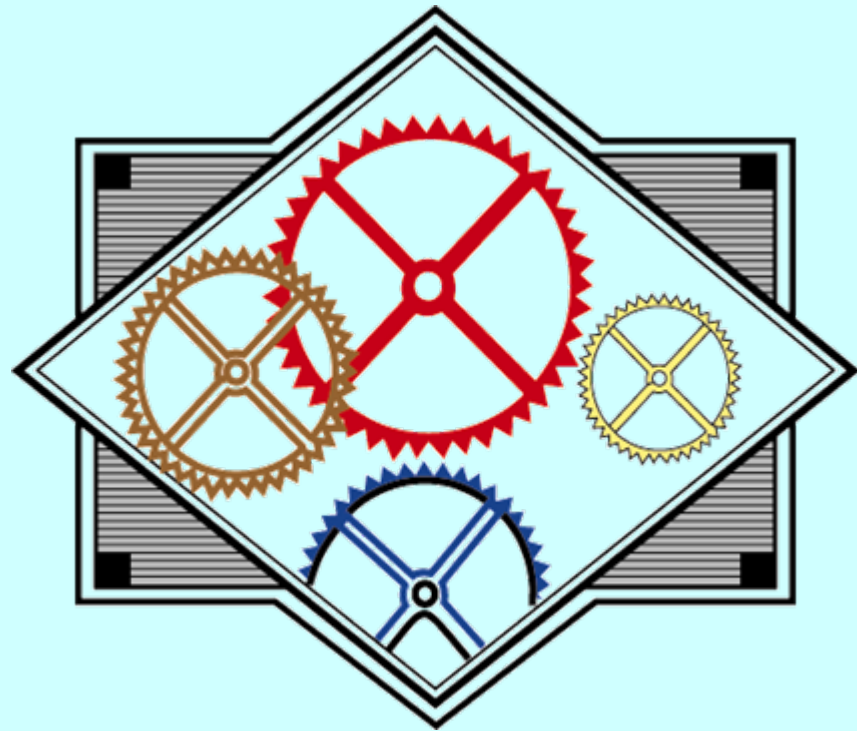
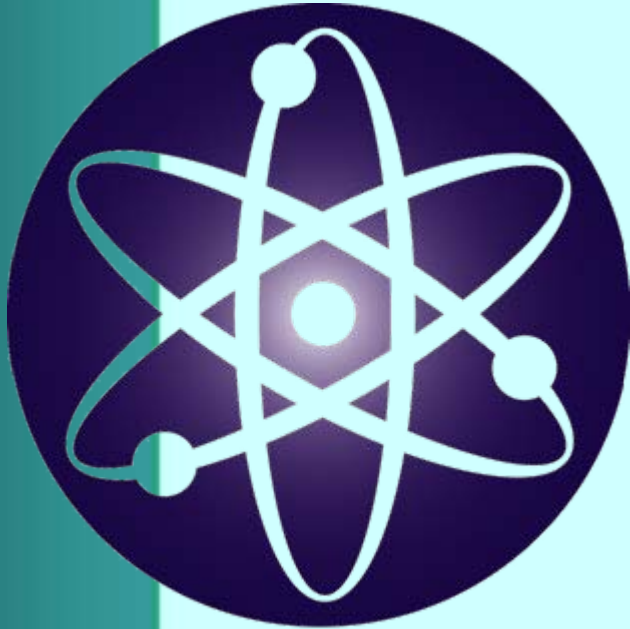


