AUTOMOTIVE HISTORY REVIEW

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EDITOR'S NOTES:

In its 28-year existence, the Society of Automotive Historians has had its own historic milestones. Certainly, the cumulative enrollment of its 100th, 500th, 1,000th, and 2,000th member qualify as such. But there are three occurrences which I think have been of paramount importance in the history of the Society.

The first, of course, was the act in October 1969 of founding a Society based upon automotive history, the inspiration of Richard B. Brigham and Marshall Naul. From this, "all blessings flow." The second occurred in the Winter of 1973-74 with the publication of the first issue of the *Automotive History Review*. While far from the first magazine devoted to "old cars," the interests of the Society transcend makes, geography, and time, and its publications try to reflect this, thus the uniqueness of the *Review*.

Most recently, there has been the first Automotive History Conference which the Society co-chaired with the Henry Ford Museum in Dearborn, Michigan, in September 1996. To this attendee, the Conference was significant for two principal reasons. The first was the breadth of the topics covered, going far beyond the traditional historical studies of the machines and the men who made them. The second was the fact that many of the presenters were graduate students or young professors. This augurs well for the future of the automotive past as its study becomes increasingly a respected academic discipline.

Those of us who heard these presentations were convinced that some forum ought to be available for their publication. The Society discussed the possibility of a book of all papers with a university press and a commercial one, but the project appeared too complex and costly to achieve. In the end, it seemed best to do the job ourselves, and the SAH Board authorized an issue of the *Review* devoted to the Conference papers. Because of space limitations, we have chosen to provide a representative sample of the papers, followed by Abstracts of the remaining ones. I regret that we could not publish them all, but if a reader has a further interest in a paper that is only abstracted, I will be happy to make available the author's address.

Given the consensus that Henry Ford was the most important figure in the American automobile industry in its first 50 years, if not 100, and the fact that the Conference was held under the auspices of the Henry Ford Museum, it is fitting that we give our cover to a photo of the man in front of his museum. Professor David Lewis's paper "Henry Ford and the 20th Century" was a natural choice to lead off the issue. Indeed, one issue alone could have been devoted to the papers on Henry Ford and his projects. David Lewis is Professor of Business History, University of Michigan, Ann Arbor, Michigan. He is also a former president of the Society, and winner of its Cugnot and Friend of Automotive History Awards.

Bill Kovarik's "Henry Ford, Charles Kettering, and the 'Fuel of the Future'" is the longest article that has ever appeared in the *Review*. It basically is the history of the technological, economic and political context of the use of alcohol fuels in the United States through the 1930s. I got so caught up in it that I couldn't bring myself to wield the blue pencil more than lightly, so much of it was new. Dr Kovarik is Assistant Professor, Department of Media Studies, Radford University, Radford, Va.

Because it would not be the *Review* without at least one article on a bygone make, Craig S. Pascoe's "Made in Dixie But . . . The Anderson Motor Company and the Problems of Financing and Acceptance of a Southern Made Automobile" ought to please. It seemed significant to me for its discussion of the advent of credit financing in the rural, impoverished South of the 'Teens of this century. Mr. Pascoe is with the Department of History, Georgia Southern University, Statesboro, Georgia.

As automotive safety has been my vocation for over 30 years, I found Daniel Albert's "The Psychotechnologist & The Good Driver: Granting Admission to Road Society" from his paper "Efforts to Promote Auto Safety" especially intriguing. His account of the efforts by the Detroit police department in the '30s and '40s to develop psychological profiles of traffic offenders in an attempt to rehabilitate them will be new to many of you. Daniel Albert was a doctoral candidate at the University of Michigan, Ann Arbor, Michigan, at the time of his presentation, and has since received his doctorate.

SAH has a number of racing enthusiasts among its members. The editor is not among them. Nor is he labor-minded. Yet he found Harry Carpenter's "Unionization Efforts at NASCAR" riveting and an example of the kind of paper that he thought ought to be shared with SAH members as an effort to broaden the Society's traditional approach to automotive history. Mr. Carpenter is a Ph.D. candidate at Auburn University, Auburn, Alabama.

You will be interested to know that four of our principal authors, Dave Lewis, Craig Pascoe, Dan Albert, and Harry Carpenter, are members of the Society, the latter three joining as a result of the conference.

In sum, Issue Number 32 departs from the main highway and carries the *Review* into the less-traveled roads of automotive history. I doubt that it is feasible for the *Review* ever to become what some have suggested, a refereed publication, but this issue of greater variety and depth illustrates the wide and sophisticated range of interests in the academic community today.

Finally, you will note on the inside rear cover an announcement of the second Auto History Conference for September 1998. The Society hopes that this issue will serve as an encouragement to join us in Dearborn — and to have an advance preview of a future issue devoted to the proceedings of that conference.

I want to close by thanking Pat Chappell and Kit Foster for proof-reading the galleys of this issue, and their suggestions for its enhancement.

—— Taylor Vinson

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The 1996 Automotive History Conference: The American Automobile Industry: Past, Present, Future

Front Cover: Henry Fords I and II on the steps of the Henry Ford Museum, Dearborn, 1944.
Rear Cover: Henry Ford with his 1896 Quadricycle, 1933.

Acknowledgments: The cover photographs are from the collections of Henry Ford Museum & Greenfield Village. Each author has provided the photographs accompanying his article or abstract.

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HENRY FORD AND THE 20TH CENTURY

By David L. Lewis

As the 20th Century draws to a close, there will be much stocktaking of its greatest and/or most influential persons, Henry Ford among them. Getting ahead of the game I should like to put this greatest of auto figures into a century-long perspective.

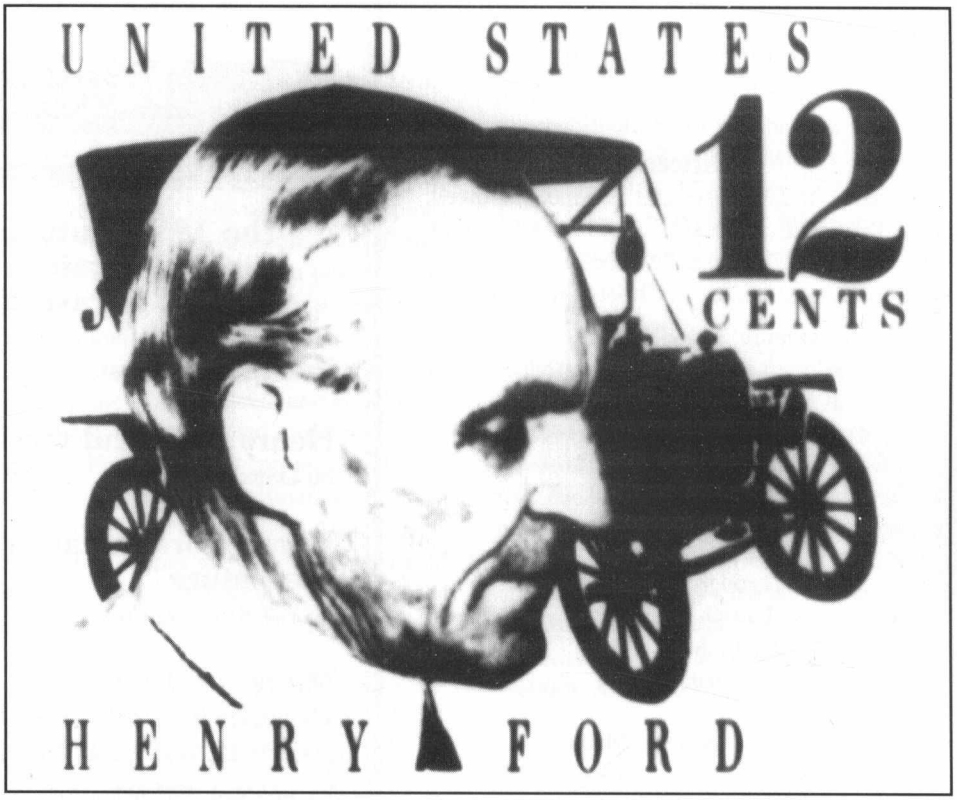
Let's first examine Ford's reputation during his prime, the years 1914 to 1929, then between 1930 and the time of his death in 1947, followed by consideration as to how he is viewed today and may be regarded in future.

At the start of 1914 Ford was little known outside of automotive and business circles. That year, however, thanks to his Model T, mass production methods, and five-dollar day, he became one of the world's best-known persons. Within a few years he also would be an American folk hero.

Ford's reputation, like that of most public figures, was built on publicity along with achievement. Between 1914 and 1920 the automaker received more press attention in the U.S. than all but four persons—Woodrow Wilson, Charles Evans Hughes, William Jennings Bryan, and Theodore Roosevelt. He was five times more publicized than either of the nation's best-known entertainers, Mary Pickford and Charlie Chaplin.

Ford began to figure prominently in "greatest man" polls and selections as early as March 1914 when *The Detroit News'* editorial staff named him the world's fifteenth "greatest living man." The list was headed by Thomas A. Edison, Theodore Roosevelt, and Guglielmo Marconi.

During the 1920s Ford received more publicity than any other American except Calvin Coolidge, and Coolidge received a bigger press only because he occupied the presidency nearly two-thirds of this time. The most publicized entertainers, Will Rogers and Charlie Chaplin, obtained less than one-twelfth of the manufacturer's publicity. Abroad, during the 1920s only premiers, presidents, and dictators of the Great Powers received as much attention as Ford.



Also, during the 1920s Ford was the subject of 15 books and full chapters in at least 14 volumes devoted to world leaders, prominent Americans, and leading businessmen. In contrast, our generation's most publicized business figure, Lee Iacocca, is the subject of four biographies, two of them self-authored.

In addition to being one of the most publicized figures of the 1920s, Ford also was one of the most highly esteemed. In 1922 he was named, after Woodrow Wilson, the second greatest living American by readers of *The Denver News*; the third greatest living American by readers of *The Kansas City Journal-Post;* and the eighth greatest living American by representative citizens polled by *Commerce & Finance*. The following year he was named the third greatest living American by members of the General Federation of Women's Clubs. In 1924 he was ranked second to Theodore Roosevelt as the 20th Century's greatest man by President Marion Leroy Burton of the University of Michigan. That same year representative Detroiters surveyed by *The Detroit News* rated Ford the world's third greatest man, behind Roosevelt and Edison.

In 1926 Ford was ranked second to Benito Mussolini as the world's greatest living man in a YMCA-sponsored poll of boys and girls in more than 50 nations speaking 22 languages. That year he also was rated the world's greatest living man by U.S. police chiefs polled by the United Press. In 1927 the faculty at City College of New York named Ford the second greatest living man, after Edison, and Northwestern journalism students named him the second most important man in world news, behind Charles A. Lindbergh.

In 1928 only Lindbergh and Coolidge outranked Ford in a survey of 682 Belleville, New Jersey, schoolboys asked who they would like to be if they were not themselves. Also that year, Ford was ranked fifth by prominent Americans asked to designate twelve living immortals, the four persons ahead of him being Edison, Mussolini, Albert Einstein, and George Bernard Shaw. The inclusion of Mussolini on such lists indicates how fleeting greatness can be.

Given the esteem in which Ford was held, many babies were named for him. In Detroit alone there were twelve namesakes in 1930. Hollywood director Francis Ford Coppola was named for Ford as were Henry Ford Hubbard, the son of a Dearborn mayor, Edsel Henry Ford, a co-founder of the Edsel Owners Club of America, and Virginian Henry Ford Pugh, a twin of Edsel Ford Pugh.

Ford's reputation remained durable during the 1930s, despite a decrease in his publicity. A 1937 *Fortune* survey found that the nation's poor people ranked only Senator William E. Borah and Postmaster General James Farley ahead of Ford when asked to name whom they would prefer (aside from Franklin D. Roosevelt) as President. The same year students at Stout Institute, Menominee, Wisconsin, ranked the manufacturer with Lincoln, Washington, Edison, and Franklin as one of the five greatest Americans of all time. Princeton students, when asked in 1939, "What famous person would you like to know?", placed only Hitler, Roosevelt, and Britain's Foreign Minister Anthony Eden ahead of Ford, who was followed by Lindbergh, Secretary of State Cordell Hull, Hedy Lamarr, George Bernard Shaw, Farley, Arturo Toscanini, and Thomas E. Dewey.

In 1941, as America prepared to enter World War II, Ford's reputation and achievements were such that *Time* magazine had decided to name him Man of the Year, until the attack on Pearl Harbor propelled President Roosevelt to the fore.

At the time of his death in April 1947, Ford was summed up by the press and others as a patriot, philanthropist, philosopher, sociologist, reformer, economist, teacher, and, above all as a man of simple tastes. He also was widely depicted as an inspiration to youth, as an authentic American, and as a symbol of individualism, of America's productive genius, of free enterprise, of America itself.

Almost everyone agreed that Ford's career had benefited the public, and that public service was the compelling motive behind his acts and decisions. The general media glossed over the industrialist's errors of judgment and prejudices; these were simply traits that he shared with the rest of us. The African-American press praised the automaker as a great benefactor of the black race, while the liberal, labor, and Jewish press were highly critical.

Although Ford's reputation was generally favorable at the time of his death, it would have been enhanced if the magnate, like Pope John XXIII and John F. Kennedy, had died earlier, after having set in motion sweeping changes. Had he passed on in late 1914, with his moving assembly lines humming, his Model T running away with the market, and his Selden patent fight, five-dollar day, and price cuts behind him, his star might have been even brighter.

Similarly, Ford's reputation would have been higher had he died or retired at age 66 in 1929, leaving behind a mixed bag of additional accomplishments: the building of a great vertically-integrated company, the launching of the Model A, and the start of Greenfield Village/Henry Ford Museum, to name a few, while revealing his ignorance, anti-Semitism, and other assorted deficiencies. But rather than move offstage and permit his capable son, Edsel, and others to run the company, he hung on until 1945, occasionally displaying visionary flashes and intuitive inspiration, but progressively falling out of step with the times and himself acquiring a Model T image.

Even in his grave, Ford probably has received more media attention than any automen other than Henry Ford II and Lee Iacocca. Some of the publicity has been startling, e.g., a 1989 book suggesting that Ford may have arranged for John Dodge's murder and a 1978 book, The Secret Life of Henry Ford, by John Dahlinger, who claimed to be Ford's illegitimate son.

There also are occasional references to Ford on TV and radio. "It was 96 years ago this very week that Henry Ford made the first safe nighttime drive through the streets of Detroit," Jay Leno informed his Tonight Show audience in 1992. Leno added, "that was also the last safe nighttime drive through Detroit."

Estimates of Ford's greatness have remained unaltered through the years. In 1968 the industrialist was one of 108 persons receiving votes in a University of Michigan survey of America's daily newspaper editors to determine the most admired figures in all of world history.

In 1976 newspaper editors and radio-TV news directors polled by the Associated Press named Henry Ford, his Model T, and the rise of the automobile one of the 10 top news stories since 1776. In 1986 *Detroit Free Press* columnist Judd Arnett cited Ford, along with Jesus Christ, Charles A. Lindbergh, and Albert Einstein, as one of 11 authentic heroes. In 1991, 60 historians and other authorities, asked by *Life* magazine to select the 20th Century's 100 most influential persons, voted unanimously for only three persons: Ford and the Wright brothers.

In 1992, *Time* magazine rated Henry the century's second greatest person, behind Sigmund Freud, ahead of Gandhi, Churchill, Picasso, Pope John XXIII, FDR, Margaret Sanger, Mother Teresa, and Martin Luther King, Jr. The magazine also cited the mass produced Model T as one of the century's greatest technological breakthroughs. Abroad, Ford was among those portrayed in a 1993 British film documentary on the century's greatest figures.

In 1996, Ford was rated as the 91st most influential person in world history—and the 16th most influential of the 20th Century—in Dr. Michael H. Hart's book, The 100: A Ranking of the Most Influential Persons. Another 1996 book, Time's Great People of the Twentieth Century, ranked Ford among the century's nine greatest innovators and 80 greatest persons. In making its assessment, the book observed that Ford more than any man in the 20th Century changed the way we lived. In 1997, *Life* ranked Ford as the 15th most important person of the last 1,000 years, and the mass-produced Model T as the 17th "most cataclysmic event" of the millenium. I know of only one ranking of auto figures in which Ford was not first. To celebrate the centenary of the automobile in Britain, *Autocar* polled its readers to name the greatest automan. Their choice: Enzo Ferrari.

Another measure of esteem for Ford are the continuous press references to industrial leaders and others as the Henry Ford of a country, a company, or a sphere of activity. For example, William R. Morris has been referred to as the Henry Ford of Britain, Louis Renault as the Henry Ford of France, Soichiro Honda as the Henry Ford of Japan, Henry J. Kaiser as the Henry Ford of shipbuilding, William T. Piper as the Henry Ford of aviation, Milton Hershey

as the Henry Ford of candy, William J. Levitt as the Henry Ford of suburban development, Ray Kroc as the Henry Ford of hamburgers, Steven Jobs as the Henry Ford of computers, and drug kingpin Carlos R. Rivas as the Henry Ford of cocaine.

Many businesses, hoping to cash in on Ford's reputation, bear the auto king's name. Among them are Ferndale, California's Henry Ford's Tavern & Oyster Bar, Ireland's Henry Ford Tavern, Hong Kong's Henry Ford Tool and Plastic Manufacturing Company, and Taipei's Henry Ford Barbershop, none associated with Ford Motor Company.

Ford's name often is invoked by advertisers and promoters with campaigns linking products and services to famous people. In 1995-96, the Ford Company itself, for the first time in more than 60 years, trotted out its founder's ghost in national advertising. In TV commercials, a Ford family-approved voice, sounding as if it came from the distant past and accompanied by drumbeats, intones, "I want to build a motor car for the great multitudes" etc.

Full-size statues of Ford stand on display in Dearborn, Ft. Myers, Fla., Dagenham, England, and Sao Paulo, Brazil. Until June 1996, when a statue of Henry Ford II was unveiled at the Henry Ford II World Center, the senior Ford's effigies were the only life-size effigies of an American automan—unless Lee Iacocca has one of himself in his living room.

Henry Ford's greatness is not universally accepted, however. In 1992 *American Heritage* invited historians and politicians to nominate the single most overrated figure in American history. Historian Bernard Weisberger named Ford. Despite popular misconceptions, Weisberger observed, [Ford] did not invent the automobile, the assembly line, vertical integration, or mass ownership of cars. Weisberger is correct, although Ford's contribution to and identification with each of these phenomena is so great as to make it seem that he invented them, which perhaps helps explain his election to the National Inventors Hall of Fame. Others whom Weisberger deems overrated include Benjamin Franklin, Thomas Jefferson, Woodrow Wilson, and John F. Kennedy.

Ford probably has been named to as many halls of fame as any other American. Among them are the Automobile Hall of Fame in Dearborn; the Aviation Hall of Fame in Dayton; the Automobile Racing Hall of Fame in Los Angeles; the International Motorsports Hall of Fame in Talladega, Ala.; the Motorsports Hall of Fame in Novi, Mich.; the Michigan Sports Hall of Fame in Detroit; the *Fortune* magazine-backed American National Business Hall of Fame; and the Hall of Giants at Enterprise Square in Oklahoma City. If there were halls of fame for tractormen, railroaders, soybean growers, plastic producers, folk dancers, publicists, educators, tunnel, chapel, and museum builders, and ecologists, environmentalists, and preservationists, he likely would be elected to them as well.

As noted earlier, commentators and pollsters soon will begin to reflect on the century's greatest/and or most influential figures. Henry Ford seems sure to be ranked highly by the mature and well-informed. But he likely will receive low marks, perhaps even be ignored, by the audience-seeking media and Generation X. As columnist Judd Arnett observed in *The Detroit Free Press* in 1986, "[today's heroes are comprised] of athletes, TV personalities, authors overflowing with four-letter words...and politicians with pretty faces and empty noggins."

Generation X views may be mirrored by those of a 20-year-old Frenchwoman asked by *Detroit News* sportswriter Joe Falls in 1992 to identify Ford and 24 other prominent North American people and well-known names. Although a student of tourism and the English and German languages, the Frenchwoman replied, "We see many Ford signs in our country, so I will say [Ford] was a politician." Lindbergh, Jonas Salk, Dan Quayle, and Iacocca also were unknown, the latter being described as an Indian who fights for the rights of his people.

The Frenchwoman was able to correctly identify Mickey Mouse, Santa Claus, Elvis Presley, Mike Tyson, Elizabeth Taylor, Frank Sinatra, Marilyn Monroe, Dwight D. Eisenhower, John F. Kennedy, Lee Harvey Oswald, and Butch Cassidy and the Sundance Kid.

Perhaps Ford's name recognition would improve among the young and less well informed if the tabloids occasionally shouted that he, like Elvis, James Dean, Amelia Earhart, and Hitler, had been sighted in Las Vegas, Argentina, or elsewhere.

Notwithstanding present values and youthful ignorance, it seems safe to assume that Henry Ford's name is one for the ages. A 1930 assessment of Ford is no less valid today. It could be, said author Nevin Bush, Jr., that if it were possible to preserve alive, for the interests of history, one man from each century and country, not, of course, the best or the wisest, but the one who represents most thoroughly the hopes, crudities, background, and achievements of his place, no one could better represent this time and the United States than Henry Ford.

In 1943 General Motors' great inventor, Charles F. Kettering, went further. A thousand years from now, he observed, when the Churchills and the Roosevelts are but footnotes in history, Henry Ford will loom as the most significant figure of our age. *The New York Times* concurred in 1992, describing Ford as the quintessential American and noting that "only once or twice in a century is the world blessed...with such a fount of industrial innovation and vigor [as Henry Ford]."

In forthcoming polls on the 20th Century's leading figures, Ford seems certain to retain his ranking as the world's greatest automotive figure and industrialist. Also, it seems likely that he will be named to every list of the most influential persons of the century. In addition, he probably will be named to most lists of the century's greatest figures, and receive some support in surveys measuring most admired persons.

Ford's future reputation rests not only on his achievements, but on future value systems as well. The auto king played the key role in putting Americans on wheels and providing greater abundance for millions. He likely will be judged favorably for as long as vehicle and factory wheels spin. If they wind down, his star may fade.

In any event, Ford will be remembered for his great achievements. By preaching high-volume production, low prices, and universal consumption, he became the most important figure in a visionary, far-reaching revolution that actually did remold the world and, in most people's view, made it a better place in which to live.

HENRY FORD, CHARLES KETTERING AND THE "FUEL OF THE FUTURE"

by Bill Kovarik, Ph.D.

Abstract

The fuel of the future, according to inventor Henry Ford and General Motors' scientist Charles F. Kettering, was ethyl alcohol made from farm products and cellulosic "biomass" materials. Henry Ford's enthusiastic support culminated with the Dearborn, Michigan, "Chemurgy" conferences in the 1930s. This paper shows that Kettering's interest in ethyl alcohol fuel involved G.M.'s long term strategy to maintain the automotive industry even if oil supplies faltered. Aside from the Chemurgy conferences and a brief period of commercial alcohol-gasoline sales in the Midwest during the 1930s, very little is known about the technological, economic and political context of alcohol fuels use. This paper examines that context, including the competition between lamp fuels in the 19th Century; the scientific studies about alcohol as a fuel in the early 20th Century; Kettering's support for leaded gasoline as a bridge to the "fuel of the future" in the 1920s; the worldwide use of alcohol - gasoline blends in the 1920s and 1930s and Ford's support for the farm "Chemurgy" movement and alcohol fuel in the 1930s.

Introduction

When Henry Ford told a *New York Times* reporter in 1925 that ethyl alcohol was "the fuel of the future," he was expressing an opinion that was widely shared in the automotive industry. "The fuel of the future is going to come from fruit like that sumach out by the road, or from apples, weeds, sawdust — almost anything," he said. "There is fuel in every bit of vegetable matter that can be fermented. There's enough alcohol in one year's yield of an acre of potatoes to drive the machinery necessary to cultivate the fields for a hundred years."[1]

Ford's optimistic appraisal of cellulose and farm-based ethyl alcohol fuel can be read in several ways. In 1925, the American farms that Ford loved were facing an economic crisis that would later intensify with the Depression.[2] Although the causes of the crisis were complex, one possible solution was seen in creating new markets for farm products. With Ford's financial and political backing, the idea of opening up industrial markets for farmers would be translated into a broad movement for scientific research in agriculture that would be labelled "Farm Chemurgy." But Ford's support might also be seen as an oblique jab at a competitor. General Motors (G.M.) had come to considerable grief that summer of 1925 over another octane boosting fuel called tetraethyl lead, and government officials had been quietly in touch with Ford engineers about alternatives to leaded gasoline additives.

The history of ethyl alcohol fuel has been explored by Giebelhaus,[3] Bernton[4] and this author,[5] but the historical focus of all three works tended to be on the U.S. Farm Chemurgy Movement in the 1930s. The context of Ford's support has been obscured and the positions of Ford's competitors, particularly Charles Kettering of G.M., have not been understood at all.

