

## SMITHSONIAN \*\*



# TRAIN





## 



THE DEFINITIVE





#### **DORLING KINDERSLEY**

Senior Editors Sam Atkinson, Jemima Dunne, Kathryn Hennessy Senior Art Editor Sharon Spencer Project Art Editor Amy Child Editors Suhel Ahmed, Rod Green, Alison Sturgeon, Miezen van Zyl

Editorial Assistance Alexandra Beeden

Design Assistance Alex Lloyd Photographer Gary Ombler Picture Research Nic Dean

DK Picture Library Claire Bowers, Claire Cordier, Romaine Werblow

Jacket Designers Amy Child, Mark Cavanagh
Jacket Editor Maud Whitney

Jacket Design Development Manager Sophia MTT
Producer, Pre-Production Nikoleta Parasaki

**Producer** Linda Dare Managing Editor Esther Ripley Managing Art Editor Karen Self Publisher Sarah Larter Art Director Phil Ormerod

Associate Publishing Director Liz Wheeler Publishing Director Jonathan Metcalf

#### DK INDIA

Managing Editors Pakshalika Jayaprakash, Rohan Sinha Managing Art Editors Arunesh Talapatra, Sudakshina Basu

Senior Editor Anita Kahar Senior Art Editors Chhaya Sajwan, Mahua Sharma Project Editor Antara Moitra

Project Art Editor Vaibhav Rastogi Editor Vibha Malhotra

Art Editors Namita, Supriya Mahajan, Divya PR, Devan Das Assistant Art Editors Roshni Kapur, Vansh Kohli, Riti Sodhi

Production Manager Pankaj Sharma Pre-production Manager Balwant Singh Senior DTP Designers Sachin Singh, Jagtar Singh DTP Designers Nand Kishor Acharya, Bimlesh Tiwary Picture Researcher Aditya Katyal Picture Research Manager Taiyaba Khatoon

**General Consultant** Tony Streeter **Contributors** Julian Holland, Keith Fender Gary Boyd-Hope, Jonathan Randle Falconer, Peter Herring, Keith Langston, Ashwani Lohani, Malcolm McKay, David Wilcock



#### Smithsonian

Established in 1846, the Smithsonian—the world's largest museum and research complex—includes 19 museums and galleries and the National Zoological Park. The total number of artifacts, works of art, and specimens in the Smithsonian's collection is estimated at 156 million. The Smithsonian is a renowned research center, dedicated to public education; national service; and scholarship in the arts, sciences, and history.

Smithsonian Curator L. Susan Tolbert, Deputy Chair and Curator, Work and Industry Division, National Museum of American History, Kenneth E. Behring Center, Smithsonian Institution

Smithsonian Enterprises
Product Development Manager, Licensing Kealy Wilson
Licensing Manager Ellen Nanney
Vice President, Education and Consumer Products Brigid Ferraro Senior Vice President, Education and Consumer Products Carol LeBland

First American Edition, 2014

Published in the United States by DK Publishing, 1450 Broadway, Suite 801, New York, NY 10018

Copyright © 2014 Dorling Kindersley Limited DK, a Division of Penguin Random House LLC 22 23 24 25 14 13 12 029–269868–Sept/2014

All rights reserved.

Without limiting the rights under the copyright reserved above, no part of this publication may be reproduced, stored in or introduced into a retrieval system, or transmitted, in any lorm, or by any means (electronic, mechanical, photocopying, recording, or otherwise), without the prior written permission of the copyright owner

Published in Great Britain by Dorling Kindersley Limited

A catalog record for this book is available from the Library of Congress.

ISBN 978-1-4654-2229-3

premiums, fund-raising, or educational use. For details, contact: DK Publishing Special Markets, 1450 Broadway, Suite 801, New York, NY 10018 or SpecialSales@dk.com.

#### For the curious www.dk.com



in DK's commitment to a sustainable future www.dk.com/our-green-pledge

## Contents

Introduction: The Rail Revolution

8

#### 1804-1838: THE IRON HORSE

The invention of the steam-powered locomotive led to the development of the first passenger railroad in Britain. This new mode of transportation spread to other countries, with Rocket setting the benchmark for future locomotives.

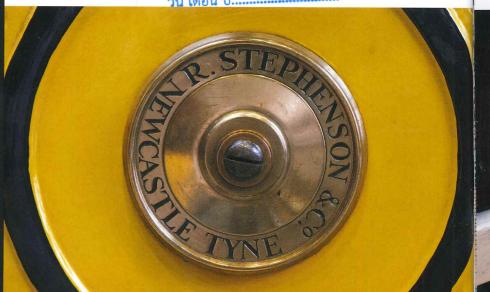
Pioneer: Richard Trevithick	14
A British Invention	16
Profile: Rocket	18
The Liverpool & Manchester Railway	22
Steam for Home and Export	24
Pioneers: The Stephensons	26
World Pioneers	28
Railroad Expansion	30

#### 1839-1869: BUILDING NATIONS

New tracks were laid across Europe, the US, and India. Meanwhile, engineers made further innovations to all aspects of rail travel, increasing its speed and efficiency. Mass transit began with the London Underground.

The US Forges Ahead	625.1	36
Profile: Thatcher Perkins	T768	38
Building Great Railroads: Union Pacific	2014	42
Britain Advances		44

เลขหมู่..... 1 3 W.U. 2500



Euro Progress	46
Pioneer: Isambard Kingdom Brunel	48
The GWR's Broad Gauge	50
Mass Movers	52
Building the Tube	54
Nations and Colonies	56

### 1870-1894: A WORLD OF STEAM

The rapid growth of the railroads defined the power of human endeavor. Tracks negotiated every terrain and all kinds of obstacles, covering vast distances and making rail travel across continents possible. The glamour of rail travel was epitomized by grand stations and luxury services.

