[My personal highlights of]

FREEDOM’S FORGE

How American Business Produced Victory in World War II

ARTHUR Herman

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PERSONS IN THIS BOOK

[Sorted on last names.]

**Eddie Allen**  
Boeing's test pilot. The most famous test pilot in America. Killed while testing a prototype of the B-29.

**Stewart Alsop**  
Columnist of the *New York Herald Tribune*.

**Katherine Archibald**  
A liberal sociologist who went to work in the Moore Dry Dock in Oakland.

**Henry "Hap" Arnold**  
An American general officer holding the grades of General of the Army and later General of the Air Force An iconoclastic Washington, D.C. lawyer. He was best known for his trust-busting campaign as Assistant Attorney General in charge of the Antitrust Division with FDR.

**Thurman Arnold**  
An iconoclastic Washington, D.C. lawyer. He was best known for his trust-busting campaign as Assistant Attorney General in charge of the Antitrust Division with FDR.

**George Babbitt**  
George F. Babbitt is the main character in Sinclair Lewis's novel named *Babbitt*.

**Michael Barone**  
A historian.

**Bernard Baruch**  
A wealthy financier and longtime Democratic fund-raiser. Roosevelt’s point man with Wall street and big business. An American financier, stock investor, philanthropist, statesman, and political consultant. After success in business, he devoted his time toward advising U.S. Presidents Woodrow Wilson and FDR on economic matters and became a philanthropist.

**William "Bill" Batt**  
Was OPM's deputy chief of industrial materials. Later vice chairman of WPB.

**Albert Bauer**  
Assistant general manager found says to push through the preassembly production per ship-building worker in every department. Finished the *Joseph Teal* ship in just ten days.

**Wellwood Beall**  
Boss of the Air Corps engineers in 1941.

**Lord Beaverbrook**  
British air minister. Announced the Merlin as proof that America and Ford were standing behind Britain before our direct involvement in the war, which caused Henry Ford to explode with fury.

**Steve Bechtel**  
Helped to finance the building of Hoover Dam and later became Henry Kaiser’s partner.

**Warren Bechtel**  
A Kansas farmer’s son.

**Clay Bedford**  
Fresh from engineering school, his father worked for Kaiser in California. Kaiser put him in charge of highway building in Cuba. Later Kaiser commissioned him to build a ship-building yard in Richmond, California.

**Tim Bedford**  
Clay Bedford’s brother.

**Norman Bel Geddes**  
The designer who had built GM's Futurama for the 1939 World’s Fair. Later hired by Kaiser to create pre-fab houses after the war.
Leo Churne  An economist who forecasted another depression after the war.

Harry Bennett  Labor relations head of Ford. Later helped to start operations at Willow Run. President of Libby-Owens Glass. One of the most principled men that Knudsen knew, and an FDR favorite. Knudsen made him his personal deputy. Later he was moved to London by FDR.

John D. Biggers  Cracked the champagne bottle on the prow of Joseph Teal.

Anna Boettiger  Cracked the champagne bottle on the prow of Joseph Teal.

Humphrey Bogart  Famous movie star actor in that period. Mentioned only once in the book.

Mead Bricker  Took over the Willow Run plant upon Roscoe Smith's departure.

Ralph Budd  Of the Chicago Burlington Railroad.

William Bullitt  Ambassador to Russia in 1939.


James Byrnes  Supreme Court judge. FDR's friend. Near the end of the war, he had so many sweeping powers that some called him the Assistant President.

Jimmy Byrnes  Husband of Maude Byrnes.

Maude Byrnes  Swung the champagne bottle on Hull No. 440, the Robert E. Peary, which was built in 4 days, 15 hours, and 26 minutes.

Chad Calhoun  Kaiser's lawyer when arrangements for building a steel mill in California were made.

Carlson  A fellow Norwegian friend of Harry Hansen who taught Knudsen boxing.

Bruce Catton  Editor of American Heritage magazine.

Albert Champion  Founder of the Champion spark plugs company.

Leo Cherne  After war economist who forecast doom on the economy.

Louis Chevrolet  A Swiss immigrant who loved to build and race cars and founded the Chevrolet company.

Corporal Kenneth Christner  Witness and rescuer of the B-29's crash into the Frye Packing Plant on Airport Way, Wichita, KS.

Walter Chrysler  Originally an employee of GM but later walked out with a bang.

Winston Churchill  Prime minister of Great Britain.

Augusta Clawson  New York writer.

Bill Collins  Knudsen's secretary.

George Comstock  Frank Hobb's partner.

Alistair Cooke  A British visitor and radio commentator.

Calvin Coolidge  30th U.S. President (Rep) - 1923-1929. The 'roaring twenties.'
Tommy Corcoran  Kaiser’s lobbyist in Washington.
James Couzens  A partner of Henry Ford.
Colonel Carl Cover  Knudsen’s choice to take over the plane plant in Marietta.
William Cox  Ship designer and business partner of William Gibbs. Designed the ship that Henry Kaiser and his team would make famous.
Frank Crowe  Said to be the best engineer in the business. Designed not only the Hoover Dam, but Shasta Dam as well.
Joseph Crowe  Son of Hoover Dam’s designer Frank Crowe. Helped with the Wake Island military projects.
Carlo D’Este’s  His father worked the graveyard shift in the Richmond ship-building yards. 1452-1519. An Italian Renaissance polymath: painter, sculptor, architect, musician, mathematician, engineer, inventor, anatomist, geologist, cartographer, botanist, and writer.
Leonardo da Vinci  A wealthy aviation fan who gave Douglas Aircraft its first $40,000 to build a plant and a plan to fly across the country.
Sam Davis  Another witness and rescuer of the B-29’s crash in Wichita, KS.
Chester Davis  Of the Federal Reserve Board.
James Devereux  A Marine major of 500 that assisted in the Wake airfield construction.
Tom Di Lorenzo  The UAW boss at Brewster Aviation in Long Island.
Bud Doerfner  An engineer who designed a drill press used to help improve gun production by a factor of over ten times.
Karl Dönitz  A German commander-in-chief whose son, Karl, was killed in a submarine by a B-24 American bomber. He thus decided to call off such attacks.
Peter Dönitz  The younger son of Germany’s commander-in-chief who was killed in a submarine by a P-24 American bomber.
Jimmy Doolittle  General/Doctor James Harold “Jimmy” Doolittle, USAF was an American aviation pioneer. Doolittle served as an officer in the United States Army Air Forces during the Second World War.
Norma Jean Dougherty  Barely 17, her husband was in the Merchant Marines. Captain Ronald Reagan spotted her and asked her to pose for some pictures. She later changed her name to Marilyn Monroe.
Donald Douglas  Aviation executive.
Herbert Dow  Founder of Dow Chemicals.
May Doyle  A 19-year-old phone operator in a dentist’s office who Norman Rockwell based his Rosie.
James Dunlop  An engineer from Westinghouse.
Mr. Dunn
Showed "his ladies" at Willow Run how to adjust the amperage and voltage of welding machines.

Billy Durant
Founded General Motors.

Colonel Oliver Echols
Of Material Command.

Charles Edison
Navy secretary.

Thomas Edison
"The white-haired deaf old man who invented the electric lightbulb and the phonograph." But also a master of photography.

Claire Egtvedt
A long, spare Scandinavian who dreamed of creating a majestic plane that would sweep the skies and rain bombs on enemy targets—a true dreadnought of the air.

Albert Einstein
A German-born theoretical physicist who developed the general theory of relativity, one of the two pillars of modern physics.

General Dwight Eisenhower
Named Supreme Commander of Allied Forces in Europe in 1943.

Harriett Elliott
Dean of women from the University of North Carolina, the "advisor on consumer problems."

Carl Emde
An understudy of Flanders.

Clara Elizabeth Euler
Knudsen’s bride in 1911. Of German descent.

Mordecai Ezekiel
A mutual friend of Calhoun who liked Kaiser’s aircraft carrier plans, so scheduled an appointment for FDR to be briefed on them.

Walther Flanders
A veteran machinist who had dropped out of grade school and gone to work at Sinter Sewing Machine.

Reuben Fleet
One of the great aviation pioneers, founder of Consolidated Aircraft.

Edward Foley Jr.
General counsel for the Treasury Department

Frank Folsom
From Montgomery Ward, helped Donald Nelson in war efforts.

Benson Ford
Son of Edsel Ford, grandson of Henry Ford.

Edsel Ford
Son of Henry Ford.

Henry Ford
Awarded the biggest order of parts ever for the Keim’s company that Knudsen was virtually running by that time of 1904.

Henry Ford II
Son of Edsel Ford, grandson of Henry Ford.

Dillon Forrester
An investment banker for Dillon, Read.

Harlan Fowler
The aviation engineer who developed the Fowler flaps.

Jack Fox
North American field rep.

Waldo Frank
An economist.

Felix Frankfurter
Frankfurter was born in Vienna and immigrated to New York at the age of 12.

Joe Friedman
Kaiser’s cost accountant.
Norman Gel Geddes | An American theatrical and industrial designer who focused on aerodynamics.

William Francis Gibbs | The reigning king of American ship design and co-founder of Gibbs and Cox, the biggest naval architecture firm in America.

Max Gilman | Packard’s president in 1941.

Norman Gindrat | Designed modular deckhouses for Kaiser’s ships.

Tom Girdler | Of Republic Steel. Defied the New Deal. Henry Kaiser’s friend who later became president of Consolidated Aircraft making bombers and flying boats.

Paul Joseph Goebbels | A German politician and Reich Minister of Propaganda in Nazi Germany from 1933 to 1945.

Hermann Wilhelm Goering | Also spelled “Göring.” A German politician, military leader, and leading member of the Nazi Party. A veteran of World War I as an ace fighter pilot.

Bud Goodman | Quit college when father died and took job at Fisher as a metal finisher. Only 37 when he took over the Fisher Tank Arsenal building Sherman tanks.

Dick Grant | Knudsen’s sales manager in 1924.

Katie Grant | Worked the graveyard shift for 2 years in the Richmond yards.

John Green | Of the CIO’s Industrial Union of Marine and Shipbuilding Workers.

General Leslie Groves | From the Army Corps of Engineers.

Roy Grumman | Hired whites and blacks without discrimination.

Irving "Pappy" Gunn | An engineer working with Jack Fox to transform the B-25 into a low-flying strafing machine.

Edwin W. Hannay | A famed West Coast shipyard manager and troubleshooter. Came out of retirement to help Kaiser build ships in Richmond.

Harry Hansen | Ran the boarding house that Knudsen stayed at in 1900.

Major Charles Hansen | The first pilot to encounter air conflict with a B-29. One Jap fighter was shot down--the plane was ready for battle.

Dr. Fritz Hansgirg | An odd little Austrian scientist. Was supposed to help Henry Kaiser learn the secrets of magnesium but turned out to be a "cantankerous, unreliable character contemptuous of American business methods and ties to the Nazi government.

Warren G. Harding | 29th U.S. President (Rep) - 1921-1923. Died while in office.

Jake Harmon | General Kenneth Wolfe's assistant and a test pilot. The first to fly a B-29 prototype after Eddie Allen was killed testing one.

Richard Harrington | Of the family that made machine tools for turning artillery shells and tank turrets.
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<th>Name</th>
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<td>Russell Harrington</td>
<td>Of the family that made machine tools for turning artillery shells and tank turrets.</td>
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<tr>
<td>Ma Harrington</td>
<td>Of the family that made machine tools for turning artillery shells and tank turrets.</td>
</tr>
<tr>
<td>Pa Harrington</td>
<td>Of the family that made machine tools for turning artillery shells and tank turrets.</td>
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<td>Bill Harrison</td>
<td>Head of construction from American Telephone and Telegraph, whose president had been the first to push for a National Defense Advisory Commission.</td>
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<tr>
<td>J. P. Hartley</td>
<td>Director of the National Association of Manufacturers.</td>
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<td>George Havas</td>
<td>The guy Kaiser called when he needed him to build a steel mill.</td>
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<tr>
<td>Leon Henderson</td>
<td>From the Security Exchange Commission. Head of the Office of Price Administration and Civilian Supply. The man put in charge of closing down unnecessary civilian production. His favorite target was the auto industry. The founder and owner of Higgins Industries, the New Orleans-based manufacturer of “Higgins boats” during World War II.</td>
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<tr>
<td>Andrew Jackson Higgins</td>
<td>Andrew Jackson Higgin’s youngest son and a lieutenant in the U.S. Engineers Amphibian Corps.</td>
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<td>Roland Higgins</td>
<td>President of the Amalgamated Clothing Workers. An FDR appointee to head the political base of the Office of Production Management. A supporter of Knudsen.</td>
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<tr>
<td>Sidney Hillman</td>
<td>American trumpeter and bandleader. He is best remembered for his million selling recordings of “Java” and the accompanying album Honey in the Horn, and for the theme song to The Green Hornet.</td>
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<tr>
<td>Al Hirt</td>
<td>Legal counsel to Senator Gerald Nye.</td>
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<tr>
<td>Alger Hiss</td>
<td>Adolf Hitler was an Austrian-born German politician and the leader of the Nazi Party. He was chancellor of Germany from 1933 to 1945 and dictator of Nazi Germany from 1934 to 1945. Grew up in California before moving to Portland, Oregon to open a Firestone tire dealership. Later launched his own company that eventually produced a substance called Colotype.</td>
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<tr>
<td>Adolf Hitler</td>
<td>31st U.S. President (Rep) - 1929-1933. The depression started with Hoover.</td>
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<tr>
<td>Frank Hobbs</td>
<td>31st U.S. President (Rep) - 1929-1933. The depression started with Hoover.</td>
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<td>Herbert Hoover</td>
<td>Secretary of State.</td>
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<td>Harry Hopkins</td>
<td>White House aide and FDR’s most trusted advisor.</td>
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<tr>
<td>Geraldine Huff</td>
<td>The woman whose picture J. Howard Miller tried to make famous, but it didn’t work out.</td>
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<tr>
<td>Howard Hughes</td>
<td>A well-known private aviator and head of Hughes Tool Company.</td>
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<tr>
<td>Cordell Hull</td>
<td>Chrysler’s chief engineer.</td>
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<tr>
<td>Ed Hunt</td>
<td>Chrysler’s chief engineer.</td>
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Eddie Hunt Assisted in experimenting how armored tanks could be made by auto manufacturers.

Frazier Hunt Respected news commentator for CBS.

Harold Ickes Secretary of the Interior. A true believer in FDR’s New Deal. Wanted only unemployeed to be hired at the dam, and wanted the dam workers to be unionized.

Eliot Janeway Another columnist who realized that a war would be too big to be organized by one person.

Bill Jeffers Former Union Pacific president.


Hiram Johnson A U.S. Senator.

Philip Johnson Boeing's president during the development of the B-29.

Jesse Jones A Hoover appointee. Waged a one-man guerilla campaign against the administration’s strident New Dealers since they took office.

Albert Kahn Another poor immigrant with a positive genius for industrial architecture. Revealed his gift working for Packard in 1907, then later helped to design and erect more than one thousand plants for Ford. At the beginning of WW II, he designed a facility where Chrysler could make tanks.

Felix Kahn A shrewd, urbane German and brother of Albert Kahn.