American farmers embraced the vision of new industrial markets for farm products, especially alcohol fuel, three times in the 20th Century: around 1906, again in the 1930s with Ford's blesssing, and most recently, during the oil crisis of the 1970s. By the mid-1980s over 100 corn alcohol production plants had been built and over a billion gallons of ethyl alcohol were sold per year in the fuel market. In the late 1980s and 1990s, with an apparently permanent world oil glut and rock bottom fuel prices, most of the alcohol plants shut down. Some observers joked that ethyl alcohol was the fuel of the future — and always would be. "Gasohol" had become passé.

Even if infinite amounts of petroleum were available, the history of alternative energy sources is worthy of study from many points of view, not the least of which is the pragmatic need to understand alternatives to oil supply from politically unstable regions of the world. Francis Garvan noted the problem in a speech promoting alcohol fuel at the Dearborn, Mich. Conference on Agriculture, Industry and Science in 1936. "They say we have foreign oil," he said. "It is ... in Persia, and it is in Russia. Do you think that is much defense for your children?"[6] Another pragmatic reason to consider the history of alternative fuels involves the risk of continued reliance on oil relative to global climate change — a problem more recently appreciated.

Aside from pragmatic justifications, historians of technology have long noted a general preoccupation with "success stories" to an extent that might be called "whiggish." Research into some of the "roads not taken" would provide history with better focus and broader perspective, according to historian John Staudenmier.[7] The direction a technology takes is all too often inaccurately seen as a result of pre-determined or inevitable conditions that arise from instrinsic properties of a technology, rather than from industry preference or political policy choices.

Background

Ethyl alcohol has long been used as an automotive fuel in two ways: First, it replaces gasoline outright in a somewhat modified internal combustion engine; and secondly, it is an effective "octane booster" when mixed with gasoline in blends of 10 to 30 percent and requires no engine modification. These blends achieve the same octane boosting (or anti-knock) effects as petroleum-derived aromatics like benzine or metallic additives like tetraethyl lead.

Many people are familiar with "Gasohol," a popular fuel blend in the American Midwest in the late 1970s, which was a blend of 10 percent ethyl alcohol and gasoline. (Fuel pumps are now simply labelled "with 10 percent ethanol."). Most people are not familiar

with the other fuel blends using alcohol. "Gasonol" (with an "n") was a blend of 20 percent sugar cane alcohol with gasoline and kerosene used in the Philippines in the 1930s. Koolmotor, Benzalcool, Moltaco, Lattybentyl, Natelite, Alcool and Agrol are some of the other obscure but interesting blends of fuels once found in Britain, Italy, Hungary, Sweden, South Africa, Brazil and the U.S. (respectively) in the 1920s and 1930s.

Economic issues have generally worked against the use of alcohol in favor of petroleum, but it is simplistic to view the problem merely in terms of prices at the pump. Production costs for ethyl alcohol blends and high octane gasoline are in the same relative range, and alcohol has been cheaper at times in various countries, depending on international politics and national tariff or incentive programs.

In its cultural and political context, alternative fuels — especially ethyl alcohol — have held a politically strategic and symbolic significance among advocates and opponents alike that goes far beyond the simple substitution of one product for another. Opponents have seen ethyl alcohol fuel as a scheme for robbing taxpayers to enrich farmers, as turning food for the poor into fuel for the rich, as compounding soil erosion problems, and as a marginally useful enhancement or replacement fuel for a transportation system that is poorly designed in the first place. Advocates have seen in alcohol fuels the potential for revolutionizing agricultural economics, for dispelling city smog, and for curbing the power of the petroleum industry over the economy. In addition, the idea that agriculture and biological resources could be primary sources of energy, the idea that humankind could live on solar "income" rather than fossil fuel "capital," has held a fascination for several generations of automotive and agricultural engineers. Proponents could see in ethyl alcohol the potential to help strike a balance between city and farm and the prospect of civilizing and humanizing industrial machinery.

This idea of civilizing the machine is graphically depicted in the symbolism used at the 1902 Paris alcohol fuel exposition. On the cover of the exposition's proceedings, a muse with an overflowing bouquet of roses looks down over the steering wheel with a confident smile. She is a portrait of wisdom and beauty, firmly in control of a gentle machine which seems appropriately located in some lush flower garden (Fig. 1).[8]

Rhetoric of the technological sublime, as it has been called, frequently

Fig. 1 Cover, program of Congress des Applications de l'Acool Denature, Paris, 16-23 December 1902.

attends the birth of any new technology, and of course there is nothing surprising about the high hopes of French automobile enthusiasts for alcohol fuel in 1902. While the spirit of the marriage was not always as artfully depicted, many of the great scientific minds of the 20th Century expressed their support and interest specifically in alcohol as a high quality fuel and the general idea of opening vast new industrial markets for farm products. These included Henry Ford, Alexander Graham Bell, Thomas Edison and Charles F. Kettering.

Bell called alcohol "a wonderfully clean-burning fuel ... that can be produced from farm crops, agricultural wastes, and even garbage."[9] Henry Ford, who idealized country life despite his contribution to the urbanization of America, hoped that alcohol could help power a rural renaissance. Thomas Edison backed the idea of industrial uses for farm products, and respected Ford's vision of the fuel of the future.[10] Charles Kettering and protegés Thomas Midgely and T.A. Boyd noted that the "most direct route which we now know for converting energy from its source, the sun, into a material suitable for use as a fuel is through vegetation to alcohol...."[11] Kettering's interest is particularly important because, as we will see, he was enthusiastic about alcohol fuel even after the discovery of tetraethyl lead. In fact, Kettering originally planned that the octane boosting power of leaded gasoline would pave the way for the fuel of the future — ethyl alcohol from cellulosic biomass.

The broad ranging competition between gasoline and alcohol fuels around the turn of the century is not as well known today as a similar competition between steam, electric and gasoline-powered automobiles.[12] Nevertheless, the competition from alcohol fuel was a well recognized fact at the time. Hundreds of magazine articles, reports, books and technical papers were written about alcohol fuel from the 1900 - 1926 period before and during the "Ethyl" leaded gasoline controversy, and hundreds more were published in the 1926-1960 period.[13]

Ethyl Alcohol Fuel Before the Discovery of Petroleum

The history of energy is loaded with inaccuracies and myths. One myth is that Edwin Drake's first oil well, drilled in Pennsylvania in 1859, arrived in the nick of time to replace a rapidly dwindling supply of whale oil. Actually, as we will see, a variety of lamp fuels was common in the U.S. and Europe through the 19th and early 20th Centuries. These fuels offered the most logical starting point in the search for portable liquid fuels which inventors would use in the internal combustion engine.

Lamp fuels included all kinds of vegetable oils (castor, rapeseed, peanut); animal oils (especially whale oil and tallow from beef or pork,); refined turpentine from pine trees; and alcohols, especially wood alcohol (methanol or methyl alcohol) and grain alcohol (ethanol or ethyl alcohol). The most popular fuel in the U.S. before petroleum was a blend of alcohol and turpentine called "camphene" or simply "burning fluid."

The "whale oil myth," appears in many places, most recently in the history of the oil industry, The Prize, which hailed kerosene as "the new light

which pushed back the night and extended the working day." It was a "marvel to eyes that had strained to see by means of a lighted rag,"[14] A recent Smithsonian exhibit provided a similar perspective: "It was the discovery of petroleum in 1859 that kindled the revolution in artificial lighting," the exhibit said. "Kerosene ...was cheap and relatively clean. Lamp companies had sprung up immediately and by the 1870s virtually everyone could enjoy indoor lighting."[15] This traditional error is found in many other accounts of the history of energy. According to a 1960 history, "petroleum arrived on the scene in answer to a world-wide quest for a new source of artificial light."[16] In an Ethyl Corporation magazine of 1943, for example, we find the following:

> "During the first half of the 19th century, scientists eagerly sought to develop better lighting fuels ... At that time, rural America for the most part depended on whale oil and sperm oil lamps to light its homes, and upon beeswax and tallow candles. Supplies, however, were limited and were becoming insufficient to meet a constantly growing demand."[17]

These accounts seem to be inspired examples of rhetoric of the technological sublime. They are also fiction. In fact, kerosene came into an already well-established liquid fuel system with full scale production, distribution and end-use technology well in place. In other words, kerosene replaced other fuels; it did not emerge to light up a previously dark world. In the 30 or 40 years before petroleum was discovered in Pennsylvania, the leading fuel was "camphene". It was a blend of high-proof ethyl alcohol with 20 to 50 percent turpentine to color the flame and a few drops of camphor oil to mask the turpentine smell. Alcohol for camphene was an important mainstay for distilleries, and many sold between one third and 80 percent of their product on the fuel market.[18] The first U.S. patent for alcohol as a lamp fuel was awarded in 1834 to S. Casey, of Lebanon, Maine, but it is clear that alcohol was routinely used a fuel beforehand.[19] Samuel Morey used the readily available alcohol in the first American prototype internal combustion engine at the surprisingly early date of 1826.[20] We should note that Morey's work was lost in the enthusaism for the steam engine and a lack of funding. No other internal combustion engine would be developed until Nicholas Otto began his experiments 35 years later.

By the late 1830s, alcohol blends had replaced increasingly expensive whale oil in most parts of the country. It "easily took the lead as the illuminant" because it was "a decided improvement on other oils then in use," (especially lard oils) according to a lamp manufacturer's "History of Light."[21] By 1860, thousands of distilleries churned out at least 90 million gallons of alcohol per year for lighting.[22] In the 1850s, camphene (at $.50 per gallon) was cheaper than whale oil ($1.30 to $2.50 per gallon) and lard oil ($0.90 per gallon). It was about the same price as coal oil, which was the product first marketed as "kerosene"[23] (literally "sun fuel") (Fig. 2).

Kerosene from petroleum was a good fuel when it arrived in the 1860s: it was usually not too volatile, it burned brightly and it was fairly cheap. A gradual shift from camphene to kerosene might have occurred, but instead, a $2.08 per gallon tax on alcohol was imposed in stages between 1862 and 1864 as part of the Internal Revenue Act to pay for the Civil War. The tax was meant to apply to beverage alcohol, but without any specific exemption, it was also applied to

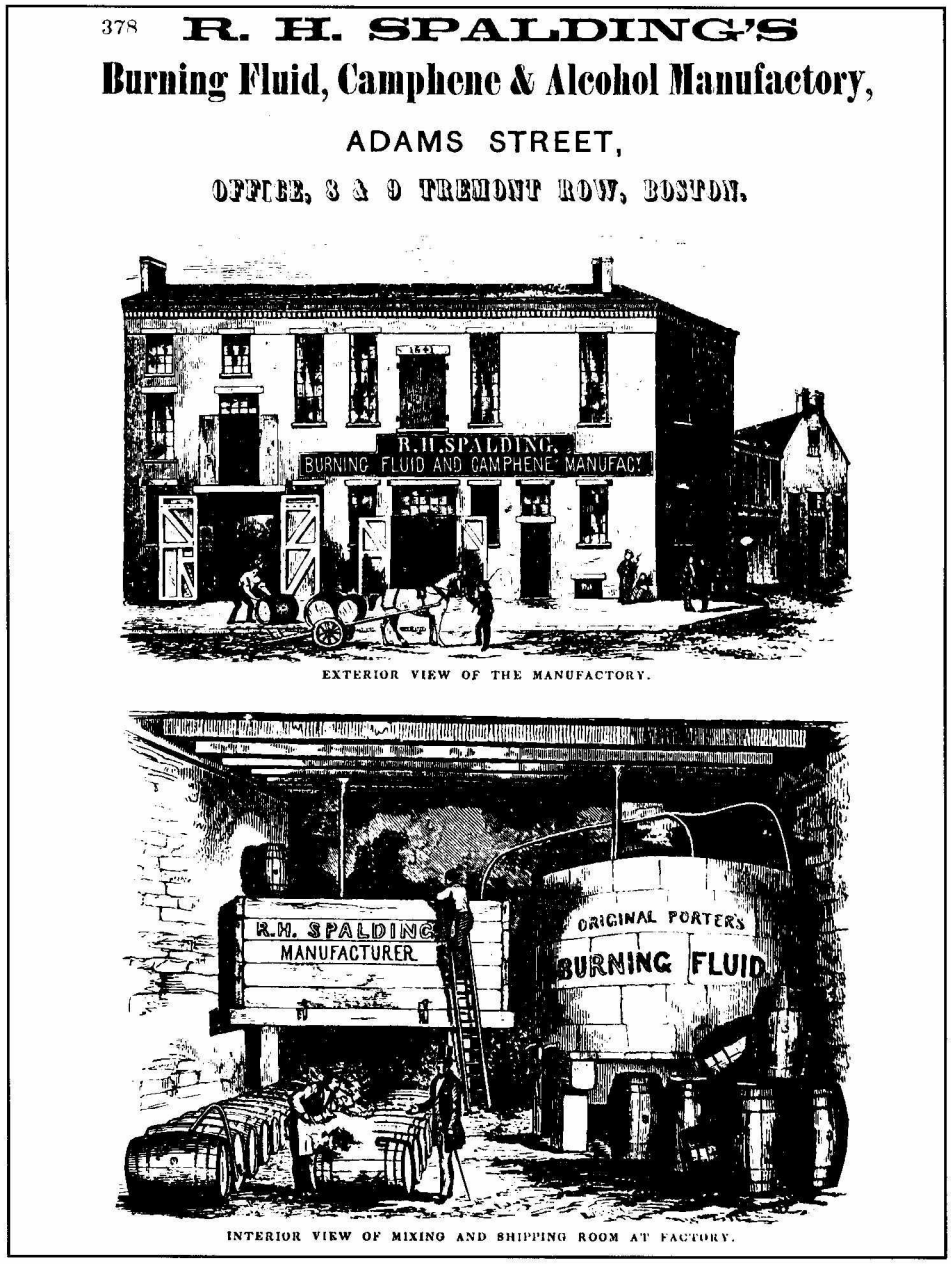


Fig. 2 - R. H. Spalding Co. manufactured distilled alcohol and blended it into various grades of lamp fuel during the 1840s and 1850s.

fuel and industrial uses for alcohol. "The imposition of the internal-revenue tax on distilled spirits ... increased the cost of this burning fluid' beyond the possibility of using it in competition with kerosene..," said Rufus F. Herrick, an engineer with the Edison Electric Testing Laboratory who wrote one of the first books on the use of alcohol fuel.[24]

While a gradual shift from burning fluid (or spirit lamps) to kerosene did occur in Europe during the last half of the 19th Century, the American alcohol tax meant that kerosene became the primary fuel virtually overnight, and the distilleries making lamp fuel lost their markets. The tax "had the effect of upsetting [the distilleries] and in some cases destroying them," said IRS commissioner David A. Wells in 1872. "The manufacture of burning fluid for lighting suddenly ceased; happily, it was replaced by petroleum, which was about to be discovered."[25] Similarly, C.J. Zintheo, of the U.S. Department of Agriculture, said that 90 million gallons of alcohol per year were used for lighting, cooking, and industry before the tax was imposed.[26] Meanwhile, use of oil shot up from almost nothing in 1860 to over 200 million gallons in 1870.[27] "The effect was disastrous to great industries, which, if [they were to be] saved from ruin, had to be rapidly revolutionized," according to Irish engineer Robert N. Tweedy.[28]

The distress in the alcohol industry may be reflected in the number of patents for various combinations of burning fluids. Between 1861 and 1867, the patent office issued 32 different patents for burning fluids, alcohol or camphene blends; only five had been awarded in the previous 33 years. After 1867, no patents for "burning fluids" are listed.[29] The dramatic increase in numbers of patents, as alcohol became prohibitively expensive, may reflect desperate attempts to find new combinations of inflammable liquids to replace the product of the rapidly dying alcohol fuel industry .

Thus, the growth of the petroleum industry in the 1860s was greatly aided by the heavy federal tax on its primary competitor. The myth that petroleum was at first a dramatic deliverance from the darkness, and then the only important fuel for the horseless carriage, indicates the extent to which oil industry historians have been influenced by the rhetoric of the technological sublime. In fact, early automotive inventors resorted to both petroleum and alcohol spirit lamp fuels as readily available energy sources.

Fodder for the Horseless Carriage

The idea of replacing the external combustion steam engine with an internal combustion liquid fuel engine seized the world's imagination in the late 19th Century, but the origins of internal combustion engines can be traced back to early experiments with gunpowder in the late 1600s. Historian Lyle Cummins has noted that at least a dozen inventors tried to develop some form of internal combustion engine by the early 19th Century.[30]

The first authentic internal combustion engine in America, developed by Samuel Morey around 1826, ran on ethyl alcohol and turpentine. It powered an experimental wagon and a small boat at eight miles per hour up the Connecticut River. Morey, like many other inventors, was never able to attract financing for his idea and only the prototype was built.[31]

Another early developer of the internal combustion engine was German inventor Nicholas August Otto. In 1860, Otto used ethyl alcohol as a fuel in an early engine because it was widely available for spirit lamps throughout Europe. He devised a carburetor which, like Morey's, heated the alcohol to help it vaporize as the engine was being started. But a January 1861 patent application with the Kingdom of Prussia was turned down, probably because heated alcohol carburetion was already being widely used in spirit lamps.[32] It is interesting to note that Otto's initial financing came from Eugen Langen, who owned a sugar refining company that probably had links to the alcohol markets of Europe. Of course, the Otto & Langen company went on to success in the 1870s by producing stationary gas engines (usually powered by coal gas) and the later "Otto-cycle" engine was fueled primarily with gasoline but was still adaptable to alcohol or benzene from coal.

Numerous other engine prototypes were developed using alcohol or turpentine, including U.S. inventor George Brayton's engine developed in the 1870s. However, at the dawn of the automotive age, kerosene was widely available and gasoline, although volatile and dangerous for lamps, was cheap and very much in surplus.

Promoting Alcohol Fuel in Europe 1890 - 1914

During the 1890 - 1914 time period, German, French and British scientists and government officials were worried about the longevity of oil reserves and the unpredictable nature of oil supplies from Russia and America. "The oil trust battles between Rockefeller, the Rothschilds, the Nobels and Marcus Samuel's Shell kept prices in a state of flux, and engines often had to be adaptable to the fuel that was available," said Cummins.[33] Manufacturing companies in Germany, England and France sold engines equipped to handle a variety of fuels. In tropical nations where oil supplies were quite irregular, and in closed environments such as mines and factories, alcohol engines were often preferred.

With few domestic oil reserves, France and Germany especially were eager to encourage widespread development of a fuel that could be readily distilled from domestic farm products. Research at the Experimental Mechanical Laboratory of Paris and at the Deutsche Landwirtschäftliche Gesellschaft in Berlin in the 1890s helped pave the way for expanded use of alcohol fuel.[34] By 1896, horseless carriages were showing up on roads in Europe and the United States, and internal combustion engines were also beginning to replace steam engines in light machinery and farm equipment. The question of whether gasoline or alcohol was the better fuel often provoked spirited debate, and numerous races between cars with different fuels were held in Europe.

One of these races took place in 1899 with four alcohol-fueled vehicles racing from Paris to Chantilly. Only one made the entire distance.[35] Two years later, 50 vehicles ranging from light quadricycles to heavy trucks made the 167-mile trek from Paris to Roubaix. The rallyes were sponsored by the Automobile Club of France and fuels varying from pure alcohol to 50 percent alcohol and 50 percent gasoline were measured for each vehicle before and after the 1902 rallye. Most drivers apparently preferred the 50-50 blend.[36] Exhibits of automobiles held every year contained large proportions of alcohol-fueled cars, and the growing

enthusiasm was reflected in the 1902 Paris exhibit (mentioned above in the introduction). The exhibit was devoted to alcohol-powered automobiles, farm machinery and a wide variety of lamps, stoves, heaters, laundry irons, hair curlers, coffee roasters and every conceivable household appliance and agricultural engine powered by alcohol. Many of these were not experimental items but represented a well-established industry. By one estimate, some 95,000 alcohol-fueled stoves and 37,000 spirit lamps were made in Germany in 1902.[37] The exhibit published a set of papers and speeches, and was reported in many newspapers and technical journals of the day.[38] Eight other exhibitions and congresses on alcohol fuels took place, in Germany, France, Italy and Spain, between 1901 and 1904.[39] Meanwhile, French fuel alcohol production rose from 2.7 million gallons in 1900 to 5.7 million gallons in 1903 and 8.3 million in 1905.[40] Enthusiasm over the marriage of agriculture and industry in alcohol fuel was not the only motivation for French interest. A very practical problem was the decline in French sugar beet exports and rising surplus of many crops. Another concern was the increase in oil imports from the U.S. and the lack of domestic oil reserves.[41]

Germans were also concerned about a domestic fuel supply that would provide farmers with new markets for crops. In 1899, the German government organized the Centrale für Spiritus Verwerthung (office of alcohol sales) which maintained alcohol prices at an equilibrium with petroleum at around the equivalent of 27 cents per gallon through subsidies to alcohol producers and a tariff on imported oil.[42] Other incentives included scientific prizes, including a medallion from the emperor offered for the best alcohol engines. As a result, alcohol production rose from 10 million gallons to about 26 million gallons between 1887 and 1904.[43] "To Kaiser William II, it seems, we are indebted for the great, new industry," said a *New York Times Magazine* writer in 1906. "Not that he discovered the fuel, but that he forced its use on Germany. The Kaiser was enraged at the Oil Trust of his country, and offered prizes to his subjects and cash assistance ... to adapt [alcohol] to use in the industries."[44]

According to a representative of the Otto Gas Engine Works of Philadelphia, by 1906 10 percent of the engines being produced by the firm's parent company in Germany were designed to run on pure ethyl alcohol, while one third of the heavy locomotives produced at the Deutz Gas engine works of Germany ran on pure ethyl alcohol.[45] Alcohol engines were advertised as safer than steam engines (as they did not give off sparks from smokestacks) and far cleaner than kerosene or gasoline engines. In a survey conducted around 1903, some 87 percent of German farmers considered alcohol engines to be equal or superior to steam engines in performance.[46] Conflicting reports on the number of German distilleries at least give some idea of the scale of the enterprise. By one 1906 account, some 72,000 distilleries operated, of which 57,000 were small farm "Materialbrennereien" stills producing a total of 27 million gallons.[47] Another account, from 1914, put the number at 6,000 distilleries producing 66 million gallons of alcohol per year.[48]

These alcohol stills may have had the effect of prolonging World War I. According to Irish engineer Robert Tweedy, when oil shortages seemed likely to paralyze Germany's transportation system in 1915, thousands of engines were quickly modified. "Every motor car in the empire was adapted to run on alcohol. It is possible that Germany would have been beaten already [by 1917] if production of alcohol had not formed an important part of the agricultural economy."[49]

U.S. Congress Lifts Alcohol Tax in 1906

American farmers watched the growing use of alcohol fuel in Europe with great interest. Their markets were glutted with grain surpluses created when vast new tracts of virgin prairie were plowed under to produce bumper crops. To absorb these surpluses, many looked to the market for liquid fuels created by the widespread acceptance of the automobile. It seemed logical to replace their declining market for horses by growing fuel for the horseless carriage.

Several attempts had already been made to remove the $2.08 per gallon Federal tax placed on alcohol during the Civil War. In 1894 the Wilson tariff bill allowed a rebate of taxes on alcohol for industrial uses, but the Treasury Department refused to issue regulations. Manufacturers tried to claim the rebate but lost in court. In 1896 a joint committee studied the issue, and minutes show opposition from wood alcohol (methyl) producers.

In 1906, the farm lobby found an ally in President Theodore Roosevelt, a bitter foe of the oil industry. Although embroiled in other disputes at the time, Roosevelt sent a message of support for the repeal of the alcohol tax to the House of Representatives, saying it provided a possible check to the depradations of the oil trust.[50] In April 1906, a bill to repeal the alcohol sales tax sailed through the House on a 224 to 7 vote with widespread support from farm-belt representatives. Additional support came from the Temperance Party, which saw in alcohol fuel a beneficial use for a pernicious commodity.