19th-Century Racers	62
London Locals	64
End of the Great Western Broad Gauge	66
Profile: C&PA Snow Plow	68
Delivering to America	72
Building Great Railroads: Canadian Pacific	74
Specialty Steam	76
Profile: Merddin Emrys	78
Shrinking the World	82
Profile: DHR B Class No.19	84
The First Electric Passenger Train	90

#### 1895-1913: GOLDEN AGE

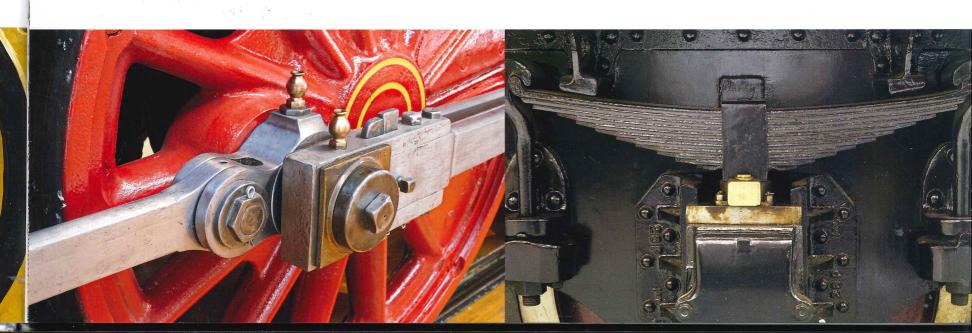
Electric-powered railroads rose to prominence in North America and Europe, while new innovations increased the efficiency of steam. Emulating London, Paris and New York introduced their own underground systems.

Express Steam for the UK	96
British Evolution	98
Profile: GWR Auto Trailer No. 92	100
Continental Glamour	104
Pioneer: Fulgence Bienvenüe	106
Profile: H&BT Caboose No.16	108
Rapid Development	112
Profile: VGN Class SA No.4	114
The New York Elevated Railway	119
On Other Gauges	121
Building Great Railroads: Trans-Siberian Railway	122
Competition From the New Electrics	124

#### 1914-1939: STEAM'S ZENITH

During World War I, locomotives were key in the transport of soldiers and munitions. After hostilities ended, steam trains became faster and streamlined, and diesel trains were rolled out for the first time in the US and Europe.

Locomotives for World War I	130	
War Machines		132



Fast and Powerful	134
Profile: King Edward II	136
Great Journeys: Orient Express	140
Mixed-Traffic Movers	142
Versatile Engines	144
Freight Shifters	146
Pioneer: Sir Herbert Nigel Gresley	148
Streamlined Steam Around Europe	150
Profile: Mallard	152
The Age of Speed and Style	156
Diesel and Electric Streamliners	158
Practical Diesels and Electrics	160
Profile: Reading MU No. 800	162

Britain Makes the Change	186
Profile: Deltic Prototype	188
Europe Follows the US	192
Great Journeys: The Blue Train	194
Electric Charge	196
Postwar Steam	198
Profile: N&W J Class No. 611	200
World Steam's Last Stand	204
Profile: Class WP No.7161	206
Europe's Last Steam	210
Profile: Beyer-Garratt No.138	212
Moving People and Goods	216

#### 1940-1959: WAR AND PEACE

The destruction of many European rail lines during World War II and the redrawing of national borders at the end of the conflict forced many governments to overhaul their rail systems. Technological advances saw diesel and electric power take over from steam.

World War II Logistics	170
Profile: DR No. 52.8184-5	172
Wartime Service	176
The US Moves into Diesel	178
Postwar US	180
Profile: N&W GP9 Class No. 521	182

#### 1960-1979: BUILT FOR SPEED

The Japanese "bullet" train heralded a new age of high-speed rail travel, inspiring Western countries to innovation on their own railroads. Increasing competition from road and air led to further modernization.

Freight and Passenger Accelerates	222
Profile: Modified DR V100	224
High-speed Pioneers	228
The Bullet Train	230
Profile: DR No.18.201	232
Technology in Transition	236
Great Journeys: Indian Pacific	238
Traveling in Style	240



#### 1980-1999: CHANGING TRACKS

New technology focused on developing high-speed networks throughout the world, but the period also saw the introduction of luxury trains. The Channel Tunnel opened, linking Britain to mainland Europe.

High Speed Goes Global	246
Building Great Railroads: Eurostar	248
Diesel's Next Generation	250
A New Wave of Electrics	252
Profile: Palace on Wheels	254
Urban Rail Solutions	260

#### AFTER 2000: RAIL REVIVAL

The new millennium has seen China become a major proponent of rail travel, building tracks at an unprecedented rate and introducing new trains, including the ultrafast Maglev. On a global level, rail travel offered a more glamorous and luxurious alternative to the jetliner.

Universal Applications	266
Historic Railways	268
Profile: Clan Line & Belmond British Pullman	270
High Speed—The New Generation	278
Spectacular Stations	280
Faster and Faster	282

Profile: Javelin No. 395 017	284
Dubai Metro	290
Into the Future	292

### HOW RAILWAYS WORK: ENGINES AND TRACKS

This chapter offers an overview of basic rail technology, from how rails and locomotive wheels are designed, to signaling systems past and present. The engineering principles behind steam, diesel, and electric locomotives are explained.

How Tracks Work	296
How Wheels Work	297
How Signals Work	298
Radstock North Signal Tower	300
How Steam Locomotives Work	302
How Diesel Locomotives Work	304
How Electric Locomotives Work	306
GLOSSARY	308
INDEX/ACKNOWLEDGMENTS	312

