves a law that makes religious heresy punishable by death.            1647-Massachusetts passes a law, requiring all sizable towns to institute some form of public education.            1649-1653-First period of the Commonwealth of England.            1651-The First Navigation Act is passed by Cromwell's Parliament, prohibiting the shipment of colonial goods to England in non-English ships.            1652-Rhode Island enacts the first colonial law making slavery illegal.</p>

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pestilence.	hardening of steel based on the colors it turns during tempering and relates it to the hardening of other materials by cold working.	1653-1659-Protectorate under Oliver Cromwell. 1659-1660-Protectorate under Richard Cromwell.
<p>1660-English Parliament calls for the restoration of the monarchy and invites Charles II to return from France.</p> <p>1661-Charles II is crowned King of England. Louis XIV begins his personal rule as absolute monarch and starts to build Versailles.</p> <p>1664-The English limit “Nonconformity” with the reestablished Anglican Church.</p> <p>-Isaac Newton experiments with gravity.</p> <p>1665-The Great Plague in London kills 75,000.</p> <p>1666-The Great Fire of London. Molière writes <i>Misanthrope</i>.</p> <p>1667-Milton writes <i>Paradise Lost</i>, widely considered the greatest epic poem in English.</p>	<p>Late 17<sup>th</sup> century-Blast furnaces double in size.</p> <p>-The invention of reverberatory furnace makes it possible to substitute raw coal for charcoal in the process of smelting.</p>	<p>1659-Second period of the Commonwealth of England.</p> <p>1660-The Navigation Act of 1660 allows the colonies to trade with only English-built ships and crews that are at least three-quarters English. Certain enumerated goods, including indigo, sugar, cotton and tobacco, are allowed to be shipped only to England or other English colonies.</p> <p>1660-1685-Reign of Charles II.</p> <p>1663- Charles II establishes the colony of Carolina. Anthony Ashley Cooper establishes a feudal society there.</p> <p>1664-Sir George Carteret and John, Lord Berkeley, found New Jersey.</p> <p>-Dutch Governor Peter Stuyvesant surrenders New Netherlands to English forces who rename the colony New York.</p>

Medieval Europe	Iron & Mills	Colonial America
		<p>York.</p> <p>-Maryland makes lifelong servitude for black slaves legally mandatory. Similar laws are later passed in New York, New Jersey, the Carolinas and Virginia.</p> <p>1667-The Virginia House of Burgesses passes a law that binds blacks to servitude, even if they convert to Christianity.</p> <p>1672-The Royal Africa Company monopolizes the English slave trade.</p> <p>1673-Dutch military forces retake New York from the British.</p> <p>-The British Navigation Act of 1673 requires a customs commissioner to collect duties on goods that pass between plantations.</p> <p>-French explorers, Father Jacques Marquette and Louis Joliet, explore the interior of North America, including the Great Lakes and the Mississippi River.</p> <p>1674-The Treaty of Westminster returns Dutch colonies to the English.</p> <p>1675-1676-King Philip's War (the colonists' nickname for Metacomet, chief of the Wampanoags) erupts in New England between colonists and Native Americans, resulting in the end of Native American power there.</p> <p>1676-Nathaniel Bacon leads a rebellion against Virginia Governor William Berkeley, which results in Bacon's burning of Jamestown. Bacon and his western Virginia rebels also crush the Susquehannock Indians who have been attacking the settlers of western Virginia. The rebellion disintegrates when Bacon dies suddenly that year.</p>
<p>1683-The war of European powers against the Turks (to 1699) begins. Vienna withstands a three-month Turkish siege at the high point of Turkish advance in Europe.</p> <p>1684-Gottfried Wilhelm Leibniz's calculus is published.</p> <p>1687-James II calls for freedom of conscience. Protestants fear the restoration of Catholicism and demand a "Glorious Revolution." William of Orange is invited to England and James II escapes to France (1688). William III and his wife, Mary, are crowned.</p> <p>-In France, the Edict of Nantes of 1598, granting freedom of worship to Huguenots, is revoked by Louis XIV, forcing thousands of Protestants to flee.</p> <p>1689-Peter the Great becomes Czar of Russia and attempts to westernize the nation and build Russia as a military power. He defeats Charles XII of Sweden at Poltava (1709).</p>		<p>1680-New Hampshire becomes an independent colony, separate from Massachusetts.</p> <p>1681-Quaker William Penn, is granted a charter from Charles II, making him proprietor of Pennsylvania.</p> <p>1682-French explorer LaSalle reaches the mouth of the Mississippi and claims the surrounding territory, which he names Louisiana.</p> <p>1685-1688-Reign of James II.</p> <p>1686-James II consolidates the colonies of New England into a Dominion, removing the colonists' local political rights and independence. Sir Edmund Andros is named governor.</p> <p>1687-Andros orders Boston's Old South Meeting House to be converted into an Anglican Church. The towns of Ipswich and Topsfield, Massachusetts, shunning taxation without representation, protest against Andros' assessments.</p>