Julius Kahn Made a fortune constructing city landmarks and other projects. Put up $1 million for the Hoover Dam project.

Ale Kaiser Henry Kaiser's 2nd wife.

Bess Fosburgh Kaiser Henry Kaiser's bride in 1907.

Edgar Fosburgh Kaiser Son of Henry Kaiser.


Henry Kaiser The other of the two figures that this story is built around.

Chiang Kai-shek Builder of the Hoover Dam, the Grand Coulee Dam (the biggest concrete structure in the world), President of China.

Ernest Kanzler A former Ford executive and a lawyer. Named by Don Nelson to be the overseer of the conversion of the auto industry to switch from making cars to building war machines.

John R. Keim A Buffalo, NY jeweler who bought a bicycle factory that Knudsen worked at after helping to build locomotives for a while. The factory soon changed to building machine parts.

K. T. Keller Executive at Chrysler. Respected Knudsen immensely and was happy to agree to make tanks in addition to cars.

Joe Kennedy U.S. Ambassador to Britain at that time.
General George Kenney  General MacArthur’s air chief and commander of the Fifth Air Force.

John Maynard Keynes  A British economist whose ideas have profoundly affected the theory and practice of modern macroeconomics, and informed the economic policies of governments.

Admiral Ernest King  Stationed in Washington D.C., said no to Henry Kaiser’s proposal to build an aircraft carrier.

Lieutenant John Kinney  Dropped the bomb that sunk the Japanese ship *Kisaragi* during the first Japanese attack on Wake Island.

Frank Kluckhohn  A New York Times reporter.

Frank Knox  The secretary of the Navy.

Martha Knudsen  The daughter of William Knudsen.

Morris Knudsen  No relation to GM’s Knudsen. Helped to finance the building of Hoover Dam.

William "Bill" Signius Knudsen  One of two featured figures of this book. Immigrated from Denmark in 1900 at age 20. Worked on a dock yard, locomotive plant, bicycle turned to machine parts plant, Ford, later saved GM, then spearheaded America’s reararmament of World War II. A lifelong Republican.

Patricia Cain Koehler  A local employee of the Portland shipbuilding plant

Hank Krueger  One of American industry’s legendary toolmakers.

Isaac "Mac" Laddon  Designer of the B-24 bomber.

Veronica Lake  An American film actress.

Admiral Jerry Land  Knudsen’s point man on shipbuilding. Chairman of the United States Maritime Commission. Supervised the building-up of America’s merchant shipping fleet.

Henry M. Leland  Former owner of Cadillac of Detroit.

R. G. LeTourneau  A prolific inventor of earthmoving machinery. His machines represented nearly 70 percent of the earthmoving equipment and Engineering vehicles used during World War II, and he was responsible for nearly 300 patents.

A Major General with an engineering degree from Ohio State and a reputation as the mastermind of daylight bombing in Europe. Later assigned to Guam.

General Curtis LeMay  The fiery leader of the United Mine Workers.

John L. Lewis  An American novelist, short-story writer, and playwright. In 1930, he became the first writer from the United States to be awarded the Nobel Prize in Literature.

Sinclair Lewis  A key figure in the opposition to getting entangled in Europe.

Charles Lindbergh  Dean of the American columnists when FDR was running for 3rd term.

Walter Lippmann  The widow of James Longstreet, Confederate General. They married when he was 76 and she was 34. She started work for Bell Aircraft at age 80, and was there every day. A real morale booster for the employees.

Helen Dortch Longstreet  A local employee of the Portland shipbuilding plant
Vera Lowe  *Life* magazine made her famous, her hair in a kerchief and a riveting gun in her hand, as Rosie the Riveter.

Henry Luce  A writer for *Time* magazine who idolized Henry Kaiser, but wondered if his magnesium plant idea was a failure.

Melvin J. Maas  U.S. Representative for Minnesota.

Douglas MacArthur  General of the Army. An American general and field marshal of the Philippine Army who was Chief of Staff of the United States Army.

Alvan Macauley  Chairman of Packard Motor Car Company.

Alan MacDonald  A partner of Felix Kahn.

George Catlett Marshall  General. Army Chief of Staff in 1939.

Glenn Martin  Founder of Martin Aircraft.

Peter Martin  An understudy of Flanders. Became production chief of Ford.

Stacy May  The man who was able to figure out the statistics required to make it all work, OPM’s [Office of Production Management] numbers man.

John McCone  A steel engineer that Steve Bechtel since college days at Berkeley.

O. H. McCoon  Bedford’s top foreman.

Colonel McCormick  A rival publisher of Merrill Meigs.

J. M. McFarland  Superintendent of Yard No. 2 at the Richmond shipbuilding yards. He agreed that they could build a ship in just 5 days.

James C. McGowan  Owner of McGowan Brothers Hardware in Spokane, WA where Kaiser decided to concentrate on getting his first job in the west.

Sir William McKenzie  A Vancouver banker and director of the Canadian Bank of Commerce. Lent Kaiser $25,000 to fulfill his first road-building contract.

William McKinley  25th U.S. President (Rep)


Dr. George Mead  One of the most respected figures in American aviation. Co-founder of Pratt and Whitney. Became too ill to continue at the start of the war. Probably the best-known American aviator after Lindbergh.

James Mead  U.S. Senator from New York. Predicted massive unemployment and inflation in the war’s aftermath.

Merrill “Babe” Meigs  Chicago newspaper publisher picked to head aircraft production. Meigs taught then Senator Harry S. Truman how to fly.

General Erhard Milch  A German field marshal who oversaw the development of the Luftwaffe as part of the re-armament of Germany.
J. Howard Miller  An artist during the war that thought he had found a “Rosie the Riveter” photo, but it wasn’t nearly as possible.
Logan Miller  One of Mead Bricker’s staff at Willow Run.
Jean Monnet  Head of the French purchasing board (later architect of the Common Market).
Charlie Moore  Manager of Joshua Hendy Iron Works of which Kaiser was part owner.
Henry Morgenthau  U.S. Treasury Secretary in 1939.
Ann Morrison  Wife of Harry Morrison. Present on Wake Island as the war began.
Harry Morrison  Morris Knudsen’s partner. Also agreed to help finance Hoover Dam. Later helped to build an airfield on Wake Island.
Philip Murray  CIO chief.
Benito Mussolini  Benito Amilcare Andrea Mussolini. An Italian politician and leader of the National Fascist Party, ruled Italy from 1922 to his ousting in 1943.
William Nash  Another one who originally worked for GM but later started a company that was its direct competitor.
Donald T. Nelson  The former president of Sears Roebuck who later became deputy for Edward Stettinius. Developed the "Rocket Gun” that could make possible one-thousand welds per hour instead of the previous 40.
Ted Nelson  Aviation executive.
Gerald Nye  A former federal judge and general counsel for OPM.
John Lord O’Brian  Purchasing agent in 1922 for Chevrolet parts department.
Donald O’Keefe  Ran the Reo Motor Company in Lansing, MI.
Ransom E. Olds  The first man that Kaiser hired when he started his road-building company in 1914. Worked with Kaiser for 40 years. Helped rush Edgar to a hospital when his foot was crushed, then stopped doctors from amputating until Henry Kaiser could see it.
Alonzo “Ord” Ordway  Lead actor in a movie called The Man from Frisco based on Kaiser’s career.
Michael O’Shea  An engineer specializing in oil refinery designs.
Robert Patterson  Undersecretary
George Patton  Brigadier General Commander of Army’s Second Armored Brigade in 1939.
Drew Pearson  A Washington columnist who called Kaiser the nation’s shipbuilding ace.
Frances Perkins  The U.S. Secretary of Labor from 1933 to 1945, and the first woman appointed to the U.S. Cabinet.

John J. Pershing  A general officer in the United States Army who led the American Expeditionary Forces in World War I.

Key Pittman  Nevada senator. Joined with Roosevelt in 1939 to modify the Neutrality Act.

Captain Wesley Platt  With his 90 marines on Wilkes Island and outnumbered by the Japs 5-to-1, they charged the Japs with fixed bayonets. Caught by surprise, the Japs fled.

Pop  Grabbed a bag of grenades, waded into the surf, and tossed them one-by-one into Japanese landing craft on Wake Island.

John Pratt  Another GM executive that was called to Washington for service on Roosevelt’s ill-fated War Resources Board.

Tom Price  Hand and Canal Zone helper. Built the steel mill in Southern California.

Arthur Purvis  British purchase agent.

Major Donald Putt  Head of Material Command's experimental engineering division.

Ronald Reagan  Although he eventually became the 40th president of the United States, here in this book he was just a lowly Army captain who asked a woman parachute stuffer in 1943 if she would pose for some pictures. Her name was then Norma Jean Dougherty. She later dyed her hair blonde and took on a new name: Marilyn Monroe.

Jack Reese  President of a nearly defunct automotive company. Agreed to make tank engines for the Chrysler tanks.

Todd Reilly  Former head of Todd’s yards in Seattle where ships were made. Teamed up with Knudsen.

Joaquin “Joe” Reis  Started as a timekeeper in Vancouver and went on to become one of Kaiser’s key men in shipbuilding during WW II.

Fred Rentshler  Pratt & Whitney founder. Was unprecedentedly banned from doing business in this country for 5 years, so he moved to Canada to operate the airline that would become Air Canada.

Walter Reuther  An American labor union leader, who made the United Automobile Workers a major force not only in the auto industry but also in the Democratic Party in the mid 20th century.

Fred Riebel  President of Brewster Aviation. He was Brewster’s fifth president in 16 months.

Eleanor Roosevelt  FDR’s wife, the first-lady.

Paul Samuelson  A professor who warned that another Great Depression was coming after the war.
Franklin D. Roosevelt 32nd U.S. President (Dem). Served most of 4 terms from 1933-1945.

Theodore Roosevelt 26th U.S. President (Rep). Governor of New York in 1900.

George Schairer Aerodynamics expert who helped design the turrets on the B-29.

George Sharp A design agent commissioned to do the preliminary drawings of Kaiser’s first ever aircraft carrier.

Charlie Shea Present at the FDR ribbon-cutting ceremony for the Hoover Dam.

Anne Shirley Lead actress in a movie called The Man from Frisco based on Kaiser’s career.

Alfred P. Sloan The new executive VP of GM when Knudsen quit Ford to go to work at GM.

Adam Smith Adam Smith was a Scottish moral philosopher and a pioneer of political economy.

Bill Smith Owner and founder of A. O. Smith Corporation, welding experts.

Edward “Pinky” Smith A Colonel. General LeMay’s adjutant on Tinian.

Roscoe Smith Sorenson appointee to head the new Willow Run B-24 bomber facility near Detroit, MI. However, there was a disagreement which involved a fist, and Roscoe was never seen in the plant again.

William H. Smith The superintendent of the bicycle shop.

John Snyder The new head of the Office of War Mobilization and Reconversion after the war.

General Brehon Somervell Brehon Burke Somervell was a General in the United States Army and Commanding General of the Army Service Forces in World War II. As such he was responsible for the U.S. Army’s logistics.

Charles Sorensen “Cast-Iron Charlie.” An understudy of Flanders. Pete Martin’s assistant jockeying to become the favorite.

George Spangenberg Of the Navy Aeronautics Board. Admired Howard Hughes for his engineering knowledge.

Albert Speer A friend of the Führer’s and armaments minister. Hitler named him to be the guy to institute Knudsen’s productions techniques in Germany.

Joseph Stalin Joseph Vissarionovič Stalin was the de facto leader of the Soviet Union from the mid-1920s until his death in 1953.

Edward Stettinius Jr. Son of the great J. P. Morgan partner and president of U.S. Steel.

Jimmy Stewart Lieutenant Colonel. Learned how the B-24 could suddenly lose altitude if your attention wandered from the controls.


Daisy Suckley A cousin of FDR.
Dan Teeters: A veteran MK engineer who was put in command of building an airfield on Wake Island.

Florence Teeters: Wife of Dan Teeters. She was one of 3 women at the time on Wake who had accompanied her husband.

James Walter Thompson: The namesake of the JWT advertising agency and a pioneer of many advertising techniques.

Gene Threfethen: Helped "run the show" when building the steel mill in south California.

Paul W. Tibbets: The pilot who flew the Enola Gay mission.


Ernst Udet: Colonel General Ernst Udet was the second-highest scoring German flying ace of World War I.

Harold Vance: Chairman of Studebaker, which had one of the smartest engineering divisions in the car business.

Arthur H. Vandenberg: U.S. Senator (R-MI) in 1939. Warned Roosevelt that it would take more than appropriations to make a national defense.

Admiral Howard Vickery: The Maritime's Commission's head of construction.

Jesse Vincent: Learned mechanical engineering through a correspondence school course. His technological breakthroughs at Packard read like a history book of modern cars.

Walter Wagner: Was going to leave the new mammoth Detroit plant to go to Ford at 3 times the pay. Sorenson told him he couldn't leave and made him an assistant to Logan Miller.

Henry Wallace: The U.S. Vice-President.

Clyde Walling: President of a tool company that operated out of his 2-car garage.

Dr. Ed Warner: Head of the Civilian Aviation Board.

Robert Warren: Owner of the biggest road builder in British Columbia. Sometimes Kaiser's competitor, sometimes his partner on bigger jobs.

Bill Wattis: The other of the 2 Wattis brothers.

Edmund Wattis: 1 of 2 brothers who owned the biggest construction firm in Utah.

Howard Welch: Kaiser's secretary.

Ed Wells: The engineer who worked with Claire Egvedt to design the XB-17 bomber--"the Flying Fortress."

Oliver West: Boeing production engineer of the B-29.

Major General Whitehead: Pleased with Kenney not to stop making the P-38.

Roger Williams: General Kenneth Wolfe's tech chief.

Wendell Willkie: A Republican who opposed FDR for his 3rd term, a corporate lawyer. Drew more support than FDR had anticipated.
Charles Wilson  Left school at age 12 to work as a stock boy at Sprague Electrical Works, which was acquired by General Electric, taking night classes and working up to president in 1939. 28th U.S. President (Dem) from 1913 to 1921. A leader of the Progressive Movement, he served as President of Princeton University from 1902 to 1910, and then as the Governor of New Jersey from 1911 to 1913.

Woodrow Wilson  A liberal Republican, former governor of New York, replaced Joe Kennedy as ambassador to Britain.

John Winant  The man who was head of the B-29 program.

General Kenneth B. Wolfe  Consolidated Aircraft's master of mass production.

Harry Woodhead  Secretary of War.


Morris Wortman  An associate of Henry Kaiser after the war.
PREFACE

THIS IS THE STORY of America’s forgotten heroes of World War II. They didn’t wear uniforms, at least not at first. They wore business suits, dungarees and flannel shirts, spectacles and Stetsons, Homburg hats and hard hats, lab coats and welding leathers and patterned scarves.

They were American businessmen, engineers, production managers, and workers both male and female who built the most awesome military machine in history: the arsenal of democracy that armed the Allies and defeated the Axis. Together they produced two-thirds of all Allied military equipment used in World War II. That included 86,000 tanks, 2.5 million trucks and a half million jeeps, 286,000 warplanes, 8,800 naval vessels, 5,600 merchant ships, 434 million tons of steel, 2.6 million machine guns, and 41 billion rounds of ammunition—not to mention the greatest superbomber of the war, the B-29, and the atomic bomb.