# SCIENCE AND ENGINEERING, NOBLE ACTIVITIES



# **SCIENCE & ENGINEERING, NOBLE ACTIVITIES**

## **INTRODUCTION**

### **OTHER PROFESSIONS**

## **SCIENCE & ENGINEERING**

### **GENERAL EXAMPLES**

**STATUE OF LIBERTY**

**EMPIRE STATE BUILDING**

**GOLDEN GATE BRIDGE**

**CHANNEL TUNNEL**

**ITAIPU DAM**

### **TRANSPORTATION**

**HEAT ENGINE**

**EXTERNAL COMBUSTION ENGINE (STEAM)**

**INTERNAL COMBUSTION ENGINE**

**HORSELESS CARRIAGE**

**AIRPLANE**

### **COMMUNICATIONS**

**PRINTING PRESS**

**TELEGRAPH**

**TELEPHONE**

**RADIO**

**TELEVISION**

**COMPUTER**

### **MANUFACTURING / PRODUCTION**

**INTERCHANGEABLE PARTS / ASSEMBLY LINE / MASS PRODUCTION**

**STEAM ENGINE**

**ELECTRICAL GENERATOR**

# STATUE OF LIBERTY



GIFT FROM FRANCE

DEDICATED OCT 28, 1886

LIBERTY ISLAND IN NEW YORK HARBOR

SCULPTOR, FREDERIC AUGUSTE BARTHOLDI

INTERNAL STRUCTURE ENGINEER, GUSTAVE EIFFEL

305 FT FROM THE GROUND TO THE TOP OF TORCH

STATUE HEIGHT 151 FT

STATUE WEIGHT 204 TONS

PEDESTAL WEIGHT 24,500 TONS

POEM BY EAMMA LAZARUS, "THE NEW COLOSSUS"

GIVE ME YOUR TIRED, YOUR POOR

YOUR HUDDLED MASSES YEARNING TO BREATH FREE,

THE WRETCHED REFUSE OF YOUR TEEMING SHORE

SEND THESE, THE HOMELESS, TEMPEST-TOST TO ME,

I LIFT MY LAMP BESIDE THE GOLDEN DOOR!

# EMPIRE STATE BUILDING

1,250 FT HIGH (102 STORIES)

WORLD'S TALLEST SKYSCRAPER FOR 41 YEARS

2.2 M FT<sup>2</sup> FLOOR SPACE

WEIGHT 330,000 METRIC TONS

6,500 WINDOWS

LOCATED ON FIFTH AVENUE MIDTOWN MANHATTAN

OPENED MAY 1, 1931

CONSTRUCTED IN 1 YEAR 45 DAYS

ON JULY 28, 1945 CRASHED INTO A BY A B-25  
BOMBER PLANE IN THICK FOG, EASILY  
REPAIRED



# GOLDEN GATE BRIDGE



SUSPENSION BRIDGE ACROSS GOLDEN  
GATE STRAIT

HANGS FROM TWO 746 FOOT-HIGH TOWERS  
ONE PIER IN OPEN SEA, 1 100 FT FROM SHORE  
70 MPH GUSTS AND OCEAN CURRENTS DURING  
CONSTRUCTION

80,000 MILES OF WIRE IN THE 3.61 FT DIA. CABLES  
ENGINEER, JOSEPH STRAUSS / CHARLES PURCELL

1.7 MILES LONG, 90 FT WIDE  
MID SPAN CAN SWING 27FT

OPENED MAY, 1937

NOT DAMAGED BY 1989 EARTHQUAKE

COST \$35 MILLION

COMPLETED IN 4 YEARS

# CHANNEL TUNNEL



31 MILE TUNNEL LINKING ENGLAND AND FRANCE

24 MILES UNDERSEA (ENGLISH CHANNEL)

150 FT BELOW SEABED

TWO RAIL TUNNELS (25 FT DIA) AND ONE SERVICE  
TUNNEL (16 FT DIA)