Medieval Europe	Iron & Mills	Colonial America
<p>defeats Charles XII of Sweden at Poltava (1709).                      1690-William III of England defeats the former king James II and Irish rebels at the Battle of the Boyne in Ireland.                      -John Locke writes <i>Human Understanding</i>.</p>		<p>representation, protest against Andros' assessments.                      1688-Andros limits New England town meetings to one per year. He then places all militias under his control.                      -Quakers in Pennsylvania formally protest against slavery in America.                      1689-Edmund Andros is jailed and the Dominion of New England dissolves in the colonial response to the Glorious Revolution.                      1689-1694-Reign of William III and Mary II.                      1689-1691-Governor Nicholson of New York is overthrown during Leisler's Rebellion.                      1690-King William's War begins, as French and English hostilities in Europe extend to the colonies. Schenectady, New York is burned by the French and their Native American allies.                      1691-The newly appointed Governor of New England, Henry Sloughter, arrives in New York from England and institutes a royally-sanctioned representative government. Massachusetts receives a new royal charter that includes government by a royal governor and a governor's council.                      1692-150 people are accused of witchcraft in the village of Salem, Massachusetts. A special court is set up by the governor of Massachusetts, with twenty people being executed.                      1693-The College of William and Mary is founded in Williamsburg, Virginia.                      1694-1702-Solo reign of William III.                      1696-The Royal African Trade Company loses its monopoly on the slave trade, spurring colonists in New England to begin trading slaves.                      -The Navigation Act of 1696 is passed, requiring all colonial trade to be done exclusively in English-built ships.                      1697-King William's War ends with the Treaty of Ryswick.                       1699-The Wool Act is passed, designed to protect England's wool industry by limiting wool production in Ireland and forbidding the export of wool from the colonies.</p>