How this remarkable mobilization of American history, technology, and material production happened remains the great untold story of World War II. This book builds that story around two central figures, William Signius Knudsen and Henry Kaiser. One was a Danish immigrant who worked his way up for the shop floor to become president of General Motors. The other grew up as a problem child in upstate New York before going west to head the most titanic construction cartel in America, the Six Companies, who built the Hoover Dam [and the Grand Coulee Dam].

Almost forgotten today, their names and faces were emblazoned across the news in wartime America.

. . .

Most accounts of America in World War II center on the great climactic battles from Midway and Tarawa to D-day and Iwo Jima. The battles American business fought and won came earlier—some a year before the country went to war. Yet they enabled the United States to win those battles to come, and crush the forces of Fascism. In so doing, they transformed America’s military into the biggest and most powerful in the world. They also laid the foundations for a postwar prosperity that would extend across three decades until the 1970s and fuel the economic growth of the rest of the planet.
PROLOGUE

From the fourth-biggest military force in the world in 1918, the United States Army shrank to number eighteen, just ahead of tiny Holland. By 1939 the Army Air Corps, forerunner of the U.S. Air Force, consisted of some seventeen hundred planes, all fighters and trainers, and fewer than 20,000 officers and enlisted men.


... When Roosevelt learned in October 1938 that Neville Chamberlain had handed over a large chunk of Czechoslovakia to the Third Reich, he sent a congratulatory telegram: “Good man.” But soon after the surrender at Munich, Roosevelt’s mood began to change. He realized Hitler’s thirst for power was not going to be assuaged, ever. This would inevitably mean war,


... Reports that summer had it that Hitler’s Luftwaffe had reached a combined strength of nearly 8,500 fighters and bombers—most of them advanced types less than three years old. The Army Air Corps had barely a fifth of that number, and most were out of date. When it came to the other ingredients of modern mechanized warfare—tanks, armored cars, antiaircraft guns, and troop-carrying trucks—Americans were even more hopelessly behind. Brigadier General George Patton learned this when he took charge of the Army’s Second Armored Brigade at Fort Benning, Georgia, the summer of 1939. Patton had 325 tanks—at a time when the Germans had more than 2,000—but no reliable nuts and bolts to hold them together. Patton asked the quartermaster for the necessary nuts and bolts; they never reached him. In desperation he ordered them at his own expense from the Sears and Roebuck catalogue.

All of this is hardly surprising, considering that the Army had just six working arsenals for manufacturing weapons. Eighty-five percent of the machinery in those arsenals was over ten years old, and much of it predated the start of the century. Some went back all the way to Gettysburg and Antietam.

Then in August 1939, on the eve of war in Europe, the Army held major war games at Plattsburgh, New York, to find out what it could do. Fifty thousand men were put on the field—but more than two-thirds were part-time National Guardsmen. They quickly lost their direction as units haplessly bumped into each other. Without radios to issue orders, soldiers began wandering in search of officers to give them. Some stumbled on lines of Good Humor trucks parked in a field: The Army had been forced to hire them to serve as decoy tanks because there weren’t enough real tanks or armored cars to go around. “The U.S. Army,” Time magazine said, summing up, “looked like a few nice boys with BB guns.”

No wonder, then, that on September 1, when Ambassador to Russia William Bullitt called the White House to say that Germany had invaded Poland, Roosevelt’s response was, “God help us all.”
After Poland fell, Roosevelt dared to appoint a War Resources Board of industrial leaders to consider what might be needed if America did have to prepare for a modern war. The board sat for six weeks before public outrage forced him to disband it.

Right up to May 13, 1940, Roosevelt was still unwilling to challenge a Congress, and a vast majority of Americans, who were deeply opposed to getting involved in another shooting war, anywhere and under any circumstances. He began thinking about retirement. Two terms as president were enough, he was telling friends; time to retire to Hyde Park and write his memoirs. In January he told Treasury Secretary Henry Morgenthau he didn’t want to run again, “unless things get very, very much worse in Europe.”

On May 14 they very much did. Roosevelt realized he had to act.

On May 20 the Germans reached the Channel. The British army in France was cut off. Unless they were able to retreat to the closest port still not in German hands, Dunkirk, they would have to surrender. Churchill began to plan for a German invasion. Britain’s odds of surviving, which Roosevelt had privately set at fifty-fifty, now looked like running to zero. On the seventeenth, Churchill had drafted one last telegram to Roosevelt. In it he warned the president that if Britain lost the war, it might mean that Germany would seize the Royal Navy, the single greatest armed force in the world. “I could not answer for my successors,” he wrote, “who in utter despair and helplessness would have to accommodate themselves to the German will.” In other words, Churchill was saying, if Britain lost, Roosevelt would find himself facing a German fleet large enough to patrol in force right off America’s Atlantic shore.

A man of many gifts and strengths, on policy matters FDR was a procrastinator. He preferred to put off decisions—or at least to keep news about them from going public—as long as possible, especially the big ones. But on May 23 he sensed his options had run out. He called the one person whose advice in this hour he trusted, the person he believed could figure out a way to get America ready for a war it didn’t want and hadn’t yet been declared, but which now seemed inevitable.

When Roosevelt announced his plans for 50,000 planes a year, Hitler branded the number a fantasy. He scoffed, “What is America but beauty queens, millionaires, stupid records, and Hollywood?”

Airplane makers like Curtiss and Boeing and Glenn Martin had little choice. Military contracts were the only way they could survive during the Great Depression. Boeing, however, felt the full force of the government’s revenge. In 1934 its leading executives, including Pratt & Whitney founder Fred Rentschler, found themselves banned from the industry for five years—unprecedented for an act of Congress. A disgusted Bill Boeing quit the company he had founded back in 1917 from a barn on the shore of Lake Union. His partner Phil Johnson had to
find work manufacturing trucks in Seattle, then moved to Canada to operate the airline that would become Air Canada.

CHAPTER ONE—The Gentle Giant

Knudsen spent weeks arranging the tools and machines on the Keim floor in order to put together the Model T components. He taught his mechanics how to assemble the car in separate stages, from bolting together the chassis to trimming the body and varnishing. Then one morning Knudsen was stunned to come in and find all the machines idle.

The Keim workers told him they were on strike. They had decided they didn’t like the piecework rates they were being paid on some of the outside contracts. Knudsen couldn’t believe they were so shortsighted as to break off building the country’s fastest-selling automobile over a minor contract dispute. But the men wouldn’t budge. He decided this was a crisis requiring the advice of the owner himself. At great trouble and expense, Bill Knudsen managed to reach Ford on the primitive telephone in the Keim office.

Ford listened and said, “That suits me. If the men don’t want to work, get some flatcars and move the machinery to Highland Park.”

Three days later it was done. Then Ford ordered Knudsen himself, William H. Smith, and other key Keim managers out to Michigan.

They were now part of the team running the most famous factory in the world.

Knudsen realized that the key to mass production was not uniformity or even speed. It was creating a continuous linear sequence that allowed every part to be fitted where and when it was needed, while keeping costs down by growing the volume instead of skimping on materials. Knudsen had found the key to the economy of scale underlying all industrial manufacturing. “In other words,” as Knudsen liked to explain it, “the less complex parts were, the easier they were to make; the easier to make, the less the cost; the less the cost, the greater the demand.” It was a guaranteed formula for success and profit.

Ford had developed his assembly line to make a single product. Knudsen would show him how it could be used to make any product, anywhere. He was happy to explain the process in his gruff Danish accent to anyone willing to listen—including later the president of the United States.


In 1919 GM had been selling at one hundred dollars a share. By November 10, 1920, it hit fourteen dollars. In a brutal all-night session, Durant’s key investors—bankers from J. P. Morgan and Pierre S. du Pont, scion of the famous munitions firm—negotiated a buyout of Durant, who agreed to quit as president of GM. Du Pont agreed to take his place, and brought Sloan in as his assistant.

The situation was dire. . . .

The solution they came up with revolutionized American business. At its heart was a paradox. The best way to make General Motors a single integrated company, they decided, was to give each separate division, from Buick and Chevrolet to Pontiac and Oakland Trucks, as much freedom as possible. Let each division’s chief executive produce the products he saw as best suited to his share of the market, and best suited to his factories and engineers and
workers. Then keep overall control strictly limited to coordinating the different divisions and making sure everyone was staying profitable.

In effect, Thomas Jefferson had been as right about business as he had been about political constitutions. The best corporate government was the one that governed least. “Decentralization [is] analogous to free enterprise,” Sloan later wrote, “Centralization, to regimentation.” The best way to run a complex corporation was to have the boss at the top providing only an overall direction and oversight, while turning the entrepreneurial instincts of his top executives loose on the problem of how to produce cars and bring them to market. Meanwhile, the chief executive’s job was not to give orders but gather information, in order evaluate the company’s overall progress, anticipate problems, smooth out bottlenecks, and, as Bill Knudsen might have said, keep all noses pointed in the right direction.

On New Year’s Day, 1922, Sloan presented his plan to the board of GM, which enthusiastically endorsed it. There was only one question. Would it work?

That depended on getting the right man to put the new GM corporate culture to the test. Sloan decided that was Big Bill Knudsen.

Almost as soon as he had finished sorting out the final details of the General Motors reorganization, he picked up the phone. A few days later, Knudsen was in his office. Sloan explained that he had no particular job at GM in mind for Knudsen, but that he needed someone good on his staff—“someone who can help the operating units do a better job. If you would like that job, we would like to have you here.”

“All right,” Knudsen said.

“How much shall we pay you, Mr. Knudsen?”

“Anything you like,” Knudsen replied with a shrug. “I’m not here to set a figure.”

“What were you getting at Ford?”

“Fifty thousand dollars a year,” came the answer.

So Sloan started him on February 23, 1922, at six thousand dollars a year.

Everyone who dealt with him noted Knudsen was a driven man, but a soft-spoken one. It went back to his days at Keim, where he had earned a reputation for a ferocious temper that, combined with his commanding figure and his skills as a boxer, made him a dangerous man to cross. One day an angry worker tried to do just that. Knudsen came back to the office after leaving the man flat on his face on the shop floor.

His mentor Bill Smith shook his head. “If you’re going to fight one,” he finally said, “are you going to be ready to fight them all?” Knudsen didn’t answer. Then Smith said something that Knudsen never forgot. He said, “From now on you’ve got to lead, not drive.”

It was the last lesson Smith left him, and one of the most important. From that day Knudsen learned to bottle up his rage and lock it away, and deal with his employees, even the most menial, patiently as equals. “I learned when you shout at someone,” he once said, “you make him afraid. And when he’s afraid, he won’t tell you his troubles”—or tell a manager the truth about what on the assembly line wasn’t working, or what had gone wrong. An old Ford employee later put it this way. “Mr. Sorensen,” he said, meaning Knudsen’s rival Cast-Iron Charlie, “was a wild man, Mr. Knudsen a mild man.”
Many years later, in wartime Washington, some people would mistake Knudsen’s gentle manner for meekness or a lack of conviction. It wasn’t, as employees and colleagues at Chevrolet had learned. It was the manner of a man who had learned that the price of being a true leader was self-mastery.


The next year, Chevy sales and income jumped again. But there was more to come. In January 1924 two thousand of the company’s dealers met at the Palmer House in Chicago. Knudsen was there, and as he walked through the lobby into the ballroom, dealers came up to shake his hand and slap the back of the man who had saved their livelihoods and given their cars a future.

Knudsen made to sit at the head table, but his sales manager, Dick Grant, caught him by the arm.

“Mr. Knudsen,” he said, “you just can’t sit there and expect me to do all the talking. You’re the boss, so you have to say something to these people.”

Knudsen had never given a public speech in English in his life. He struggled to his feet before the cheering throng, his mind a complete blank. In desperation he glanced back at Grant. “What do I say to them?” he whispered.

“Whatever you’ve got in your head,” Grant hissed back encouragingly, his hand cupped against the side of his mouth.

Knudsen stared out across the sea of humanity, studded with waiters clearing dishes and the steady updrift of cigar smoke.

Then suddenly he raised both hands over his head, his index fingers extended.

“I vant vun for vun!!” he shouted in his thick Danish accent, and then abruptly sat down.

At first there was a stunned silence. Then those who understood the message whispered it to others, and soon the entire room knew what Knudsen had meant. He wanted one Chevrolet to sell for every Ford Model T. It was the first open challenge by a car company to Ford’s sales supremacy, and the dealers loved it. Pandemonium broke loose. They cheered, they stamped their feet, they pounded the tables. Some stood on their chairs as they roared their approval.

“Vun for vun” spread through the company and became the new battle cry for Chevrolet. Dealers, managers, and even workers were sensing that Knudsen was about to push them toward another major breakthrough.

And they were right.


Centralization equals regimentation. Decentralization equals free enterprise. By 1937 the Sloan-Knudsen formula had saved GM. In three years it would have to save the world.

CHAPTER TWO—The Master Builder

After the San Francisco earthquake of 1906, the state population grew like a second gold rush. The demand for road construction was desperate. Kaiser got his break—one that would change his life and also the state of California—by luck and accident. Alonzo Ordway had decided, after seven years of nonstop fourteen-hour days, he needed a vacation. He and his wife set out for San Francisco, enjoyed a brief but refreshing holiday, and on their return stopped at a hotel outside Redding, California.

That morning at breakfast, Ordway heard two men in the next booth talking about plans for building a new U.S. Highway connecting Redding and Red Bluff. Ordway casually struck up a conversation, learned the details, and then rushed out of the hotel. In minutes he had a telegram off to Kaiser in Seattle, where he was supervising one of his road contracts. Kaiser phoned him immediately at his hotel. Bess Kaiser remembered they spoke for barely five minutes before her husband ordered “Ord” to meet him in Portland. That contract was going to be his.

In Portland, Ordway gave the rest of the details he had gleaned to his boss, who was more impatient than ever to win that job, no matter what. They looked at the train schedule and then caught the Shasta Limited south for San Francisco, planning to get off at Redding.

As they chugged through the mountain scenery, Ordway asked when the train stopped in Redding. “It doesn’t,” the conductor told him; “we don’t make any stops on that part of the line.” The Shasta Limited just slowed enough at Cottonwood, three miles outside Redding, for the engineer to pick up his orders on a mail pole, then set off again for points south.

Ordway broke the news to his boss. Kaiser was unfazed. “Then we’ll jump,” he said. Ordway stared unbelieving as the portly Kaiser grabbed his briefcase and headed for the end of the car.

Sure enough, the train began to slow as they drew near Cottonwood. “He let go near the little Cottonwood station house and tumbled head over heels,” Ordway later remembered, “and skidded headfirst into a pile of railroad ties. When I jumped I rolled over my suitcase and came to a stop right in front of the station door.”

Ordway dashed over to his boss, who was still lying on the ground. “I had to find out if he had broken his neck,” he said. But Kaiser was all right, only a little bruised and scraped. Ordway helped him to his feet as the Shasta Limited vanished out of sight.

“I’ve ruined my brand-new suit,” Ordway exclaimed with disgust. Kaiser laughed as the pair brushed themselves off.

