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MOTORIZING WORLD WAR II

Charles K. Hyde, *Arsenal of Democracy: The American Automobile Industry in World War II*. Detroit: Wayne State Univ. Press, 2013. Pp. xvi, 248. ISBN 978-0-8143-3951-0.

———, *Images from the Arsenal of Democracy*. Detroit: Wayne State Univ. Press, 2014. Pp. xii, 296. ISBN 978-0-8143-3981-7.

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These two volumes chiefly explore vehicular and winged weaponry in 1940s Detroit. Charles Hyde provides one facet of the narrative and illustrations for President Franklin Roosevelt's fireside chat of 29 December 1940, during which he exhorted an isolationist and uninvolved America to serve as the world's "arsenal of democracy." The United States, still neutral, would provide the guns and ammunition, tanks, planes, ships, and collateral equipment necessary for Britain, France, China, and the Soviet Union to continue their fierce battles against the Axis powers on land and sea and in the air. In the event, "Lend-Lease" shipments accounted for roughly one-third of American defense production during the war.

Hyde (Wayne State Univ.) has published widely on the American auto industry.¹ This and his academic base in Detroit make him ideally suited to tell the peculiar story of the marriage of automotive capitalism and the war needs of an expanding state and its militarized economy. Companies used to making private automobiles and business trucks converted quickly to mass-production of trucks, jeeps, and tanks. Further, they took on the more complicated manufacturing of bomber and fighter aircraft, huge ship and airplane engines, aircraft equipment, and artillery shells. They manufactured first for non-allied "allies" fighting before Pearl Harbor and, afterwards, for American and Allied forces in both the European and Pacific theaters.

Few Americans now realize the extent of preparations for the war prior to December 1941. In August 1940, the German army numbered six million men, the US Army 280,000. The carnage of World War I, the "obscene profits" reaped by US industry during it (4-5), and the belief that the European and Asian wars were remote from American interests and needs led to the passage of four Neutrality acts in Congress. But Roosevelt and others recognized the need to prepare for war, and myriad war-financing and war-machinery agencies were created. There was much infighting, and FDR often appointed new boards to replace old ones that had become sclerotic—or seemed so. The Defense Plant Corporation and many other committees managed rearmament and mobilization of industry to supply thirty-eight certified allies and Lend-Lease recipient countries, originally on a "cash and carry" basis. These foreign states received about one-third of the matériel produced by the United States during the Second World War. After Pearl Harbor, 82 percent of the auto industry's huge output consisted of aircraft, tanks, and other military vehicles (26). Roosevelt set a production goal for tanks in 1942 alone of forty-five thousand units.

Labor agreed not to strike, and union leaders like Walter Reuther took a back seat to the generals and captains of industry in FDR's administration.² There were, however, wildcat strikes and a few government takeovers of plants, but unemployment was virtually nil by December 1943. Hyde, working chiefly from corporate records, is uninformative about labor's gripes. Ruefully noting that aircraft engines and propellers are not very sexy compared to fighter aircraft (44), he proceeds to catalogue the dates, production quotas, and surpassed expectations of each of the engine-makers whose assembly-line efficiencies replaced old-

1. *Riding the Roller Coaster: A History of the Chrysler Corporation* (Detroit: Wayne State U Pr, 2003), *The Dodge Brothers: The Men, the Motor Cars, and the Legacy* (id., 2005), *Storied Independent Automakers: Nash, Hudson, and American Motors* (id., 2009).

2. For the sometimes disgruntled view from below, see Studs Terkel's Pulitzer Prize-winning *"The Good War": An Oral History of World War II* (NY: Pantheon 1984).

style “station assembly” methods at Pratt & Whitney, locomotive construction companies, and their congeners (without reducing the seventy thousand inspections of every Allison engine, or the seventy thousand gauges that Nash required to make sure all machining equipment was compliant). Packard picked up the slack when Chrysler and Ford vetoed manufacturing Merlin aircraft engines—82 percent of which were ordered by the British government. A typical engine had 11,723 parts. Ford was able to use test engines to produce 95 percent of one plant’s electric power. Studebaker eventually had to sell expensive excess tools for scrap.