**18<sup>th</sup> century**

1701-The War of the Spanish Succession begins, the last of	Early 18 <sup>th</sup> century-New methods of producing	1700-Massachusetts orders all Roman Catholic priests to
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Medieval Europe	Iron & Mills	Colonial America
<p>Louis XIV's wars for domination of the continent. The Peace of Utrecht (1714) will end the conflict and mark the rise of the British Empire. Called Queen Anne's War in the colonies, it ends with the British taking New Foundland, Acadia, and the Hudson's Bay Territory from France, and Gibraltar and Minorca from Spain.</p> <p>1704-Bach writes his first cantata.</p> <p>1707-The United Kingdom of Great Britain is formed, as England, Wales, and Scotland are joined by the parliamentary Act of Union.</p>	<p>iron and steel are introduced.</p> <p>-Swedish scientists, Emanuel Swedenborg and Christopher Polhem, improve Swedish metallurgical and mining methods, almost doubling their country's iron production.</p> <p>1700-The volume of the Stückofen triples in size from that of 1500.</p> <p>1702-Mathurin Jousse writes the first publication, actually one on carpentry, that included viable instructions for the construction of a windmill.</p> <p>1709-The first recorded successful experiment in using coke for smelting iron ore, at Bosley, in Shropshire.</p>	<p>leave the colony within three months, or suffer penalty of life imprisonment or execution. New York then passes a similar law.</p> <p>1701-The French establish a settlement at Detroit.</p> <p>-Yale College is founded in Connecticut.</p> <p>1702-1714-Reign of Anne.</p> <p>1702-Charles II, king of Spain, dies. The War of the Spanish Succession begins, as England declares war on France to stop the union of France and Spain. In the colonies, the war is called Queen Anne's War; English colonists will battle the French, their Native American allies, and the Spanish for the next eleven years.</p> <p>-The Anglican Church is established as the official church of Maryland.</p> <p>1703-Delaware, originally called New Sweden by the Swedish settlers, breaks away from Pennsylvania to form a separate government.</p> <p>1704-The first enduring newspaper in America, The Boston News-Letter, is published.</p> <p>1705-The Virginia Black Code of 1705 assigns slaves the status of real estate in Virginia. -A law against runaway slaves in New York punishes with the death penalty any slave caught over forty miles north of Albany.</p> <p>-Massachusetts declares marriage between blacks and whites illegal.</p> <p>1706-The Anglican Church is established as the official church of South Carolina.</p>
		<p>1706-1790-Life of Benjamin Franklin.</p> <p>1710-The Post Office Act establishes a postal system in the colonies, controlled by the postmaster general of London and his deputy in New York City.</p> <p>1711-1713-The Tuscarora Indian War begins with a massacre of settlers in North Carolina by Native Americans.</p> <p>1712-The Carolina colony is officially divided into North Carolina and South Carolina.</p> <p>-The Pennsylvania assembly bans the import of slaves.</p>

Medieval Europe	Iron & Mills	Colonial America
		<p>1713-Queen Anne's War ends with the Treaty of Utrecht.  1714-1727-Reign of George I.  1714-Tea is introduced for the first time into the colonies.  1716-The first black slaves are brought to the Louisiana territory.  1717-Scots-Irish immigration increases, with most settling in western Pennsylvania. Many Germans, known as Pennsylvania Dutch, also begin to settle in Pennsylvania.</p> <p>1718-New Orleans is founded by the French.</p>
<p>1729-Bach writes the <i>St. Matthew Passion</i>.  -Isaac Newton's <i>Principia</i> is translated from Latin into English.</p>	<p>1722-The first reliable treatise on iron metallurgy, Réaumur's essay on the art of converting iron into steel, is written.</p>	<p>1722-1803-Life of Samuel Adams.  1725-The population of black slaves in the American colonies reaches 75,000.  1726-The poor riot in Philadelphia, tearing down the pillories and stocks and burning them.  1727-1760-Reign of George II.  1728-The first colonial synagogue is built by Jewish colonists in New York City.</p> <p>1729-Benjamin Franklin begins publishing The Pennsylvania Gazette.</p>
	<p>1732-By this time, there are six blast-furnaces and nineteen hammer-forges, besides numerous bloomeries, in the British colonies of North America.  Mid 18<sup>th</sup> century-The first known round-house post-mills are constructed.  -By employing a continuous process of feeding ore and fuel into the furnace as the pig iron is tapped, furnaces are producing twice the amount of pig iron per day as the first blast furnaces of 1500, while consuming less fuel.  -Cast iron is applied to uses where stone, wood and other metals had formerly served.</p>	<p>1730-Baltimore is founded in the Maryland colony.  1731-Benjamin Franklin founds the first colonial public in Philadelphia.  1732-The first colonial mass is celebrated in the only Catholic church, in Philadelphia.  -Georgia, the 13th English colony, is founded by James Oglethorpe as a haven for those in debtors' prisons.  1732-1799-Life of George Washington.  1732-1757-Benjamin Franklin publishes Poor Richard's Almanac.  1733-The Molasses Act imposes heavy duties on molasses, rum and sugar imported from non-British islands in the Caribbean.</p>