TOOK 15,000 WORKERS 7+ YEARS TO COMPLETE  
COST 10 BILLION POUNDS

# ITAIPU DAM



DAM OF PARANA RIVER ON BORDER OF  
BRAZIL & PARAGUAY

LARGEST HYDROELECTRIC POWER PLANT  
IN THE WORLD

14 BW GENERATOR CAPACITY

20 TURBINES, 700 MW EACH

ENOUGH IRON & STEEL TO BUILD 380  
EIFFEL TOWERS

15 TIMES THE CONCRETE TO BUILD THE  
CHANNEL TUNNEL

DAM IS 196M HIGH

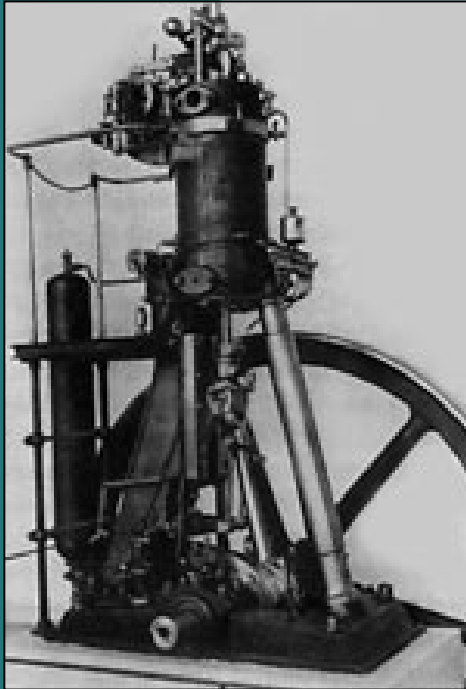
OVER 50 MILLION TONS OF EARTH &  
STONES REMOVED

BEGAN OPERATION IN 1984 WITH TWO UNITS

# HEAT ENGINE

## EXTERNAL COMBUSTION ENGINE

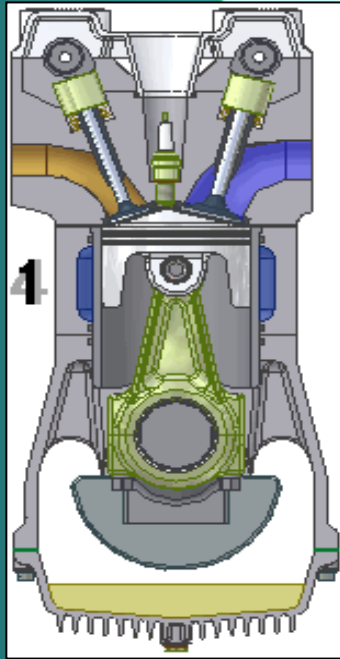
IN 1769, JAMES WATT, A SCOTTISH ENGINEER  
INVENTED THE FIRST PRACTICAL STEAM  
ENGINE.



# HEAT ENGINE

## INTERNAL COMBUSTION ENGINE

### 4 STROKE GASOLINE & DIESEL



4 STROKE INTERNAL COMBUSTION ENGINE PATENT

1862 ALPHONSE BEAU DE ROCHAS , FRENCH  
ENGINEER

MAY 1876, NIKOLAUS AUGUST OTTO BUILT THE FIRST  
4 STROKE PISTON CYCLE COMBUSTION ENGINE

1892, RUDOLF DIESEL, A GERMAN ENGINEER ISSUED  
A PATENT FOR THE DIESEL ENGINE

# HORSELESS CARRIAGE



KARL BENZ, GERMAN ENGINEER, BUILT THE  
FIRST AUTOMOBILE POWERED BY AN  
INTERNAL COMBUSTION ENGINE  
1886 PATENT

# AIRPLANE

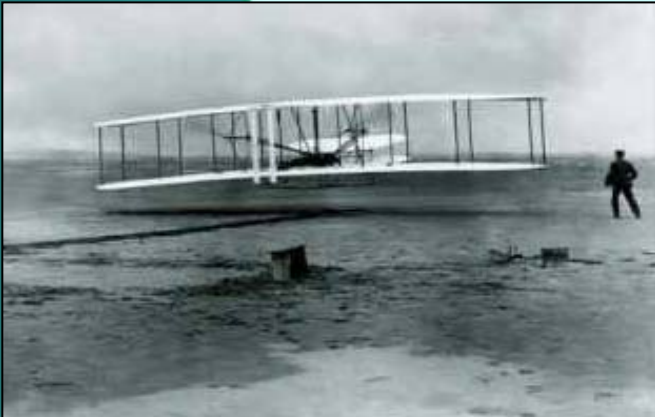
DEC 17, 1903

KITTY HAWK, NC

WEIGHT 600 LBS

FIRST CONTROLLED, SUSTAINED FLIGHT IN  
HEAVIER-THAN-AIR-CRAFT

|                        |            |        |
|------------------------|------------|--------|
| 1 <sup>ST</sup> FLIGHT | 12 SECONDS | 120 FT |
| 2 <sup>ND</sup> FLIGHT | < 200 FT   |        |
| 3 <sup>RD</sup> FLIGHT | 200 FT     |        |
| 4 <sup>TH</sup> FLIGHT | 59 SECONDS | 852 FT |