Neither enemies nor allies could compete with the American war machine when it shifted gears to armament production. Japan and the Soviet Union had negligible auto industries to turn to (115–16). The Luftwaffe depended on private aircraft manufacturers (Junkers, Heide, Dornier, Messerschmitt, etc.) that cooperated neither with each other nor with the automakers (Volkswagen and Opel). When the Germans doubled their aircraft production, the British tripled theirs, and the Americans increased theirs twentyfold. The Japanese aircraft industry could not even replace losses.

The United States was slow to recognize that tanks could be more than accompaniments to infantry. Eventually, Midwestern industry built 88,410 medium-size tanks (Shermans), 22,235 of them at the Detroit Chrysler Tank Arsenal alone. Eventually, US tank building capacity dwarfed that of the Germans. Many of the tanks went to the British Empire and the Soviet Union. In chapter 6, “Jeeps, Trucks, and Amphibious Vehicles,” we learn that only two of 135 companies approached by the government in May 1940 bothered to submit proposals—American Bantam Car and Willys-Overland. The authorities judged Bantam’s product best, but gave Willys and Ford additional contracts because Bantam was a lightweight in the automobile industry. When Willys produced five hundred jeeps per day, Ford produced six thousand (151). The 6x6 Truck became “the workhorse of the army,” and over thirteen thousand Yellow Trucks had been ordered by early 1941. All closed-cab Studebaker trucks went to the Soviet Union, “presumably because of the cold Russian winters” (155). Some models, like the “Aqua-Cheetah,” died early in their development process. Yellow Truck (158) built all 21,000+ DUKWs³ (amphibious vehicles known as “Ducks”).

Chapter 7, “Guns, Shells, Bullets, and Other War Goods,” informs us that Chrysler (and over two thousand subcontractors) built the American version of the Swedish Bofors 37mm antiaircraft gun. The engineers had to convert European metric designs to American inches. Modifying specifications for mass production, they whittled assembly time down from 450 to fourteen hours.⁴

Chapter 8, “The New Workers,” which is just as densely statistical as the others, treats a more human topic: the “tapping of previously underutilized pools of labor” (174)—white Appalachians and Southerners, African-Americans, and women. In 1940, the Great Depression still lingered (14.6 percent unemployment), but, by 1943, the rate was down to 1.9 percent. The armed forces grew from 458,000 to 9 million in the same period and reached 12.1 million by 1945. As the military sucked up the usual manpower, new workers were needed to perform many new kinds of work (for example, riveting aluminum aircraft). Workers who migrated from the deep South and border states faced the scorn of the local Michiganders, who called them “hillbillies” and “briarhoppers,” while the migrants themselves brought their own vicious anti-black attitudes, often shared by their employers (Fisher Body Corporation, for one) and existing workers (Polish heritage employees are mentioned on 182), especially women.

Union leaders had a mixed record: they pressed for better opportunities for blacks and women and equal pay for equal work, but the members often went on wildcat strikes (termed “hate strikes” in the press). On 18 June 1942, ten thousand whites walked off their jobs at Hudson Motor Car because a few African-American men gained transfer to machinist jobs. Blacks were typically employed in the lowest-paying jobs, such as janitors, sanders, and foundry-workers, and many plants were segregated by departments (179). Black women faced even more virulent discrimination, for example, in the allocation of bathroom

3. On 160, Hyde says General Motors built them.

4. Other sources state that production time was cut only by half. Elsewhere, Hyde claims the use of solid nickel in building U-235 gaseous diffusers for the Manhattan project would have exhausted the national supply (171), then writes that it would have exhausted the *world* supply (210). Chrysler’s engineers solved this unprecedented problem by electroplating nickel onto steel diffusers.

facilities. The Detroit Race Riot (June 1943) found eloquent if repugnant individual expression in one worker's statement: "I'd rather see Hitler and Hirohito win than work beside a nigger on the assembly line" (184)—this in the heartland of a nation fighting against racism. At times during the war, companies, unions, and government agencies made odd bedfellows as they tried to maintain crucial production quotas in the face of the prejudices of Southern white male assembly-line workers.