When the Senate Finance Committee attempted to table the "Free Alcohol" bill, the president of the Automobile Club of America said that he was considerably surprised and disappointed at the Senate committee, although he did not think Standard Oil would oppose the bill. "Gasoline is growing scarcer, and therefore dearer, all the time...Automobiles cannot use gasoline for all time, of that I am sure, and alcohol seems to be the best substitute that has yet appeared."[51] U.S. Representative (and future Speaker of the House) Champ Clark of Missouri, however, placed "the Rockefellers" squarely in the opposing camp as attempting to retain the tax on a potential competitor.[52]

By mid-May, 1906, the Senate committee relented and *The New York Times* reported the bill was likely to be approved. "It is only the heavy tax imposed by the United States that has prevented the use of a large number of vegetable products for the manufacture of exceedingly cheap and available alcohol," a *Times* editorial said. These sources included potatoes in the West, sugar beets in Michigan, and cheap imported molasses in the east. A report from the U.S. ambassador to Cuba noted alcohol made there cost 10 cents per gallon, and with improved methods in the U.S. it could cost even less when made from imported molasses. "The chief opponents, at least the open opponents, have been the manufacturers of wood alcohol," the *Times* said.[53]

Auto manufacturers supported the bill wholeheartedly. A representative of the Detroit Board of Commerce, James S. Capen, told the Senate Finance Committee that alcohol was "preferable" to gasoline because it was safer, "absolutely clean and sanitary," and because "artificial shortages" could not raise the price in the future. The biggest problem for auto makers, Capen said, was not so much cost as the question of long term supply.[54]

The Senate passed the bill May 24, 1906, and *The New York Times* again noted the low cost of alcohol (14 cents from corn, nine and a half cents from molasses) as compared to the high price of kerosene and gasoline (18 and 22 cents, respectively). "The new fuel and illuminant will utilize completely an important class of agricultural crops and byproducts thus benefiting in a double sense the farms and villages throughout the country," an editorial said.[55] Roosevelt signed the bill June 8, 1906.

Additional bills specifically exempting farm stills from government controls passed shortly afterwards, and triumphant farm belt senators, like North Dakota's Hansbrough, proclaimed that "every farmer could have a still" to supply heat, light and power at low prices. "Advocates look forward with hope to a big change in the farmers life," *The New York Times* reported. "If the law accomplishes what is hoped it will... make a revolution on the farm."

Experts noted that while alcohol would probably not drive out gasoline entirely, "it will find its field as every other fuel energy has." More typical was the statement of a National Grange master who predicted an immediate market for 100 million gallons of alcohol. Along with a large additional market for farm crops, alcohol would serve as a "balance wheel to maintain an equilibrium" in commodity prices.[56]

The lofty farm rhetoric obscured a difficult economic picture, but the bill kindled interest in alcohol fuels among farmers who wanted new markets and automakers who wanted to continue to have a market if oil were to run out. Pure alcohol fuel went on sale in Peoria, Illinois, at 32 cents per gallon in January 1907 as the tax took effect, and prices elsewhere hovered around 25 to 30 cents. At the same time, gasoline prices at 18 to 22 cents per gallon were beginning to drop as new Texas oil fields came on line and found markets on the East Coast. These new fields were brought in by independent oil companies, especially Gulf and the Texas Co. (Texaco). Suddenly, the future for alcohol fuel seemed more remote than anticipated.

"Of all the chimerical projects ever foisted upon Congress, the free denatured alcohol scheme has proved the greatest disappointment," said a news column in *The New York Times* in 1907. With only 10 alcohol plants built under the new law, "gasoline, kerosene and electricity are still being used." One disappointed farm machinery manufacturer said the problem was a lack of frugality among Americans; the manufacturer said German farm stills often used "cull" crops that had been partly damaged or spoiled. Meanwhile, an Internal Revenue commissioner noted that Germany protected farm alcohol with tariffs on petroleum imports, and said that fuel prices there were the equivalent of 15 to 27 cents per gallon.[57] USDA set up a demonstration small scale alcohol still in the Bureau of Chemistry with "the aim of creating a body of experts who would return to their districts filled up with enthusiasm and knowledge which would be served out to farmers." Fourteen experts were trained in 1908; in 1909 only four could be trained, and the project was abandoned. The U.S. Commissioner of Internal Revenue noted in 1910 that no alcohol had been used for fuel, and in 1911 he reported that a new industrial alcohol industry was unlikely.

Attempts to revive the moribund hopes of the alcohol industry proved futile. In 1914 the Free Alcohol bill was amended again to decrease the regulatory burden, but one observer said that the small distillery "is only a myth in this country." In 1915, Congressional hearings on more demonstrations and proposals for an Industrial Alcohol Commission within the Department of Agriculture were held, but the proposals were turned down. "The theater is open, the stage is set, but the play does not begin. There are no actors..." said Tweedy.[58]

Alcohol from grain and potatoes, at about 25 to 30 cents per gallon, was far too expensive to compete with petroleum, but alcohol from Cuban molasses, at 10 cents per gallon, was thought to be competitive. Some observers suspected a conspiracy in the fact that Standard Oil of New Jersey had financial ties to the Caribbean alcohol market. The influence of an oil company over the alcohol industry was "a combination which many will regard as sinister," said Tweedy.[59] In 1942, Senate committees began looking into the extent to which the oil industry had controlled other industries, including the alcohol industry and the rubber industry. Assistant Attorney General Thurmond Arnold testified that anti-trust investigations had taken place into the oil industry's influence in the alcohol industry in the 1913-1920 period, in the early 1920s, and between 1927 and 1936. "Renewed complaints in 1939 were brought to the anti-trust division but because of funds no action was taken," Arnold said.[60] Then the investigation of 1941 which exposed a "marriage" between Standard Oil Co. and the German chemical company I.G. Farben also brought new evidence concerning complex price and marketing agreements between du Pont Corp., a major investor in and producer of leaded gasoline, U.S. Industrial Alcohol Co. and its subsidiary, Cuba Distilling Co. The investigation was eventually dropped, like dozens of others in many different kinds of industries, due to the need to enlist industry support in the war effort. However, the top directors of many oil companies agreed to resign and oil industry stocks in molasses companies were sold off as part of a compromise worked out with Arnold.

Scientific Investigations of Alcohol Fuels 1890 - 1920

Scientific journals contain hundreds of references to alcohol fuel at the dawn of the automotive era. Research during the earliest decades tended to focus on pure alcohol as a replacement for petroleum. The focus shifted to the anti-knock ("octane" boosting) properties of alcohol blends in gasoline during the 1915 to 1936 period because of an increasing need for anti-knock gasoline and because of improvements in anhydrous alcohol production techniques.[61]

Studies of alcohol as an internal combustion engine fuel began in the U.S. with the Edison Electric Testing Laboratory and Columbia University in 1906. Elihu Thomson reported that despite a smaller heat or BTU value, "a gallon of alcohol will develop substantially the same power in an

internal combustion engine as a gallon of gasoline. This is owing to the superior efficiency of operation...."[62] Other researchers confirmed the same phenomena around the same time.

Tests in 1906 by the United States Department of Agriculture (USDA) also demonstrated the efficiency of alcohol in engines and described how gasoline engines could be modified for higher power with pure alcohol fuel or for equivalent fuel consumption, depending on the need (Fig. 3).[63] The U.S. Geological Service (USGS) and the U.S. Navy performed 2000 tests on alcohol and gasoline engines in 1907 and 1908 in Norfolk, Va. and St. Louis, Mo. They found that much higher engine compression ratios could be achieved with alcohol than with gasoline. When the compression ratios were adjusted for each fuel, fuel economy was virtually equal despite the greater BTU value of gasoline. "In regard to general cleanliness, such as absence of smoke and disagreeable odors, alcohol has many advantages over gasoline or kerosene as a fuel," the report said. "The exhaust from an alcohol engine is never clouded with a black or grayish smoke."[64] USGS continued the comparative tests and later noted that alcohol was "a more ideal fuel than gasoline" with better efficiency despite the high cost.[65]

The French War Office tested gasoline, benzene and an alcohol-benzene blend in road tests in 1909, and the results showed that benzene gave higher mileage than gasoline or the alcohol blend in existing French trucks.[66] The British Fuel Research Board also tested alcohol and benzene mixtures around the turn of the century and just before World War I, finding that alcohol blends had better thermal efficiency than gasoline but that engines developed less brake horsepower at low rpm.[67] On the other hand, a British researcher named Watson found that thermal efficiencies for alcohol, benzene and gasoline were very nearly equal.[68]

These experiments are representative of work underway before and during World War I. The conclusions were so definitive that *Scientific American* concluded in 1918: "It is now definitely established that alcohol can be blended with gasoline to produce a suitable motor fuel...."[69] By 1920, the consensus, *Scientific American* said, was "a universal assumption that [ethyl] alcohol in some form will be a constituent of the motor fuel of the future." Alcohol met all possible technical objections, and although it was more expensive than gasoline, it was not prohibitively expensive in blends with gasoline. "Every chemist knows [alcohol and gasoline] will mix, and every engineer knows [they] will drive an internal combustion engine."[70]

Fig. 3 - Low-compression engines such as these could operate on a variety of cheap or high grade fuels.

During and after the war, the British Fuel Research Board actively researched military and civilian fuels. W.R. Ormandy in 1918 said that alcohol and coal-based fuels could replace oil in the post-war period, and Ormandy noted that only five percent of the American grain crop would meet requirements for a blended fuel.[71] The board's committee on "power alcohol" noted the absence of technical problems a year later, although it concluded that "alcohol cannot compete with gasoline at present prices."[72] Harold B. Dixon, working for the board and other governmental departments, reported in 1920 that higher possible engine compression compensated for alcohol's low caloric value. A mixture of alcohol with 20 percent benzene or gasoline "runs very smoothly, and without knocking."[73] Also, B.R. Tunnison reported in 1920 the anti-knock effects of alcohol blends in gasoline and said that mileage was improved.[74]

Another significant set of British experiments was performed by the London General Omnibus Co. in 1919, comparing gasoline with blends of ethyl alcohol and benzene. Mileage was about the same, with gasoline slightly ahead. "In all other respects the [alcohol] fuel compared favorably with petrol [gasoline], and exhibited the characteristics of other alcohol mixtures in respect of flexibility, absence of knocking and cleanliness."[75] The absence of knocking is significant, since London omnibus studies were widely reported and well known two years before leaded gasoline was discovered and six years before oil industry representatives told government officials that alternatives to leaded gasoline did not exist.[76] The bus experiment also showed that a large scale switch from petroleum was technically feasible. "We are fast squandering the oil that has been stored in the fuel beds, and it seems so far as our present knowledge takes us that it is to the fuels experimented with that we must turn for our salvation," said the omnibus company engineer in a technical journal.[77]

Despite the value of demonstrating the flexibility of technology, road tests proved to be an unreliable index of mileage and thermal efficiency. A German road test of benzene alcohol blends found that the 50/50 alcohol benzene mixture had 30 percent better mileage than gasoline.[78] Because of the unreliability of such road tests, Thomas Midgely in the U.S. and H.R. Ricardo in Britain developed reference engines, indicators, and measuring apparatus for showing the exact extent of knocking. Midgely's system led to the

development of iso-octane as a reference fuel, and eventually, the "octane" system of measuring anti-knock. Ricardo's work focused in part on testing fuels at various compression ratios up to the point where they would begin knocking, or what he termed the "highest useful compression ratio." Ethyl alcohol had a 7.5 value, with commercial gasolines then available at 4.5 to 6. Ricardo also developed the Toluene Index, which like "octane" measured anti-knock with a reference fuel. Ricardo concluded that the low burning rate of alcohol lessens the tendency to knock, and that, using toluene as the reference point at 100 anti-knock, alcohol had a 130 rating.[79]

Several difficulties with alcohol fuels were known: cold starting was one, and E.C. Freeland and W.G. Harry noted in a chemical society paper that blends of small amounts of ether in alcohol could solve the problem.[80] Another problem was "phase separation," noted above. But the tendency of alcohol and gasoline to separate at lower temperatures in the presence of water could be easily overcome with "binders," and was noted by Thomas Midgley, among others. These were small amounts of additives such as higher-carbon alcohols (such as propyl or butyl alcohol), ethers and/or benzene. Operating practice was also important in dealing with alcohol fuels. Fuel distributors and chemists used anhydrous (low water content) alcohol and avoided storing alcohol-gasoline blends in tanks with water "bottoms." Swedish researcher E. Hubendick said that the danger of separation "can be ignored in my estimation" because even if it did occur, it would never stop the motor in the way that a small amount of water in the gas tank would.[81]

In short, technical research into ethyl alcohol as a fuel ranged from neutral to extremely positive, with very few negative findings. By 1925, an American researcher speaking at the same New York Chemists Club told an audience:

> "Composite fuels made simply by blending anhydrous alcohol with gasoline have been given most comprehensive service tests extending over a period of eight years. Hundreds of thousands of miles have been covered in standard motor car, tractor, motor boat and aeroplane engines with highly satisfactory results... Alcohol blends easily excel gasoline on every point important to the motorist. The superiority of alcohol gasoline fuels is now safely established by actual experience... [Thus] the future of alcohol motor fuels is largely an economic problem.[82]"

Yet in the 1930s, oil industry opponents of alcohol blends in the U.S. claimed that technical problems prohibited their use. "Alcohol is much inferior, gallon for gallon, to gasoline as a motor fuel," claimed the American Petroleum Industries Committee. While admitting there was some anti-knock advantage, the Committee said the blends would be "unstable in the presence of small amounts of accidental moisture."[83] The American Petroleum Institute's (API) Conger Reynolds, in a 1939 barb aimed at Henry Ford and the Farm Chemurgy conferences of the 1930s, said:

> "With all due deference for the dream chemists, armchair farmers and platform orators who have touted alcohol-gasoline as the greatest of all fuels, oil industry technologists know and automotive engineers know that it is not as satisfactory a fuel as straight gasoline of normal quality."[84]

The context of Reynolds speech to fellow oil men was that of fending off (by his count) 19 federal bills and 31 state bills on alcohol gasoline tax incentives and blending programs between 1933 and 1939. To be forced to use alcohol gasoline would mean giving consumers an inferior fuel at an exorbitant cost, Reynolds said. At the time, the API had virtually no technical data to back up claims of inferiority. The vast bulk of scientific research pointed very much in favor of alcohol blended fuels. That soon changed as industry-sponsored tests found phase separation, cold starting and other problems. Ten years later, British researcher S.J.W. Pleeth would observe:

> "The bias aroused by the use of alcohol as a motor fuel has produced [research] results that are incompatible with each other ... Countries with considerable oil deposits — such as the U.S. — or which control oil deposits of other lands — such as Holland — tend to produce reports antithetical to the use of fuels alternative to petrol; countries with little or no indigenous oil tend to produce favorable reports. The contrast ... is most marked. One can scarcely avoid the conclusion that the results arrived at are those best suited to the political or economic aims of the country concerned or the industry sponsoring the research. We deplore this partisan use of science, while admitting its existence, even in the present writer."[85]

U.S. Automakers, Alcohol Fuels and Ethyl Leaded Gasoline

Before World War I, U.S. automakers were aware of the potential for alcohol fuel, but given the short-term economic picture, stayed with gasoline and low compression engines. Most popular cars, such as the Ford Model T, had low compression engines, an adjustable carburetor and a spark advance that made it possible to switch from gasoline to alcohol to kerosene as needed. Despite Ford's later support for alcohol fuel in the 1920s and 1930s, the only fuel the company actually handled was "Fordsol," benzene from Ford factory coking operations, and regular gasoline. Some early auto manufacturers offered a simple mixer attachment for alcohol and found that "under actual operating conditions ... the fuel consumption per horsepower is about the same, pound for pound, whether using alcohol or gasoline." The Hart-Parr Company, a tractor manufacturer based in Charles City, Iowa, commented in 1907: "We have watched with great interest, and added our efforts to help bring about the free use of alcohol for power purposes... Our engine is so constructed that alcohol can be used with very little change ...."[86]

Minneapolis Steel and Machinery Co. began making alcohol engines for tractors in 1909, and with increasing demand for alcohol-powered farm equipment after World War I, began intensive studies on a more efficient alcohol engine. "In our opinion alcohol is an ideal fuel," said researcher A.W. Scarratt, because it vaporized at a practically constant temperature and it formed no carbon deposits. "We believe the entire automobile industry should get behind this idea and bring it to pass as quickly as possible so as to provide another source of fuel supply and to bring down the operating costs of all equipment

depending now on hydrocarbon fuels."[87]

After World War I, the focus of fuel research shifted into two directions. One research direction led to the discovery of a metallic additive called tetraethyl lead. The story of how G.M. researchers Thomas Midgley and Charles F. Kettering discovered it has often been told.[88] However, the second research direction into the "fuel of the future" is not well known.

Kettering and Midgley's initial research into fuel involved work on DELCO generators and airplane engines in World War I. In a report on the war research, Midgley wrote: "Engineers have heretofore believed knocking to be the unavoidable result of too high a compression, and while the fact that [ethyl] alcohol did not knock at extremely high compressions was well known, it was [erroneously] attributed to its extremely high ignition point...."[89] The point was generally understood by scientists and military technology experts. For example, a naval committee concluded in 1920 that alcohol gasoline blends "withstand high compression without producing knock."[90]

Kettering, who had become G.M.'s vice president of research and the president of the Society of Automotive Engineers (SAE), noted two directions in fuel research in a 1919 speech to the Society. There was, he said, a "high percentage" direction, with blends of up to 20 percent or more of benzene or alcohol; the other was a "low percentage" additive, such as iodine, which was too expensive to be practical but pointed to the possibility of other additives.[91] The low percentage research effort would lead to the discovery of leaded gasoline in 1921.

Around 1920 and 1921, Kettering came to believe that alcohol fuel from renewable resources would be the answer to the compression problem and the possibility of an oil shortage. Along with his British counterpart, H.R. Ricardo, Kettering settled on alcohol as the key to unshackling the internal combustion engine from non-renewable fossil fuels," said historian Stuart Leslie. "Ethanol (ethyl alcohol) never knocked, it could be produced by distilling waste vegetable material, and it was almost pollution-free. Ricardo compared alcohol fuel to living within a man's means, implying that fossil fuels were a foolish squandering of capital."[92]

At Kettering's urging, G.M. began to consider just what would be involved in a total switch from petroleum to alcohol fuel. One G.M. researcher reported that some 46 percent of all foodstuffs would have to be converted to alcohol to replace gasoline on a BTU for BTU basis.[93] In another G.M. study, T.A. Boyd surveyed the steep rise in number of new cars and the increasing difficulty of providing new fuel supplies. The solution, Boyd said, would be to use other fuels, and benzene and alcohol "appear to be very promising allies" to petroleum.[94] Alcohol was the "most direct route ... for converting energy from its source, the sun, into a material that is suitable for a fuel..." Boyd said.

Despite advantages of cleanliness and high anti-knock rating, there were supply problems. In 1921, about 100 million gallons of industrial alcohol supply were available. Overall, enough corn, sugar cane and other crops were available to produce almost twice the 8.3 billion gallon per year demand for gasoline. But the possibility of using such a large amount of food acreage for fuel "seems very unlikely," he said.[95] In a speech around 1921, Kettering noted that "industrial alcohol can be obtained from vegetable products ... [but] the present total production of industrial alcohol amounts to less than four percent of the fuel demands, and were it to take the place of gasoline, over half of the total farm area of the United States would be needed to grow the vegetable matter from which to produce this alcohol."[96]

Kettering, Midgley and Boyd apparently framed the question in terms of totally replacing gasoline, although a related goal of the research was to create anti-knock additives. It stands to reason that if a 20 percent blend of alcohol were to be used in all fuel, then (using Boyd's figure) only about nine percent of grain and sugar crops would be needed. Since grain was in surplus after the war, American farmers probably would have welcomed a new market for their crop, and the kinds of supply problems in the G.M. and du Pont studies would probably not have materialized. Also, with Prohibition, distillers would have welcomed a new use for their services. Another problem with Kettering's analysis demonstrates a lack of understanding of agriculture and the distilling industry. Grain is not "used" for fuel; it is fed to cattle after it is distilled with no loss in food value. This is as true of brewers' grains from beer distilleries as it is of fuel facilities.

Thus, supply of an additive would not have been the problem that G.M. engineers apparently assumed that it would have been. However, since the original studies on fuel alcohol are missing from the archives, it is difficult to fathom the reason for their narrow frame of reference.[97] One reasonable explanation is that Kettering, Boyd and Midgley were preoccupied with the long-term replacement of petroleum. In 1920 and 1921 they were not technically or politically opposed to ethyl alcohol as a straight fuel or in blends with gasoline. Kettering spoke out against taxes on alcohol as an impediment to fuel research and helped overcome other obstacles.[98] In 1920, K.W. Zimmerschied of G.M.'s New York headquarters wrote Kettering to note that foreign use of alcohol fuel "is getting more serious every day in connection with export cars, and anything we can do toward building our carburetors so they can be easily adapted to alcohol will be appreciated by all." Kettering assured him that the adaptation "is a thing which is very readily taken care of," and said that G.M. could rapidly change the floats in carburetors from lacquered cork to metal.[99] Midgley also filed a patent application for a blend of alcohol and cracked (olefin) gasoline on February 28, 1920, clearly intending it to be an antiknock fuel.[100]

The problem of the long-term resource base for the fuel of the future continued to worry Kettering and Midgley. At one point they became interested in work on cellulose conversion to fermentable sugar being performed by Prof. Harold Hibbert at Yale University. Hibbert was a visionary, and pointed out that the 1920 USGS oil reserve report had serious implications for his work. "Does the average citizen understand what this means?" he asked. "In from 10 to 20 years this country will be dependent entirely upon outside sources for a supply of liquid fuels... paying out vast sums yearly in order to obtain supplies of crude oil from Mexico, Russia and Persia." But chemists might be able to solve the problem, Hibbert said, by converting abundant cellulose waste from farm crops, timber operations and seaweed into

ethyl alcohol.[101] In the summer of 1920, Boyd and his family moved to New Haven so that he could study with Hibbert. Boyd found Hibbert impressive but the volume of literature about cellulose hydrolysis and synthesis was overwhelming. When Midgley came east in late July, he was more interested in meeting Standard Oil Co. officials than with Hibbert, and Boyd left without a clear sense of where the cellulose research could go.[102]

Boyd did insist that a source of alcohol "in addition to foodstuffs" must be found, and that the source would undoubtedly be cellulose: "It is readily available, it is easily produced and its supply is renewable." Using it and returning farm crop residues to the soil would not harm soil fertility. But the problem of developing a commercial process for cellulose conversion to alcohol was serious, he had learned in his stay with Hibbert. A ton of wood yielded only 20 gallons of alcohol in the least expensive "weak acid" process, whereas a commercially profitable "weak acid" process would need a yield of at least 50 gallons, and possibly 60 to 65. Such yields had been achieved with the "strong acid" process, but that technology was complex and more expensive. Still, success might be found if the "strong acid" yield could be obtained in a weak acid process, and as a result, "the danger of a serious shortage of motor fuel would disappear," Boyd said. "The great necessity for and the possibilities of such a process justify a large amount of further research."

To promote the idea of alcohol blended fuels among automotive and chemical engineers, Midgley drove a high compression ratio car (7:1) from Dayton to an October, 1921 SAE meeting in Indianapolis using a 30 percent alcohol blend in gasoline. This was only two months before tetraethyl lead was discovered. "Alcohol has tremendous advantages and minor disadvantages," Midgley told fellow SAE members in a discussion. Advantages included "clean burning and freedom from any carbon deposit... [and] tremendously high compression under which alcohol will operate without knocking... Because of the possible high compression, the available horsepower is much greater with alcohol than with gasoline..." Minor disadvantages included low volatility, difficulty starting, and difficulty in blending with gasoline "unless a binder is used."[103] Another unnamed engineer (probably from G.M., possibly Boyd) noted that a seven and a half percent increase in power was found with the alcohol-gasoline blend "...without producing any `pink' [knock] in the engine. We have recommended the addition of 10 percent of benzol [benzene] to our customers who have export trade that uses this type of fuel to facilitate the mixing of the alcohol and gasoline."[104] In a formal part of the presentation, Midgley mentioned the cellulose project. "From our cellulose waste products on the farm such as straw, corn-stalks, corn cobs and all similar sorts of material we throw away, we can get, by present known methods, enough alcohol to run our automotive equipment in the United States," he said. The catch was that it would cost $2 per gallon. However, other alternatives looked even more problematic — oil shale wouldn't work, and coal would only bring in about 20 percent of the total fuel need.[105]

Midgley and Kettering's interest in ethyl alcohol fuel did not fade once tetraethyl lead was discovered as an antiknock in December, 1921. In fact, not only was ethyl alcohol a source of continued interest as an antiknock agent, but more significantly, it was still considered to be the fuel that would eventually replace petroleum. A May 1922 memo from Midgley to Kettering was a response to a report on alcohol production from the Mexican "century" plant, a desert plant that contains fermentable sugars. Midgley said he was "not impressed" with the process as a way to make motor fuel:

> "Unquestionably alcohol is the fuel of the future and is playing its part in tropical countries situated similar [sic] to Mexico. Alcohol can be produced in those countries for approximately 7 - 1/2 cents per gallon from many other sources than the century plant, and the quantities which are suggested as possibilities in this report are insignificantly small compared to motor fuel requirements. However, as a distillery for beverage purposes, these gentlemen may have a money making proposition."[106]

Even as chemists tinkered with various processes to produce tetraethyl lead in a nearby lab, Midgley and Boyd continued working on alcohol for fuel. In a June 1922 SAE paper, they said:

> "That the addition of benzene and other aromatic hydrocarbons to paraffin base gasoline greatly reduces the tendency of these fuels to detonate [knock] ... has been known for some time. Also, it is well known that alcohol ... improves the combustion characteristics of the fuel...The scarcity and high cost of gasoline in countries where sugar is produced and the abundance of raw materials for making alcohol there has resulted in a rather extensive use of alcohol for motor fuel. As the reserves of petroleum in this country become more and more depleted, the use of benzene and particularly of alcohol in commercial motor fuels will probably become greatly extended."[107]

In September 1922, Midgley and Boyd wrote that "vegetation offers a source of tremendous quantities of liquid fuel." Cellulose from vegetation would be the primary resource because not enough agricultural grains and other foods were available for conversion into fuel. "Some means must be provided to bridge the threatened gap between petroleum and the commercial production of large quantities of liquid fuels from other sources. The best way to accomplish this is to increase the efficiency with which the energy of gasoline is used and thereby obtain more automotive miles per gallon of fuel."[108] At the time the paper was written, in late spring or early summer 1922, tetraethyl lead was still a secret within the company, but it was about to be announced to fellow scientists and test marketed. The reference to a means to "bridge the threatened gap" and increase in the efficiency of gasoline clearly implies the use of tetraethyl lead or some other additive to pave the way to new fuel sources.