Medieval Europe	Iron & Mills	Colonial America
	<p>and other metals had formerly served.</p> <p>-Cast iron gears are used in the mill, allowing for improvements in turning.</p> <p>1738-Schlüter's metallurgical handbook is written.</p>	<p>Caribbean.</p> <p>1734-John Peter Zenger, a New York newspaper publisher, is accused of seditious libel by the Governor. He is acquitted after his lawyer successfully convinces the jury that truth is a defense against libel.</p> <p>-The Great Awakening religious revival movement begins with Jonathan Edwards, a Congregationalist clergyman, preaching a series of sermons in Northampton, Massachusetts. Over the next ten years the revival, led by Edwards and George Whitefield, will sweep all of the American colonies.</p> <p>1734-1820-Life of Daniel Boone.</p> <p>1735-1818-Life of Paul Revere.</p> <p>1735-1826-Life of John Adams.</p> <p>1737-The first colonial copper coins are minted in Connecticut.</p> <p>1739-England declares war on Spain. As a result, hostilities break out between Spaniards in Florida and colonists in Georgia and South Carolina. Three separate violent uprisings by black slaves occur in South Carolina.</p>
<p>1740-Captain Vitus Bering, a Dane employed by Russia, discovers Alaska.</p> <p>-Frederick II "the Great" is crowned king of Prussia.</p> <p>1746-The British defeat the Scots under the Stuart Pretender, Prince Charles, at Culloden Moor, the last battle fought on British soil.</p>	<p>1745-Edmund Lee patents the automatic fantail, keeping a windmill facing directly into the eye of the wind.</p>	<p>1740-Fifty black slaves are hanged in Charleston, South Carolina, after their plans for revolt are revealed.</p> <p>1740-1748-In Europe, the War of the Austrian Succession, known as King George's War in the colonies, begins after the death of Emperor Charles VI and results in France and Spain allying against England.</p> <p>1741-Russian Tsar, Peter the Great, sponsors Danish navigator, Vitus Bering, to explore the coast of Alaska.</p> <p>1743-Benjamin Franklin and his associates found the American Philosophical Society in Philadelphia.</p> <p>1743-1826-Life of Thomas Jefferson.</p> <p>1745-Colonial forces capture the French fort of Louisbourg.</p> <p>1747-The New York Bar Association is founded in New York City.</p> <p>1748-The Treaty of Aix-la-Chapelle ends King George's War. Louisbourg is returned to the French.</p>
<p>1751-Publication of the <i>Encyclopédie</i>, the "bible" of the Enlightenment, begins in France.</p> <p>1755-Samuel Johnson's <i>Dictionary</i> is first published.</p> <p>-A great earthquake in Lisbon, Portugal kills over 60,000.</p> <p>1757-The British Empire in India begins, as Robert Clive,</p>	<p>c1750-Good sheet iron is produced by rolling-and slitting-mills.</p> <p>1759-John Smeaton presents to the Royal Society the first scientific study of windmill sails.</p>	<p>1750-The Iron Act bans the construction of iron mills and steel furnaces in the colonies.</p> <p>1751-The Currency Act bans the issuing of paper money by the New England colonies.</p> <p>1752-The first general hospital is founded in Philadelphia.</p>