Women escaped such extreme hostility as a group, but were often restricted to light precision work such as riveting aluminum wing and fuselage sections.⁵ At Ford plants, women had separate factory entrances, an advance from the policies of the 1930s when automobile companies generally refused to hire married women at all. Wartime production quotas in the automobile industry led to a jump in female employees from 70,000 to 203, 300 by November 1943. Nevertheless, the pay for "women's work" was less, even when it was identical, in practice if not designation, to that of males. Industrial departments were generally segregated by sex (194) and engineers modified some machines to benefit both sexes in ease of use and efficiency. However, when the nation demobilized, both industry and unions ignored any seniority women had earned, falsely claiming that they wanted to return to their prewar housewives' roles (199). In one year after April 1945, women in the industrial workforce fell from 25 to 9 percent.

Hyde should have discussed in more detail the personal experiences of these new workers: men migrating from one region of the country to another, women seeking child-care while they worked, and African-Americans lacking previous industrial experience. It is disappointing that, despite his thousands of statistics on procurement and production of the weapons that won the war, he rarely broaches the subject of the consequent human dislocations in the American Republic or puts a face on the numbers, even though he has lived near the dwindling number of eyewitnesses and workers themselves. The war set in motion the unstoppable growth of the military-industrial complex, a corporatizing development that engendered or profited from "Cold War" tensions with the Soviet Union, the Bomb Race, the Missile Race, the Space Race (none mentioned here), and the concomitant distortion of the American economy. Even the democrat FDR "minimized the influence of ... the New Dealers, organized labor, and Congress" (201).

Hyde attributes the staggering US manufacturing achievements to superior American worker productivity and more efficient large-scale industrial techniques. Workers and companies fiercely coveted the rarely bestowed Army-Navy "E" production awards.⁶ The criteria for these included quantity and quality of production, health and safety records, conservation of raw materials, fair labor standards, absence of work stoppages, and effective management. Production in Great Britain, the Soviet Union, Japan, and Germany amounted to less than half that of American manufacturing. Surprisingly, Adolf Hitler's Third Reich never fully mobilized its civilian population for war production, thinking it unnecessary after the initial Blitzkrieg victories and fearing to damage civilian morale (203). Japan fully mobilized, but too late.

Hyde divides the photo volume into nine chapters paralleling those of the earlier book: "Preparing for War before Pearl Harbor," "Planning Defense Production after Pearl Harbor," "Aircraft Engines and Propellers," "Aircraft Components and Complete Aircraft," "Tanks and Other Armored Vehicles," "Jeeps, Trucks, and Amphibious Vehicles," "Guns, Shells and Other War Goods," "The New Workers," and "Celebrating the Production Achievements." He has selected photographs from the Automobile Manufacturers Association's donations to the National Automotive History Collection, now in the Detroit Public Library. Archivists at Ford, General Motors, Chrysler, the Walter Reuther Library of Labor and Urban Affairs, and the US Army assisted him. His past research taught him where to look for information from now defunct or merged companies like Nash and REO.

5. My father, Alfred Lateiner, trained and supervised women riveting Warhawk and Helldiver warplanes at a Tarrytown, New York Fisher Body manufacturing plant, developing worker safety-training programs he later deployed at the Brooklyn Navy Yard. My father-in-law, Richard Landis Gabel, helped manage Superior Tube Company in Norristown, Pennsylvania, "The Big Name in Small Tubing." This manufacturer of high-precision parts for airplanes and medical equipment won the coveted "E" award (see below and the Naval History and Command website - www.miwsr.com/rd/1504.htm).