This inference is consistent with an important statement in an unpublished 1936 legal history of Ethyl gasoline for the du Pont corporation:

> "It is also of interest to recall that an important special motive for this [tetraethyl lead] research was General Motors' desire to fortify

itself against the exhaustion or prohibitive cost of the gasoline supply, which was then believed to be impending in about twenty-five years; the thought being that the high compression motors which should by that time have been brought into general use if knocking could be overcome could more advantageously be switched to [ethyl] alcohol."[109]

Thus, during the time Kettering and Midgley researched anti-knock fuels (1916 to 1925), and especially after tetraethyl lead was discovered in December of 1921, there were two "ethyls" on the horizon for G.M.: Ethyl leaded gasoline, which would serve as a transitional efficiency booster for gasoline, and ethyl alcohol, the "fuel of the future" that would keep America's cars on the roads no matter what happened to domestic or world oil supply. Thus, Kettering's strategy in the post World War I years was to prepare cars for high-octane alternative fuels.

Clearly, G.M. switched gears sometime in 1923 or 1924. When controversy broke out about the public health impacts of leaded gasoline in 1924, Midgley and Kettering told the media, fellow scientists and the government that no alternatives existed. "So far as science knows at the present time," Midgley told a meeting of scientists, "tetraethyl lead is the only material available which can bring about these [antiknock] results, which are of vital importance to the continued economic use by the general public of all automotive equipment, and unless a grave and inescapable hazard exists in the manufacture of tetraethyl lead, its abandonment cannot be justified."[110] And at a Public Health Service conference on leaded gasoline in 1925, Kettering said: "We could produce certain [antiknock] results and with the higher gravity gasolines, the aromatic series of compounds, alcohols, etc... [to] get the high compression without the knock, but in the great volume of fuel of the paraffin series [petroleum] we could not do that."[111] Even though experts like Alice Hamilton of Harvard University insisted that alternatives to leaded gasoline were available,[112] the Public Health Service allowed leaded gasoline to remain on the market in 1926. (Leaded gasoline was banned in 1986, addressing public health concerns that had been expressed 60 years earlier).

Interestingly, Kettering and Midgley came up with another fuel called "Synthol" in the summer of 1925, at a time when the fate of leaded gasoline was in doubt. Synthol was made from alcohol, benzene and a metallic additive — either tetraethyl lead or iron carbonyl. Used in combination with a new high-compression engine much smaller than ordinary engines, Synthol would "revolutionize transportation."[113] (Fig. 4) When Ethyl leaded gasoline was permitted to return to the market in 1926, Kettering and Midgley dropped the Synthol idea.

By the mid-1930s, the alliance between G.M., duPont, and Standard Oil to produce Ethyl leaded gasoline succeeded beyond all expectations: 90 percent of all gasoline contained lead. Public health crusaders who found this troubling still spoke out in political forums, but competitors were not allowed to criticize leaded gasoline in the commercial marketplace. In a restraining order forbidding such criticism, the Federal Trade Commission said Ethyl gasoline "is entirely safe to the health of [motorists] and to the public in general when used as a motor fuel, and is not a narcotic in its effect, a poisonous dope, or dangerous to the life or health of a customer, purchaser, user or the general public."[114]

Direct comparison between leaded gasoline and alcohol blends proved so controversial in the 1920s and 1930s that government studies were kept quiet or not published. For instance, a Commerce Department report dated May 15, 1925 detailed dozens of instances of alcohol fuel use worldwide.[115] The report was printed only five days before the

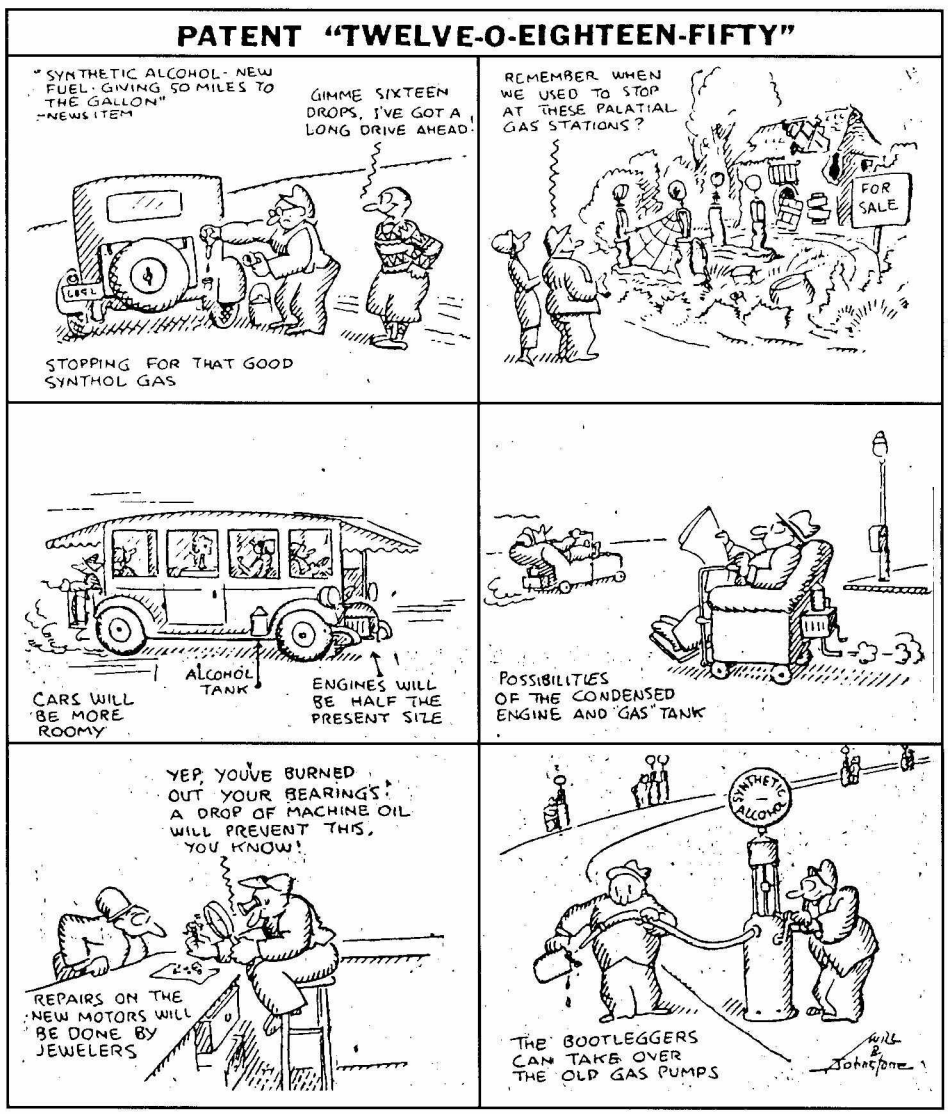


Fig. 4 - Cartoonists like Will B. Johnstone enjoyed poking fun at GM's claims that the new fuel would double gas mileage.

Surgeon General's hearing on Ethyl leaded gasoline. Yet it was never mentioned in the news media of the time, or in extensive bibliographies on alcohol fuel by Iowa State University researchers compiled in the 1930s. Another instance of a "buried" government report was that of USDA and Navy engine tests, conducted at the engineering experiment station in Annapolis. Researchers found that Ethyl leaded gasoline and 20 percent ethyl alcohol blends in gasoline were almost exactly equivalent in terms of brake horsepower and useful compression ratios. The 1933 report was never published.[116]

International Use of Alcohol Fuels, 1920s and 1930s

By the mid-1920s ethyl alcohol was routinely blended with gasoline in every industrialized nation except the United States. Ten to 25 five percent alcohol blends with gasoline were common in Scandinavian countries, where alcohol was made from paper mill wastes; in France, Germany and throughout continental Europe, where alcohol was made from surplus grapes, potatoes and other crops; and in Australia, Brazil, Cuba, Hawaii, the Philippines, South Africa, and other tropical regions, where it was made from sugar cane and molasses (Fig. 5). In some countries, especially France, gasoline retailers were required to blend in large volumes of alcohol with all gasoline sold. Germany, Brazil and others also followed the "mandatory blending" model. In other countries, such as Sweden, Ireland and Britain, alcohol blends received tax advantages.[117]

In France, insecure supplies of oil during World War I led to a research program at the Pasteur Institute on sources of alcohol, including marine biomass sources like kelp.[118] Continued research by a national fuels committee appointed in 1921 led to a recommendations of a national fuel consisting of 40 to 50 percent alcohol. Article 6 of the Law of February 28, 1923, required gasoline importers to buy alcohol from a state monopoly at a volume of at least 10 percent of their gasoline imports. Article 7 of the Law provided a five-Franc-per-hectolitre tax on gasoline to help subsidize the alcohol monopoly. The blend, often reaching as much as 50 percent in some fuels, was not well accepted by consumers who were using engines which were specifically adapted to gasoline. At a minimum, carburetor settings needed to be changed to allow a greater fuel volume when the percentage of alcohol in the gasoline rose above 20 to 30 percent, and bitter complaints flowed in from motor clubs and garages.[119] Amendments to the law in 1926 and 1931 helped create a more workable blend, and alcohol fuel use rose from 7.8 million gallons per year in 1925 to 20 million gallons in 1932.

Although the French government was initially one of the most enthusiastic toward alcohol, by 1932 so many other nations had surpassed the French effort that one proponent explained the "slowness" in reviving alcohol fuels use. It "is due in part to the poor results obtained when such fuels were first introduced and also to the casting of discredit upon such fuels by its adversaries who profit in the fuel business," said Charles Schweitzer, a research chemist in the Melle complex.[120] Schweitzer also noted that alcohol was far preferable to leaded gasoline from a public health standpoint.[121]

National initiatives were also under way in Britain, Italy and Germany, and tax incentives were passed in all three nations to encourage the use of alcohol or alcohol-blended fuels.

In England, a Departmental Committee on Industrial Alcohol reported in 1905 that alcohol from potatoes would be more expensive than gasoline, even though farmers wanted an alcohol industry built to absorb crop surpluses. In 1915 "agitation" for an alcohol industry was noted.[122] A Fuel Research Board experimented with alcohol production between 1917 and 1924, and reported that while economics of traditional crops were marginal, novel crops like Jerusalem artichokes might be useful. "The most economical source [of alcohol] may be found ultimately in some of the luxuriant tropical growths within the Empire," an article in *SAE Journal* said. Even so, it continued attention to power alcohol was important. "Looking at the fuel question very broadly, the dominant fact is that almost all the fuel supplies at present used are what lawyers call wasting securities... As mineral fuels grow dearer, the advantage of fuels of vegetable origin must become accentuated."[123] By the 1930s, two major blends of up to 30 percent alcohol — Cleveland Discoll (owned in part by Standard Oil of New Jersey) and Cities Service — were widely used. Discoll continued to be used until the 1970s.

German firms such as I.G. Farben had by the early 1920s come up with a process for making synthetic methanol from coal, a development which was widely reported in the popular and technical press. Observing the synthesis of methanol and other fuels, the editor of

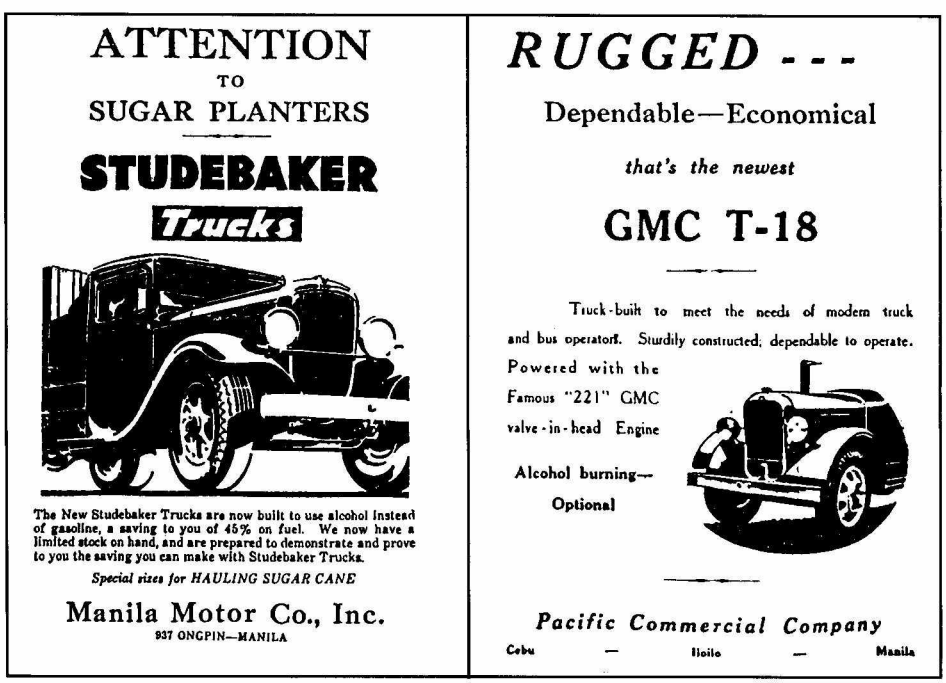


Fig. 5 - 1930s truck advertisements from the Philippines where pure alcohol fuels were made from sugar cane to absorb some of the country's large surplus.

Industrial and Engineering Chemistry said: "We do not predict that these will necessarily be the fuels to supplement our diminishing petroleum reserves ... But who shall say? The field is new and the opportunities are correspondingly great."[124] The German ethyl alcohol monopoly of the pre-World War I (the Centrale für Spiritus Verwerthung) had apparently fallen apart in the postwar chaos, but in September, 1926 a commercial fuel called "Monopolin" was introduced and "favorably received due to its anti-knock qualities." [125] The fuel, which included I.G. Farben's octane-boosting iron carbonyl additive, was endorsed by a famous race car driver of the era, Herbert Ernst, and alcohol use in fuel climbed from a quarter million gallons in 1923 to 46 million gallons in 1932. In 1930 gasoline importers were required to buy from 2.5 to 6 percent alcohol relative to their gasoline import volumes, but around 1933, I.G. Farben and several oil companies acquired 51 percent of Monopolin.[126] Production of alcohol did not diminish, but climbed by 1937 to about 52 million gallons per year as part of Hitler's war preparations.[127]

In Italy, the first Congress of Industrial Chemistry which took place in April 1924 focused strongly on fuel problems, with a large percentage of the papers concerned with alcohol fuels. [128] A strong scientific endorsement of the idea of using surplus crops in the national fuel mix led to a national decree on mandatory use of alcohol fuels in 1925. Several oil companies initially refused to blend alcohol with gasoline, but government pressures prevailed. By the late 1920s blends included Benzalcool (20 percent ethanol and 10 percent benzene) and Robur (30 percent ethanol, 22 percent methanol, 40 percent gasoline and other additives). Other nations, such as Hungary, Poland, and Brazil would follow the French and Italian examples with mandatory alcohol and gasoline blends in national fuels in the 1920s and 1930s, while the tax incentive approach was adopted by many other European nations such as Switzerland, Sweden, Germany and Czechoslovakia.

The total use of alcohol as a substitute fuel in Europe may have never exceeded five percent, according to the API. Synthetic gasoline and benzene created by I.G. Farben from coal substituted for seven percent and 6.5 percent respectively of European petroleum by 1937. Synthetic gasoline was cheaper (at 17 to 19 cents per gallon) than alcohol at around 25 cents per gallon, API said. [129]

In tropical nations where sugar cane was abundant and petroleum sources distant, blends and straight alcohol fuels were common. A tractor operator for the American Sugar Co. in Cuba in the 1921-24 period recalled using cheap molasses-derived alcohol by the barrel at a time when gasoline was expensive to import. The practice was to start the tractors with gasoline (which cost 40 to 50 cents per gallon) and then run them on alcohol (at 5 cents per gallon) for the rest of the day. When the tractors were to be idled over a weekend or between harvests, a little gasoline was injected into the cylinders to minimize corrosion.[130] In 1931 the Brazilian government followed the French example and required alcohol mixtures in five percent of imported oil; blending continued sporadically through the 1950s. When the oil price shocks hit Brazil in the 1970s, the relatively recent technological expertise with alcohol fuel blends was a factor in that nation's adoption of an extensive alcohol fuels program.[131]

Alcohol use in fuel dropped by 25 percent in 1937 as Europe shifted gears and prepared for war. Crop failures in 1938 and 1939 eliminated surpluses and, temporarily, the need for an alcohol fuels program for farmers. With the outbreak of World War II, virtually all industrial alcohol production shifted to ammunition, and crop surpluses disappeared for a decade.

U.S. Commercial Alcohol Fuels Programs

Alcohol-blended fuel was adopted in isolated instances in America during the 1920s and early 1930s. One World War I era American blend was "Alcogas." Little is known about it, although a photo of a service station at an unknown location survives [132] and references to Alcogas are found in the technical literature.[133] Another 1920s blend was made from potatoes. The alcohol was distilled in Spokane and the blended fuel, called "Vegaline," was widely sold in Idaho and Washington state. "There was no apparent difference in the operation of the vehicle whether it was fueled by the Standard Oil pump or the Vegaline pump," said Ralph Curtis, a Washington resident. Curtis' great-grandfather was an enthusiastic investor in Vegaline. "He would tell us that by adding this alcohol to gasoline that the farmers of our area would benefit. His theory was that production of the alcohol would not be limited to cull potatoes but [could include] other unmarketable fruits and vegetables." The Vegaline plant was caught up in the Great Depression of 1929 and closed its doors.[134]

An apparently formative experience for the oil industry was Standard Oil's attempt to market a 10 percent alcohol blend in Baltimore for a few months in 1923. At the time, industrial alcohol from molasses was selling for less than 20 cents per gallon, while retail gasoline prices had reached an all-time high of 28 cents per gallon. But "difficulties" stopped the experiment, according to a cryptic 1933 internal memo of the API's "Special Technical Committee" on alcohol fuels. All that is known about the difficulties is that they "largely were of a marketing and car operating nature and resulted from the instability of the alcohol-gasoline in the presence of water."[135] Standard Oil apparently did not clean out its fuel storage tanks and viewed the resulting "problem" as a difficulty inherent in using the fuel rather than in the fuel handling system. Standard did not document the experiment or publicize its results. No reference to it is found in *The Baltimore Sun* during this period. However, the API used this single incident as a technical justification for opposition to alcohol-blended fuels in the 1930s.

Alcogas, Vegaline and other sporadic attempts to market an alcohol-blended fuel never caught on in the 1920s, due primarily to economic disadvantages but also to Prohibition and opposition by the oil industry. By the 1930s, with the country caught in the depths of the Great Depression, new ideas were welcome. Corn prices had dropped from 45 cents per bushel to 10 cents; it was only natural that people in Midwestern business and science would begin thinking about new uses for farm products, and indeed, alcohol fuel turned out to be the most controversial of these proposals. The battle between U.S. farmers and the oil industry in the 1930s over alcohol fuel has been reviewed by Giebelhaus[136] and Bernton[137] but aspects of this tumultuous

debate have yet to be fully explored.

Many scientists, businessmen and farmers believed that to make their own fuel would help put people back to work and ease the severe problems of the Depression. Nearly three dozen bills to subsidize alcohol fuel were taken up in eight states in the 1930s. Most of the subsidy proposals involved forgiveness of state sales taxes. Not surprisingly, the incentives had the most support in the central farm states such as Iowa, Nebraska, Illinois and South Dakota. Legislation did pass in Nebraska and South Dakota, but the tax break passed by the Iowa legislature was struck down by the state supreme court. The Nebraska legislature also petitioned the U.S. Congress for a law making 10 percent ethyl alcohol blending mandatory throughout the country. This proposal, a national tax incentive, and other pro-alcohol bills, were defeated in Congress in the 1930s.

The thinking behind these proposals had little to do with energy substitution. Rather, it was "a form of farm relief and not energy relief," said Ralph Hixon, who along with Leo Christensen and others in Iowa State University's chemistry department, had been testing blends of alcohol and gasoline. "We found that it was one of the very best fuels, it gave a performance greater than Ethyl," Hixon said. The Ames chemists worked with local gasoline retailers to put a 10 percent alcohol blend with gasoline on sale in Ames service stations in 1932. The alcohol-gasoline pump at the Square Deal stations operated until the late 1930s, and the blend sold for 17 cents a gallon. It was "in competition with Ethyl," which also sold for 17 cents at the same stations.[138] Some 200,000 gallons of Agricultural Blended Motor Fuel were eventually sold in an Iowa campaign in the early 1930s.[139]

Similar efforts, not as well backed up with research and documentation, broke out all over the Midwest. In Lincoln, Nebraska, the University of Nebraska and the Earl Coryell gasoline company marketed several hundred thousand gallons of "Corn Alcohol Gasoline Blend (Fig. 6)." In Peoria, Illinois, the Illinois Agricultural Association teamed up with Keystone Steel & Wire Co. and Hiram Walker distillery to produce half a million gallons of "HiBall" and "Alcolene" blended fuels.[140] (Fig. 7) In Yankton, South Dakota, Gurney Oil Co. marketed 200,000 gallons of blended fuel.[141]

After legislative setbacks in 1933, the movement for alcohol fuels then came to be seen as part of a broader campaign for industrial uses for farm crops to help fight the Depression. It was called "farm chemurgy," and it was, in part, a populist Republican alternative to Democratic President Franklin Delano Roosevelt's agricultural policies. Henry Ford backed the idea by sponsoring a conference at Dearborn, Michigan, in 1935. The conference created the National Farm Chemurgic Council, and annual conferences followed.[142]

Another key supporter of the farm chemurgy concept was the Chemical Foundation, a quasi-federal agency which administered German patent royalties as part of reparations for World War I. The Chemical Foundation, with Ford's blessing, decided in 1936 to finance an experimental alcohol manufacturing and blending program in the Midwest. The chemurgy movement, with alcohol fuel as a controversial centerpiece, had far outstripping original legislative proposals and had grown into an unprecedented mixture of agronomy, chemistry and Prairie Populism. Many felt that the time had come to compete directly with the oil industry. By 1937 motorists from Indiana to South Dakota were urged to use Agrol, an ethyl alcohol blend with gasoline. Two types were available — Agrol 5, with five to seven percent alcohol, and Agrol 10, with 12 1/2 to 17 1/2 percent alcohol. "Try a tankfull — you'll be thankful," the Agrol brochures said. The blend was sold to high initial enthusiasm at 2,000 service stations. However, Agrol plant managers complained of sabotage and bitter infighting by the oil industry,[143] and market prices were also a major influence. Although Agrol sold for the same price as its "main competitor," leaded gasoline, it cost wholesalers and retailers an extra penny to handle it and cut into their profit "spread," *Business Week* said. "Novelty appeal plus ballyhoo provided sufficient increase in gallonage to offset the difference in spread. Now jobbers and dealers, having done their share, are again plugging the old house brands with four and a half cent spreads. Agrol is in the last pump — for those who want it."

By 1939, the Atchison Agrol plant closed its doors, not in bankruptcy, but without viable markets to continue. The experiment had failed, but it was not the end of the story. As war broke out two years later, the California Assembly considered a motion to create an auxiliary fuel from surplus fruits and vegetables. President Franklin Roosevelt wrote the speaker of the assembly and said:

"While it is true that a number of

Fig. 6 - The Earl Coryell Co. of Lincoln, Nebraska, switched to "corn alcohol" in April 1933 as enthusiasm for new markets for farm products grew in the midwest. Note the "ears" on the fuel tanks. Photo courtesy of Nebraska State Historical Society.

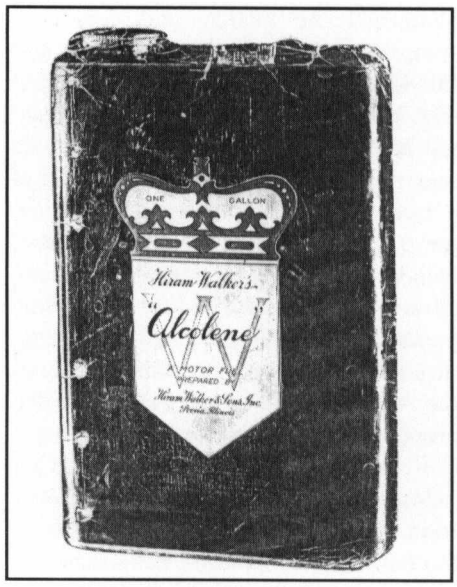


Fig. 7 - Hiram Walker Distilleries produced "Alcolene" motor fuels in the 1930s.