The station door opened and the stationmaster stepped out. He gazed at the pair and shook his head. “You damned fools,” he said.

But Kaiser and Ordway made their meeting in Redding. Although they looked a sight with their torn, dirt-covered suits and bleeding palms, they landed the job—$527,000 worth, the biggest in Kaiser’s history up to that time. From that point on, Kaiser and California would be joined at the hip. Neither would ever be the same again.

Kaiser also taught his inner circle his surprisingly oblique management style. You learned never to say “do this” and “do that,” Bedford recalled. “What you do is to ask the kind of questions that will draw the response you want,” he told an interviewer, “and once you get that response you say, ‘That’s a great idea,’ never indicating that you planted the idea” in the first place.

Kaiser’s other secret was his willingness to look for any technical advance that might make his work easier and cheaper. He was the first contractor to attach rubber tires to the wheels of his company’s wheelbarrows—grateful workmen called it the greatest invention since the paycheck. He was one of the first to use tractors that the Caterpillar Company fitted specially for road work by putting a plow blade on the front end. Kaiser would make the name “Caterpillar” synonymous with heavy construction, as he would diesel trucks, which he preferred to gasoline ones because the fuel was cheaper: a dollar a day compared to a dollar an hour for gasoline. Kaiser tried for years to get Caterpillar to install diesel engines on their tractors, but they held out. So Kaiser told Ord Ordway, “All right, I’ll buy ’em, but I won’t use their damn engines.” Instead, as each new Caterpillar was delivered, Henry Kaiser ordered the old engine ripped out and a new diesel one put in its place.

Kaiser was also taken with a contraption made by an inventor named Le Tourneau, which could scoop almost ten cubic yards of earth in a minute. Le Tourneau dubbed it his “earth mover.” Kaiser saw at once how it could transform road construction, and ordered a dozen. The earthmover, like the Caterpillar tractor, became another signature piece of equipment at Kaiser sites, along with dump trucks from Kaiser’s favorite truck maker: Mack of Cleveland, Ohio.

The last and most essential secret of Kaiser’s business was his immense skill in building close relations with local, state, and eventually federal officials. As government dollars poured into road construction, Kaiser was quick to move as close as he could get to the stream’s headwaters. His bustling, rotund figure became a familiar sight in the state capitol buildings in Portland and Sacramento. It was Kaiser who lobbied the California legislature to pass a tax on gasoline to help pay for new roads—the first such tax in the nation.

Then and later, Kaiser never could understand businessmen who shunned dealing with the government. He quickly discovered that government contracts were often also the longest running. Later, as the Depression took hold, they offered a security for him and his employees that private contracts no longer could—and state governments wouldn’t default on their obligations in the middle of a project. He also grasped that government officials—local, state, or federal—all needed to get certain things done in order to please their constituents, whether it was building a road or a bridge (to complete his highway through swamp-infested Cuba, Kaiser and Clay Bedford built no fewer than five hundred bridges) or, later, dams and ships and planes.

“You’ve got to help them get these things,” he told an audience of business executives at the National Press Club during the war, “you’ve got to come to Washington and say, ‘Here is a way. Now I know this [will work], see if I’m right,’ and if he thinks you’re right he’s tickled to death you came.”
So Henry Kaiser had his bond and his merry band. They would call themselves the Six Companies, although over time that number would fluctuate as new opportunities arose and new partners stepped in and old ones bowed out. The men who led it formed a personal as well as a professional bond. All of them had come west as young men in search of adventure as well as money. Most had left school early to do manual labor. Only Kahn and MacDonald had ever been to college, and MacDonald had been such a misfit that he was fired from fifteen different jobs before finding a man like Kahn, who recognized the genius behind the eccentricity.

. . . Henry spent much of those three years in Washington, venturing out from his suite at the Shoreham Hotel to flatter and ease tensions with the man overseeing the entire Boulder Dam operation, Secretary of the Interior Harold Ickes—" the Old Curmudgeon," as he was known. Ickes was a true believer in Franklin Roosevelt’s New Deal, a rock-ribbed progressive who wanted Boulder Dam (as it was soon renamed) to be a showcase of enlightened labor relations. In the middle of the Depression, Ickes wanted the Six Companies to hire as many unemployed men as possible. Kaiser had to point out they needed men with genuine skills, not just people willing to turn up for a paycheck. Ickes wanted the door open to union organizing; Kaiser persuaded him the best route to happy workers was paying them well, not giving them a union card. In addition, Ickes wanted every federal safety regulation to be rigorously enforced; Kaiser patiently showed him that doing so would mean the dam would never be finished on time, let alone on budget. The progressive Interior secretary was also deeply suspicious of all capitalist enterprise, and he constantly accused the Six Companies and their subcontractors of trying to cheat the government. At one point Ickes drew up a list of no fewer than 70,000 separate violations of the letter of the contract, and considered imposing a $300,000 fine.

Kaiser struck back—not by confronting Ickes directly but by having a pamphlet with color illustrations drawn up, called "So Hoover Was Built," celebrating the heroic achievements of the Six Companies and its engineers and employees, which Kaiser intended to mail en masse to congressmen and members of the media. A week before the pamphlet was supposed to go out, Kaiser dropped a copy off on Ickes’s desk. The prickly Interior secretary saw he was about to lose a massive public relations battle, and backed down. The fine was reduced to $100,000, and when the dam was finally finished Ickes wrote Kaiser a grudgingly conciliatory letter. “Your company has made a remarkable engineering record,” it read, “I have been very impressed with the fair attitude of you and other officials, which resulted in a satisfactory working relationship.” The two men remained friends until Ickes’s death, and Henry Kaiser had learned another valuable lesson. It paid to stay close to government officials, even the hostile ones. In exchange for loyalty, he had discovered, they would offer loyalty in return.

“Before you work yourself out of the last job,” Henry Kaiser used to say, “line up a bigger one to pull yourself out.” Kaiser had skipped the ceremony out in Nevada. He was back in
Oakland, already working on the next big project for the Six Companies, a dam on the Columbia River at Bonneville in Oregon. He and his partners had already submitted their bids. When his son Edgar and thirty-year-old Clay Bedford had finished supervising the work at Bonneville in the spring of 1937, they would be ready to move on to Grand Coulee, which would become the biggest concrete structure in the world.


Kaiser also learned that taking care of business meant taking care of employees. Higher pay and good working conditions, including housing, kept not only the unions but federal government inspectors at bay. At Grand Coulee, Kaiser added one more element. It came at the suggestion of Dr. Sidney Garfield, the on-site physician Kaiser hired to oversee the health of his workers. Garfield suggested setting aside part of the employees’ paychecks to provide health insurance in case of injury or illness, which would also extend to their families. Kaiser enthusiastically agreed, and the result was the creation of the Kaiser Health Plan—the biggest and most successful private health insurance plan ever established by a private business, which is still up and running today.

“If you spent as much time on your labor as your sales,” he once advised an audience at a business meeting in Washington, “you wouldn’t have any problems”—not just with getting the best workers and raising productivity, he might have added, but also in cultivating a good public image.


Urban legend has it that the Mafia and George “Bugsy” Siegel were the creators of Las Vegas. They weren’t. It was Henry Kaiser and the workers of Boulder Dam.

CHAPTER THREE—The World of Tomorrow

ON APRIL 30, 1939, the World’s Fair opened in New York. 

The New York World’s Fair would be the biggest fair of all time. More than 44 million visitors would eventually come to the 1,262-acre site at Flushing Meadows. They would tour exhibits from across the country and from more than thirty countries—including several that would soon be at war.

On September 1 [1940] the future arrived.

German tanks and planes roared across the Polish border. The next day France declared war on Germany, and on September 3 Great Britain followed suit. The Polish pavilion was declared closed until further notice. Italy’s and Japan’s, however, remained open, since although both were Germany’s Axis allies, both were still officially neutral. The priceless copy of Magna Carta on display in the British pavilion was supposed to go home when the fair closed on October 1. After high-level discussion, however, officials thought it would be safer to let it stay in the United States.*

When the fair reopened on April 30, 1940, the mood was very different. The slogan of “Building the World of Tomorrow” was replaced by a more somber “For Peace and Freedom.” The Soviet, Czech, and Polish pavilions were gone. Newspapers were filled with news of French and British troops poised on the Belgian frontier in the event of a German attack. A pipe bomb set at the gate of the British pavilion went off, killing two New York City policemen.

On April 9, German troops had invaded and occupied Denmark. Bill Knudsen would not hear a word from his four sisters for almost six years.

That spring the number of visitor was down, too. The public face of American industry had changed. 

CHAPTER FOUR—Getting Started

When Bill Knudsen told his wife and children he was going to be leaving General Motors to help the president with the defense effort, they were stunned. Why? they protested. . . . “Why are you leaving to work for this man now?” Knudsen’s answer was simple and direct. “This country has been good to me, and I want to pay it back.”


The Dane [Bill Knudsen] flew to New York that afternoon, where he had an acrimonious meeting with General Motors’ chairman and his mentor, Alfred Sloan. “War’s not coming anytime soon,” Sloan predicted. “Your duty is here with GM.”

Knudsen shrugged. “The president of the United States called me,” he said quietly, “and asked me to come.”

“They’ll make a monkey out of you down there,” Sloan predicted, who was no fan of Roosevelt or the New Deal. During the punishing United Auto Workers strike, he had had Labor Secretary Frances Perkins calling him up in the middle of the night screaming that he was a scoundrel and a skunk for not giving in to the union’s demands. “You don’t deserve to be counted among decent men,” she had ranted. “You’ll go to hell when you die.”


Knudsen returned to his hotel that night [after attending FDR’s first Council of National Defense Advisory Commission meeting] convinced of two things. The first was that the NDAC had absolutely no legal status; neither the Cabinet nor the War Department nor the Department of the Navy was under obligation to heed their advice—nor was anyone else. No one had even been appointed as chairman. “There was quite a lot of confusion,” he wrote in a memorandum for himself. “In true New Deal style, [we have] no authority except what the President delegates piecemeal.”

The second realization was that if the council was going to have any real impact on how America would prepare itself for war, then its influence would depend entirely on how it presented the problem of how to convert butter into guns—or more precisely, turn an economy geared around producing consumer goods and services into making more weapons and war materiel than anyone had ever imagined.


. . . When President Woodrow Wilson had declared war in April 1917, the situation had quickly descended into chaos. The Army and Navy had no idea what they needed or how to get it, even as they handed out contracts right and left. In July Wilson appointed the War Industries Board to try to pull things back from the brink. Its first chairman, overwhelmed by the problems, suffered a nervous breakdown. Its second quit in frustration as the Army’s insistence on doing everything itself, from handling transportation (it took over the nation’s railroads when supplies weren’t arriving in time) to supervising industrial plant expansion, did more harm than good.
At last, in January 1918, Wilson appointed Bernard Baruch to restore some sort of order. But it was too late. American companies wound up producing tons of war materiel, but almost all of it arrived in France after the Armistice. British prime minister Lloyd George noted bitterly in his diaries, “It is one of the inexplicable paradoxes of history, that the greatest machine-producing nation on earth failed to turn out the mechanism of war after eighteen months of sweating and toiling and hustling.”

Knudsen decided his job was to make sure that never happened again.

On June 2 he [Bill Knudsen] sent a letter to President Roosevelt:

“Dear Mr. President,” it read, “I trust you will permit me to express my most sincere appreciation of the honor conferred on me by your recent appointment…. I will function for any period that may be necessary to demonstrate my fitness, entirely at my own expense and further, I will cheerfully accept for any additional period necessary the duties assigned to me, on the same basis.”

In closing, Knudsen penned down at the bottom: “I am most happy and grateful that you have made it possible for me to show, in small measure, my gratitude to my country for the opportunity it has given me to acquire home, family, and happiness in abundant measure.” Two days later the last British soldier waded out to boats along the shore and left Dunkirk, along with virtually every piece of heavy equipment the British army owned. Only a miracle could save France and Britain now. The source of that miracle would have to be the United States.

Six names, six men. Later there would be others. For now Knudsen would get Bigger, Harrison, and Vance leave of absence from their companies (the others were retired or, in Land’s case, already in Washington). He also landed them offices near his own in the Federal Reserve Building, the NDAC’s temporary home. They were the first of the so-called dollar-a-year men who would begin to descend on Washington from scores of other companies and business to take charge of the war production effort. As a group and as individuals, they would be scorned and vilified, dismissed as narrow-minded incompetents or, alternately, denounced as scheming greedy profiteers.

But as a team, Knudsen and his colleagues would guide the country into facing the greatest and most complex challenge in its history.

And thus far Henry Stimson was not even a glimmer in anyone’s eye.

“He [Henry Stimson] also agreed with Knudsen that the only way for America to prepare for war was through American private enterprise. “You have got to let business make money out of the process,” he would write in his diary, “or business won’t work.”

“Mass production has never depended on speed and never will,” he told his listeners.

“Speed, as such, is worthless. The only thing that produces good work is accuracy.”
Bill Knudsen was out to prove his former boss wrong. “No one can do what we can do if we all get together,” he liked to boast. Americans’ love of freedom, of individuality, of doing things differently from the other guy—these were sources of strength, he believed, not weakness. He believed in the power of the average American worker—“Progress in the world is accomplished by average people,” he would tell audiences—and the power of American business. “American ingenuity has never failed to cope with every specific problem before it,” he told a national radio audience, “and if we have your support and confidence, we will surely succeed.”

His colleague Ed Stettinius could tell him how after World War I Bethlehem Steel had been forced to close down its plant for making large artillery pieces because the federal government demanded the company pay a special tax for the facilities. Bethlehem offered to give the government the plant, and its huge forging, boring, and casting machinery, for free. The government had refused. And so, at its own expense, Bethlehem had been forced to break up and tear down every fixture and sell it for scrap. [Woodrow Wilson was president at this time.]
CHAPTER FIVE—Call to Others

“The government can’t do it all,” Knudsen told Roosevelt. “The more people we can get into this program”—in other words by offering incentives instead of threats—“the more brains we can get into it, the better chance it will have to succeed.”

Knudsen also insisted that a “letter of intent,” meaning an official War or Navy Department letter stating the government’s intention to do business with a particular firm before a formal contract was drawn up and signed, should be enough to get a company advance funds from their bank—and to protect the company’s out-of-pocket expenses in case the contract never went through. It was a practice he borrowed from the British, and critics would hound him for it, decrying the fact that he had abandoned the costly, time-consuming process of competitive bidding. But Knudsen sensed that the time for slow, deliberate action was over. The government had to be willing to work with those companies willing to work with it.

Roosevelt was deeply dubious. He pointed out that never in the history of the United States had such a provision been made for government contractors. Knudsen replied it was time to shatter precedent. Otherwise, he said, they might never get a job of that size done in time. Roosevelt’s 50,000 planes a year would remain only a pipe dream, while Hitler’s Luftwaffe ruled the skies over Europe.

With Stimson firmly backing Knudsen, the White House at last conceded.