6. Only 5 percent of eligible defense plants received the award after its introduction in July 1942.

The visual record provided in *Images from the Arsenal of Democracy* is remarkable. We see the last 1942 Plymouths rolling off the line before the War Production Board shut down most civilian car production; machines (some as much as 175 feet long) modified for military motors, vehicle bodies and parts; generals inspecting plants (every manufacturing facility had at least one military “resident representative” or “permanent watchdog”); huge new factories (the Dodge-Chicago Division, for example, air-conditioned “only” twenty-two acres of the plant) building the B-29 Superfortress’s 2,200 hp engines (18,413 completed). We see FDR visiting the Willow Run Ford plant with his wife Eleanor (September 1942) and Henry Ford squished between these “two people he despised” (97). Another sequence shows the building of B-24 Liberators.⁷ One gigantic Ingersoll machine completed forty-two machining operations on the central portion of the wings, which weighed 2.25 tons before workers attached the landing gear, engines, engine mounts, gas tanks, and other equipment. Some nicknamed the Liberator the “Flying Coffin,”⁸ because it was difficult to fly, hard to ditch safely (with its high Davis wing), vulnerable to attack (because of the placement of its fuel tanks), and hard to exit through its single door in the rear. Willow Run produced 46 percent of these most manufactured of all US bombers—nearly one per hour in April 1944. Photographs of dive-bombing Avengers (Grumman), helicopters (Nash-Kelvinator), and gliders (Ford; 70,000 parts each) end the chapter.

Automakers produced 49,000 of 88,000 light and heavy tanks. Some were judged effective (M4 General Shermans) or not (M3 General Grants) based on their turret’s ability to turn 360 degrees. Six different engines from various manufacturers were allocated to power the Shermans. One Chrysler Tank Arsenal photo shows five parallel assembly lines in action. Since the Shermans were, however, “no match” for the Germans’ 1943 Tiger and Panther heavy tanks, US engineers later designed the 46-ton M26 General Pershing, but few of the 2,400 built saw combat, since the army deployed them only in 1945.

Bantam Cars was the first company (July 1939) to build quarter-ton Jeeps; Willys-Overland and Ford got into the game later. FDR appears in one in Casablanca (January 1943). Trucks ranging from half-ton to 2.5-ton carried troops and supplies, food for men and gas for vehicles, and ferried the wounded and dead back from the front. Hundreds of 6x6 trucks (that is, six wheels, all connected to drive shafts) appear in one photo, described as a single day’s (!) production (171); General Motors built 78 percent of them. The Quartermaster Corps broke down many of them to be shipped in pieces and reassembled on site in China, New Guinea, France, and elsewhere. One photo shows a DUKW crossing the Danube in April 1945. We see state-side trials and actual combat photographs of the rarer Army Ordnance commissioned “Seeps” (Sea Jeeps) and Weasels, vehicles that could move over ice, across rivers, and up steep embankments. The Army and Navy replicated Swedish Bofors antiaircraft guns and the Navy ordered copies of Swiss Oerlikons. Some antiaircraft cannon could hit planes at thirty-five thousand feet. Three Packard V-12, 1,500 hp engines propelled the Navy’s nearly eight hundred PT boats.

One picture (235) shows American workers of Chinese descent at the Hudson Motor Car plant assembling wings for the Helldiver. Hyde states that, before the war, no plant would have hired them. Another photo shows “little people,” men who could work in confined spaces, another an entirely African-American female assembly line packaging .45 caliber munitions under the eye of a white male supervisor. There are photos of women wiring aircraft (249),⁹ riveting fuselages, sewing seat-cushions, and inspecting pistons, gyroscope rotors, and finished engines. Identically dressed women assemble parts for Ranco binoculars in

7. The statistics presented here are stupefying: the B-24 bomber required over 30,000 drawings, 152,000 parts (30,000 unique) and 313,000 rivets of 520 types and sizes (89). The Consolidated “shop-engineered” B-24 did not suit Ford’s mass-production techniques. All thirty thousand drawings had to be redone. When Willow Run (dubbed “Will It Run?”) reached full production, ninety planes were in some stage of construction at once. In six days of April 1945, the plant produced 453 bombers, one every sixty-two minutes (103).