> foreign countries process agricultural materials for the production of alcohol as a motor fuel, it is equally true that the motor fuel economy of countries possessing no petroleum resources is very different from such economy in the United States. It has never been established in this country that the conversion of agricultural products into motor fuel is economically feasible or necessary for national defense. On the other hand, it has been recognized for a long time that a real need exists in this country for the development of all the information possible on this very contentious subject...." [144]

Roosevelt's intense political feud with the Republican forces who backed chemurgy would have led him to oppose virtually anything that the Midwestern Republicans advanced, but Roosevelt's judgment was premature. Several months later, as war industry plans were accelerated, the need for alcohol became apparent. Within two years, chemists and agricultural engineers from Midwestern universities who had tried their alcohol production ideas at the Agrol plant would be mass-producing enormous quantities of ethyl alcohol for synthetic "Buna-S" rubber and for aviation fuel. From a prewar peak production of 100 million gallons of alcohol per year, well over 600 million gallons of new capacity was created. The alcohol-based system which in 1942 seemed capable of providing only one-third of the raw materials for the total synthetic rubber demand ended up supplying three-quarters and making a significant impact on the war effort.[145] The Agrol experience had clearly helped pave the way for this war effort, in terms of providing trained personnel, novel techniques and a history of mistakes to avoid. The resilience and flexibility of agricultural systems was well demonstrated, the chemists believed, because petroleum based synthetic rubber technologies owned by Standard and the German chemical company I.G. Farben had faltered at the critical moment. Without the previous experience in alcohol fuels production in the 1930s, the war effort might have been considerably delayed.[146]

The Agrol experiences and the mass production of alcohol for war industries were also recalled in the 1970s, when the conventional wisdom recognized only coal and nuclear power as alternatives to embargoed Middle Eastern oil.[147] In contrast, it was clear at the end of World War II that eventually U.S. oil reserves would be depleted. According to the U.S. Tariff Commission in 1944: [148]

> "When a certain point in costs has been reached, several methods of meeting the situation will be available: These include: increased importation of petroleum; more complete recovery of domestic petroleum from the ground by various so-called secondary methods; conversion of natural gas into gasoline; extraction of oil from shale; synthesis of oil from coal; domestic production of alcohol from vegetable materials; and foreign production of such alcohol."

Oil Industry Opposition to Ethyl Alcohol Fuel

The onset of interest in alcohol fuel in 1933 caught the oil industry off guard, but once alarmed, it reacted swiftly. API urged formation of state level "emergency committees" in the spring of 1933 to oppose proposals for tax incentives. In a set of memos sent under a red cover marked "IMPORTANT," API introduced a "coordinated program to be connected throughout the industry" to combat alcohol gasoline blending. The memo explained the threat: compulsory blend of alcohol and gasoline, as was used in France, Italy and Germany in the 1920s and early 1930s, "will harm the petroleum industry and the automobile industry as well as state and national treasuries by reducing [oil] consumption," the memo said. The only ones to benefit would be distillers, railroads (which would transport the alcohol) and bootleggers "to whom would be opened brand new fields of fraud." [149]

API's campaign was waged across many states, especially the Midwest, in the spring of 1933, and at the federal level for most of the 1930s.[150] Technical experts in the oil industry claimed that alcohol fuel blends "are definitely inferior to gasoline alone from every angle of motor performance."[151] Editorials by Lowell Thomas and other radio announcers paid for by oil industry sponsors claimed that alcohol fuel would make "speakeasys" out of gasoline stations because bootleggers could easily separate out the gasoline and sell the alcohol. Thomas said: "The automobile manufacturer resents it [alcohol] because it interferes with the horsepower of the motorist's car, requires extensive carburetor changes and presents other difficulties...." (In fact, this might be true of pure alcohol but not alcohol blends with gasoline). Thomas' radio address was recorded in a cable sent from Sun Oil's J.Howard Pew to H.D. Collier, president of Standard Oil Co. of California, on April 26, 1933. "Confirming telephone conversation reference alcohol blend our radio announcement was as follows quote...." When an apparently large number of critical telegrams poured in, Sun took pains to distance Thomas from "our radio announcement," even writing a "suggested reply to Congressman Dirksen" in which Thomas was to say "This is news and not propaganda, which I myself nor my sponsors would for a moment tolerate over the air." The suggested reply was unsigned but written on stationery clearly showing the Sunoco watermark.[152] It was not clear whether Thomas actually sent the suggested reply.

Other tactics involved private investigations of politicians and businessmen who supported alcohol blends. Sun Oil Co. investigated the private lives of the directors of Keystone

Steel and Wire Co. and others.[153] Then-Representative Everett Dirksen, who supported Keystone, wrote constituents that he was being investigated by unknown people. "Here you have the proof of how the insidious oil lobby works in order to defeat any measure or any individual who opposes their interests," Dirksen said.[154]

Officials from Standard Oil of Indiana and the Ethyl Corp. exchanged worried letters about the outbreak of interest in alcohol blends in the winter of 1933. Standard's chief lawyer wrote Ethyl president Earle Webb: "Much publicity has gone through the state to the effect that alcohol mixed with gasoline makes a motor fuel high in anti-knock rating and the move has been to require gasoline to contain a high percentage of alcohol (manufactured locally, of course) or pay a high state tax. Manifestly this would materially interfere with the use of Ethyl in Iowa... Let me know what you are doing or intend to do, and to what extent we can cooperate."[155] Webb wrote back: "I entirely agree that proposed legislation of this character is apt to have a serious termination and that almost anything may happen where there is so much discontent. We would very much appreciate being kept informed as to developments."[156] By April 1933, Standard was apparently worried about antitrust laws, and wired Ethyl: "Believe absolutely necessary Ethyl Gasoline Corp. avoid any public opposition or any such direct action."[157]

Also in the 1930s, as Ethyl's marketing power grew, the company began to enforce what it considered to be "business ethics" on the market. Ethyl refused to grant dealer contracts to certain gasoline wholesalers, and often provided no formal explanation for their actions. The exclusion of "unethical" businessmen was especially aimed at those who cut prices, but it was a means of excluding from the entire fuel market any wholesaler who adopted practices which the oil industry disliked. Since wholesalers had to carry a wide range of products to survive, and since advertising had created enormous consumer demand for Ethyl, to be denied an Ethyl contract was in effect to be forced out of business. Most wholesalers could not or would not tell the Federal Bureau of Investigation why Ethyl would consider them unethical, but at least one wholesaler, the Earl Coryell company of Lincoln, Nebraska, blended ethyl alcohol about the same time that it could not get an Ethyl license.[158] Pressure to stick with Ethyl leaded gasoline exclusively rather than try alcohol fuel blends would have been quite strong with this enforcement mechanism at the oil industry's disposal, but it is difficult to estimate how many gasoline dealers wanted to use alcohol instead of lead. In 1940 the U.S. Supreme Court upheld an antitrust verdict against Ethyl, [159] but by then, the Midwestern alcohol fuel movement had disintegrated.

Clearly, the tactics used by the oil industry involved more than simple marketplace competition and public relations in response to the prospect of legislative controls. Yet economic issues and assumptions are at the heart of the dispute and deserve careful consideration.

Economics of Alcohol Fuel

Alcohol fuel has never been economically attractive as a straight gallon for gallon substitute for gasoline. When alcohol fuel returned to the American market in 1907 at a retail price of 32 cents per gallon, it was competing with gasoline at 18 to 22 cents per gallon. This roughly one-third advantage has been the rule for most of the 20th Century in the U.S. In 1933, grain alcohol cost 25 cents per gallon wholesale as opposed to gasoline at 10 to 13 cents per gallon wholesale. Despite attempts to make alcohol from cheaper materials (such as wood waste and cellulose), the cost differential has been the most serious obstacle to the widespread use of alcohol fuel and, according to some historians, the primary focus of most oil industry resistance to its use.[160]

Modern researchers have noted that the value of alcohol as a fuel depends on whether it is considered a gasoline substitute or an octane enhancer. "If refiners turn to using alcohols as octane enhancers as lead phasedown occurs, there may be sufficient demand to warrant the capital outlay required for production facilities, in which case the market value of alcohol fuels would become much greater," according to the Canadian Energy Research Institute.[161]

Although T.A. Boyd and Thomas Midgley of Ethyl found ethyl alcohol to be a good anti-knock additive in 1922, it was not until 1933 that studies at Iowa State University publicly quantified the quality and economic comparisons between ethyl alcohol and Ethyl lead. Hixon and others concluded that it took 15 percent alcohol to create the octane boost of 3 grams of lead, as seen in Table 1. Since Ethyl lead sold at a 3-cent premium over regular gasoline, the question was whether ethyl alcohol blends, with the same anti-knock/octane advantage, should not be sold at the same premium price. Proponents of alcohol blended fuels insisted that this — and not the "extender" use of alcohol — was the proper basis of comparison.

The extreme example of the oil industry's argument is illustrated by a letter from Joseph Pew of Sun Oil Co. to an alcohol fuels proponent. Pew said that alcohol had 60 percent the BTU value of gasoline, and it would only be worth 60 percent of the value of gasoline. To a refinery, gasoline was worth only 6 cents per gallon. Thus, alcohol would have to cost only 3.6 cents per gallon to compete with gasoline, and even then there would still be the expense of having it transported to the refinery. "I figure it isn't worth more than a cent" per gallon, Pew said.[163]

The differences in these economic assumptions demonstrate that the debate over alcohol fuel that broke out in the Midwest in the 1930s depended greatly on the viewpoint of the company or individual. In essence, political conditions shaped the marketplace and the new competition faced a difficult economic playing field heavily tilted toward established industries.

Conclusion

Alcohol fuels as anti-knock blending agents were well known long before tetraethyl lead was discovered in 1921, and their technical qualities had been well characterized by engineers in the U.S. and in Europe by 1925. The experience in other nations with alcohol blended fuels was usually (although not universally) positive. Practical techniques were well known to overcome most problems with alcohol as a pure fuel or in blends with gasoline. Fuel blends were economically successful in countries where oil tended to be relatively expensive or where independence in fuel supply was seen as a political or strategic priority.

Alcohol fuels advocacy among American farmers emerged in the 1906 - 1908 period and again in the 1930s. Scientists and engineers in the U.S. and

TABLE I
OCTANE (ANTI-KNOCK) IMPROVEMENT AND COST COMPARISON ETHYL ALCOHOL AND ETHYL GASOLINE

	Octane number &	Increase	Wholesale Price *
Base fuel	**56**	**—**	**10**
Base fuel plus 3 grams lead	**68**	**12**	**13**
Base fuel plus 10 % ethyl alcohol	**65**	**9**	**11.5 ****
Base fuel plus 20 % ethyl alcohol	**80**	**24**	**13 ****

* Wholesale price; assumes 25 cents per gallon for ethyl alcohol and 10 cents per gallon for gasoline purchased from jobber in Midwest.
** Note substitution of base fuel with 10 percent ethyl alcohol means 9 cents worth of gasoline added to 2.5 cents worth of alcohol. Substitution of 20 percent ethyl alcohol is 8 cents gasoline + 5 cents alcohol = 13.
Also note: Iowa State included a half-cent per gallon blending charge for the two alcohol blended fuels. Data from: Iowa State College, The Use of Alcohol In Motor Fuels, Progress Report Number III, Divs. of Industrial Science, Engineering, Agriculture; Jan. 20, 1933. Also: Rayburn D. Tousley, The Economics of Industrial Alcohol, Washington State Univ., 1945.

The oil industry did not use the same economic yardsticks in comparing the costs of alcohol fuel blends, although they did incorporate the same half cent per gallon blending charge used by the Iowa State researchers. According to one pamphlet, alcohol cost five to 10 times more than gasoline, depending on the price of corn, and had technical problems. "Seeing that alcohol fuels cannot compete with gasoline on a price or quality basis ... huge sums of money [are] now being spent on a nationwide propaganda campaign to convince the American people that alcohol gasoline would bring permanent prosperity to farmers." The "Alky-Gas" scheme "robs Peter to pay Paul," that is, it takes money from motorists to pay for farm relief. It would be cheaper just to pay farmers to burn their corn.[162]

TABLE II
OIL INDUSTRY PRICE COMPARISONS

Total cost gasoline one gallon		**13.5 cents**
Base gasoline 9/10 gal		**12.1 cents**
Ethyl alcohol 1/10 gal	**(at 39.3 cents per gallon)**	**3.9 cents**
Total cost 10 percent alcohol blend		**16.0 cents**

Note: All prices before taxes. Source Who Would Pay for Corn Alcohol? Iowa Petroleum Council pamphlet, 1933, API library, Washington, D.C.(Fig. 8)

Europe ranged from neutral to enthusiastic about the clean burning, high compression characteristics of alcohol fuel, yet the U.S. oil industry claimed it was technically inferior. Charles Kettering and his General Motors researchers were particularly interested in alcohol from cellulose in the 1919 - 1925 time frame, and saw Ethyl leaded gasoline as paving the way for the "fuel of the future" by providing a temporary octane boost and allowing engine compression ratios to increase, which would in turn make pure alcohol fuel more feasible. In 1924, however, G.M. allied itself with Standard Oil, creating the Ethyl Corporation. Shortly afterwards, G.M. researchers contradicted years of their own research and hundreds of other studies by claiming that only tetraethyl lead could produce anti-knock results.

If there is an historical lesson to learn from the "fuel of the future," it is that technology is often political. In this case, fuel technology developed in a direction that was a matter of policy choice and not predetermined by any clear advantage of one technology over another. For different reasons, Henry Ford and Charles Kettering both saw the fuel of the future as a blend of ethyl alcohol and gasoline leading to pure alcohol from cellulose. A dedicated agrarian, Ford thought new markets for fuel feedstocks would help create a rural renaissance. On the other hand, Kettering, as a scientist, was worried about the long term problem of the automotive industry's need for oil, a resource with rapidly declining domestic reserves. Clearly, the shortage of domestic oil that was feared in the 1920s has occurred in the late 20th Century, although it has hardly been noticed because of the abundance of foreign oil. Whether the oil substitute envisioned by the scientists and agrarians of the first half of this century will be appropriate in the next century remains an open question.

"Many years may be necessary before the actual development of such a [fuel] substitute," Kettering concluded. There was always the possibility, according to Kettering's friend Charles Stewart Mott, "that if a time ever came when the sources of [fossil] heat and energy were ever used up .... that there would always be available the capturing of...energy from the sun...through agricultural products...."[164]

1 "Ford Predicts Fuel from Vegetation," *The New York Times*, Sept. 20, 1925, p. 24.

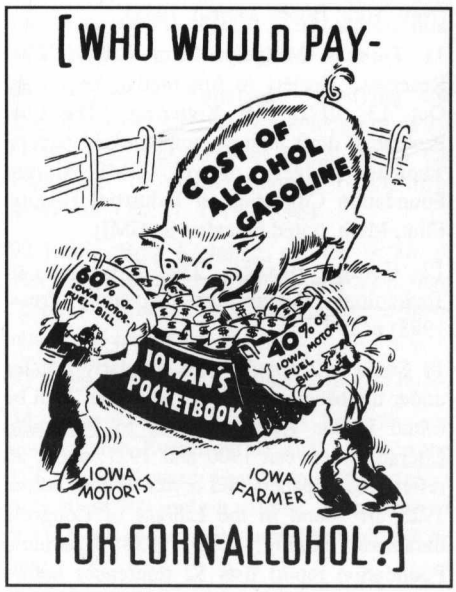


Fig. 8 - This 1933 Iowa Petroleum Council illustration is representative of the scorn of the oil industry to proposals for alcohol tax incentives in the midwest.

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18 Robert N. Tweedy, Industrial Alcohol (Dublin, Ireland: Plunkett House, 1917).

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29 Author's search of records at the U.S. Patent Office, Arlington, Virginia.

30 Cummins, Internal Fire, op. cit. fn 20.

31 Ibid., p. 81. See above for additional references.

32 Ibid., p. 135. The patent was not granted "because of cited prior art." Apparently the idea was a commonplace. American burning fluid lamp manufacturers described the carburetion process in brochures in the 1850s.

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54 Capen testimony to Senate Finance Committee.

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94 Large-scale production of benzene was questionable. Even if all the coal mined in the U.S. in 1920 were used to supply benzene, only about 900 million gallons, or one-fifth of the U.S. gasoline supply would be replaced, he said.

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98 Leslie, Boss Kettering, op. cit. fn 88, p. 156.

99 Zimmerschied to Kettering, Feb. 27, 1920; Kettering to Zimmerschied, March 3, 1920, Kettering collection, GMI. Note that carburetors had been built with lacquered cork floats before this time, which was not a problem with gasoline. However, alcohol was a solvent for the lacquer. Therefore, GM switched to metal carburetor floats to accommodate the new international fuel blends.

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111 U.S. Public Health Service, Proceedings of a Conference to Determine Whether or Not There is a Public Health Question in the Manufacture, Distribution or use of Tetraethyl Lead Gasoline, PHS Bulletin No. 158, (Washington, D.C.: U.S. Treasury Dept., August 1925), p. 6. (Hereafter cited as PHS Conference). Of course, Kettering originally planned to get alcohols from outside the paraffin series through grain and cellulose.

112 "U.S. Board Asks Scientists to Find New 'Doped Gas,'" *New York World*, May 22, 1925, p. 1.

113 "Work on New Type of Auto and Fuel," *The New York Times*, Aug. 7, 1925; also "New Auto, Fuel to Save Costs are Announced," United Press, Aug. 6, 1925.

114 Federal Trade Commission Docket No. 2825, Cushing Refining & Gasoline Co., June 19, 1936, Dept. of Justice files, 60-57-107, National Archives, Washington, D.C.

115 Homer S. Fox, "Alcohol Motor Fuels," Supplementary Report to World Trade in Gasoline, Minerals Division, Bureau of Domestic and Foreign Commerce, Trade Promotion Series Monograph No. 20 (Washington, D.C.: Dept. of Commerce, May 15, 1925). The report provided detailed statistics on trade volume, duties, tax incentives and laws surrounding the use of alcohol blended fuels, including ethanol and methanol, in France, Germany, England, Italy and 15 other countries were it was routinely used.

116 R.B. Gray, "On the Use of Alcohol-Gasoline Mixtures as Motor Fuels," unpublished, USDA, April 1933, National Agricultural Library, Beltsville, Md.

117 World Trade in Gasoline, Bureau of Domestic and Foreign Commerce, U.S. Dept. of Commerce monograph, Trade Promotion Series No. 20, May 15, 1925.

118 "Seaweed as a Source of Alcohol," *Scientific American*, Nov. 9, 1918, p. 371. A simple acid hydrolysis technique yielded only about 10 gallons per ton.

119 "What French Motorists Say about Alcohol-Gasoline Motor Fuel Blends," Washington, D.C.: American Motorists Association, Dec. 15, 1933. The association reprinted letters to the magazine of the French National Federation of Automobile, Bicycle, Aeronautical and Related Trades. In a decidedly non-random poll, the majority of 40 letter writers disapproved of the inconveniences of alcohol blends, primarily citing problems with cork floats in carburetors and hesitation and stalling with high volume alcohol blends used in unadapted engines. Note that GM changed cork floats to metal floats in the early 1920s to deal with this problem.

120 Charles Schweitzer, "L'État Actuel de la Question de l'Alcool Carburant," *Chimie & Industrie* Vol. 28, No. 1, 1932; Translated and abstracted by E.I. Fulmer, R.M. Hixon, L.M. Christensen, W.F. Coover in "The Use of Alcohol in Motor Fuels: Progress Report Number I, A Survey of the Use of Alcohol as Motor Fuel in Various Foreign Countries," May 1, 1933, unpublished manuscript, Iowa State University archives.

121 "Anti-détonants: leur emploi dans les carburants et leur danger," *Ind. Chimique*, 1931, No. 208, p. 332, cited in Fulmer et al, "The Use of Alcohol in Motor Fuels," op. cit. fn 120.

122 *The New York Times*, Nov. 28, 1915.

123 "Power Alcohol from Tubers and Roots", *SAE Journal*, May, 1925, p. 546. Also, Nathan, "Alcohol for Power Purposes," op. cit. fn 48.

124 *Industrial and Engineering Chemistry*, April 1925, p 334 .

125 Fulmer et al, "The Use of Alcohol in Motor Fuels," op. cit. fn 120.

126 Ibid.

127 Gustav Egloff, Motor Fuel Economy of Europe (Washington, D.C.: American Petroleum Institute, Dec. 1940).

128 "Italian Congress of *Industrial Chemistry*," Industrial & Engineering Chemistry, July 10,1924, p. 6.

129 Egloff, Motor Fuel Economy of Europe, op. cit. fn 127.

130 Personal communication, Fred R. Robinson to columnist Jack Anderson, April 24, 1978. See fn 91. Cuba continued using alcohol fuels throughout the 20th century, especially after the communist revolution of 1960, in order to stretch petroleum supplies from the former Soviet Union.

131 Bernton et al, The Forbidden Fuel, op. cit. fn 4, p. 140, p. 226.

132 Personal communication, Maurine Lorenzetti, editor, *Oxy-Fuel News*, Information Resources Inc., Washington DC, March, 1991.

133 "Alcogas as Aviation Fuel Compared with Export Gasoline," SAE Journal, June 1920, p. 397.

134 Personal communication, Col. Ralph Curtis, April 17, 1979. Curtis' letter to columnist Jack Anderson was prompted by Anderson staffer Hal Bernton's articles about gasohol.

135 "Analysis of Technical Aspects of Alcohol Gasoline Blends," prepared by American Petroleum Institute Special Technical Committee, No. 216 in an unspecified series, undated, with memo dated April 10, 1933. Series 4, Box 52, Pew collection, Hagley Library, Wilmington, Del.

136 Augustus W. Giebelhaus, "Resistance to Long-Term Energy Transition: The Case of Power Alcohol in the 1930s," *American Association for the Advancement of Science*, Jan. 4, 1979.

137 Bernton et al, The Forbidden Fuel, op. cit. fn 4.

138 Joyce Manchester, "Gasohol born in Ames, sold at service station," Ames Daily Tribune, March 11, 1978.

139 Donald Despain, The One and Only Solution to the Farm Problem (New York: Vantage Press, 1956), p. 113. Critics of alcohol fuel might describe this book as one of the world's longest crank letters because Despain is so obviously emotional about his subject. Factual information should be seen in this light as potentially biased.

140 Everett M. Dirksen, "The Congressional Front," March, 1933, Dirksen Congressional Center archives, Peoria, Ill. Also, "Why the Proposal to Blend Alcohol with Gasoline for Automotive Fuel is Simple and Practical..." Keystone Steel & Wire Co., Peoria, Ill.

141 Despain, The One and Only Solution to the Farm Problem, op. cit. fn 141, p. 113.

142 See, for example, Proceedings of the Third Dearborn Conference, Farm Chemurgic Journal, National Farm Chemurgic Council, Dearborn, Mich., various volumes. Numerous references to the Farm Chemurgy movement are found in the literature.

143 Statement of L.M. Christensen, "Use of Alcohol from Farm Products in Motor Fuel," Committee on Finance, U.S. Senate Hearings on SB 522, May 1939 (Washington: GPO, 1939); Also see "Alky-Gas Flops in Sioux City," *Business Week*, July 30, 1938, p. 20; "Farm Crop Alcohol Blended into Auto Fuel," *Popular Mechanics*, Oct. 1937; "Alky-Gas Gets Going," Business Week, Dec. 25, 1937; "Blackstrap Alky-Gas," *Business Week*, Sept. 9, 1939.

144 "Power Alcohol: Not yet feasible or necessary in U.S.," *Scientific American*, April, 1942.

145 U.S. Tariff Commission, Industrial Alcohol, War Changes in Industry Series, Report No. 2, (Washington, GPO: Jan. 1944).

146 It certainly would have been delayed had not chemists familiar with details of the synthetic rubber process been smuggled by British spy groups out of Poland and Russia to the U.S. just as war broke out. The British were well aware that Standard Oil of N.J. had a deal with Farben to block synthetic rubber, and considered Standard a "hostile and dangerous element of the enemy" according to William Stephenson's A Man Called Intrepid (New York: Ballentine, 1976), p. 284.

147 For example, see Al Frisbie, "The Old Alcohol Plant: Is there a Lesson There?" *World-Herald Magazine*, May 28, 1978, Omaha, Nebraska. Similar articles by other enterprising reporters turned up information about American energy history which had been completely overlooked.