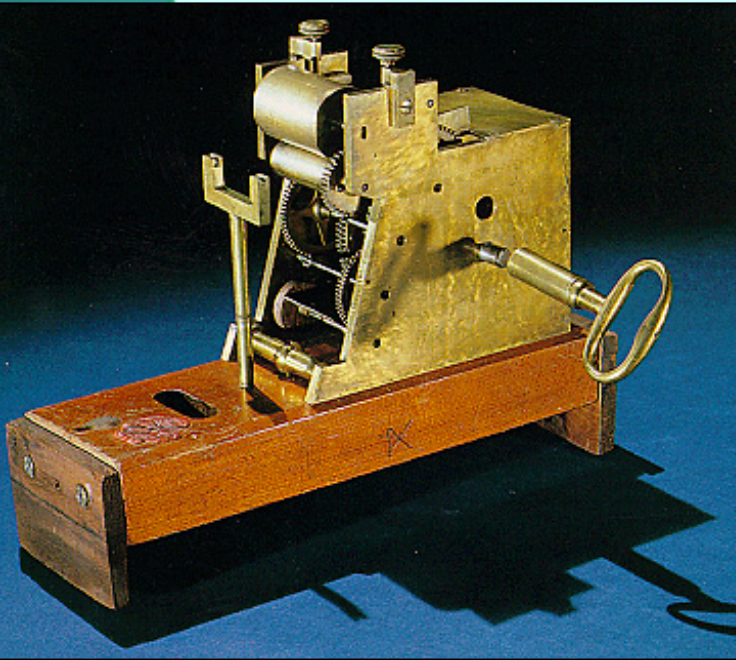
# PRINTING PRESS

1436 INVENTED BY JOHANN GUTENBERG,  
A GERMAN GOLDSMITH  
1456 FIRST MASS PRODUCTION OF BIBLE



# TELEGRAPH

SAMUEL MORSE  
1840

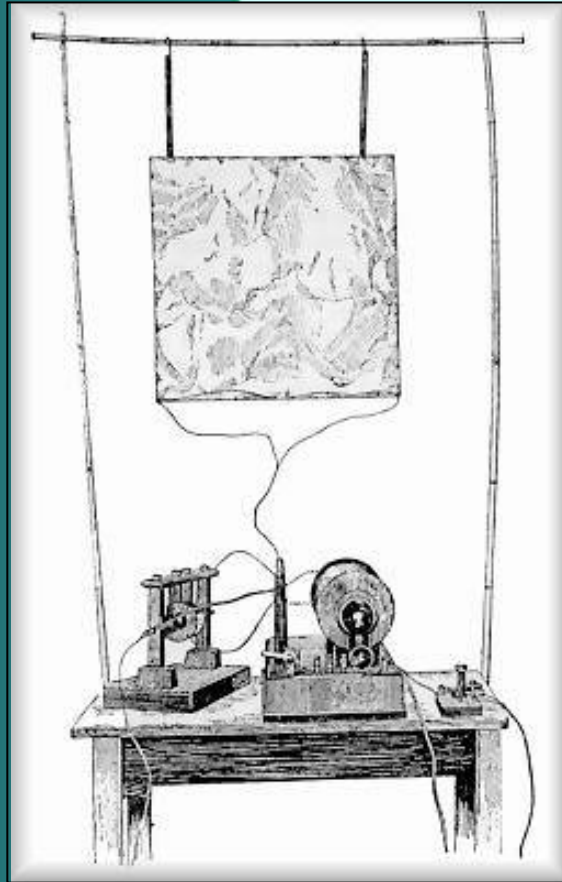


# TELEPHONE



ALEXANDER GRAHAM BELL  
1876

# RADIO



NIKOLA TESLA, FILED PATENT 1897, GRANTED  
PATENT 1900

GUGLIELMO MARCONI, FILED PATENT, NOV 10,  
1900, GRANTED PATENT 1904

IN 1943, A FEW MONTHS AFTER TESLA'S DEATH  
THE U.S. SUPREME COURT UPHELD  
TESLA'S RADIO PATENT 645,576

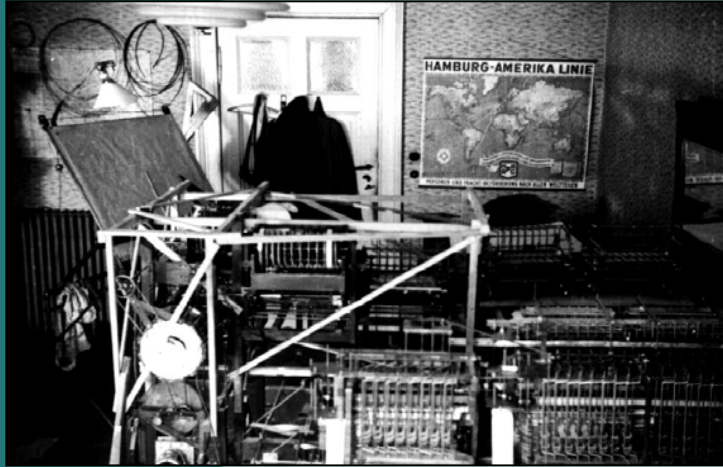
# ALL ELECTRIC TELEVISION

PHILO T. FARNSWORTH, PATENT ISSUED  
AUG 26, 1930. FARNSWORTH WAS  
20 YEARS OLD



1936 RCA Model RR-359  
Field Test Prototype Set

# COMPUTER



KONRAD ZUSE, GERMAN CONSTRUCTION  
ENGINEER

1936 FIRST BINARY COMPUTER

1939 FIRST FULLY FUNCTIONAL ELECTRO-  
MECHANICAL COMPUTER (DID NOT  