Medieval Europe	Iron & Mills	Colonial America
<p>British commander, defeats Nawab of Bengal at Plassey.            1759-Voltaire writes <i>Candide</i>.            -Haydn composes <i>Symphony No. 1</i>.</p>		<p>1752-1836-Life of Betsy Ross.            1753-Benjamin Franklin and William Hunter are appointed as postmasters general for the colonies.            1754-The French and Indian War, known in Europe as the Seven Years' War, begins as a result of disputes over land in the Ohio River Valley.            1755-English General Edward Braddock and George Washington battle the French in the Ohio territory, only to be defeated by a force of French and Indians. Braddock is mortally wounded and is replaced by Massachusetts Governor William Shirley as the new commander in chief.            -The U.S. postal service is established.            1755-1804-Life of Alexander Hamilton.            1757-William Pitt, England's Secretary of State, establishes a policy of unlimited warfare.            1758-English forces are defeated in Lake George, New York by French forces at Fort Ticonderoga.            -The first Indian reservation in America is founded, in New Jersey.            1759-French Fort Niagara is captured by the English.</p> <p>-War erupts between Cherokee Indians and southern colonists.</p>
<p>1762-Catherine II ("the Great") becomes the czarina of Russia.            -Jean Jacques Rousseau writes his <i>Social Contract</i>.            -Mozart tours Europe as a six-year-old prodigy.            1765-James Watt invents the steam engine.            1769-Sir William Arkwright patents a spinning machine, an early step in the Industrial Revolution.</p>	<p>Late 18<sup>th</sup> century-The role of carbon is finally recognized as the essential difference between wrought and cast iron and steel.</p>	<p>1760-1801-Reign of George III.            1760-Much of Boston is destroyed by a raging fire.            -Quebec surrenders to the English.            1763-The Treaty of Paris ends the French and Indian War.            -The Ottawa Native Americans under Chief Pontiac begin warfare against the British west of Niagara. His forces are eventually defeated near Pittsburgh.            -The Proclamation of 1763 forbids settlement west of the</p>

Medieval Europe	Iron & Mills	Colonial America
<p>1772-Joseph Priestley and Daniel Rutherford independently discover nitrogen.</p> <p>-The Austria, Prussia and Russia divide the land and people of Poland in 1772, 1793, and 1795, ending its independence.</p> <p>1775-Priestley discovers hydrochloric and sulfuric acids.</p> <p>1776-Adam Smith writes <i>Wealth of Nations</i>.</p> <p>-Edward Gibbon writes <i>The Decline and Fall of the Roman</i></p>	<p>1772-In England, Andrew Meikle invents the spring-sail for windmills, solving the problem of setting and shortening the sail-cloths in poor weather.</p>	<p>Appalachian Mountains.</p> <p>1764-The Sugar Act is passed as a means of raising revenue from the colonists.</p> <p>-A committee of correspondence is formed by Massachusetts House of Representatives to foster discussion of common grievances with other colonies.</p> <p>1765-The Stamp Act imposes a direct tax on all printed material in the colonies. Colonists protest through mob action, boycotts of British goods, and the Stamp Act Congress.</p> <p>-The Quartering Act requires the colonists to house British troops.</p> <p>1766-The Stamp Act is repealed on the same day the Declaratory Act is passed.</p> <p>-The Declaratory Act declares total Parliamentary supremacy over the colonies.</p> <p>1767-The Townshend Acts place duties on colonial importation of glass, lead, paints, paper and tea, leading to widespread boycotts of British goods.</p> <p>1770- The Boston Massacre occurs when British troops fire on a Boston mob, killing three colonists and injuring eight.</p> <p>-The Townshend Acts are repealed except for the tax on tea.</p> <p>1773-The Tea Act repeals the export tax on English tea heading for the colonies, but maintains a three-penny import tax on the colonists. The East India Company is granted monopoly of the tea trade. The Boston Tea Party results with</p>