148 U.S. Tariff Commission, Industrial Alcohol.

149 Harry Benge Crozier, Director of Public Relations to members of the public relations advisory committee, American Petroleum Institute, April 24, 1933, Series 4 Box 52, J. Howard Pew papers, Hagley Museum and Library, Wilmington, Del.

150 Hundreds of memos on the organization of the anti-alcohol campaign originating from API's various committees, including the industries, public relations and refinery committees, are found in Series 4 Box 52, J. Howard Pew papers, Hagley Museum and Library, Wilmington, Del. Memos prepared by the "Special Technical Committee" and the "Special Economics Committee" show an intense level of activity. Every major American oil company and most minor ones were involved in the campaign against alcohol fuel through these committees, either directly or indirectly. It is interesting to note that the position papers presented by these committees contained not a whiff of dissenting data, nor were any of the conclusions footnoted or referenced in any way whatsoever.

151 Gustav Egloff, "Alcohol Gasoline Motor Fuels," National Petroleum Association paper, April 21, 1933, Series 4 Box 52, J. Howard Pew papers, Hagley Museum and Library, Wilmington, Del.

152 These documents are found in Series 4 Box 52, J. Howard Pew papers, Hagley Museum and Library, Wilmington, Del.

153 "I have told you what we could find out about the Keystone officials...." E.W. Teagle, Chicago office of Sun, to J.N. Pew, April 27, 1933. Series 4 Box 52, J. Howard Pew papers, Hagley Museum and Library, Wilmington, Del.

154 Everett M. Dirksen, "The Congressional Front," May 5, 1933, Dirksen Congressional Center archives, Peoria, Ill.

155 L.L.Stephens to Webb, Jan. 24, 1933, transcribed by F.B.I. agents, U.S. Dept. of Justice Central Files, RG 60-57-107, Box 386-387, National Archives, Washington, D.C. Parentheses as transcribed.

156 Webb to Stephens, Feb. 9, 1933. U.S. Dept. of Justice Central Files, RG 60-57-107, Box 386-387, National Archives, Washington, D.C.

157 William B. Plummer to Graham Edgar, Ethyl, April 12, 1933, U.S. Dept. of Justice Central Files, RG 60-57-107, Box 386-387, National Archives, Washington, D.C. It should be noted that while the F.B.I. found this telegram, other documentary sources about Ethyl's activities at this time that should have been reviewed are missing from GMI, Justice Dept. archives and other areas.

158 F.B.I. interview with L.L. Coryell, Jr., Jan. 18, 1935, U.S. Dept. of Justice Central Files, RG 60-57-107, Box 386-387, National Archives, Washington, D.C.

159 Ethyl Gasoline Corp. et al, v United States, 309 US 436, March 25, 1940.

160 For example, Giebelhaus reaches this conclusion.

161 Michelle Heath, "Towards a Commercial Future: Ethanol and Methanol as Alternative Transportation Fuels," Canadian Energy Research Institute, Study No. 29, Jan. 1989.

162 "The ABCs of Alky-Gas," Iowa Petroleum Public Relations Committee, 1936, library, API, Washington, D.C.

163 Joseph Pew to H. Smith Richardson, Dec. 23, 1938, Hagley Museum & Library, Wilmington, Del.

164 C.S. Mott, Kettering Oral History Project, Interviewed by T.A. Boyd, October 19, 1960, GMI, Flint, Mich.

Made in Dixie But...The Anderson Motor Company and the Problems of Financing and Acceptance of a Southern Made Automobile

By Craig S. Pascoe

"Mr. Anderson is now figuring on production of automobiles, and will probably be the first manufacturer in the South to make them, though he maintains the utility of these machines will necessarily be limited until the Southern states [acquire] more desirable roads."[1]

This announcement appeared in the Rock Hill, South Carolina newspaper in the summer of 1902. John Gary Anderson (Fig. 1) was head of the Rock Hill Buggy Company, a manufacturing firm that he started with the financial backing of his father-in-law in 1886. By the turn of the century the Rock Hill Buggy Company had become one of the largest buggy manufacturing firms in the South. Throughout the South, the Rock Hill Buggy had proven its durability on the muddy pathways that served as the region's network of roads and Anderson had become one of the region's most influential manufacturers and business leaders.

At the start of the 20th Century the buggy industry had survived the bicycle craze, the advent of the electric trolley, and the Depression of 1893. And while announcing his intention to participate in the new transportation revolution, Anderson believed that the threat of the horseless carriage to the buggy and carriage trade was minimal. But Anderson kept in mind that a number of the nation's largest carriage builders like the Studebaker Brothers and William C. Durant had already entered the automobile business.[2] There were other indications that convinced Anderson that the automobile would not affect his business in the South. In addition to the fact that most southern farmers could not afford the price of an automobile, many

Fig. 1 - John Gary Anderson

South Carolina farmers in the early years of the automobile showed little enthusiasm for the new mode of transportation. In 1905 a local South Carolina newspaper reported that "one 'Nick' Britton, who does not approve of automobiles rolling on the roads in the neighborhood of Alcolu, held up Mr. A.E. Jenkins, of Sumter, with a pistol and fired one shot at him. It appears that this is Britton's second offense of this kind."[3] Other South Carolina farmers claimed that they had experimented with an automobile but preferred the horse and buggy as their choice of "locomotion." And one farmer explained that one reason why he married his wife was that she "didn't want an automobile to run around in all the time, enjoying the frivolous things of life."[4] The automobile did not appear to fit into the lives of these farmers.[5] Farmers were not the only southerners who viewed the advent of the automobile with some suspicion. Southern businessmen and civic leaders saw in the automobile a "grave peril....A gentleman...told us the other day that in the city of Greensboro [North Carolina] there are one hundred and forty homes mortgaged to pay for automobiles. The craze is full of peril...we are in the hard grip of an automobile panic, and unless our people stop to consider the trend of the times, the worst is yet to be."[6] Not only was the automobile a new and extremely unusual conveyance but its cost and the lengths that people went to purchase one caused many southern businessmen to believe that the southern people might become entangled in a web of debt. Critics warned that the advent of the automobile meant that "for every automobile we buy, practically twenty bales of cotton must be sent out of the country to pay for it." Economic critics of the automobile also predicted that an automobile owner "immediately ceases, very largely, to be a consumer." And on a moral note, some southerners warned that "the auto is a sport-breeder, a Sabbath-desecrator, and the effect produced on the rising generation will certainly be serious."[7]

Despite the outcry against the potential economic and moral damage that the presence of the automobile on the southern landscape would cause, Anderson considered himself an innovative and modern businessman and, although confident that the automobile would never be anything more than a luxury item, he kept his options open. In 1910, in response to a number of southern buggy and carriage manufacturers who had announced their intention to add automobiles to their line of manufactures,

Anderson unveiled plans for designing and manufacturing an automobile. Anderson credited his son John Wesley for building the prototype: "He assembled the parts, made a body, had the thing painted and upholstered, and lo, and behold, it actually ran, much to his surprise as well as my own, because I do not think he had the least idea it would pull a setting hen off her nest...."[8] The automobile, which Anderson planned to manufacture and market under the Rock Hill Buggy Company name, incorporated all of the modern equipment and accessories available. Automobile historian G.N. Georgano described Anderson's automobile as a "five-seater car, of toy tonneau design, [and] equipped with a 4.1 litre, four-cylinder engine."[9] Beverly Kimes noted that this new entry into the automobile manufacturing field was basically a 35hp Norwalk which Anderson supplied only the body and upholstered interior.[10] Named the Rock Hill 35, the car represented Anderson's attempt to secure a position among his fellow buggy manufacturers in southern automobile manufacturing.[11] On advice from a banker friend not to venture into an endeavor that could not possibly succeed in the South and because orders for his Rock Hill buggies picked up with the new season, Anderson, while enthusiastic about the prospect of "going into the automobile business," temporarily abandoned the project.[12] Trade journals during this period, like *Carriage and Wagon Builder and American Vehicle*, discounted the impact that the automobile had on the carriage and buggy industry, and instead blamed the falling demand for buggies and carriages on the poor weather and low prices for cotton and other agricultural products.[13] Industry experts assured nervous buggy manufacturers and their creditors that the farmer, an important consumer base for the buggy and wagon industry, was not going to pass up the chance to "buy a first class buggy for...$75 to $100 while an automobile costs from $750," and upward.[14] But by 1914, an increasing number of southern buggy and carriage manufacturers throughout the eastern United States had also moved into the production of motorized transportation, or at least had added them to their line of vehicles. In the South many buggy companies simply added a gasoline engine to a carriage, such as the Asheville Light Car Company in Asheville, North Carolina.[15] Others, like the Corbitt Buggy Company in Henderson, North Carolina, established the Corbitt Auto Company, and began production of automobiles modeled after those made in Detroit and other automobiles manufacturing centers of the period.[16]

Corbitt's entry into the automobile market concerned Anderson. Corbitt was one of Anderson's main competitors in the buggy business. Corbitt entered the automobile market in 1907 with an automobile that was little more than a converted buggy equipped with a 2-cylinder engine and driven by a chain (a good description of a cyclecar). Corbitt later built a larger automobile, in two different styles, and began to market it regionally, then dropped the automobile business to concentrate on manufacturing trucks. No records exist of how many automobiles Corbitt produced, but estimates run around 100.[17] There were many other examples of early attempts throughout the South to manufacture automobiles. The Kline Kar Company of Richmond, Virginia operated from 1912 to 1923. The Atlanta Motor Car Company produced the White Star automobile from 1909 to 1911, the Cyclone in Greenville, South Carolina, the Dixie Flyer in Louisville, Kentucky from 1916 to 1923, the Great Southern in Birmingham, Alabama, and the Piedmont in Lynchburg, Virginia from 1917 to 1922 are some examples of the automobile manufacturing fever that gripped the South during this period. Other attempts in South Carolina that never went further than a promise or prototype were the Barnes in Clemson, the Hoffman in Aiken, the Hough in Chester, and the Mountain City in Greenville. There was also the Piedmont in Monroe, North Carolina.[18]

In 1915, Fall orders for Rock Hill buggies that usually accounted for the majority of Anderson's yearly business were slow to almost non-existent. Anderson complained that: "there was no buggy business...people didn't want them...," and that former customers would "rather have automobiles even if they could not afford them."[19] Anderson further conceded that "This was the last of the buggy business....I began to visualize as far back as 1908 that the gasoline buggy was a potential menace, although I would not admit it....I persuaded myself to believe that the South, because of its poverty and bad roads, would be a long time getting around to the use of the automobile in sufficient numbers to hurt us."[20] But despite the lack of good roads and small numbers of consumers able to purchase such a high priced item, the automobile was making inroads in the South. And Anderson's northern creditors were becoming equally concerned about their investments and loans to the Rock Hill Buggy Company. Despite his hopes that the buggy industry could survive the onslaught of the automobile, Anderson nevertheless started to plan for the future of the Rock Hill Buggy Company.[21] Trying to assuage the fears of one of his creditors, The Irving National Bank of New York, Anderson assured them that he was prepared for the future:

> "You will find that I am more interested in that subject [the automobile] than you can possibly be. I have been watching the automobile very carefully, and have been taking steps to guard against just that very thing....I am not going to get 'run over'....just the minute we commence to lose ground, on account of the auto, I will know it and take definite action....I am vain enough to think that I have enough foresight to protect ourselves....Before a creditor can lose a penny on us I have to be ruined by losing the accumulations of a life time, and you may be assured I have no idea of taking any chances."[22]

Anderson believed that the conversion from manufacturing horse drawn buggies to automobiles was a natural and simple transition. To Anderson, "the automobile appealed, because it was, in a sense, a kindred line —woodworking, body-building, painting and upholstering — things we knew, from years of experience...."[23] The chance that a small entrepreneur could succeed in this new industry appeared quite possible in the period before World War I. Trade journals and other periodicals provided encouragement to the entrepreneur who wished to try his luck at building automobiles. Automobile historian John B. Rae noted that in the mid 1910s there was still the opportunity for the small entrepreneur who possessed some

"technical skill, a little capital, and some business acumen," to succeed.[24] Anderson, confident in his own ability, encouraged by automotive experts who wrote glowing reports of the status of the small manufacturer, and fortified with what he considered enough financial capital and good will, formally entered the fray in 1916. Later when the company was incorporated Anderson announced to the citizens of Rock Hill "that there was no reason why Rock Hill should not become the Detroit of the South."[25] Realizing that he had no real technical experience in building automobiles, Anderson hired Joseph A. Anglada of New York, a professional automotive engineer, to design his first major line of automobiles. Anglada was a member of the New York chapter of the Society of Automotive Engineers and had designed an automobile called the Liberty for the Liberty Motor Company of New York, a company that he served as president.[26] The six cars designed and built by Anglada were placed on display in the company's new showroom for the grand opening in January, 1916. T.L. Johnston, President of the Peoples National Bank of Rock Hill and board member of the Anderson Motor Company, along with Mrs. W.E. Gonzales of Columbia, South Carolina, wife of the American foreign minister to Cuba, were the first to buy an Anderson 6-40-6 (Fig. 2).

The price for the Anderson 6-40-6 was $1250, considerably higher than Henry Ford's asking price of $500 for a Model T. It was not Anderson's intention to compete with Ford in the lower-priced category. Instead Anderson planned to build and sell an automobile that was of a higher quality (Fig. 3). He had succeeded before in selling buggies of a higher quality and charging a higher price than his competitors. Anderson expected his reputation as a manufacturer of quality buggies to carry over into the automobile venture. Anderson adopted the Rock Hill Buggy Company slogan "A little higher in price but...." for the Anderson 6-40-6 in expectation that the reputation of the Rock Hill Buggy Company would follow. Anderson used the slogan sparingly in advertising during the first few years. Instead, Anderson claimed that he wanted the Anderson automobile to sell itself.[27] Despite the excellent reputation of the Rock Hill Buggy Company, Anderson faced some obstacles in selling his automobile that proved difficult to overcome. During the late 19th and early 20th Centuries, many people in the North viewed the South as an economic wasteland. Except for cotton fields and cotton mills, they believed that the South was barren of industry. Anderson confided to a fellow southerner that northerners even acted "surprised that we have a town with paved streets and electric lights, sewerage and that we are not burning up from the hot sun, and that alligators are not crawling around in the streets."[28] It was this picture of the South as an agricultural expanse, void of modern conveniences, dotted with sharecropper shacks and plantations with grand mansions, and totally dependent upon northern interests for financial support and mercantile supplies, that Anderson confronted in his efforts to market his automobile nationally.

Anderson even encountered this negative attitude towards the South when trying to order parts from northern suppliers:

> "The Detroit concern...is a big manufacturing institution that makes locks, hinges, etc., for automobile bodies, and who know about as much about the South and Southern people as we do about 'Adam's cat.' He expressed surprise that we wanted $2,000 worth of locks and hinges. He wanted to know what in the name of common sense we were going to use them for.[29]

Anderson also believed the lack of confidence of others toward southern

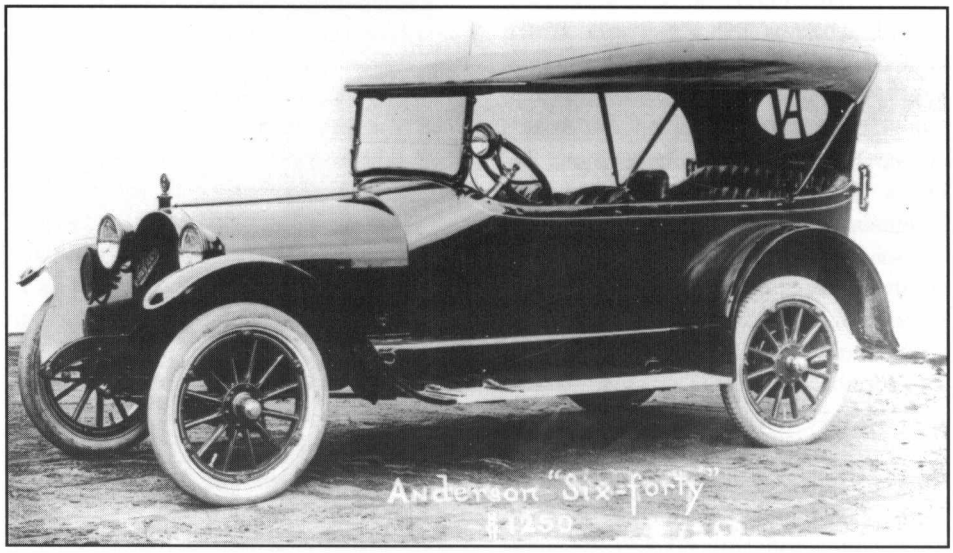

Fig. 2 - 1916 Anderson 6-40. Note the distinctive"A" rear window.

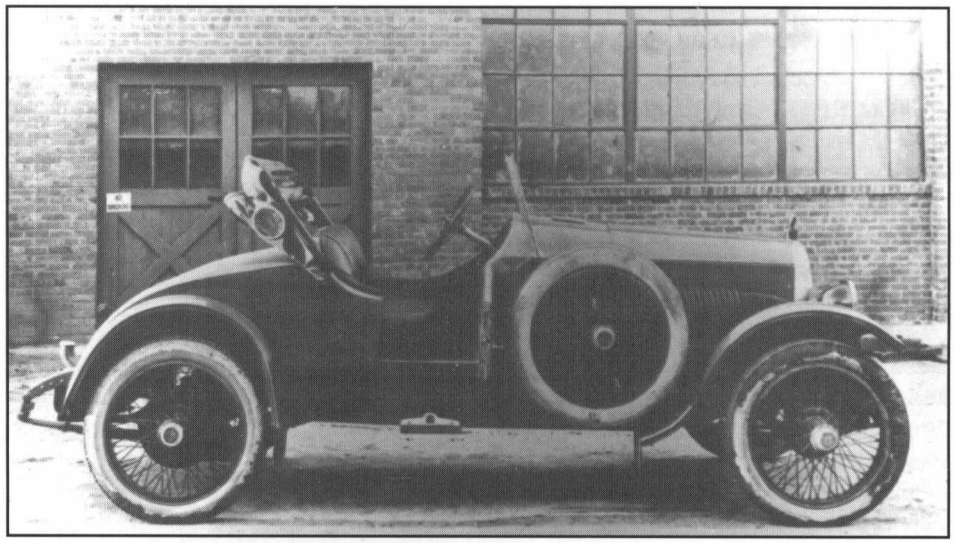

Fig. 3 - 1916 Anderson 6-40 Racer

manufacturing prevented him from expanding his sales territory. A good example of the negative attitude toward southern-made products occurred when one of the Anderson's northern distributors replaced the original identification plates that read "Anderson. Made in Dixie. Rock Hill, S.C., U.S.A." with plates that simply stated "Anderson. Made for Sidney E. Bowman & Co., New York City."[30] Anderson begrudgingly admitted that "since the Anderson car was made in the SOUTH—IN DIXIE if you please— [it was] a real handicap in appealing to the Yankee, who looks upon the South and the Southern people as backward and ignorant, capable only of producing cotton, alligators, and corn 'likker'."[31] Anderson later expanded the list of recognizable southern commodities to include crab grass, mules, and fried chicken.

In order to make Rock Hill the "Detroit of the South" Anderson had to sell his automobiles both regionally and nationally. Instead of hiring salesmen to cover territories and relying on advertising alone to generate sales, Anderson utilized a system of distributors, much like the network of distributors he established for the Rock Hill Buggy Company. Anderson advertised for people interested in establishing Anderson Motor Company franchises throughout the South, North, and Midwest. These dealers also acted as wholesale distributors in their protected territories. More importantly, the franchise agreements Anderson arranged required:

> ". . . a proper service station for the rendering of such services and the maintenance of the conditions of the guarantee...[and] agrees to inspect all ANDERSON MOTOR CARS, of current model, at least once each month during the twelve months following the sale of such car....provide a properly equipped and properly operating demonstrating car, or cars, with which to demonstrate free of charge to any interested prospective buyers....[and] agrees to maintain an attractive, clean and representative showroom in which to display ANDERSON MOTOR CARS.[32]

With this system of requiring his distributors to provide basic service functions, parts inventories, and warranty check-ups, Anderson hoped that his automobile would have a better chance of survival in a market full of competitors.[33]

Dealerships of the Anderson 6-40-6 were established in numerous cities in the South and throughout the nation—Jacksonville, Charlotte, Cleveland, St. Louis, Boston, Washington, and Kansas City. New York City had several dealerships, from the Mathison Motor Sales Company in Brooklyn to Sidney E. Bowman & Company in Manhattan. Anderson worked hard to develop a network of distributors and was largely successful because there were many people looking for a way to enter the automobile business. By 1918, Anderson boasted of dealerships in China, Havana, Mexico City, Puerto Rico, Santiago, Chile, and Montreal. He also had franchises in England, Australia, France, India, and Japan.[34] With the success of signing up distributors in 1916 and early 1917, Anderson was confident in the results his network of U.S. distributors would achieve. But the Anderson Motor Company experienced some serious setbacks. Some of the initial distributors failed to successfully market and sell the Anderson cars in their protected territories. The rush to buy the Anderson 6-40-6 was subsiding by mid-1917. Consumer's nervousness over the war in Europe combined with fewer customers, especially in the South, who could afford to pay $1250 for an automobile further diminished the pool of potential consumers. And as one worried Anderson distributor in Florida claimed, the Anderson automobile was unknown by his customers who seemed to prefer a name that had some recognition[35] The Florida distributor also encountered a problem that Anderson would later point to as a major reason for the Anderson Motor Company's failure—that of the seasonal nature of the automobile business in the rural areas of the country. In Florida, like most of the South, agriculture dominated the area's economy. People relied on the sale of the region's crops to provide cash for the local economy. When a hard freeze destroyed orange orchards or the area's crop of vegetables, prices fell and the local economy suffered from a lack of cash. When Anderson's franchisee established his territory in Florida in 1917 he discovered that "under the circumstances, it will be almost impossible for me to sell any cars for cash."[36] Rather than attempt to provide potential buyers with an installment plan, the franchisee abandoned the distributorship. [37] Of course the newness of the Anderson automobile and the economic problems in Florida during the winter of 1917 contributed to the franchisee's failure to sell any automobiles. But the one factor that hampered Anderson's efforts to sell automobiles in the South was the inability of many southerners to pay in full the cash price for the automobiles at the time of purchase. It was a problem because Anderson himself lacked the capital to carry a large inventory of automobiles.[38] His distributors were also without the necessary capital to stock up on automobiles and usually ordered only one car for display and demonstration purposes. Only when they were assured of a cash, in full, sale would they place an order with the Anderson factory.

The use of credit to purchase automobiles was relatively new at this time, but increased as the production rates of automobiles rose. Automobile sales finance companies started to appear in 1912, such as Commercial Credit Corporation and National Bond and Investment Company of Chicago. As economic historian Martha L. Olney noted in her study of the emergence of retail credit, "standard economic theory interprets the establishment of sales finance companies as the economy's rational response to a perceived imperfection in the capital market." Apparently with the introduction of these forms of finance, at first to the automobile dealers and later extended to the buyer, the problem of finding customers who could afford to purchase an automobile was solved.[39] By 1920, over two-thirds of new cars and half of used cars were purchased in this way. The initial reason for the establishment of credit financing was to protect the manufacturer from the seasonal response of consumers. In the winter and early spring months, when the roads were at their worst and farmers were short of cash, automobile sales dropped considerably. In mid-spring the demand for automobiles was at its highest. The same thing had happened in the buggy business, and for basically the same reasons. But with the much higher capital investment necessary for the

manufacture of automobiles, owners faced extreme financial burdens from winter inventories. Manufacturers were unable to carry a large inventory of finished products and their distributors were in much the same situation.[40] In order to even out the production costs of automobiles, automobile finance companies extended credit to distributors, usually from 60 to 90 days, for delivery of automobiles from the manufacturer. This allowed the manufacturer to get out from underneath a large capital outlay of finished goods and provided the dealer with a ready inventory of automobiles. The "at-hand" availability of the automobile made it easier for the distributor to make a sale.[41] The distributor would then sell the automobiles to customers on the installment plan. The customer put down anywhere from 30 to 50 percent and financed the balance for a period from ten to 16 months.[42] The small manufacturer of automobiles and the larger Detroit concerns utilized credit financing in order to move their inventory out of the factory, relieving them of the burden it placed on their capital reserves.[43] Along with the emergence of the large finance companies used by the bigger automobile manufacturers, many smaller installment finance companies were formed to handle automobile and other large-ticket retail items. But almost 90 percent of automobile financing was done by larger companies who had ties to large manufacturers.[44] While the promise of relief by the implementation of retail and wholesale credit for automobiles in the 1910s solved the problem for buyers and sellers in the North, it was not the case in the South.