8. Laura Hillenbrand, in her bestselling *Unbroken: A World War II Story of Survival, Resilience, and Redemption* (NY: Random House, 2010), retells, from personal interviews, bombardier Louis Zamperini’s Army Air Corps experiences before and after the crash of his B-24 during a search mission on 27 May 1943. His horrific POW experiences in Japanese camps ended only long after the B-29s started flying uncontested missions over Japan. After reading so much about the conflicts, disputes, and misunderstandings in procuring, commissioning, and constructing the B-17 Flying Fortresses, B-24 Liberators, B-25s, and B-29s (Boeing built 12,962 of the latter), the reader appreciates seeing them fly in formation into action. Twenty-one thousand bombers fell and 140,000 aviators died in American bombing raids.

9. There were thirty miles of wire in a B-29.

Columbus, Ohio—just the kind of delicate, precise work deemed appropriate for women. But a few photos show women operating cranes, lathes, and metal presses, assembling wing-flaps, and serving as security police for Studebaker's aircraft engine plant in South Bend, Indiana.¹⁰ Female Parts-Department clerks donned roller-skates to rapidly deliver needed parts (276). Both of Hyde's volumes concentrate on Washington's financing and the Detroit-centered production of flying machines, ship engines, land vehicles, and the armor and weapons they were equipped with, but the author delivers hardly any photographs of these instruments of destruction in action.

Journalist A.J. Baime, in another, still more recent book entitled *The Arsenal of Democracy*,¹¹ focuses on leading personalities, especially Henry Ford and his only son Edsel. Henry, a friend of Charles Lindbergh—"America First," pacifist, and recipient of Hitler's "Grand Cross of the German Eagle" decoration—did not want his company to join the war effort, but the government eventually persuaded Edsel to turn out "a Bomber an Hour" at Ford's sprawling Willow Run plant. Hyde immerses his readers in cold statistics, while Baime introduces his to flammable personalities. Neither offers much about how workers lived and felt. Walter Reuther has no index entry in Hyde's volumes, while Baime vividly describes the "Battle of the Overpass" (45-49) in May 1937, when Ford's company goons slammed the union leader into concrete. Baime includes fewer photographs (twenty-one in all), but one shows strikers marching in April 1941 with a placard asking "Why did FORD get a NAZI medal?" Otherwise, this was Detroit's finest hour.

Though they may be read separately, Hyde's two books belong together. The dry, statistics-studded prose of the text volume becomes more digestible when leavened by visual images. Hyde provides students of history with a narrative of the daunting problems and striking successes of retooling for war, not profiles of dashing pilots and their flying machines, or, like Baime, scandalous tales of wealthy industrialists and their German business connections. In the end, Roosevelt's propagandistic vision of an "Arsenal of Democracy" rings somewhat hollow, indeed ironic, however desirable the defeat of the totalitarian Axis countries. Very few of the Allied nations and their colonial dependencies were democratic or thought of themselves as such during the Second World War. Recall the governing entities of China, India, the Philippines, the Soviet Union, or indeed the plight of America's racial minorities. Hyde's well-researched volume will enlighten serious students of the war, but his laborious prose will deter any more general readership.

10. Hyde regrettably neglects to explore which commission authorized the photos and to what ends: favorable corporate publicity, historical records, proof of work-force diversity, or what?

11. Subtitle: *FDR, Detroit, and an Epic Quest to Arm an America at War* (NY: Houghton Mifflin Harcourt, 2014).