Medieval Europe	Iron & Mills	Colonial America
<p><i>Empire.</i>                      -Fragonard paints <i>Washerwoman</i>.                      -Mozart composes the <i>Haffner Serenade</i>.                      1778-Franz Mesmer uses hypnotism.</p>		<p>Boston colonists dumping East India Company tea into the Boston Harbor.                      1774-The Coercive (Intolerable) Acts are passed to quell the rebelliousness of the Massachusetts Colony. The Boston Port Act prevents any trade ships from entering or leaving the Boston harbor until the East India Company is reimbursed for its stolen tea. The Administration of Justice Act allows British officials accused of crimes in Massachusetts to be tried in British, rather than colonial courts. The Government Act dissolves the Massachusetts Assembly, making all Massachusetts officials appointed by the King or the royal governor. The First Continental Congress meets in Philadelphia with representatives from all of the colonies except Georgia. The Congress issues a Declaration and Resolves, which oppose the Coercive Acts and assert the rights of colonists and colonial assemblies.                      1775-The Battles of Lexington and Concord are the result of British troops marching to Concord to destroy an arms depot there. The Massachusetts militia retaliates, beginning the Revolutionary War. The second Continental Congress meets in Philadelphia, appointing George Washington as commander of the Continental Army but still rejecting a declaration of independence.                      1776-Thomas Paine's "Common Sense" is published and is widely read.                      -A declaration of independence is adopted by the Second Continental Congress.                      -The British defeat Washington's Continental Army at several battles in the New York area.                      1777-Revolutionaries win the Battle of Saratoga, forcing British General Burgoyne to surrender. France officially recognizes the independence of the United States.                      1778-The U.S. and French sign a treaty of alliance and a treaty of amity and commerce which stated that in the case of a war between the British and French, the French would not make peace until U.S. independence was assured. France declares war on Britain. Spain and the Netherlands later join France in the war.</p>
<p>1781-Immanuel Kant writes <i>Critique of Pure Reason</i>.                      Herschel discovers Uranus.                      1783-William Blake writes his poetry.</p>	<p>c1784-Henry Cort invents the puddling process, in which the evolved heat of coal fuel was transmitted by reverberation to make pig iron</p>	<p>1780-Pennsylvania mandates the gradual abolition of slavery. Massachusetts adopts a bill of rights that applies to blacks and whites equally.</p>

Medieval Europe	Iron & Mills	Colonial America
<p>-Beethoven's works are first printed. 1784-Crimea is annexed by Russia. -John Wesley writes <i>Deed of Declaration</i>, the basic work of Methodism. 1785-Russians settle the Aleutian Islands. 1787-Lavoisier completes his work on chemical nomenclature. -Mozart composes <i>Don Giovanni</i>. 1788-The French <i>Parlement</i> presents grievances to Louis XVI, who agrees to the convening of the Estates-General in 1789, not called since 1613. -Goethe writes <i>Egmont</i>. -Laplace writes <i>Laws of the Planetary System</i>. 1789-1799-The French Revolution begins with the storming of the Bastille.</p>	<p>into bar iron, ensuring the triumph of coal in iron metallurgy. 1789-Stephen Hooper invents the roller-reefing sail, allowing all blinds in the windmill sails to be opened and closed simultaneously without stopping the mill.</p>	<p>-The British defeat the revolutionaries at the Battle of Charles Town. 1781-British General Cornwallis surrenders to revolutionary and French troops. 1782-Many British loyalists leave the United States for Canada and elsewhere. 1783-The Treaty of Paris ends the Revolutionary War. 1789-1797-Presidency of George Washington.</p>
<p>1790-The H.M.S. <i>Bounty</i> mutineers settle on Pitcairn Island. -Aloisio Galvani experiments on electrical stimulation of the muscles. -Lavoisier formulates <i>Table of 31 chemical elements</i>. 1791-Boswell writes <i>Life of Johnson</i>. 1792-Mary Wollstonecraft writes <i>Vindication of the Rights of Woman</i>. 1793-Louis XVI and Marie Antoinette are executed. The Reign of Terror begins in France. 1794-Kosciusko's uprising in Poland is quelled by the Russians. -The Reign of Terror ends with the execution of Robespierre. 1796-Napoléon Bonaparte, a French general, defeats the Austrians. -Edward Jenner introduces the smallpox vaccination. 1798- Napoléon extends French conquests to Rome and Egypt. 1799-The Rosetta Stone is discovered in Egypt. -Napoléon leads a coup that overthrows the Directory, establishes the Consulate, and becomes the First Consul, one of three who rule France together.</p>	<p>1795-American, Oliver Evans, designs the first automatic mill for the mass-production of flour, using power-driven roller-mills and cylindrical bolters.</p>	<p>1797-1801-Presidency of John Adams. 1798-The U.S. Navy Department is established.</p>