Three factors prevented the emergence of retail credit for automobiles in the South from helping Anderson's business. One, in the late 1910s and early 1920s, the average price for a passenger car was as much as 50 to 100 percent of the annual disposable income of farm households. Since there was a large number of farm households in the South, many families in the South were unable to buy a car, even on the installment plan.[45] The second reason retail credit for automobiles in the South proved ineffective in stimulating sales for the Anderson automobile was that lending institutions in the South did not like to lend money for automobile purchases. True, there were small, local finance businesses that would lend money based solely on the "three C's of credit: Character, Capacity and Capital."[46] But those finance companies, like their cousins, the banks, took a dim view of the automobile. They considered the automobile a poor instrument for collateral and ownership of one a luxury rather than a necessity.

The third reason automobile credit financing failed to help Anderson and his distributors was the lack of sales finance companies. Even as late as 1935 there was a dearth of automobile finance offices throughout the South.[47] And of the finance companies in the South during the late 1910s and early 1920s, many charged exorbitant interest rates. One study claimed that the rates reached as high as 1,700 percent in some southern cities.[48] The paucity of finance companies combined with the reluctance of southern bankers to consider the automobile anything more than an extravagance, effectively slowed the advance of the automobile into the southern states in the 1910s.

In 1917, with the war in Europe dragging on, the demand for automobile and truck parts, especially engines, for use in war related manufactures created a shortage in the United States. The smaller manufacturers were especially hurt by their inability to acquire automobile parts. The Anderson Motor Company scraped up enough transmissions, axles, engines and metal sheeting that year to construct between 40 and 50 automobiles. Anderson considered the year's production and sales admirable.[49] Total passenger car sales in the U.S. for 1917 was 1,745,792, up slightly from the previous year. If the Anderson Motor Company had been able to find more parts in 1917, it would probably have been able to sell more cars because the demand was still there. In 1918 passenger car sales plummeted. Only 943,436 new automobile sales were registered, showing a drop of nearly 47 percent from the previous year.[50] Material used in the manufacture of automobiles was channeled into the efforts of supplying the belligerent nations of Europe and later to build the United States' own arsenal. Profits from manufacturing war material were very lucrative—lucrative enough for many large automobile manufacturers to abandon the profitable and growing demand for passenger cars for the duration. And in 1918, the War Industries Board, concerned that the industrial machine was not gearing up quickly enough, took measures to curtail the production of automobiles.[51] The consumers could wait for their automobiles, the war in Europe would

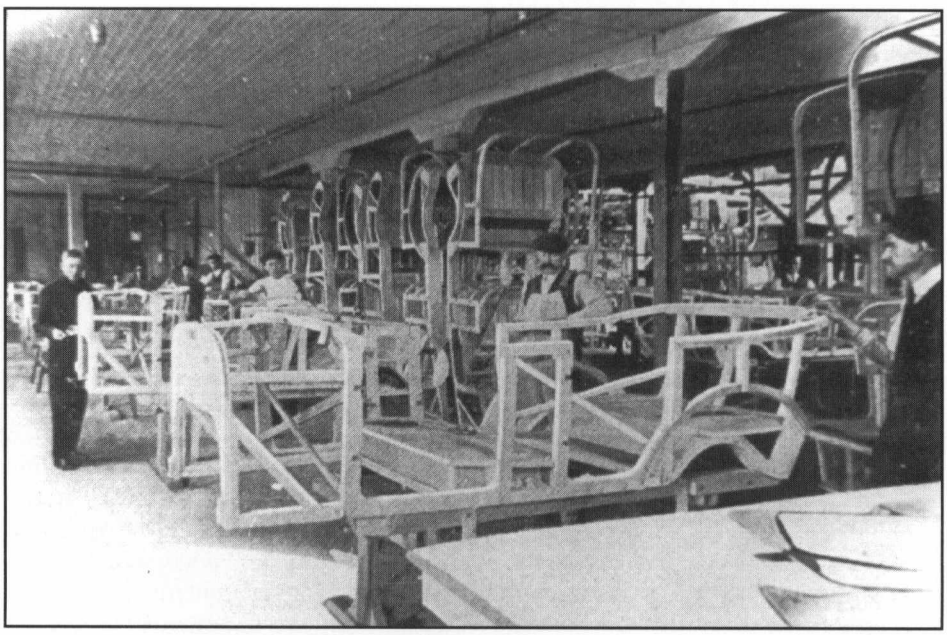

Fig. 4 - The Anderson assembly "line"

not. The Anderson Motor Company managed to build and sell about 100 automobiles in 1918 (Fig. 4). Inventory records show that Anderson had on hand enough material to build up to 358 automobiles, but Anderson probably lacked engine blocks from Continental and sheet metal from Armco Steel to complete the jobs.[52] Regardless of Anderson's enthusiasm for selling less than 150 automobiles in a two-year period, the company needed other sources of income to survive. Although unburdened by any large loan payments, Anderson's inventory of parts and materials to build automobiles was over $500,000. The Anderson Motor Company secured contracts with the War Department to build a number of wagons for the Navy Department and this provided the company with enough income to survive during the war.

In the summer of 1918 Anderson realized that the war in Europe was quickly drawing to a close. He knew that with the cessation of fighting, many of the materials needed in building his cars would become available and that consumer demand for automobiles, which had been unsatisfied for a long period, would be high. In order to capitalize on the expected increase in production, Anderson made a second stock offering in late 1918. He increased the company's preferred stock from $750,000 to $1,500,000 and common stock from $750,000 to $1,125,000 in order to fund the anticipated growth of business. Both the preferred and common stock sold for ten dollars per share. Like the original stock offering, Anderson realized that many people in the community and the South could not afford to buy shares outright. Anderson offered a deferred payment plan, similar to the one used in 1892 to sell Rock Hill Buggy Company stock. The deferred plan required "20 percent cash, 20% within 90 days, and 10% payable quarterly thereafter, with interest at 7% on deferred payments."[53] Locally owned cotton mills in Rock Hill and throughout the Piedmont region used this method to acquire capital from local investors. In the early part of 1919, with the outpouring of consumer demand that had been held back by the war, the factory received orders for the Anderson 6 faster than they could be filled. Anderson, concerned about the delays, was nonetheless encouraged by the results achieved by his network of distributors. The factory increased production by adding extra shifts and working employees overtime. The Anderson Motor Company financial statement dated March 31, 1919 showed a profit for the previous six months of $60,000.[54]. By early 1920 with Anderson car sales still strong, and the conventional wisdom of the period supporting the growing consumer demand for a high-priced automobile, Anderson increased the base prices on his automobiles twice in a two-month period and added four more models to the Anderson line. The least expensive of the Anderson line was the C 5-Passenger Touring Car, listed at $2,145 and the most expensive was the model B 4-Passenger Coupe which listed for $3,200.55 Trade journals like *Motor Age* editorialized that a substantial and increasing market existed for higher priced automobiles. Anderson's price increases and model additions occurred just a few months before the industry faced a major crisis, an event that radically changed the nature of the automobile industry.

The prosperity of the postwar economy abruptly ended with the recession of 1920. The recession also signaled the beginning of the end of the small automobile entrepreneur in the United States.[56] Even larger manufacturers were losing money as well as forward momentum. Henry Ford was forced to cut prices, "institute rigorous economies, and shift to his suppliers and his dealers part of the financial burden of carrying the company throughout the storm."[57] By mid-1920, the entire automobile industry was forced to follow Ford's example and dramatically reduce the selling price of its cars, often below the cost of production. No longer was competition based on quality, advertising, and reputation alone. Price was now one of the most important factors in the competition for the American consumer.[58] The Anderson Motor Company, a small company with an expensive product, was losing money for the first time in its history. The company's forward momentum came to an abrupt halt in the summer of 1920. The flow of monthly orders from its distributors literally disappeared overnight. Parts and materials ordered for the scheduled monthly production of 500 automobiles in July were received and paid for in June, before Anderson and his two sons realized the full effects of the recession. Instead of the planned shipment of 500 vehicles for July, only 27 automobiles were delivered to dealers. Anderson conceded that "the bottom had, indeed, dropped out, leaving us up in the air, with high priced material and parts on hand for a thousand cars, and no orders."[59] Despite Henry Ford's radical price restructuring before the war and after the recession of 1920-21, Anderson remained confident that there was a viable market for a higher priced automobile. Anderson's convictions were often supported by the trade journals who continued to forecast increased sales of higher priced automobiles.[60] By the spring of 1921 Anderson had only slightly reduced the prices of the Anderson automobiles but he discovered that "nobody fell over themselves to buy them." Dealers in Seattle, Portland, Oregon, San Francisco, and Los Angeles refused carloads of Anderson automobiles.[61] While sales dropped dramatically, the Anderson Motor Company managed to continue producing automobiles without the threat of foreclosure from creditors. By the end of the company's fiscal year on June 30, 1922, the Anderson Motor Company was still "solvent, with bank credit, save in one instance only....National City Bank of New York...[who] threw us over...."[62]

Anderson remained firm in his belief that the small automobile manufacturer still had a chance to survive. Industry analysts insisted that the small producer "has just as good a chance of success today as he had a decade ago. His product must have distinctive characteristics, however, and he will have a class rather than a mass business."[63] Experts also pointed out that it was not the effect of economies of scale on the success of the business as much as it was "a question of management and less a question of size of investment or equipment."[64] Although outwardly it appeared that Anderson still had a chance to succeed in the automobile business and that the company remained relatively free of any long term debt, bankers remained reluctant to extend any more credit to Anderson. Banks in South Carolina during this period "did not get in on the ground floor of either the production or consumption ends of the auto industry."[65] Like many banks throughout the South, their focus remained on lending money to

cotton farmers and to small scale mercantile operations or industries closely associated with cotton or tobacco. Historians John G. Sproat and Larry Schweikart noted that South Carolina banks left investment banking to "investment banks, which meant the 'economic development' in the Palmetto State, as far as most banks were concerned, meant very limited, small-scale, enterprises." Anderson did have some success in finding capital in local and state banks but they remained too conservative in the amount of money lent to such a unique business venture.[66] And when he requested even larger lines of credit in 1923 and 1924 to purchase materials to build automobiles that had already been ordered, banks refused to extend the Company any further credit. Banks and bankers were not the only anxious creditors Anderson faced. Stockholders in the Anderson Motor Company were overwhelmingly southerners, many small time investors who did not understand the dangers of owning stock. The historian, C. Vann Woodward, referred to these people as the typical southern "widow and orphan" stockholders. By 1924 Anderson Motor Company stockholders were worried about the financial condition of the firm. Most of the company's stockholders had not shown much concern over the effects of the recession of 1920-21 on the company's profitability. But, with the company forced to accept the guidance of a bank creditor's advisory committee in 1924, and the earlier mechanical problems with a new model called the Anderson Light 6, stockholders became more aware of the riskiness of their investment. W.J. Roddy, a local banker and enthusiastic supporter of the Anderson Motor Company, complained about southern stockholders being "the worst spoiled set of people I ever saw in my life. They are so hungry for dividends that they never give a poor bank officer any rest at all."[67] The Anderson Motor Company never paid dividends on its preferred and regular stock issued in 1916 and 1918. Investors complained about this in the past, but most stockholders understood that the company was new and that it could take a few years for the company to pay out dividends. In September 1923, Anderson, in an attempt to raise working capital, appealed to the original stockholders to purchase an additional $500,000 in preferred stock. Anderson believed that support of the new stock by the original stockholders was a way to demonstrate their confidence in the "management of our Company by its officers and directors and assure them that we appreciate the efforts they have made...."[68] Stockholders responded with less than enthusiasm for the offering. They countered Anderson's pleas for stockholder support with complaints that the company was not run economically, salaries of the owners and managers were extravagant, and that "Northern monied men" were siphoning the profits out of the company and into their pockets, (a common complaint of southerners who were unfamiliar with the risk involved in owning stock in a company).[69] Anderson assured stockholders that the company was run economically as well as conservatively. He pointed out that he had not drawn a salary from the company since 1919. And as to the interference of the "Northern monied men," Anderson explained that, at that time, they were not even interested in investing in the company.[70] The only people who might possibly help the company were the stockholders, most of whom were southerners. Anderson further warned stockholders that "unless this money was furnished....we could not make a success of the business." Of the $500,000 in First Preferred stock Anderson offered to stockholders in 1923, only about $63,000 was sold.[71] A year later at the annual stockholders meeting Anderson announced that the company was unable to show a profit because there was too little capital left to increase operations.[72] Stockholders were informed that the company was in the process of selling off as much material and automobiles as possible, in order to pay off its debts. S.R. Felmet, a southern stockholder who also owned a Ford distributorship, demanded that Anderson use the proceeds to pay off the preferred stockholders.[73] Some stockholders responded to the news by claiming that Anderson and his board of directors had guaranteed the value of the stock and its dividends and they should receive full reimbursement, including accrued dividends. Anderson explained to one stockholder that "you had to take your chances with the Anderson Motor Company just as I took my chances. If we had gone ahead and made a big success, you would have gotten your part of the profits: on the other hand, if we make a failure, and lose everything we have, then you have to take your part of the losses."[74]

In 1924 Anderson faced imminent liquidation of the assets of the Anderson Motor Company. It was the only course of action left to him. He feared that if the property was sold to the highest bidder, the proceeds would be much less than the property was worth. If that happened there would not be enough capital to pay off all the creditors. Anderson tried to find someone to buy the factory before it was sold on the courthouse steps. Because the factory was set up for the production of automobiles, Anderson first focused his attention towards other automobile makers. He recruited Edward A. Seiter, vice president of the Fifth-Third National Bank of Cincinnati to help him locate a suitable buyer. Anderson was convinced that the plant's location in Rock Hill was ideal for an automobile factory:

> "Studebaker or Hudson or Chrysler, or some of the others. None of these concerns have branch assembling plants in the South and they ought to have this plant. It is perfectly equipped and is just the very thing for something of the kind."[75]

Seiter and Anderson contacted General Motors and Chrysler but they were not interested in the Rock Hill location.[76] Seiter blamed the lack of interest for Anderson's factory on the presence of a large number of empty factories in the North.[77]

None of Anderson's ideas to save his company or salvage his reputation worked. Major creditors, mainly banks, demanded that the Anderson Motor Company be placed under the supervision of an Advisory Committee. The committee, comprised of representatives of both financial and mercantile creditors, was formed in July, 1924.[78] Their purpose was to supervise the total liquidation of the Anderson Motor Company in order to satisfy the outstanding debt of $312,000, not including the debt to the American Trust Company of Charlotte.[79] The news that the company had been placed under the supervision of an Advisory Committee produced the same effect as if the company was in bankruptcy. Anderson's efforts to make some money by building

and selling a few cars in late 1924 was halted by the news. It was extremely important to Anderson that all of the Anderson Motor Company's creditors be paid, in full. Anderson needed to sell off as many automobiles as possible before the dealers and public found out about the closing of the business. But the rumors of impending bankruptcy spread among stockholders and suppliers. Anderson distributors declined any further shipments of automobiles:

> "In reference to us taking a car load of cars for the floor, would say that we have given up this idea for the present, due to the fact that a report seems to have been broadcast by someone that the Anderson Motor Car Co. are in bad shape finincily [sic], and we don't want to be stuck with cars on our floor, if such is the case."[80]

And consumers, on hearing the rumor, responded angrily towards the dealers for selling them a potential orphan car. The Hughes Motor Sales Company reported that "two of the people we sold new Anderson's to in the past few weeks, have received this report and are now peeved at me."[81] Anderson remained convinced that there were enough assets left in the real estate physical plant to pay off all the creditors. But the lack of confidentiality on the part of the creditors ruined any chance of selling them off at their real value. Anderson confided in Monte J. Goble, a vice president of the Fifth-Third National Bank of Cincinnati that "if the banks will cooperate with us and help us we will pull this thing through. There are plenty of assets here if properly handled to pay all indebtedness and have a good, nice sum left, but the proposition must be handled perfectly quiet."[82] The effects of "spilling the beans" prevented Anderson from making or selling any more automobiles.[83] By mid-1926 Anderson acknowledged that the company was no longer making cars and that it "is at present engaged in manufacturing, under contract, cold drink refrigerators, and is negotiating for contracts to manufacture radio cabinets, automobile floor boards and running boards and automobile bodies, and any other contract work that can be profitably handled with the equipment in hand."[84] The Anderson Motor Company was sold at public auction in September, 1926. Local newspapers were not kind in their announcement of the sale:

> "The Anderson Motor Company, at one time one of the south's largest industrial projects, and later one of its most stupendous business failures, was sold today....For several years it has been virtually out of operation and manufacture of automobiles has long been abandoned....scores of employees have been out of work."[85]

One hundred people attended the sale on the courthouse steps. The highest bid for the property was only $53,000. Edward Seiter, a vice president of the Fifth-Third Bank in Cincinnati headed up a group of bankers who purchased the property. Anderson had estimated that the value of the factory was over $400,000. In the final liquidation notice distributed in 1930, stockholders were notified that they were to receive only .0428 percent of the face value of their stock.[86] While the common assumption that economies of scale and the concentration of automobile manufacturing in the Detroit area were the contributing factors to the decline of the small automobile manufacturer throughout the United States, it is important to also understand that there were other negative influences working against these small entrepreneurs. As for the South, these negative factors represent a much deeper problem of accepting new technology and industrialization in a largely agricultural region. This pattern was probably repeated across the South during the 1910s and 1920s as many other automobile entrepreneurs attempted to create their own "Detroit of the South."

1 "John G. Anderson—An Appreciation," *Rock Hill Journal*, August 20, 1902, p. 1.

2 James J. Flink, America Adopts the Automobile, (Cambridge: Massachusetts Institute of Technology Press, 1971), p. 52.

3 "South Carolina Squibs," *Rock Hill Record*, February 24, 1905, p. 4.

4 "South Carolina: Ella E. Gooding and Robert E. Gooding," WPA Life Histories Collection, Library of Congress, Washington, D.C.; and "South Carolina: Conyers Elliot Frasier," WPA Life Histories Collection, Library of Congress, Washington, D.C.

5 James J. Flink, America Adopts the Automobile, p. 66.

6 "In the Grip of an Automobile Panic," *Rock Hill Record*, September 5, 1910, p. 1.

7 "The Automobile Craze May Bankrupt the Country," *Rock Hill Record*, September 11, 1911, p. 1.

8 John Gary Anderson, Autobiography (Rock Hill: Record Publishing Company, 1937), p. 505.

9 G.N. Georgano, ed., The Complete Encyclopedia of Motorcars: 1885 to Present (New York: E.P. Dutton and Company, Inc., 1976), p. 591.

10 Beverly Rae Kimes and Henry Austin Clark, Jr., Standard Catalog of American Cars, 1805-1942 (Iola, Wisconsin: Krause Publications, 1989), p. 1259; and "'Made in Rock Hill.' What the *Charlotte Observer* Thinks of Our Automobile." *Rock Hill Record*, April 18,1910, p. 3—"The shields, guards, body, top and everythng of that nature are made in Rock Hill, while the motor, axles and heavy essentials are purchased from the big manufacturing concerns that make a specialty of these parts."

11 "Rock Hill 35," *The Horseless Age*, Vol. 26, No. 6, August 10,1910, p. 200.

12 Alice Anderson Gill Oral History, Dacus Library Special Collections, Winthrop University, Rock Hill, South Carolina.

13 "Letter to the Editor," *Carriage and Wagon Builder and American Vehicle*, Vol. XXV, No. 7 (July 1912): p. 18; "Carriage Builders Expect Big Business After War," and "Country People Still Cling to Buggy," *Carriage and Wagon Builder and American Vehicle*, Vol. XXVII, No. 11 (November 1914): p. 7.

14 "To Convince the Farmer that the Buggy is a Necessity," *Carriage and Wagon Builder and American Vehicle*, Vol. XXV, No. 3 (March 1912): p. 10.

15 G.N. Georgano, ed., The Complete Encyclopedia of Motorcars: 1885 to Present, p. 106.

16 Ibid., p. 208.

17 Ibid.; and Robert E. Ireland, Entering the Auto Age: The Early Automobile in North Carolina, 1900-1930 (Raleigh, North Carolina: Division of Archives and History, North Carolina Department of Cultural Resources, 1990), p. 14. Corbitt produced his first car in 1907 and by 1910 was "advertis [ing] nationally, offering for $800 a touring car equipped with a two-cylinder eighteen or twenty horsepower engine mounted on a chassis with a 90- inch wheelbase."

18 Beverly Rae Kimes and Henry Austin Clark, Jr., Standard Catalog of American Cars, 1805-1942, various pages; and Kline Car Corporation pamphlet (no date but is probably post-World War I), National

Musuem of American History, Smithsonian Institution, Washington, D.C.

19 John Gary Anderson, Autobiography, p. 514.

20 Ibid., pp. 505-06.

21 J.G. Anderson to W.G. Nash, vice president, The Irving National Bank, New York, June 10, 1915, Johnston/Anderson Papers, Special Collections, Winthrop University, Rock Hill, South Carolina.

22 J.G. Anderson to W.G. Nash, vice president, The Irving National Bank, New York, May 12, 1915, John Gary Anderson Papers, Museum of York County, South Carolina.

23 John Gary Anderson, Autobiography, p. 503.

24 John B. Rae, The American Automobile: A Brief History (Chicago & London: University of Chicago Press, 1965), p. 96; also, in a similar vein *"Why Michigan," Michigan Quarterly Review*, p 444— John B. Rae noted that the men who succeeded in the automobile industry "had to possess a distinctive combination of qualities: technical skill, business acumen, faith that the automobile really had a future, and above all an unshakeable determination to build cars."

25 "Anderson Plans Great Company," Columbia, South Carolina The State, 3 December 3, 1916, p. 3.

26 "Liberty Motor Company to Make Anglada's Car," *Horseless Age*, Vol. XXXIII, No. 4, (January 28, 1914), 143.

27 R*ock Hill Record*, January 24, 1916, p. 1.

28 J.G. Anderson to Richard Edmonds, May 18, 1923, John Gary Anderson Papers, Museum of York County, South Carolina.

29 J.G. Anderson to C.L. Cobb, May 18, 1923, John Gary Anderson Papers, Museum of York County, South Carolina.

30 John Gary Anderson, Autobiography, p. 552. Note: This is similar to some merchants in the antebellum South who would purchase southern goods and re-label them as made in northern cities in order to avoid prejudice against southern-made goods.

31 Ibid., p. 551; and "Bankers, Grasshoppers, and Automobiles" pamphlet, p. 13, John Gary Anderson Papers, Museum of York County, South Carolina.

32 Contract between L.A. Greene & Sons, trading as the Anderson Motor Sales Co. of Williston, S.C. and Jacksonville, Florida and the Rock Hill Buggy Company, December 14, 1916, Johnston/Anderson Papers, Special Collections, Winthrop University Library, Rock Hill, South Carolina.

33 Thomas G. Marx, "The Development of the Franchise Distribution System in the U.S. Automobile Industry," *Business History Review*, 59 (Autumn 1985), p. 466. Note: On the whole "The relationships between manufacturers and distributors were thus little more than simple market exchanges covering prices and quantities." Anderson even provided service warranties on used Anderson automobiles. "Want Ads—For Sale—practically new 1917 Anderson Six demonstrator. This is a bargain. Guarantee and service goes with it. Anderson Motor Sales Co., 322 North Tryon Street," *Charlotte Observer*, May 26, 1918.

34 R*ock Hill Record*, April 4, 1921; J.A. Thomas to J.G. Anderson, February 25, 1920 and November 10, 1920, and J.G. Anderson to J.A. Thomas, December 8, 1919, James A. Thomas Papers, Special Collection, Perkins Library, Duke University; and 150,000 Anderson Motor Company Preferred Stock Perspectus, 1917, John Gary Anderson Papers, Special Collections, Dacus Library, Winthrop University, Rock Hill, South Carolina.

35 L.A. Green to J.G. Anderson, February 14, 1917, Johnston/Anderson Papers, Special Collections, Dacus Library, Winthrop University, Rock Hill, South Carolina. "We have worked awful hard to make a success of this business. This is a new car and no one down here seems to have heard of or have seen them before, consequently, it is hard to get them started. Since things have turned out in this way, you can consider me out of the business."

36 L.A. Greene to J.G. Anderson, February 10, 1917, Johnston/Anderson Papers, Special Collections, Dacus Library, Winthrop University, Rock Hill, South Carolina.

37 L.A. Green to J.G. Anderson February 10, 1917 and February 17, 1917, Johnston/Anderson Papers, Special Collections, Dacus Library, Winthrop University, Rock Hill, South Carolina; Martha L. Olney, "Credit as a Production-Smooting Device: The Case of Automobiles, 1913-1938," *The Journal of Economic History*, Vol. XLIX, No. 2 (June 1989). Note: This article pointed out that the Guaranty Securities Company (G.S.C.) was founded in 1915. "Initially offering credit exclusively to Willys-Overland dealers, several manufacturers subsequently signed contracts with G.S.C. to provide credit to their dealers." Unless Anderson arranged the contract with G.S.C., it was unlikely that a small distributor would have been able to arrange financing through G.S.C.; and Martha L. Olney, Buy Now, Pay Later: Advertising, Credit, and Consumer Durables in the 1920s (Chapel Hill: The University of North Carolina Press, 1991), p. 127. The franchisee was probably referring to G.S.C.'s announcement in April 1916 of its intention to "offer retail sales financing on all makes of autos."

