

The Romance of Engines

List of Chapters

Chapter 1 Why Was the Engine Needed?

Water Keeper Christiaan Huygens' Idea
Beginning of the Steam Engine

Chapter 2 A Great Work of the Early Period: Newcomen's Steam Engine

Fundamental Reformation of the Heat Engine
Young Man Potta's Tenacious Spirit

Chapter 3 The Watt Steam Engine Grew from a Model Steam Engine

An Indispensable Problem-Solving Technique
The *White Pigeon*
Watt's Idea for His New Engine Came from the
Newcomen Engine

Chapter 4 How Was an Internal-Combustion Engine Established?

Barrier Against the Birth of the Internal-
Combustion Engine
Who Conceived the Principle of the Four-Stroke
Cycle Engine?
Appendix A4 Compression Ratio and Thermal
Efficiency

Chapter 5 The Mind of Nicolaus August Otto

The Source of Inspiration in Solving a Problem Is
Consciousness
Otto's Dream Surviving in Present Measures on
Exhaust Gas

Chapter 6 Truth About the Completion of the Otto Engine

Have a Support Person
Maybach's Two Distinguished Services

Chapter 7 The Problems of Piston and Cylinder

We Still Have Seizure Problems
Lubricating Oil Consumption and Engine Life
Two Key Factors to Extending Engine Life
Appendix A7 Critical "Diseases" in Engine Life

Chapter 8 Engine Life and Cylinder

Life of Aircraft and Automotive Engines
Invention of Boron Cylinder Liner
Main Factors in Extending Engine Life

Chapter 9 Another Genius, Sadi Carnot

Unrealizable Carnot's Cycle
Carnot's Excellent Idea
Writing Between Military Services
Appendix A9 *Exergie* and *Anergie* in Engine

Chapter 10 Carnot's Dream, Adiabatic Engine (I)

Oil Shock and Enforcement of the Clean Air Act
Idea of Adiabatic Engine
War and Development of Scientific Technology
Basis of Energy Saving
Appendix A10 Heat Loss in Theoretical Cycle and
Recovery of Exhaust Gas Energy

Chapter 11 Carnot's Dream, Adiabatic Engine (II)

Challenge by Isuzu and Hino
Revival of Compound Engine
Appendix A11-1 Founder of Compound Engine
Appendix A11-2 Combustion Phenomenon on
Heat-Insulated Engine
Appendix A11-3 Fruit of Research on Heat-
Insulated Engine

Chapter 12 Otto Is Also a Pioneer in the Use of Exhaust Gas Energy

Historic EHV Engine
Idea Bought by Sugar Company
Idea of Double Expansion
End of the Harrah Museum and Its Miraculous
Revival
Appendix A12 Otto's Double Expansion Engine

Chapter 13 Problem of Cooling (I)

Renovation of Curtiss
What Caused the Prestigious Company to
Decline?

Chapter 14 Talk About Oil Cooler

Control of Combustion
Efficiency Enhancement of Oil Cooler

Chapter 15 Discussion of the Hino Micro Mixing System

Indirect or Direct Fuel Injection?
Diesel Engine Manufacturers Worldwide Were
at a Loss
Search for Mysterious Port
Appendix A15-1 NO_x Emission from Direct
and Indirect Injection Engines
Appendix A15-2 In-Cylinder Air Turbulence
and HMMS
Appendix A15-3 Hypothesis of HMMS
Appendix A15-4 Turbulence Generation
Mechanism in HMMS

Chapter 16 Problem of Cooling (II)

Michelotti's Rejection
Regie Renault Getting Nervous
Design of Engine Compartment

The Romance of Engines

High-Speed Plane Ki-83
Appendix A16 Contessa's Cooling System

Chapter 17 Fate Depended on Engine Compartment

Water-Cooled Rear Engine Car Tucker
Excess Idea Backfired
Tucker Car Likes Old Crow (Kentucky Bourbon)

Chapter 18 An Engine Compartment That Ruined the Third Reich

Appearance of Four-Engine Strategic Bomber
Lessons from Japan and United States
Prototype Planes

Chapter 19 An Engine Compartment That Saved a Nation

Development of Lancaster
Chadwick's Extraordinary Talent

Chapter 20 Twin Beauties, Quadruplets and Their Early Death

Bugatti, the Best Among Beauties
Development of a Parallel Eight-Cylinder Coupled Engine

Chapter 21 Imitation of Porsche

Masterpiece Renault 4CV
Birth of Volkswagen

Chapter 22 Rolls-Royce Copying Daimler

Long Story Deriving from a Stolen Engine
Royce's Decision
Successors of Mercedes

Chapter 23 Talk About Knocking

Knocking Phenomenon
Kettering Permitted the Peeping
Controlling the Knocking
Victory as a Result of Teamwork
Is Knocking Actually Detonation?