On any given day in July 1940, Winston Churchill half expected to see German paratroopers landing on the outskirts of London. On July 12 there was a serious discussion in the War Cabinet about whether the government should encourage the populace to attack German invaders with scythes and stones. Meanwhile, fighting off German air attacks on British shipping in the Channel became a top priority. In Washington the British demands for war materiel, especially planes, came with alarming frequency. Knudsen was forced to confront a new truth. American industry was going to have to satisfy the needs of war on both sides of the Atlantic at once.

Keller and Hunt had to fight to persuade the Army to let the car company, which routinely spent huge sums designing and testing chassis springs, give them a new spring design. In the end, Chrysler would basically redesign the entire vehicle—just as later, Chrysler, Ford, and GM would reengineer the M3’s successor, the M4 Sherman. The M3 Grant would finally be ready to fight Rommel in the desert in 1942 with Continental’s less-than-ideal engines. But months, and not a few lives, were lost because the Army insisted on pushing ahead on its own design without once asking if the professional experts might do it better.
America's production plant had become obsolete, run down by depression and a government committed to taxing business and giving more power to labor unions. 


...Knudsen and his team were blasted as shills for big business, whose members were scooping up the bulk of the defense contracts—and doing so with their profits intact. This would be a major criticism during the war and later. Out of nearly $100 billion worth of defense contracts, 70 percent went to America’s one hundred largest corporations, from Knudsen’s own General Motors, to Dow, DuPont, and General Electric. Senators James Murray of Montana and Harry Truman of Missouri became obsessed by the subject. They even insisted on the establishment of a Smaller War Plants Corporation, as a counterweight to what they saw as NDAC’s bias toward bigness.

Knudsen would not be budged. His strategy of getting the biggest contracts to the biggest companies was deliberate, because, as he pointed out, companies like Ford or GE had the biggest and best engineering staffs. “This is a job calling for quantity and quality,” he told colleagues on the Advisory Commission; “it is absolutely necessary to have an engineering boss on every job.” In fact, Knudsen told Roosevelt point-blank that only corporations with their own engineering departments should get the most vital defense contracts. Those engineers would have had years of experience figuring out how to make things in the greatest number and the fastest possible time—an experience that was going to get more common as America geared up for war.

The small businessman did have his place in the scheme of things, Knudsen believed, as subcontractors. A company like GM employed no less than 18,000; during the war Boeing wound up with more than 1,400 subcontractors for its B-29 project alone. The massive food chain of mass production would give the subcontractors plenty to do—and plenty of opportunity to grow.


There was one criticism, however, to which Roosevelt could not shut his ears, which he finally brought to Knudsen himself.

This was the call to shut down production of civilian durable goods so that all those resources and labor hours could go directly into war production. It was outrageous, journalists in The Nation and The New Republic grumbled, that Knudsen was letting Ford, Dodge, Packard, and others continue to make cars for commercial sale as if there were no international crisis. Were Knudsen and his Detroit friends serious about getting itself ready for war, or not?

So Roosevelt asked him, and Knudsen was probably more emphatic than in any other conversation he had with the president. Shutting down civilian car production now, with the winter of 1940 approaching, would mean shutting down the plants for months, to install the new machines and tools.

“If they are shut down,” he told Roosevelt, “the toolmakers will scatter”—probably to companies like Boeing and North American and Consolidated on the West Coast. “If the toolmakers scatter, we will have a dickens of a time getting them back again. We will lose far more time if that happens than we will by keeping right on as we are.”
Instead, he said, we have to bury the automakers under military orders now, far more orders than they can make with their present plants. They’ll have to grow their assembly lines and facilities, workers will be hired and trained, and the toolmakers will have to stay on until the time comes when America has no choice but to move to full-time war production. “When the time comes,” he assured the president, “and they have more facilities, we can shut down on them and they will still have their toolmakers.” American business would be ready to make anything from Army trucks and machine gun belts to merchant ships—and it was merchant ships that suddenly had everyone worried.

Bill Knudsen lived in a snug house near Rock Creek while he was in Washington. Two Filipino houseboys took care of his domestic needs, and one of the first things he did when moving in was purchase a piano.

He called the fact that he could play the piano his best-kept secret. It contradicted the image of the tough former Bronx shhipyard worker and boxer turned GM executive. Not only could he sight-read tunes from Cole Porter to Chopin, he also played the violin, clarinet, and xylophone. People were also amazed to learn Knudsen was an avid book collector who would stop by a bookstore window and dive in to pick up a rare copy of Edward Gibbon or the philosopher Spinoza.

After breakfast his driver Joe would set off for Constitution Avenue and the office, where Knudsen usually arrived by seven. It was rare to see him home before midnight, although on most Fridays he would catch a plane to Detroit to spend the weekend with Clara and the family.

Four days after Christmas, on the night of December 29, 1940, a resonant voice familiar to all Americans came onto radios across the country.

“My friends, this is not a fireside chat on war. It is a talk on national security.”

Like millions of other Americans, Bill Knudsen sat in the living room of his Rock Creek house and listened to his president.

“Not since Jamestown and Plymouth Rock,” Roosevelt said, “has our American civilization been in such danger as now.” The Nazi empire was bent on creating a new global order based on racial superiority and domination, one with “no liberty, no religion, no hope.” Under such an order, America would survive, if it survived at all, at the point of a gun.

But by aiding those “in the front line of democracy’s battle” and halting the Axis advance, Roosevelt told the American people, “there is far less chance of the United States getting into the war…. The people of Europe who are defending themselves do not ask us to do the fighting. They ask us for the implements of war, the planes, the tanks, the guns, the freighters which will enable them to fight for their liberty and for our security.”

The means to do it are already here, the president said. “American industrial genius, unmatched throughout the world in the solution of production problems, has been called upon to bring its resources and its talents into action.” The makers of sewing machines and cash registers and lawn mowers, he said, are now making fuses and telescope mounts and shells and tanks.
“We must be the great arsenal of democracy. For us this is an emergency as serious as war itself.”

Knudsen must have smiled. The phrase “arsenal of democracy” was his. It was already happening. Some 50,000 planes, 130,000 engines, 380 Navy ships, 9,200 tanks, and 17,000 heavy guns, plus rifles, helmets, and clothing for an army of 1.4 million men, were being made or under contract to be made. Plant facilities to arm another 2 million, and get a two-ocean navy of 800 ships out to sea, were on their way, as well. Knudsen had calculated all this would require some 18 billion man-hours of mind-bending, back-straining labor—and he sensed that was still a long way from being enough.

“I call upon our people with absolute confidence,” the president said in closing, “that our common cause will greatly succeed.”

CHAPTER SEVEN—Ships, Strikes, and the Big Book

... In February [1941], Winston Churchill had made the stirring statement “Give us the tools and we will finish the job.” But which tools? Thus far it had been pretty much ad hoc guesswork. Knudsen’s people had to get ahead of the problem by figuring out what Britain needed and when, and what America could be expected to produce and when—all without derailing America’s own effort to arm itself.

This was a problem in statistics as much as production, and the man who figured it out was OPM’s [Office of Production Management] numbers man, Stacy May. That summer Knudsen gave him the go-ahead to prepare a comprehensive study of what American industry was making, and could potentially make, by way of war materials. The result was the Big Book, a massive compilation of production figures and forecasts for everything from tanks and gas masks to brass for artillery shells and cotton for uniforms. Knudsen and the others had for the first time a comprehensive picture of what America needed to fight a modern war, what it would take to make it, and how much it would cost—roughly $50 billion.


No one as yet knew what American business could do once it really got started. This was uncharted territory. The fiercest obstacle the war-production effort faced, however, wasn’t Washington or the military or even the Axis.

It was the labor unions.


Then in November the Vultee workers, led by two CIO organizing brothers, struck against having to continue their fifty-cent-an-hour wage in spite of the new work. Woodhead’s humming assembly line fell ominously silent. White House pressure forced management to give way, but the Vultee run-in left plenty of bad feelings just as January brought strikes in a radiating wave, closing one factory after another.

In February the CIO pulled workers off the lines at the Allis-Chalmers plant in Milwaukee, which was making turbines for Navy vessels, and at the Cluett and Peabody factory making uniforms. There were strikes at International Harvester, at Ford’s major plants, and at the North American plant where B-25s were being built. By March 1941, at a time when airplane production was at a vital premium, there were no fewer than fifteen strikes at aircraft or aircraft-related companies.

Knudsen was furious. “This is criminal,” he told the National Press Club, “almost like men fighting about who should hold the hose when the house is on fire”—because he knew most of the strikes weren’t over wages or conditions but which union should have jurisdiction over new workers or a new plant.

On March 7, Knudsen sketched out for Stimson and Knox how bad things really were. He was looking at four million labor hours lost at Allis-Chalmers, where the strike was now in its eighth week. He told hair-raising stories of threats of violence against foremen and executives at the Vanadium Steel plant in Pennsylvania. Sidney Hillman, OPM’s labor head but also a staunch anti-Communist, agreed to go in person to Milwaukee to hammer out a settlement, but
failed. “The unions are so undisciplined, young, and restless,” he told Knudsen, “it’s hard to do anything with them.”

Didn’t they understand, Knudsen said, that every week’s loss of work to win a nickel or dime raise meant it would take sixteen weeks for the company to get back where they started? Hillman threw up his hands and said nothing. The fact was, Communist-led unions were determined to strike, whatever their wages. Knudsen didn’t know that, however, and took the impasse hard. Stimson noted that “poor Knudsen, who is bearing the brunt of it, is getting a little tired and discouraged with it.” It was particularly tiresome to have the union’s friends in the administration blaming him and big business for moving slowly on war production, when it was the unions who were putting on the brakes—slowing war production before Pearl Harbor, Knudsen later calculated, by as much as 25 percent.

He and Stimson told the president the only solution they could see was a national defense mediation board, and Hillman agreed. The president duly announced its creation on March 19—but the strikes went on as before.

Then, at the start of April, John L. Lewis, the fiery leader of the United Mine Workers, threatened to pull 400,000 of his men out in a nationwide strike. It was not just defense plants but the entire width and breadth of American industry that was looking at a complete shutdown.

America “has got to get over this strike epidemic,” thundered Bill Knudsen before an audience of Veterans of Foreign Wars at the Waldorf Astoria on April 5. “The hours lost can never be made up and are precious…. I am getting all out of patience with all this talk about money. This is no time to ask for quotations on the defense of the United States.” Knudsen said he didn’t think there was need for legislation to prevent strikes, but he did say something had to be done to get people to take preparedness seriously. Otherwise, as columnist Stewart Alsop noted in the New York Herald Tribune, “every informed person in Washington agrees the result may be tragedy.”


“But I want you to know,” Knox continued, striking his fist into his palm, “that no matter what happens, the United States Navy is ready! Every man is at his post, every ship is at its station. The Navy is ready. Whatever happens, the Navy is not going to be caught napping.”

Knudsen’s driver picked him up and took him back to his Rock Creek Park home. It was the evening of Thursday, December 4, 1941.

Three days later, in far-off Hawaii, the roof caved in on Knox’s prediction.

America was about to begin the test of total war.

CHAPTER NINE—Going All Out

A LITTLE BEFORE 2 P.M. on December 7, 1941, the phone rang in the secretary of war’s house. It was the president, who said excitedly, “Have you heard the news?”

“Well, I have heard the telegrams which have been coming in about the Japanese advances in the Gulf of Siam,” Stimson replied.

“Oh, no, I don’t mean that,” Roosevelt cried. “They have attacked Hawaii. They are now bombing Hawaii.”

The next day, December 8, Adolf Hitler declared war on the United States. War had come to America without warning, and from both directions.

No one had quite figured out how this was going to work. . . .

On December 10 the first Japanese troops landed on Luzon in the Philippines, after Japanese bombers had flattened the U.S. air force there on the ground. When Knudsen had asked General Marshall back in the summer of 1940 what was the most important thing he needed to get ready for war, he replied without hesitation, “Time.” Time had just run out.


Knudsen was pleased [as he left Detroit after having achieved the making of a list of auto makers that would produce $5 billion of war materials], but when he returned to Washington, the outrage was palpable. Bureaucrats were shocked; commentators were volubly outraged. The director of OPM was accused of putting the nation’s defense “up for auction,” as Time magazine phrased it. The same voices who criticized what he had done wanted to know why all this hadn’t been done a year ago, so that every company capable or willing to manufacture important war materiel was already hard at work at it.

Of course Knudsen knew the truth. A year ago, a month ago, America had not been at war. No one had had the authority to compel anyone to do anything, not even participate in surveys of the national inventory of machine tools or available factory space for conversion to defense work. And no one had had the authority to tell industries to go ahead and retool for war work in ways that would have involved a breach of existing union contracts. Indeed, doing that would have invited even more labor trouble.

Indeed, no one had that authority even now. The consequences of Roosevelt’s refusal for the past year and a half to cede authority over rearmament to any single person or agency—his insatiable desire to keep his options open—had finally been exposed. Yet it was Knudsen’s head on the public chopping block.


Days after Pearl Harbor, Roosevelt had given SPAB some authority to close down unnecessary civilian production. The man in charge was Leon Henderson, who was also the head of Office of Price Administration, and the industry he targeted was everyone’s favorite target, the auto industry. Henderson ordered the complete cessation of new car and truck manufacturing as of January 15. The 450,000 civilian vehicles now in the Carmakers’ inventory and the other quarter million still on the assembly line were not to be sold through dealers,
Henderson decreed. Instead, they would be rationed out to high-priority users like doctors, hospitals, fire and police departments, and the like.

This was the kind of bold action critics of Knudsen had been urging for more than a year. The results were exactly what Knudsen would have predicted. More than 400,000 auto workers suddenly found themselves out of work, and 44,000 auto dealers around the country had to lay off employees. Many, if not most, had to shut their doors. Instead of speeding the nation toward readiness, stopping civilian car production had led to chaos.

Still, the blame fell not on Henderson but on Knudsen.


O'Brian sat with the disconsolate Knudsen until the former head of America's defense effort went home. What hurt most was that the president hadn't had the stomach to fire him to his face. Just a month ago, two days after Pearl Harbor, FDR had declared, "This country now has an organization in Washington built around men and women who are recognized experts in their own fields … and are pulling together with a teamwork that has never before been excelled." Too late, Knudsen realized Roosevelt's promises, both public and private, always carried an expiration date.


At midnight Jones said he was going home. But first he found himself impulsively picking up the phone. “Give me the White House.”

With Knudsen listening, Jones got Harry Hopkins on the line.

“Knudsen will accept a three-star generalship in the Army and report to Bob Patterson to help in promoting production for wartime production.”

Hopkins was incredulous. No one could give away a military commission bigger than a one-star brigadier.

“I repeated that it would have to be lieutenant general,” Jones wrote later in a memorandum. Jones was used to getting his way at the White House, . . .

So with Jones pushing and the War Department pulling, Knudsen got his appointment—
the only civilian in history to be made a three-star general.


In February the Führer named his friend Albert Speer to carry out this production miracle, as armaments minister of the Third Reich. Speer pledged that he would demonstrate to the German people that by converting their entire economy to all-out production of tanks, planes, and munitions, the Third Reich could still win the war. As armaments minister, Speer had the formal power to order which factories would produce what, and to move materials and workers to whatever industry he believed needed them—everything, in fact, that people in Washington wanted for an American production czar. . . .