STORE THE PROGRAM IN MEMORY  
WITH DATA)

TRANSISTOR

JOHN BARDEEN, WALTER BRATTAIN & WILLIAM  
SHOCKLEY 1947/48

INTEGRATED CIRCUIT

JACKY KILBY & ROBERT NOYCE  
1958

MICROPROCESSOR

FAGGIN, HOFF & MAZOR OF INTEL 1971

IN JAN 2006 INTEL PRODUCED 153 MBIT

119 SQMM SRAM CHIPS CONTAINING

OVER A BILLION TRANSISTORS

## MANUFACTURING / PRODUCTION

# INTERCHANGEABLE PARTS / ASSEMBLY LINE / MASS PRODUCTION



EARLY 16<sup>TH</sup> CENTURY – VENICE ARSENAL  
EMPLOYED 16,000 WORKERS BUILDING  
WARSHIPS WITH STANDARDIZED PARTS  
USING A PRODUCTION-LINE APPROACH  
TO COMPLETE A SHIP A DAY.



1778 HONORE BLANC (FRENCH) BEGAN PRODUCING  
FIREARMS WITH INTERCHANGEABLE PARTS

1798 ELI WHITNEY BUILT 10 GUNS & DEMONSTRATED  
TO U.S. CONGRESS



1913 - 1914 HENRY FORD INVENTED AN IMPROVED  
ASSEMBLY LINE, REDUCED MODEL T  
ASSEMBLY TIME FROM 14 HRS TO 1  
1 HR 33 MIN.