Chapter 24 Energy Conservation and Tank Designer

Characteristics of X Car
Problem in F-F Use

Chapter 25 Dead Copy Saved Nation

Really Wonderful Christie Tank
Appearance of the T34 Tank
Difference Between the Russian and Japanese Engineering Staffs

Chapter 26 The Enigma of the T34 Tank

Excellent Soviet Union Engineering Staff
Why Was the Christie Tank Sold?
Christie Had Made a Mistake, but He Did Not Sell His Soul
Appendix A26 B2 (or V2) Diesel Engine for T34 Tank

Chapter 27 Dream in Star-Shaped, Radial Engine (I)

What Is a Star-Shaped Engine (Radial Engine)?
Hino Motors and GM Oppose Each Other with Stars Afloat on Sea
Success of Gnome Engine
Appendix A27-1 The Gnome Engine Was Formed from an Abundance of Ideas
Appendix A27-2 The Origin and Growth of Gasuden's Aeroengines, the Shimpu (KAMIKAZE) and the Tempu (AMAKAZE)

Chapter 28 Dream in Star-Shaped, Radial Engine (II)

Century's Masterpiece Born from a Hungry Spirit
Tragedy of Langley's *Aerodome*
The Root of the "Star" or Radial Engine Was in Australia
More Valve Consumed Than Fuel
Appendix A28 Cooling Problem in the ABC Engine

Chapter 29 A Group of Fallen "Stars" (Radial Engine)

Brief Appearance and Extinction Like a Meteor
People Tracing "Stars" (Radial Engine)
Product Value Increased by Technology Fulfilling the Users' Needs

Chapter 30 Six-Monkey Village or Salmson Still Carrying Its Point

The First and Last Water-Cooled Radial Engine
Canton-Unné Engine
Salmson's Successor
Salmson's Progressive Idea Admired by Benz
Appendix A30-1 Internal Moment of Engine
Appendix A30-2 Canton-Unné System
Appendix A30-3 Similarities Between the Benz Formula Engine and the Salmson Engine

Chapter 31 Do "Stars" (Radial Engines) Twinkle Again?

The Fate of Radial Engines Like a Comet
Trial Manufacture of a Liquid-Cooled Radial Engine in the United States and Germany
Roots of French and American "Stars"
Do the "Stars" Go Out? Future of New American and German "Stars"
Appendix A31 Zoche Aero Diesel Engine

Chapter 32 Glory and Tragedy of Packard (I)

Impact of *Life* Magazine
Achievement of Successive World Records by Packard
Fierce Competition in Improvement
Benz and MAN's Idea
Shortcomings of Diesel Engine
Advantages of Diesel Engine

The Romance of Engines

Chapter 33 Glory and Tragedy of Packard (II)

America Trailing Behind Europe
Packard's Challenge for Lightweight Diesel Engine
Fatal Blow Due to a Wife's Complaint
Disasters Made Further Attack
Essence of Failure
Packard's Concern
Appendix A33-1 Combustion in Packard Diesel Engine
Appendix A33-2 How the Packard Diesel Affixed the Cylinder

Chapter 34 Glory and Tragedy of Packard (III)

Playing Active Role in World War II
Packard's Advanced Technology Fast
Bad Luck Was the Cause
Excessive Quality and Inadequate Quality Control
Appendix A34 Cavitation Pitting of Cylinder Liner Wall

Chapter 35 Voyager and KOKENKI

Voyager Was Conceived on a Paper Napkin
The Essence of Engineering Management
Well-Conceived Design
Admirable Decision to Land Far Before Fuel Shortage
Appendix A35 KOKENKI's Lean Burn

Chapter 36 The Mystique of the Daimler-Benz DB601 Engine (I)

Fateful Confrontation
Beauty with Her Head Changed
The Story of Engine Bearing
Engineering and Company Compose an Integral Body
Appendix A36 Dyna Panhard Engine

Chapter 37 The Mystique of Daimler-Benz DB601 Engine (II)

A Basic Point Is Sometimes a Blind Spot
Testimony Obtained in Europe
Is There Evidence That the Roller Bearings Were Ill-Suited for Use?
Appendix A37 Hino EA 100 Engine

Chapter 38 The Mystique of the Daimler-Benz DB601 Engine (III)

Hitler's Anger
Tracing Troubles in Japan
Major Causes of Trouble
Could the Trouble Be Overcome?
Is the Use of Roller Bearings Appropriate?
Appendix A38-1 Alfa Romeo P2 Engine
Appendix A38-2 DB601 Engine
Appendix A38-3 Supplement to Failure Analysis of Crankshaft Bearing of DB601 Engine

Insufficient Heat Treatment of Crankshaft
Historical Process of Change to Shell Bearing
Evaluation of Bearing Design
Leap of Technology
Accuracy of Roller Bearing

Chapter 39 Looking Into the Future: I. What About Stirling Engine?

Revival of Stirling Engine
Faded Charm
Appendix A39-1 Fuel Consumption of Stirling Engine
Appendix A39-2 Noise Emission From a Truck

Chapter 40 Looking Into the Future: II. What About the Gas Turbine?

The Hope for Gas Turbine
Gas Turbine Sleeping in Museum
Why Did Ford Discontinue Its Project?
Expecting a Breakthrough for Practical Application
Appendix A40 Gas Turbine Jointly Developed by Toyota and Hino

Chapter 41 Looking Into the Future: III. What About Hydrogen Engine?

Development of Hydrogen Engine
Appendix A41 Hydrogen Diesel Engine

Chapter 42 Looking Into the Future: IV. What About Hybrid Engine?

Is It a Combination Engine or a Miscegenation of Engines?
HIMR Begins Running
Inverter Most Difficult to Develop
Hybrid System in the Future

Chapter 43 Onward to the Future

Comparison of Major Engines at Present and Alternative Engines (Powerplants)
Trade-Off Among Nitrogen Oxide and Other Emissions
Result of the ACE Research on Combustion; Unique Mode of Combustion
Why Was Diesel Selected as the Basis of Research?
Progress of Engine-Related Technologies
Catalyst and Catalytic Engine
Scientific Technology That Is Harmonious with Nature
Appendix A43-1 Diesel Combustion with High-Pressure Fuel Injection
Appendix A43-2 Catalytic Engine

Epilogue

References

Index