What Speer lacked was Knudsen's secret weapon: America's prodigious industrial base built around free enterprise, which now was giving its full attention to war production. Speer was an architect by training. He knew nothing about how to lay out a factory or run an assembly line. Likewise, Germanic pride made many key industries resist the transition to American-style mass
production. Tank and aircraft factory workers remained faithful to the traditions of quality craftsmanship, as did their managers, which ensured they never made enough. The German car industry, including the Opel factories the government had seized from General Motors, sat half-idle through the entire war. And constant meddling and changes of priorities by the German military ensured that time and energy and materials were lost in a limitless bureaucratic maze.

Still, by stripping down every civilian factory and seizing every resource he could lay his hands on, and by grabbing every worker he could round up within the Nazi empire, Speer eventually got his production miracle. German production by 1944 surged by nearly half. Yet Germany would still lose the war—and in the process Speer would reduce Europe to a barren wilderness.

... the smoke had cleared around Pearl Harbor. No fewer than eight modern battleships—California, Arizona, Nevada, West Virginia, Tennessee, Pennsylvania, Maryland, and Oklahoma—four destroyers, and two light cruisers were either sunk or too badly damaged to operate at sea. Pearl Harbor’s docks, warehouses, and naval facilities had been bombed and left in flames. More than one hundred planes had been destroyed, and more than four thousand Americans were killed or wounded.

On Wake itself, however, the Marines didn’t have a chance. Pounded by bombs and strafing planes, hammered by the cruisers’ guns, they were helpless to halt the Japanese advance. One of Teeters’s workmen, “Pop,” had served in World War I as a lieutenant and had been a corporate executive until alcohol had cost him his marriage and position and reduced him to menial jobs. Now he grabbed a bag of grenades and waded into the surf. He tossed them into one Japanese landing craft and then another, until he ran out of bombs, and hightailed it back to safety. Workmen and Marines cheered, but Major Devereux knew they were doomed. He fired off an urgent radio message: “Enemy is on the Island. The issue is in doubt.” A few hours later, he was told that the task force on its way to relieve Wake had been ordered back to Pearl. He tied a white rag to a mop handle and marched out to surrender what was left of his command. The battle for Wake was over.
CHAPTER TEN—Ships for Liberty

Cooke [a visiting British radio commentator] had seen normal shipyards in places like Philadelphia and the Mersey in his own country. He was a bit bemused at how clean and neat Kaiser’s yard was. Everything was laid out with meticulous attention. “Sheets of steel are marked VK2 and MQ3, to indicate to a moron where they fit on a ship,” since these were workers who had never built ships before. Cranes would swing overhead to gather a sheet, lay it down where drillers and fillers would break it up into the parts traced in outline in yellow chalk, then move it on into the lofts where the real work of assembling the ship was done.

Inside the hull, the noise could be catastrophic to a newcomer. A woman who worked as a welder at Yard No. 1 remembered when the chippers would get under way and two shipfitters would start swinging sledgehammers at opposite sides of a steel bulkhead, “and you wonder if your ears can stand it.” The sound “will seem to swell and engulf you like a treacherous wave in surf-bathing and you feel as if you are going under.” Yet after a few days she became used to it and never gave it another thought—nor thought it was strange that she could sing popular songs at work at the top of her lungs without anyone hearing a sound.

She grew to deal with it. So did the other welders, chippers, grinders, reamers, flangers, shipfitters, loftsmen, air-compressor operators, bolters, flanger-shrinkers, plate hangers, pneumatic drill and punch and shear operators, and riggers of cranes, machines, and planes—along with forty or so other trade workers who labored to get the plates assembled, the boilers erected and installed, and the ships ready for launching. It was incredibly dangerous work. The same woman welder remembered having to jump three-foot gaps with a forty-foot drop below, welding torch in hand. She did it, but “my knees were a little shaky under the welding leathers.”

Then there were the swinging scaffolds. Our lady welder never quite had the nerve to try, but others learned to ride up on one scaffold as it rose, then jump to another as it swung past on its way down, without a thought—even though a slight slip meant a neck-breaking plunge to the bottom of the hull. Working out on the far end of what would be the main deck was like standing atop a six-story building, with no restraints or guardrails. There were electrical wires to trip on or to be electrocuted by; red-hot rivets to drop on a foot or 250-pound-per-square-inch metal presses in which to flatten an unwary hand or finger; plus the hazards every welder faces, of searing burns that leave arms and legs covered with scars.

All this for an average of sixty dollars a week.

But the workers came.


As early as February 1942, Admiral Land had told Congress that strikes in 1941 had cost the Maritime Commission between seven and twelve ships—nearly 150,000 tons of shipping lost as surely as if it had been sunk by U-boats. And things were getting worse. In 1942 the CIO and AFL would extend their perpetual battle for supremacy to the shipyards, where clashes over membership turf would divide the workforce and cause major headaches for management, Kaiser included.

Then there were the stories of unproductive workers, and absentee ones. Land said bluntly there was “too damn much loafing going on in the shipyards.” Stories were told of managers
finding marathon craps games in out-of-the-way corners of the unfinished hulls, and of people having full-time jobs in town and only showing up at the Richmond yard to collect a paycheck. Some said Kaiser’s yards in particular were overstaffed, and that his “soft touch” with labor made him an easy mark with workers and organizers alike. A later Maritime Commission study found that Richmond No. 1 ranked number 33 of 41 shipyards in employee attendance.

Kaiser hit back hard. “The talk about absenteeism has been grossly overdone,” he bellowed to critics. “Let’s talk about presentism. My hat is off to the 93 percent faithful in the Kaiser-operated shipyards…. With hands and hearts they are fashioning complete victory as surely as if they were on the fighting front.”

Eventually Kaiser’s record would silence his critics, because at Richmond Yard No. 2, Clay Bedford was changing how ships were made.


One of the ugliest [clashes of membership turf of the CIO and AFL and management] would be in the Portland yards, where Edgar became a helpless spectator to the corruption in the AFL Boilermakers Local 72. Its president, Tom Ray, not only promoted racial strife and denied promotion to women, but had spent a quarter million dollars on parties for himself and his buddies. Ultimately the National Labor Relations Board had to strip Ray of his presidency and order a new election.

CHAPTER ELEVEN—The Production Express

When he was summoned to the White House in January 1942 to replace Bill Knudsen, however, he became the Washington media darling. Columnist Walter Lippmann hailed his hitherto-unnoticed talents. Fortune magazine was pleased that one man, any man, was at last in charge of the war production effort. So was Time . . .

Nelson disappointed them all. His regime turned out to be more like his predecessor’s than anyone had supposed—which also suggested that Knudsen’s approach had more merit than anyone supposed. . . .

. . . When Felix Frankfurter complained to Roosevelt that Nelson “was an utterly weak man incapable of exercising authority or making decisions,” it was a judgment on which both War Department Republicans and New Deal Democrats were, for once, in agreement.

After a year in office, Donald Nelson was the most despised man in Washington. . . .

Nelson knew there was nothing he could do about it. . . .

But the supreme thought governing his every action had governed Knudsen’s, as well. Any sudden switch to centralized government control over war production, whether by New Dealers or the military, would spell the end of the American system that made the promise of prodigious production possible.

Of course, the ways of Washington sometimes baffled even the best business minds. The vice president of one New York bank applied for a post in the Office of Economic Warfare. He waited a long time in vain. Then one day the OEW’s director showed up at the bank to ask its president if he knew any likely candidates for the very same job. The president mentioned his vice president, and the man was hired on the spot.

He moved to Washington and soon found himself inundated with the usual paperwork related to the OEW. A month or two passed, and a letter arrived forwarded from his old New York address. It was a rejection letter, regretfully turning him down for the very post he now occupied.

Now familiar with Washington bureaucracy, this came as no surprise to him. The surprise was he had signed the letter himself.

. . . the coming of war forced an unprecedented cooperation among these aviation competitors. Old rivals shared aerodynamic and engineering data, exchanged information on tooling and equipment, and drew together a $250 million stockpile of parts and materials under the management of the Aircraft War Production Council, to provide emergency help to anyone who needed it. . . .


If Kaiser’s Liberty ships were crucial to America’s defensive phase of keeping the lines of supply and communication with the Allies open, Higgins’s boats would be crucial in the next, offensive phase. As 1942 drew to a close all across the country shipyards, factories, and boatyards would be making thousands of landing craft with a profusion of confusing designations—LCIs, LCMs, LCPLs, LCTs, LCI (L)s, and LSTs. Twenty-one of them were in the Great Lakes and Midwest. Many, if not all, would be using Higgins designs.

In all, Higgins would design 92 percent of the vessels used by the U.S. Navy in World War II—although none of them would be big enough or important enough to warrant a christening. For July 1943 his New Orleans factory built more landing craft than all the other factories in America. Even Hitler got to know his name, and dubbed him “the new Noah.” General Dwight Eisenhower simply called him “the man who won the war for us.”

Yet the general was wrong. It was the American economy—where immigrants like Knudsen and Elmer Hann and high school dropouts like Higgins and Kaiser could become the arsenal of democracy’s most precious assets—that was shifting the balance of victory.

Donald Nelson knew this. He also knew what Knudsen had foreseen: that the key to winning this war of mass production was America’s free enterprise industrial system. That meant keeping the drive for war production as voluntary as possible, so that the right incentives—which included the profit motive—found the right people to do the job. That also meant keeping the civilian economy as strong as possible, something that his critics in the War Department sometimes didn’t seem to understand.

When they complained about the amount of newsprint being consumed for advertising and want-ad space, he pointed out that those ads might enable a defense worker to find an apartment or lead a military wife to a department store sale so she wouldn’t have to spend as much on a new hat or a pair of shoes. When the Army pushed for funding only those synthetic rubber facilities that produced for military use, Nelson had to explain that without tires for autos, buses, and trucks, none of those defense workers would be getting to work. Likewise with gasoline and aluminum and other critical materials: Unless civilian producers, often the smaller businesses, could count on their share, the entire infrastructure on which the military counted for its planes, tanks, and machine guns would slow down and grind to a halt.

Explaining elementary economics was never easy in Washington. Nelson had his work cut out for him. At one point a story circulated in the papers quoting a high Army official that the WPB’s policy had created a shortage of 100-octane aviation fuel so severe that important overseas military operations had to be suspended. Nelson looked into it, and the story wasn’t true. But people continued to act as if it were true, and the presence of spot shortages of raw materials—a perennial problem in any war (and, it should be added, any economy with price controls)—was taken as evidence not of the extraordinary demand generated by war production, or of the market-distorting effects of the Office of Price Administration, but of extraordinary incompetence on the part of Donald M. Nelson.
CHAPTER THIRTEEN—Agony at Willow Run

... by the spring of 1942, the public was noticing. Where were the mass-produced B-24s Ford had been promising for almost a year? Watching from the sidelines at North American’s plant in Inglewood, Dutch Kindelberger scoffed, “You cannot expect a blacksmith to learn to make a watch overnight.” He told the New York Times that in his opinion, far from speeding up the production of airplanes, getting the auto industry involved was slowing it down, especially (as at Willow Run) in the making of airframes. Pratt and Whitney’s founder, Fred Rentschler, worried that the government had created “a Frankenstein’s monster” by getting Ford and the car companies involved, which would end up hurting the aviation industry.

The Office of War Information had to issue a statement reassuring the public over the delay. Investigators from the Truman Committee began sniffing around, wondering where all the government money was going when no planes were being made. Willow Run was becoming a public relations disaster for Ford, and a national joke. Wits in the newspapers changed the name from Willow Run to “Will It Run?”

On Monday, July 27, Lindbergh drove back out to Willow Run to meet Henry Ford, to see what he could do to help straighten out the growing mess. They drove together to the airfield where an Air Force bomber had landed to unload a passenger, an Air Force general. Lindbergh caught sight of him talking to Sorensen and Bennett and Edsel Ford in the development engineering department.

He was a tall man wearing an Air Force uniform, an older man with wide shoulders and a white mustache who spoke English with a Danish accent.

It was Bill Knudsen, now Lieutenant General Knudsen. He was there in his new job as the War Department’s head of production, and as Undersecretary Robert Patterson’s troubleshooter to get Willow Run production off the ground. Indeed, Knudsen already had the answer.

The answer was field modification.


The lieutenant general rank and the uniform were supposed to give him authority, especially with lieutenant colonels and brigadiers used to a more formal chain of command. But in the factories around the country, Bill Knudsen needed no title. He was Knudsen (he usually answered the phone that way, “This is Knudsen”), a living manufacturing legend, and his appearance on the factory floor was always a sensation.

He would spend an hour or two looking over blueprints and production schedules, with the nervous manager at his side, before heading for the factory floor. His black-ribbon pince-nez looked out of place with the khaki uniform, gold-bedecked cap, and three silver stars on each shoulder board. But behind those glasses were eyes that noticed every detail as he walked down every aisle, stopping at every machine and speaking to the men and women working them—sometimes taking over the controls to show them how to handle a tool more easily or safely.

Then he’d walk back to the manager and, pointing down the aisle, say, “Why don’t you reverse the arrangement of the center of these three lines, so that the work will go down the first
line, up the second, and down the third, instead of having to be carried back twice?“ The manager would stare dumbfounded and tell an assistant to make a note.

Then they would head for the parking lot. Knudsen would walk down the rows of employees’ cars, pausing to point out a worn tire or a broken headlight, sometimes crawling under the car to trace an oil leak. “Get those fixed,” he would tell the manager. “Defense workers always get priority on new tires or retreads. You don’t want a blowout or a breakdown keeping an employee away from work.” Knudsen never expected every car problem to get fixed. But he was sending a message to the higher-ups: Make sure all your workers get to work. Absenteeism could be as much a threat to the production schedule as a materials shortage or a labor strike.

So it went, starting at eight o’clock, every day. Sometimes he visited 11 plants a day—350 those first six months—fixing labor shortages, material shortages, and bottlenecks large and small—“ We’re short on everything except bottlenecks,” he quipped to his new friend and Forrestal aide Admiral Lewis Strauss. It was a demanding schedule for a man sixty-four years old with one kidney (the other had been taken out in an operation in 1938) and chronic high blood pressure. But Knudsen knew these were the final necessary steps to getting the weapons and munitions out of the factories and into battle.

All the while he never forgot his higher responsibilities. This was “the price that was being paid by families,” he said, “who waited the return of their sons, their brothers, their fathers—yes, and their sisters.” To Knudsen they represented “the eternal forces of freedom”—what Hitler and the Axis were seeking to destroy. Every production delay took them one step further away from that moment of reunion—and further away from victory.

As Sorensen had foreseen, the unions also made constant trouble. United Auto Workers Local 50, the “Bomber Local,” spawned a series of wildcat strikes that interrupted production. In July there was a one-day foremen’s strike over who would be allowed to use the plant’s telephone.