1908 - 1916 MODEL T PRICE \$1,000 TO UNDER  
\$360

# STEAM ENGINE

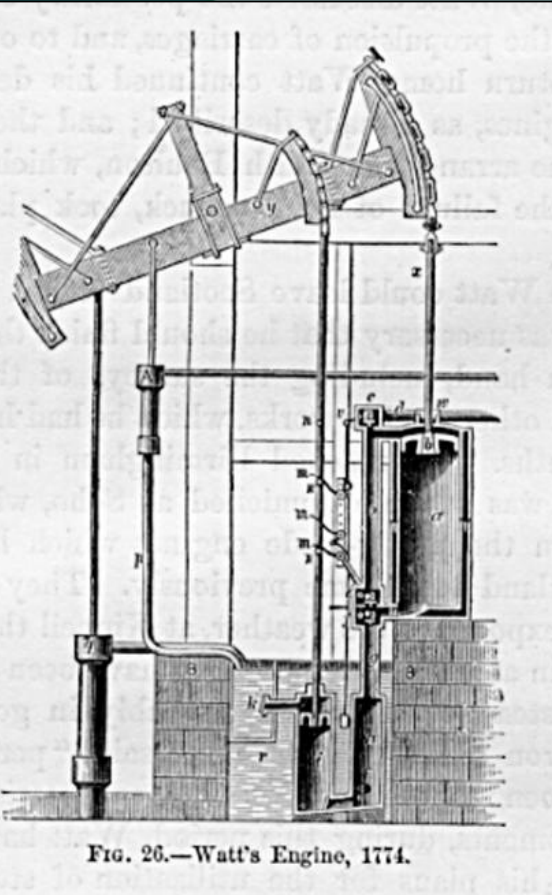


Fig. 26.—Watt's Engine, 1774.

JAMES WATT – SCOTTISH ENGINEER AT UNIVERSITY OF GLASGOW WORKED ON NEWCOMER STEAM ENGINE.

1769 – PATENT FOR SEPARATE CONDENSING CHAMBER FOR STEAM ENGINE

1781 – CONVERTED RECIPROCAL ENGINE MOTION TO ROTARY MOTION

1782 – INVENTED DOUBLE-ACTING ENGINE

1784 – PATENT FOR STEAM LOCOMOTIVE

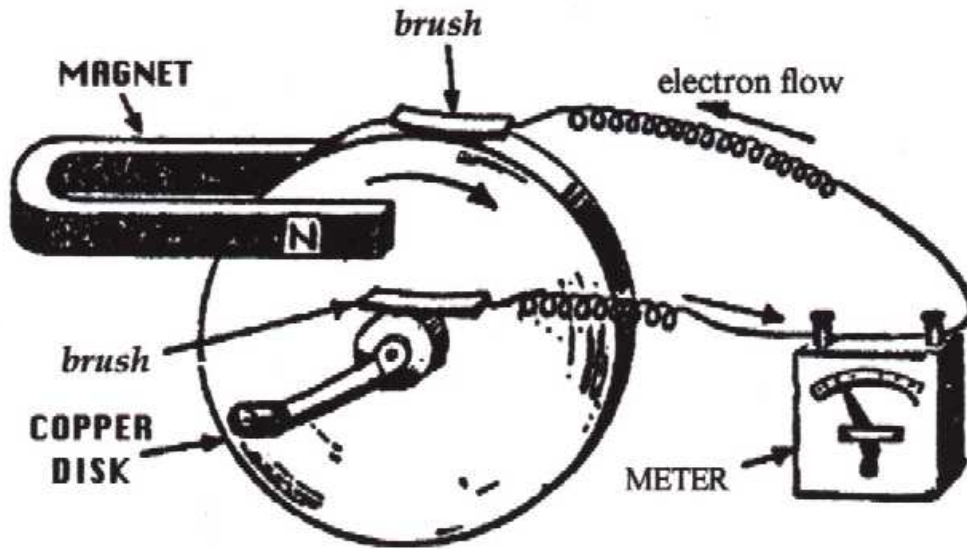
1788 – ADAPTED CENTRIFUGAL GOVERNOR FOR USE ON STEAM ENGINE

JAMES WATT'S WORK WAS INFLUENTIAL IN RADICALLY TRANSFORMING THE WORLD FROM AN AGRICULTURAL SOCIETY INTO AN INDUSTRIAL ONE.

JAMES WATT IS BURIED IN WESTMINSTER ABBEY.

# ELECTRICAL GENERATOR

MICHAEL FARADAY  
1791-1867



*Faraday's disk dynamo* - for producing continuous (pure) dc voltage. This was the world's first electrical generator.