... in the spring of 1943 the VLR [Very Long Range] Liberator slammed the [Atlantic] Gap shut. In the first twenty days of March, the Germans sank ninety-seven Allied merchant ships—more than half a million tons. In the last ten days of March, Allied convoys lost exactly one ship, thanks to the VLR’s vigilance. Then in April, British Coastal Command began flying the first of their “shuttle” patrols from Gander in Newfoundland to Reykjavik—clear across the Gap and well within the Liberator’s range. In the seven patrols they ran that month, they spotted no fewer than ten submarines. Only failures in the depth-charge mechanisms saved the Germans from certain death. But as American crews in their own VLR squadron in Newfoundland, No. 6 Antisubmarine Squadron, soon learned, it wasn’t necessary for the planes to actually sink U-boats. They just had to spot them and alert the convoy escorts, to hugely increase the odds in the Allies’ favor.

For the rest of April 1943, the battle seesawed back and forth, as American escort carriers joined in the fight, as well. Then came the decisive turning point on May 4, when convoy ONS5
came under concentrated attack after it had been battered by gales off the southern tip of Greenland. For the next three days, ONS5 lost twelve merchantmen, but combined air and sea counterattacks sank six submarines and damaged several more. A few days later, another attack on a convoy cost the Germans one submarine for every ship sunk—unacceptable losses for the Germans, especially when one of the U-boat skippers lost was Peter Dönitz, younger son of the German navy’s commander-in-chief. Attacks on the next four convoys cost the Germans six more boats, two of them killed by VLR Liberators. Every one of the Allied freighters got through unscathed.

A chastened Admiral Karl Dönitz did the dismal math. On May 24, 1943, he decided to call off his wolf packs. Germany had lost the battle for the Atlantic. Then and later, Dönitz put the blame squarely on the closing of the Atlantic Gap, and the B-24s. Later, Admiralty analysts calculated that every VLR Liberator patrol saved no less than six Allied ships. All in all, the Liberator squadrons would be credited with no fewer than seventy-two U-boat kills.

Thanks to the B-24 and the men and women who made them, the way was fully clear for Kaiser’s Liberty ships across the Atlantic. America was ready to turn its war production loose.

CHAPTER FOURTEEN—Victory is Our Business

On June 19 more than 60,000 coal miners dropped tools and went home.

This time the public reaction was overwhelming. Newspapers across the country denounced the strike as unpatriotic and vile. When Roosevelt threatened to strip the draft deferments from every mine worker, Lewis decided to halt the strike after three days, but the damage to organized labor was done. The Republican-dominated Congress passed the War Labor Disputes Act, ordering a thirty-day notice for all strikes and ending the secret ballot for union membership. On June 25, Roosevelt vetoed it. It took the Senate exactly eleven minutes to override him.


Imperial Japan and Nazi Germany, the symbols of modern military power just two years earlier, were being drowned in the flood. In 1943, American war production was twice that of Germany and Japan combined. Victory, which had seemed so elusive just ten months before, was now assured.


General Motors’ most amazing war-front plant, however, took shape in Iran. Liberty ships landed parts for the plant to supply Russian forces at the northern end of the Persian Gulf. A one-track railroad then moved the parts to the factory site at Andimeshk. The first GM employees reached Andimeshk in March 1942, to find it a hellhole with typhus, dysentery, sandfly fever, and a running temperature of 140 degrees Fahrenheit.

The first sixty men began assembling trucks out in the open, while the others worked to build a makeshift factory. Roving jackals raided the camp stores and kitchens at night. But by day the Andimeshk plant was soon turning out 2,500 military vehicles a month of all makes and types, with tool-working shops and a special oxygen-manufacturing unit for high-speed welding. For labor GM trained five thousand Iranians in the mass-production methods of Detroit, so that they could put together a complete truck in less than thirty minutes.


The one thing Knudsen and the Army could not do, of course, was order General Industries or any other company to make the things they needed. The lines of Washington’s control over the economy had been carefully drawn. It intervened to affect the consumption of civilian goods, some of which were rationed, such as meat and gasoline and coffee, and others made according to their place in the system of priorities. It also regulated wages and, to a more limited degree, prices.

Production, however, remained an entirely voluntary process. The War Production Board could and did order companies not to produce things: new cars, for instance, and refrigerators and other heavy durable goods. It never told anyone what to make. That was left to the imagination of American business.
This was how Bill Knudsen had designed things from the start, and it remained the pivot point of the entire wartime system. Everything made for the war effort was made by those who saw some advantage for themselves in doing so, and therefore they brought all their skills and tools and knowledge to bear on the task—both to help the country and to make some money. This drove the New Dealers crazy, but it was what Adam Smith had recognized a century and a half before as the cornerstone of capitalism, when he wrote, “It is not from the benevolence of the butcher, the brewer, or the baker, that we can expect our dinner, but from their regard to their own interest.”


...Bill Knudsen was present when the first twenty-five women went into the Consolidated-Vultee plant, on March 31, 1941. They were put to work in the electrical subassembly division, and started a day earlier than planned. The manager feared that if they had started the day their training was supposed to end, on April 1, everybody else would think it was an April Fools joke.

Once the women set to work, however, the joke was on the males. The ladies of Vultee showed enormous skill at the subassemblies, running, threading, connecting, and checking electrical cables. Women had “lighter fingers,” as Knudsen put it, that sometimes was as vital in manufacturing as the heavy lifting.

North American was impressed enough that they began substituting women for men in their tubing department. Production jumped by 20 percent. Before long, everyone was hiring women for other departments, and they ran milling machines, drill presses, and complex cutout saws and worked in aircraft engine assembling. They could also squeeze into places men couldn’t in airplane assemblies, such as the nose cone and tail section, to do spot welding or riveting or snapping in the electrical system.

By July 1944, 36 percent of all workers in prime defense contractors were female. And not just in aviation. In the end their numbers rose to nearly five million, doing every conceivable form of war work from making planes to building ships and tanks. In iron and steel companies, 22.3 percent of the workforce were women. At GM they were 30.7 percent of all hourly wage earners by the end of 1943, and in the Kaiser yards at Richmond they numbered 70 percent.


Women made gas masks for the Army, life rafts for the Navy and Coast Guard, and wove and stuffed parachutes for the Army Air Forces and airborne divisions. One of those parachute stuffers was a pretty brunette named Norma Jean Dougherty, who was barely seventeen and worked in an aircraft parts plant in Burbank, California, while her husband was in the Merchant Marine. In 1943 an Army newsreel team commanded by Captain Ronald Reagan spotted her and asked her to pose for some pictures. The photos of her in Yank magazine caused such a sensation that the Army used her as a model for several more shoots. After the war Norma Jean took her photos to a modeling agency and moved to Hollywood. There she dyed her hair blond and took a new name: Marilyn Monroe.

The rough edge of life in the yards shocked and disillusioned Archibald. Later historians and feminists would be disappointed by the failure of women to achieve full equality of pay and promotion, and be disappointed by the fact that so many would quit their jobs after the war.

But most women who worked in the arsenal of democracy were not out for gender transformation. They were shamelessly conventional. They would do their jobs, and appreciate the opportunity to earn some pay and serve their country. But the moment they looked forward to was the reunion with fathers and sons and brothers and husbands.

None would forget that moment when one of their co-workers would arrive in the morning with a crumpled telegram in their fist and tears in his or her eyes as they mumbled, “It’s about my son …” Most would appreciate the words of Katie Grant, who worked the graveyard shift for two years in the Richmond yards while her husband was in the Marines.

“I told Melvin later,” she recalled years later, “that I helped to make the ship for him to come home in.”

CHAPTER FIFTEEN—The Man from Frisco

Kaiser decided the best way to get Brewster Aviation productive again was to work out a deal with its labor leaders. “You don’t cure a patient by whipping him,” he said. But some in Congress, like Representative Melvin J. Maas of Minnesota, thought he was going too far.

MAAS: Of course if you give [labor] all the candy he wants, he is for you, isn’t he?
KAISER: That’s not what I said. You are making a statement that I am giving them the candy: I am not.... I hope I am building morale. I build men. I hope I take those men that exist and build better men of them.
MAAS: That is a very nice platitude.
KAISER: They are not platitudes. Thank God they are not platitudes.... Do you know how many men I am employing under me? Three hundred thousand.
MAAS: I merely wanted to know....
KAISER: Do you think I employ that many people by platitudes?
MAAS: I have just one or two questions and then I’m through, Mr. Kaiser.
KAISER: Thank God.

Platitudes or not, Kaiser did get Brewster going again. The labor problems vanished and plane production rose... . . .

As 1944 began, 70 percent of America’s manufacturing was focused on wartime production. American factories were building a plane every five minutes, and producing 150 tons of steel every minute. Shipyards were launching eight aircraft carriers a month, including Kaiser’s baby flattops, and fifty merchant ships a day.

Day and night, endless freight trains loaded with raw materials and finished war goods moved east and west to outfit a 12-million-strong American military and provide its British, Australian, Russian, and other allies almost $1 billion worth of aid a month—the equivalent of $50 billion in today’s dollars. The effort required more than 142 million carloads—the most massive cargo lift in human history. Yet, amazingly, while all this prodigious production was happening, more than half of America’s businesses were still cranking out goods and services for the civilian sector, from shoes and lightbulbs to paint and restaurant supplies and newsprint for the funny papers—including some, like GE and DuPont, who were the biggest war contractors.

What war had revealed was not the power of American industry, but the inexhaustible resources of the world’s biggest free-market economy.

At one meeting an Air Force officer warned Kaiser that Hughes’s idea was untenable with existing technology. “You’re talking as far ahead of the times as Leonardo da Vinci.” Kaiser was puzzled. As he left with Calhoun, he asked his lawyer, “Have we talked to this da Vinci yet?”


CHAPTER SIXTEEN—Superbomber

Kenney respected few men in or out of his profession, but one of them was Bill Knudsen. “His expertise in his field was unquestionable,” he remembered after the war, and Kenney was drawn to Knudsen’s simple, straightforward patriotism and wry sense of humor. Once Knudsen came out of a long Munitions Building meeting where no decision had been reached, shaking his head with a weary smile. Suddenly Knudsen said, “George, do you know what a conference is?”

Kenney said no. “A conference is a gathering of guys that singly can do nothing and together decide nothing can be done.”

Knudsen also gave him his succinct translation of status quo. “That’s Latin for what a hell of a fix we’re in.”


All in all, the B-29 was turning out to be the most massive project in the history of aeronautics. It was also, in the words of historian Tom Collison, “the most organizational airplane ever built.” American business had never before been asked to undertake an industrial project of this size or cost or complexity. Even the Manhattan Project turned out to be cheaper.

CHAPTER SEVENTEEN—The Battle of Kansas

Knudsen decided a change was needed at the top. He brought in Colonel Carl Cover, a former vice president for Douglas, to be in charge. As time went on and the facilities were finished, it turned out Bell’s training program was one of the best in the industry. Schoolteachers, salesmen, clerks, hairdressers, bank tellers, and housewives became skilled aviation workers, learning to cut aluminum sheets, lay out electric cable, or buck and rivet for ten hours at a stretch.

One of those wielding a riveting gun when Knudsen visited was a widow who lived in a tiny trailer outside Atlanta. She had been at the gates of the Marietta factory the day it opened, and remained there working the 8 A.M.-to-4:45 P.M. shift every day until the war ended.

She wasn’t just any widow. Helen Dortch Longstreet was the widow of Confederate general James Longstreet, whom she had married when she was thirty-four and he was seventy-six. She was eighty when she started work at Bell. Every day she drove in to work in her Nash coupe in her black sweater and slacks and black visored cap, a cigarette dangling from her lips. The noise and vicious kick of the riveting gun bothered her not at all. “I was head of the class in riveting school,” she liked to tell people. “In fact, I was the only one in it.” Her foreman could tell Knudsen Mrs. Longstreet was never late and never missed a day of work.

Over time, Mrs. Longstreet and Colonel Cover almost made Marietta the most efficient B-29 plant of them all. In November the first plane came out the factory doors. General Wolfe confessed to the Bell people, “I didn’t think you could do it.”

By the fall of 1944, its 28,000 workers had made producing B-29s so routine that Bell was able to renegotiate its contract at a lower cost-per-plane basis, and even Cover’s tragic death in a plane crash did nothing to break the factory’s stride. By the time the war ended, the Bell-Marietta airplane factory, once a symbol of government inefficiency and corporate waste, had become a symbol of the New South.


At Omaha, Knudsen found the situation a little better. Martin Aircraft had broken ground there in the spring of 1941, with a line of bulldozers and Euclid tractors, each with a Stars and Stripes flying from its rearview mirror. The plant had been built to supply the Army with B-26 Marauders, but production was phased out in July 1943 to shift to the B-29. When Knudsen first visited, the new jigs and dies were still showing up—at a cost to the Army of some $90 million.

But Knudsen liked the two Martin managers, Hartson and Willey, the latter a shrewd, thickset Englishman who had transferred from Martin’s Baltimore plant to oversee the new operations. In the end, however, the Omaha plant—like Boeing’s at Renton—would become a final assembly center for B-29 parts made elsewhere, a rendezvous point for so many of the companies and corporations that had made the arsenal of democracy.


The Manhattan Project (so called for its early location at Columbia University and other sites around Manhattan) had engaged the nation’s brightest minds and biggest corporations in a $2 billion venture—one that an American economy fully engaged in war production could find
the time, energy, and resources for. It was, in historian Paul Johnson’s words, a truly “capitalist bomb.” Now the biggest industrial program in the nation’s history, to build the most destructive weapon ever conceived, was converging with the second biggest, the race for a plane beyond anyone’s dreams. As America’s factories, shipyards, offices, and plants were still getting war production into high gear, light began to dawn on a new horizon.

The Age of the Superpower.

CHAPTER EIGHTEEN—Fire This Time

Some 334 B-29s lumbered into the air and made the fifteen-hundred-mile flight to Japan, arriving just after night had settled over an unsuspecting Tokyo. The effect was terrifying. In LeMay’s words, “It was as though Tokyo had dropped through the floor of the world and into the mouth of hell.” Two thousand tons of incendiaries rained down on the city from every direction, burning out sixteen square miles of the city and destroying more than a quarter million buildings. Some 83,000 people died in the conflagration that set entire blocks alight and boiled away the water in Tokyo’s canals. LeMay’s planes returned with their underwings and bomb bay doors blackened by the smoke and soot. Crews could smell roasting human flesh below, which lingered in their planes until they landed back at base.

It was the single most destructive air raid in history—and set an apocalyptic scale for what was to come.

News of the raid reached Bill Knudsen many thousands of miles away, in Dayton, Ohio, at the Air Force’s Wright-Patterson Field. It had been the home of the Wright brothers’ first airplane factory. It was now Bill Knudsen’s office, and his last.

...in July 1943, the New Deal critics had finally gotten their wish. A new centralized agency was set up with a single czar to oversee both war production and manpower mobilization.

Yet from his first day in office until the end of the war, he spent most of his time trying to demobilize the war effort and get American business back on track for an orderly transition to a peacetime economy. Production of civilian products had resumed in August 1944—a sure sign that Washington felt it was safe to begin to wind down mobilization. “Reconversion” became the catchphrase of the day.

Such was the power of the production monster Knudsen had unleashed and American business had created. Certainly as far as Knudsen was concerned, he felt his job was done. He was worn out, his health strained to the breaking point. His daughter Martha remembered him sitting at home with tears streaming down his face as the radio announcer told of German cities he once knew—Hamburg, Lübeck, Cologne—reduced to rubble by the bombers he helped build. After six months at Dayton and less than a month after V-E Day, Knudsen formally resigned from the Army, on June 1, 1945. The day before, Hap Arnold had pinned the oak leaf cluster to the Distinguished Service Medal Knudsen had been awarded the previous May, “for exceptionally meritorious and distinguished services in the performance of duties of great responsibility.” Bob Paterson told the press he calculated just by being there Knudsen had single-handedly “raised America’s war production totals by 10 percent.”

As Knudsen saluted and shook hands and set off from Dayton to rejoin his family in Detroit at last, the problem of how to finish the war had passed into other hands. It was no longer a matter of mass production. It was a matter of applying the awesome new technologies industry had developed, in the right places and in the right way.

Here Knudsen had made one final contribution.

On June 11—just ten days after Knudsen stepped down—a flight of specially modified B-29s began arriving at Tinian. The planes had been built at the Glenn Martin plant in Omaha—
the plant Knudsen had turned around with the help of a pair of hard-driving managers. These B-29s were different from the others, with slightly wider bomb bay doors and a modified cockpit with extra room for technicians and special instruments. None of the Omaha workers had known why, and even the top managers knew only that they were part of a special project dubbed Silverplate.

Silverplate’s commanding officer was a thin Air Force colonel with wavy hair and dark eyebrows. Paul W. Tibbets . . .

. . . Tibbets was assembling his men and planes at Tinian for their final preparation. Whatever their mission would be—and Tibbetts had only been told that it would very probably end the war—he had decided that the B-29 with which he would lead the Omaha pack (serial number B-29-45MO 44-86292) would be spray-painted with the name of his mother, who had encouraged him against his father’s will to enter the Air Force.

She lived in Miami, and her name was Enola Gay.

. . .

It wasn’t until May that LeMay was told about the atomic bomb, and the imminent arrival of Colonel Tibbetts’s 509 Composite Group. LeMay had no control over what they were doing, and he didn’t like the setup at all. He certainly didn’t like the attitude of Tibbetts and his specially trained crews. “They were the Second Coming of Christ,” or so they seemed to think, he grumbled later. LeMay did convince Leslie Groves that the best way to deliver the bomb was with a single B-29; that way, he said, it would be less likely to attract Japanese attention until it was too late. But LeMay was also not convinced that the bomb was really necessary. His strategy alone would force Japan to surrender in time, he believed, and his arguments were persuasive enough that his boss, Hap Arnold, was the only senior military or civilian leader to oppose dropping the atomic bomb.

. . .

LeMay couldn’t believe it. The five-ton device was so heavy it couldn’t be loaded the usual way. “The only way to load the bomb was to put it into a hole in the ground, taxi the airplane over the top of the bomb, then jack it up into the plane.” No one had flown with a 10,000-pound bomb before. But Claire Egtvedt and Ed Wells’s Superfortress could handle 20,000 pounds with ease, and so the next day at 2:45 A.M. Enola Gay, together with two other B-29s carrying cameras and monitoring instruments, rumbled down the Tinian runway and pulled themselves up into the air and away into the darkness.

At eight o’clock Tibbetts dropped his single thirteen-kiloton uranium atomic bomb on Hiroshima, killing 50,000 people almost instantly. Two days later another Omaha-built B-29, Bock’s Car (serial number B-29-40MO 44-279297), dropped the Hiroshima bomb’s plutonium cousin on Nagasaki, killing another 36,000. The Japanese government, fearful that there might be more such superweapons, surrendered on August 15.

The war was over.
CONCLUSION—RECKONING

From the moment Knudsen kicked off the armament program in July 1940 until August 1945, the United States had produced $183 billion in arms. Aircraft and ships together accounted for half that total. In those five years, America’s shipyards had launched 141 aircraft carriers, eight battleships, 807 cruisers, destroyers, and destroyer escorts, 203 submarines, and, thanks to Henry Kaiser and his colleagues, almost 52 million tons of merchant shipping. Its factories turned out 88,410 tanks and self-propelled guns, 257,000 artillery pieces, 2.4 million trucks, 2.6 million machine guns— and 41 billion rounds of ammunition. As for aircraft, the United States had produced 324,750, averaging 170 a day since 1942. That was more than the Soviet Union and Great Britain combined, although the U.S. supplied enough raw materials to enable those two allies to be the number two and number three airplane producers in World War II, respectively. For the U.S. had not only armed its own troops, marines, and sailors, it had armed its allies as well— some $50 billion worth through Lend-Lease. When Stalin, Roosevelt, and Churchill first met at Tehran in 1943, and Stalin raised his glass in a toast “to American production, without which this war would have been lost,” it was a stunning tribute from the leader of world Communism to the forces of American capitalism. Yet America had done all this while remaining the least mobilized of the Second World War combatants. The smallest percentage of the male population entered the armed forces. Compared to the Soviet Union or Great Britain, more women remained at home rather than going to work— more than 60 percent. And the United States converted the least of all its economic output to the war effort, just over 47 percent in 1944 compared to almost 60 percent for Britain and more for Germany and the Soviet Union, only to outproduce everyone else put together, including Japan. Yet the output of consumer goods was larger every war year than it had been in 1939, despite the restrictions and rationing. In 1945 Americans ate more meat, bought more shoes and gasoline, and used more electricity than they had before Hitler invaded France. The dream of an economy vibrant enough to produce both guns and butter had been realized thanks to American business.

No one had foreseen this, except Bill Knudsen. He had sensed from the beginning that Washington didn’t have to command or ride herd over the American economy to achieve new heights of production, even after a decade of depression. All you had to do was put in the orders, finance the plant expansion, then stand back and let things happen. And they did, in prodigious amounts. Total economic production in the United States had doubled;* wages rose by 70 percent. American workers were twice as productive as their German counterparts, and four times more productive than the Japanese. Later critics would point out that those numbers were no different before the war than they had been during it. But that was the point. What made America productive wasn’t the war or government dictates or a supreme sense of national urgency. It was the miracle of mass production, which, once turned loose, could overcome any obstacle or difficulty. That included what happened next.

Starting in 1946 nearly 10 million men and women in uniform would be coming home, eager to return to normal life, including a house and a job. They would be returning to an
American economy—even after a year and a half of gradual reconversion—still geared around producing tanks and planes, not clapboard houses and refrigerators. And the unions whose record of cooperation had been less stellar in the war years were poised to resume their battle with private management—in the case of the auto industry, demanding postwar pay raises from Ford and GM as high as 30 percent.

How could America afford it? Now accustomed to anticipating and paying for everything that happened, Washington became worried again. A report released by Senator James Mead of New York predicted massive unemployment and inflation in the war’s aftermath, as America’s fighting men would be returning to empty factories and empty store shelves. “There should be no mincing of words” with the American people, the new head of the Office of War Mobilization and Reconversion, John Snyder, warned President Truman. The end of war production would mean the end of prosperity, and lead to eight million unemployed by the spring of 1946. Economist Leo Cherne thought that number wildly optimistic. It would be closer to 19 million, he asserted. And Professor Paul Samuelson, later the dean of American economists, warned that unless the government took immediate action, “there would be ushered in the greatest period of unemployment and industrial dislocation which any economy has faced”—one that would equal the Great Depression.

Others were not so sure. One was Knudsen’s old boss Alfred Sloan. As he told the American Manufacturing Association in New Jersey back in June 1944, he foresaw a postwar world filled no with gloom and the pinched faces of the unemployed, but with a bright new explosion of American growth as the workers who had been saving away their paychecks now turned those savings loose. “Out of this situation that I speak of, this tremendous aggregation of purchasing power, the tremendous demand for goods,” Sloan predicted a very different future. “If American industry stepped forward and planned boldly and dramatically with courage, and expanded its operations, expanded its capacity, to take care of this post-war demand,” then the result would be a huge jump in national income and rise in standard of living far greater than anything Americans had ever experienced before. The dream of the future he and Knudsen had offered at the 1939 World’s Fair would be realized within his lifetime.

Sloan was right, the doomsayers wrong. There was a hiccup in the last half of 1945 and early 1946, as national output dropped and unemployment rose to 3.9 percent. As price controls were lifted, inflation rose by 20 percent.

Then things smoothed out. Private capital investment, which had gone flat and even turned down during the war, tripled from $10.6 billion in 1945 to $30.6 billion in 1946 and never looked back. Companies began to turn to the capital and bond markets to raise funds for their postwar ventures. Stock prices surged, and by 1947 shares had gained value by 92 percent. As one economist put it, “As the war ended, real prosperity returned almost overnight.”

It also turned out that for every returning veteran, there were three jobs waiting. The vast majority of women who had gone to work in the aircraft plants and steel mills set aside their welding tools and union membership and went home. Inflation eased, and factories that had converted to wartime use learned how to convert back to civilian production even faster. Companies like Frigidaire, Allis-Chalmers, and Walter Kidde quickly found their feet again in the new consumer-driven market. When the first Ford and Dodge and Chevrolet cars in four years rolled off the Detroit assembly lines, the buyers lined up to buy.
The gross domestic product of the United States in 1947 stood at $231 billion in 1948, paused there for 1949, and then went from $285 billion in 1950 to $398 billion in 1955. In the two decades after 1948, GNP grew at an average annual rate of 4 percent. It was, as historian Michael Barone notes, “the most awesome economic growth ever seen in human history.”

It was a growth helped by a government debt much lower than it should have been, thanks to tax increases during the war, when everyone’s incomes were rising. Federal tax receipts, which had been $5 billion in 1940, jumped to $49 billion the year of Hiroshima. This was followed in 1946 by a tax cut—imposed on a reluctant president by Congress, led by a coalition of Republicans and conservative Democrats—that pumped more private investment into the reviving economy. Growth came on so fast that it could withstand the renewal of war in Korea in 1950 without missing a beat—and sustain a massive Pentagon budget all through the Cold War. Guns and butter had come to stay.


On April 27, 1948—seven years and eleven months after President Franklin Roosevelt read the headlines about the collapse of France and picked up the phone—the world learned that the man everyone called Big Bill Knudsen had had a cerebral hemorrhage and died in his Detroit home.

“All of us,” Knudsen wrote before his death, “have a duty to perform in this world.” Knudsen had performed his, with spectacular results. But already by his death the memory of what he had done was being erased, like a bronze monument being eaten away by acid rain.

Those who had been disappointed about being left out of the major decisions about the economy during the war—New Dealers and others—took their revenge by seizing control of the historical message. Business had had nothing to do with the miracle of war production, went the narrative. In fact, there was no miracle at all; it was the vast resources and extended reach of the federal government all along. As Bruce Catton, editor of American Heritage magazine, wrote in his memoirs of his years as public relations officer at the War Production Board, big business constantly got in the way by demanding it be well paid for its services and refusing to embrace a new social contract combining government, business, and labor—an American version of socialism, one in which “labor moved up to partnership with ownership in the great U.S. industries” and government respected “its right and duty . . . to disregard the last vestiges of property rights in a time of crisis.”

Catton’s version of the war years in Washington, which cast big business as the great obstructionist villain, joined up with the narrative put together by acolytes of economist John Maynard Keynes. Far from demonstrating that government intervention failed to revive the American economy during the New Deal years, they argued that war mobilization proved the opposite. Roosevelt in the thirties simply hadn’t spent enough, they claimed. Three hundred billion dollars of deficit spending for the war completed the job the New Deal’s $50 billion couldn’t. The implications were profound. Keynesians asserted, in wartime or peacetime, all you had to do to generate economic growth was increase demand through growing the federal budget or by running government deficits, or both. From 1940 to 1945, business and industry had simply been the lucky recipients of federal largesse. In peacetime, the poor, disadvantaged, and elderly would be next to receive the blessings of big government deficit spending. “Our
mixed economy,” wrote economist Paul Samuelson—the same man who predicted economic depression at war’s end—“has a great future before it.”

Knudsen had forced Washington to give up the illusion of M-Day—of government effortlessly mobilizing an economy of war with the throw of a fiscal switch. Now the illusion returned, disguised as a Keynesian miracle rather than a mass production one.

Even before the war was over, Keynes’s disciples occupied key posts in the Office of Price Administration, the Commerce Department, the Bureau of the Budget, and Treasury. When Keynes appeared at the international economic conference at Bretton Woods in 1944, and delegates sang, “For he’s a jolly good fellow.” Knudsen and the businessmen who had made production possible were already forgotten. Samuelson’s Keynesian account of World War II in his best-selling textbook, Economics, completed the process of amnesia.

Kaiser was one of the last of the old breed, and the most complicated. He had anticipated the postwar boom by four years. “We have only a glimpse of what the future holds,” he told an audience in September 1942, echoing Alfred Sloan’s words at the World’s Fair three years earlier. “A pent-up consumer demand will be released, seeking satisfaction in every artifice and device we know how to make.”

He expanded his steel and magnesium operations, and started up Kaiser Aluminum in 1946, turning a $5 million profit his first year of operation. His experience with building homes for shipyard workers drew him to the possibility of postwar home building. He recruited designer Norman Bel Geddes—the same designer who had built GM’s Futurama for the 1939 World’s Fair—to create a prefabricated three-room steel frame house for only $1,300. He launched Kaiser Community Homes, Inc., which built miles of sprawling suburban homes across places like Panorama City, California—the ancestor of the tract housing development.

In the postwar glow, it was easy to forget the shortcomings of the Kaiser empire. After all, there had been the Hughes debacle, the cracked Liberty Ships, and the ubiquitous but cheaply made and under-armored baby flattop carriers that the sailors who sailed them called “Kaiser coffins” and “one-torpedo ships.” What finally pulled the public up short, however, was his disastrous venture into the Detroit auto industry.

Nothing worked. A discouraged Henry Kaiser had to sell his entire operation in 1958. It had been a spectacular disaster. Although he went on to launch successful construction ventures in California and Hawaii, his new adopted home, and Kaiser Aluminum remained a powerful industrial enterprise, his reputation as America’s entrepreneurial wizard was permanently tarnished.

Still, the master builder now in his sixties remained as tough and tireless as ever.
Already the era of American industrial exuberance that characterized the arsenal of democracy was fading. Thanks to two decades of concessions to unions, Kaiser’s steel and aluminum companies were about to suffer from the same problem as the rest of industrial America: high costs and low productivity plus cutthroat overseas competition—ironically, from Japan and Germany, where Kaiser Engineers had helped to install new efficient steel- and ship-making facilities after the war. The same fate was about to befall Detroit, the heartland of the arsenal of democracy. From Fontana to Pittsburgh, manufacturing America was in headlong retreat. The term “smokestack industry” would soon become a term of derision, even abuse, as it conjured up images of pollution, drab company housing, and dead-end blue-collar jobs.

Yet no man had tried to do more for his own employees than Henry Kaiser, and no firm left a more legacy for the of privately funded health care for workers than Kaiser Permanente. And no one gave America’s push for victory in World War II a sunnier, more optimistic face than the bald man with the glasses and the big grin.

It was the same optimism that had animated Bill Knudsen: the sense that America carried the seeds of its own renewal, the capacity to overcome failure and disaster and push forward. Even on his deathbed, his grandson Henry F. Kaiser remembers, he always spoke about the future, not the past.