38 Martha L. Olney, "Credit as a Production-Smoothing Device: The Case of Automobiles, 1913-1938," The Journal of Economic History, Vol. XLIX, No. 2 (June 1989), p. 385.

39 Ibid., pp. 377-78.

40 Martha L. Olney, Buy Now, Pay Later: Advertising, Credit, and Consumer Durables in the 1920s, p. 3. "No, GMAC and like companies were not established to market cars. Rather, auto manufacturers established or contracted with such companies in order to solve a production problem: The need to finance finished goods inventory so they could smooth seasonal production fluctuations."

41 J.A. Estey, "Financing the Sale of Automobiles," *American Academy of Political and Social Science*, Vol. CXVI (November 1924), p. 46.

42 Henry G. Hodges, "Financing the Automobile," *American Academy of Political and Social Science*, Vol. CXVI (November 1924), p. 50.

43 Lawrence H. Seltzer, Financial History of the American Automobile Industry (Boston: Houghton Mifflin Co., 1928), p. 54.

44 Martha L. Olney, "Credit as a Production-Smoothing Device: The Case of Automobiles, 1913-1938," *The Journal of Economic History*, Vol. XLIX, No. 2 (June 1989), p. 391.

45 Martha L. Olney, Buy Now, Pay Later: Advertising, Credit, and Consumer Durables in the 1920s, p. 102.

46 J.H. Tregoe, "Standards for Granting Credit," *American Academy of Political and Social Science*, Vol. XCVII (September 1921), p. 66.

47 Martha L. Olney, Buy Now, Pay Later: Advertising, Credit, and Consumer Durables in the 1920s, 111. Table 4.7 shows that 11 southern states only had 15.2 percent of total sales finance offices in the U.S.

48 Ibid., p. 132.

49 John Gary Anderson, Autobiography, p. 518.

50 Harold Katz, The Decline of Competition in the Automobile Industry, 1920-1940 (New York: Arno Press, 1977), p. 41, Table 2-1; and James J. Flink, The Automobile Age (Cambridge, Massachusetts: The MIT Press, 1988), p. 80. "The War Industries Board...cut the

steel tonnage allocation to the automobile industry for 1918 civilian production to half the allocation for the last six months of 1917. This led to a 45 percent decline in passenger car production by the end of 1918....New car prices shot up 42 percent with excess consumer demand."

51 Irving Bernstein, "Curtailment of Automobile Production in World War I," Historical Price Research Section, Bureau of Labor Statistics, United States Department of Labor, November, 1941, iii. in Manufacturing File of Road Vehicle Collection, National Museum of American History, Smithsonian Institution, Washington, D.C.

52 Inventory listing dated March 30, 1918. This inventory shows that by this date 43 automobiles had been built.

53 Prospectus of the Anderson Motor Company—Terms of Payment, 1916 and 1918, John Gary Anderson Papers, Special Collections, Dacus Library, Winthrop University, Rock Hill, South Carolina.

54 Statement from the Trial Balance, March 31, 1919, Johnston/Anderson Papers, Dacus Library Special Collections, Winthrop University, Rock Hill, South Carolina.

55 Anderson "Six" Price Lists Effective February 1, 1920 and Effective March 15, 1920, James A. Thomas Papers, Special Collections, Duke University.

56 Harold Katz, The Decline of Competition in the Automobile Industry, 1920-1940 (New York: Arno Press, 1977), pp. 48, 50.

57 Alfred D. Chandler, Jr., ed. Giant Enterprise: Ford, General Motors, and the Automobile Industry (New York: Harcourt, Brace & World, Inc., 1964), p. 72; and Robert Lacey, Ford: The Man and the Machine (Boston: Little, Brown and Company, 1986), p. 269. "The sudden 1920 downturn in car sales caught Ford particularly ill prepared....As sales began to fall in the summer of 1920, the Ford cash flow dwindled dangerously."; and James J. Flink, The Automobile Age, p. 84. The official reason for closing all the plants was to conduct an inventory.

58 Lawrence H. Seltzer, A Financial History of the American Automobile Industry, p. 114.

59 John Gary Anderson, Autobiography, p. 538.

60 "A New Idea in Car Construction and Sale," T*he Automotive Manufacturer*, Vol. LXI, No. 11, (February, 1920), p. 22.

61 John Gary Anderson, Autobiography, p. 540.

62 Ibid., p. 541.

63 James Dalton, "Opportunity for Small Producer's Success Has Not Waned," *Automotive Industries: The Automobile*, Vol. XLIX, No. 4 (July 26, 1923), p. 155.

64 Harry Tipper, "Efficiency, Not Size, Determines Success," *Automotive Industries: The Automobile*, Vol. XLIX, No. 5, (August 2, 1923), p. 236.

65 John G. Sproat and Larry Schweikart, Making Change: South Carolina Banking in the Twentieth Century (Columbia, South Carolina: South Carolina Bankers Association, 1990), p. 65.

66 Ibid., p. 32; and Clinch Heyward Belser, "Banking in South Carolina, 1910-1940" (M.A. Thesis, University of South Carolina, 1940), p. 24.

67 John G. Sproat and Larry Schweikart, Making Change: South Carolina Banking in the Twentieth Century, p. 46, footnote number 1.

68 Stock Subscription Proposal, September 25, 1923, John Gary Anderson Papers, Special Collections, Winthrop University Library, Rock Hill, South Carolina.

69 J.G. Anderson to M.T. Bowles, August 6, 1923, and J.G. Anderson to Helen D. Bowen, June 9, 1923,John Gary Anderson Papers, Musuem of York County, South Carolina.

70 Ibid.

71 J.G. Anderson to Charles C. Haynes, September 23, 1924, J.G. Anderson to W.T. Allison, November 21, 1924, and J.G. Anderson to S.R. Felmet, December 17, 1924, John Gary Anderson Papers, Museum of York County, South Carolina.

72 J.G. Anderson to Brewer Griffin, September 9, 1924, John Gary Anderson Papers, Museum of York County, South Carolina.

73 S.R. Felmet to J.G. Anderson, December 15, 1924, John Gary Anderson Papers, Museum of York County, South Carolina.

74 J.G. Anderson to Henry Viccellio, December 15, 1924, John Gary Anderson Papers, Museum of York County, South Carolina.

75 J.G. Anderson to Edward A. Seiter, September 25, 1925, John Gary Anderson Papers, Museum of York County, South Carolina.

76 Edward A. Seiter to J.G. Anderson, October 14, 1925 and October 7, 1925; J.G. Anderson to Edward A. Seiter, October 9, 1925 and September 25, 1925, John Gary Anderson Papers, Museum of York County, South Carolina.

77 Edward A. Seiter to J.G. Anderson, September 21, 1925, John Gary Anderson Papers, Museum of York County, South Carolina. "During the war, instead of confining manufacture to the space then occupied, as you know, the capacities were constantly increased and the apparent profits that the war brought about were in turn invested in brick and mortar, which instead of being an asset later developed as a liability."

78 J.G. Anderson to T.L. Johnston, July 25, 1924, John Gary Anderson Papers, Museum of York County, South Carolina. The banks involved in the Advisory Committee were: Fifth-Third National Bank of Cincinnati, Murchison National Bank of Wilmington, North Carolina, Norwood National Bank of Greenville, South Carolina, Citizens Bank & Trust, of Rock Hill, First National Bank of Sumter, South Carolina and the American Trust Company of Charlotte.

79 J.G. Anderson to T.L. Johnston, July 25,1924, John Gary Anderson Papers, Museum of York County, South Carolina. Note: Along with the seven banks and one manufacturer there were twelve merchandise creditors who joined in the Advisory Committee; Stanyarne Wilson to J.G. Anderson, July 27, 1925, John Gary Anderson Papers, Museum of York County, South Carolina.

80 The Hughes Motor Sales Company to J.W. Anderson, October 13, 1924, John Gary Anderson Papers, Museum of York County, South Carolina.

81 Ibid.

82 J.G. Anderson to Monte J. Goble, vice president, Fifth-Third National Bank, Cincinnati, Ohio, July 7, 1924, John Gary Anderson Papers, Museum of York County, South Carolina.

83 J.G.Anderson to Edward A. Seiter, September 10, 1924, John Gary Anderson Papers, Museum of York County, South Carolina.

84 J.G. Anderson to John R. Shurley, Advisory Committee of the Anderson Motor Company, August 1, 1925, John Gary Anderson Papers, Museum of York County, South Carolina.

85 "Large Plant of Anderson Motor Company Is Sold Today," *Rock Hill Evening Herald*, September 7, 1926, p. 1.

86 The South Carolina National Bank of Greenville, South Carolina to the Holders of Anderson Motor Company Bonds participating in the Trust Agreement, January 23, 1930, John Gary Anderson Papers, Museum of York County, South Carolina.

THE PSYCHOTECHNOLOGIST & THE GOOD DRIVER: Granting Admission to Road Society

by Daniel M. Albert

Millions of men, women and children, regardless of race, color and financial responsibility, . ..amuse themselves every pleasant weekend by driving their own engines faster than most locomotives go and do this on public highways among thousands of other amateur engineers...

— Charles C. Parlin and Fred Bremier, The Passenger Car Industry, 1932

Background

In the cold January of wartime Detroit, after a long Saturday night in an area dance hall, Arnold Bailey was driving home in his parents' late-model DeSoto. Lost, the inexperienced teen-age driver was travelling too fast as he approached an intersection and a sign pointing the way home. Bailey applied the brakes and tried to turn but the road was covered with loose gravel and patches of ice. According to newspaper accounts, police guessed that the car was travelling 80 miles an hour. They believed that the driver was sober and that he and his companions were simply "joyriding." One passenger said Bailey was doing 90, but he claimed his speed was nearer to 45. The car skidded, jumped the curb and landed against the brick storefront of a haberdashery. The crash left the driver unconscious and one of his 19-year-old passengers crippled. The other girl in the car, Bailey's girlfriend, fractured her skull against the car's windshield and died at the hospital four hours later. When Bailey came to he was charged with negligent homicide, a charge to which he plead guilty.

Several months later, Judge Thomas Maher of the Detroit Recorder's Court, Traffic Division, was trying to determine a suitable punishment for the young man. Bailey had been licensed for only a year and had only two thousand miles under his wheels when the accident occurred. On the other hand, he showed little remorse for his crime, saying that "It was just an accident." As the court often did with accident cases or with repeated traffic offenders, Maher sent Bailey for examination by Lowell Selling, director of the court's Psychopathic Clinic.

After several hours of inquiry into his physical and mental health, socioeconomic history, and his intelligence, Selling concluded that Bailey was psychopathic, immature, egocentric, unstable, and rather unreliable. He attributed these psychological failings to the poor home conditions in which the patient's illiterate Syrian parents had raised him. His intelligence and his knowledge of the traffic laws were found to be average. The physical exam revealed that Bailey was in excellent health noting only that "The genitalia are large." Together these findings — particularly Bailey's belief that "it was just an accident" — pointed to no reason for leniency. "This is a swarthy individual who is not too pleasant looking," Selling reported to the judge. He recommended: "In our opinion we see no reason why a period of institutionalization by sentence should not be ordered and in addition a lengthy suspension of his driver's license would be definitely advisable.

Arnold Bailey's tragic story is hardly unique: between 1921 and 1987 upwards of 800 traffic cases were examined annually by the Psychopathic Clinic of the Recorder's Court of Detroit. The clinic was one of several such clinics in major U.S. cities, including Chicago, Boston, Baltimore, Philadelphia, Pittsburgh, Cleveland, San Francisco, Wichita, and Washington, D.C. Clinics were founded in Europe as well. With the increased concern over traffic deaths in the middle 1930s, the media declared that "Insanity at the Wheel," in the title phrase of a *Scientific American* article, was causing moving violations and traffic accidents. The article went on to chronicle the work of the Detroit clinic's Alan Canty, who called himself a "traffic psychotechnologist." It was an evocative moniker that the press readily adopted.

By the time that article was published, forensic psychiatrists had already been trying to root out the insane for many years. The dawn of the 20th Century saw concern over urban crime spread. Many hoped that the techniques of psychological assessment would end the crime problem for all time. Mental deficiency, which they believed was the cause of crime, could ultimately be wiped out. As the director of the Chicago Municipal Court Psychopathic Clinic explained in 1928:

> "Given a certain degree of emotional defect, the low and middle grade moron is the petty thief; the high grade moron, the hold-up man; the low and middle grade sociopath, the yegg-man [safe cracker]; high-grade sociopath, of average intelligence, the check forger and confidence man.

The belief that mental defect led to crime resulted in efforts to restrict the immigration and marriage of mental defectives, forced sterilization and euthanasia. "The remedy," continued the Chicago clinic director, "is to reduce their number by a) regulating marriage, b) enforcing sterilization, c) adequate immigration laws." In 1907, Indiana became the first state to enact a law allowing forced sterilization, and 23 states had eugenics laws by 1930. In 1927, the U.S. Supreme Court upheld euthanasia as a proper exercise of state power in the battle against crime.

Of course, no one called for the sterilization or merciful killing of traffic offenders. But the traffic court clinics did follow the same line of reasoning that motivated the eugenicists, and some of the very same psychiatrists who advocated eugenics to prevent crime carried out the work of the traffic clinics. Just as they considered crime a social disease, psychiatrists who confronted the problem said that, in the words of one Detroit clinic director, "Traffic accidents largely represent a disease." If removing

the mental defective from society would reduce crime, removing the mental defective from motorized society would reduce accidents.

The city of Detroit took the lead in this mission to control access to the society of the road. As residents of the "Motor City," of course, Detroiters wanted to see the automobile business succeed. Also the city's government was dominated by Progressivism into the 1930s and its police department and court system were innovative generally. The Detroit Recorder's Court Psychopathic Clinic was created by an act of the Michigan State Assembly in 1919. The clinic examined its first traffic case in 1921 and the following year Judge Charles Bartlett sent the clinic its first speeder for an evaluation, saying, "I believe there is a mental weakness in the driver who speeds recklessly through crowded traffic, not caring how many he may kill or injure." That first speeder, one of 55 before the court on that day, was an 18-year-old woman and the papers reported that she was sent for a "Brain Test."

Judge Bartlett expressed an increasingly common sentiment. By the 1920s, the automobile had brought unprecedented freedom to many Americans. The driver of a privately owned car was freed from the tyranny of timetables and the prison of rural isolation. But with that freedom had come a responsibility to drive safely. In its early days, the automobile was a toy for the wealthy. But with the Model T and mass production, millions of average citizens began taking to the road. Although they enjoyed the freedoms of automobility, the masses did not, or could not, live up to the responsibilities of citizenship in the motor age, safety experts believed. The number of traffic deaths increased by 50 percent between 1925 and 1930 and by the middle 1930s the toll was edging toward 40,000. One could expect to travel ever more miles in an automobile before being killed, but the rate of death as a function of population shot up as well. It stood at 21.7 per 100,000 population in 1927 (the first year such statistics were kept) and climbed to 30.8 per 100,000 a decade later.

...And Sudden Death

The anxious public mood was crystallized in 1935 by the *Reader's Digest* article "...And Sudden Death" by J.C. Furnas. It was the magazine's first effort at original storytelling, and it was the first widely circulated graphic description of motor vehicle injuries. Furnas compiled his story from interviews with police officers. He told of one state trooper who described an accident victim "walking around and babbling to himself, oblivious of the dead and dying, even oblivious of the dagger-like sliver of steel that stuck out of his streaming wrist." At the time of the article's publication, *Reader's Digest* boasted a circulation of 1.5 million. Eight million reprints were provided at cost to some 8,000 corporations and organizations promoting various approaches to safety. The state of Wyoming handed out reprints with license plates while toll booth operators gave copies to Manhattan commuters.

In and of itself, the motor car was hardly more dangerous than a rock. But the car did not operate alone. It was, and is, part of a larger system of transportation which includes the hard-surfaced road and the driver. In its first few decades, the automobile had undergone rapid improvement and a network of good roads had spread quickly. The third leg of the system, however, had not kept up. Just as engineering had conquered the myriad technical problems of the auto and the road, human engineering would correct the problem of the inadequate driver.

"The machine and the highway have been given much consideration by engineers," wrote psychologist Fred Moss, secretary of Hoover's Committee on the Causes of Accidents, in 1929. "Unfortunately the human engineer has not lock washers or cotter pins to hold the human 'nuts' in their proper position, the result being the fatal accidents that we read about daily." Who were these "nuts?" Who did the clinic examine? And how did they separate good drivers from bad?

The Patients

Patients, as they were called at the clinic, ranged from individuals denied licenses by the state of Michigan to repeated traffic scofflaws and "accident-prone" drivers. The criteria fluctuated over time, but individuals involved in injury or fatal accidents, such as Arnold Bailey, and those with several violations were always included. Between 1925 and 1965, most of the patients were legal citizens, although six percent were not yet United States citizens or lived in Canada, just across the Detroit River. A significant minority were foreign born or were first-generation Americans. Their countries of origin reflect the diverse ethnic background of Detroit with Eastern and Southern Europe heavily represented. Religious affiliations also reflect the city's population, with 22 percent Baptist and 30 percent Catholic patients.

Detroit historically has had slightly more men than women, although the ratio has never been more than 55 to 45. Yet the sample of errant drivers is only 7.3 percent female. Women were somewhat more likely to benefit from a clinic visit, although the paucity of female patients makes it difficult to say this with confidence. African Americans were over represented, constituting less than 10 percent of Detroit's population for most of the sample period but accounting for more than 20 percent of the cases.

Drivers were sent to the clinic primarily by the municipal traffic court judges, but also by the circuit court, the license appeal board, the Secretary of State (Michigan's Department of Motor Vehicles), and probation departments. At the clinic, patients underwent a battery of nineteen psychophysical tests. These included a full physical exam with a standard eye test and an additional test for glare sensitivity. Depth perception, reaction times and knowledge of traffic laws were all assessed using various models of autos and city streets (Fig. 1, Fig. 2). Patients were then seated in a driving simulator linked to a film of traffic situations to further evaluate driving ability. An IQ test was administered and the patients' social, sexual, economic, medical, and family histories were taken. A 13-page questionnaire included questions such as: Have you ever been insane? Did you ever steal toys or playthings from other children? Did you ever receive help from the Welfare Department? How much money do you have in the bank? What bank? Have you ever lived commonlaw? If you 'had it do over again,' would you get married? Do you shoot pool? How often do you visit beer gardens? How often do you go to church? Who is your favorite movie actor? Would you like to be a policeman?

Some questions were intended to

reveal the patient's unconscious mind (would you like to be a policeman?) while others were to assess the individual's socioeconomic status (did you ever receive help from the Welfare Department?).

Finally, an interview with a psychologist or psychiatrist concluded the four- to five-hour ordeal. Following the examination, the several examiners would compare findings and write a report for the judge, or referee.

Each individual received up to a dozen diagnoses of mental deficiency. Of those examined between 1936 and 1965, virtually all were diagnosed by the clinic as having some type of psychological, or less commonly, physical impairment. The clinic returned recommendations to the court that three out of five times suggested that a driver's license be withheld, revoked or otherwise restricted. Some 13 percent of cases were recommended for incarceration and nearly 90 individuals were recommended for forced commitment to a mental institution. These recommendations, except in cases of forced commitment, were almost invariably followed by the court.

Who Gets To Drive?

These data are from 1387 cases taken randomly from the approximately 15,000 cases seen between 1936 and 1965. I collected them from the files of the Recorder's court thanks to the generosity of its judges. Recommendations as to licensing status were made in 60 percent (839) of the cases. A variety of recommendations is found in the remaining 40 percent of cases, ranging from incarceration and forced commitment to small fines or no recommendation at all. The following conclusions regarding diagnoses and characteristics of the population are therefore taken from the entire sample, while conclusions regarding outcomes are drawn from the 60-percent subset.

Remarkably, the data show little correlation between the number of violations a driver has had and the likelihood that the clinic will recommend revoking their license. For example, 37 percent of those with at most three violations are given, or allowed to keep, their licenses. Recidivists, those with more than 10 traffic offenses, have the same outcome 34 percent of the time. Fully 89 percent of the clinic's patients

Fig. 1 - Using models to test knowledge of traffic laws

have other convictions or cases pending. But 80 percent either had never run afoul of the law or had been convicted of petty crimes punished by fines. Among the most common offenses, besides traffic violations, were breaking and entering, check forging, and unspecified juvenile crimes. But there is no apparent connection between non traffic-related recidivism and licensing.

Although recidivism does not appear to explain the recommendations of the clinicians, the data suggest some patterns. Not only are particular diagnoses linked to an individual's age, race, or gender, but these diagnoses also had a significant impact on the clinic's subsequent recommendation and, we must assume, to the disposition of the case. The most striking result is that blacks are nearly twice as likely as whites to have their licenses suspended, have their suspensions continued, or their licenses revoked following a clinic visit. In other words, whites are twice as likely to keep a license or have one returned following a clinic exam. Also, the elderly — those over 65 — were much more likely than the young and middle aged (85 versus 60 percent) to be taken off the road.

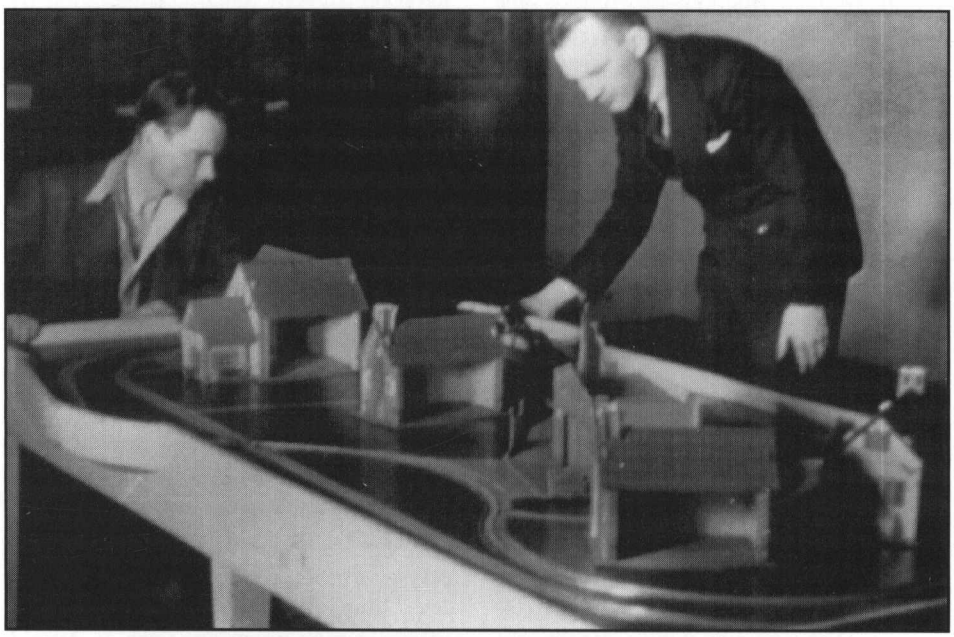

Fig. 2 - Using models to test understanding of accidents Source: Recorder's Court Pyscopathic Clinic Files

What explains these differentials? At the most basic level, having a negative recommendation from the clinic is linked to a particular diagnosis. Several common diagnoses, it turns out, are significantly correlated to race, gender and age.

For example, women were more likely to be diagnosed as unstable, impulsive, infantile, anxious and irritable than men. Moreover, women are ten times more likely to be called "excitable" and seven times more apt to be labelled "voluble" than men. Women are also more likely to be labelled "unstable" than men. More than half of all African Americans were labelled stupid in one way or another as opposed to only 20 percent of whites. A diagnosis of "feebleminded," for instance, is applied to one in five African Americans but fewer than six percent of white patients. And while a quarter of blacks were labeled "simple," only two percent of whites had that diagnosis. African Americans were also considered less honest than whites, with diagnoses such as "unreliable" and "question of dependability" being applied to them more disproportionately.

The most striking finding is that psychiatrists used labels such as "primitive" almost exclusively for African Americans, and one fifth of the black patients were given that label. In other words, to be labelled primitive was to be called "Negro." Similarly, though less commonly, a diagnosis of "poor Southern background" was listed for blacks.

In contrast, neurotic, unstable, aggressive, and immature were labels reserved for white patients. Whites were more likely to be called "immature" than blacks, suggesting that the clinicians believed that mature white adults did not violate the traffic laws while even adult blacks did.

Diagnosis, in turn, determined whether or not the patient was a good, bad, or unacceptable risk as a driver. Some examples illustrate the phenomenon: four out of five of those with low intelligence — a disproportionately "African American" diagnosis — did not get to drive. Yet even if a patient was labelled "aggressive," he or she still had an almost 60-percent chance of getting back on the road. Further, if you were "senile" you almost surely (nine times out of 10) lost your "driving privilege;" nearly half of those over 65 years old were labelled as senile. No one under the age of 59 was called senile.

Written Commentary

What the statistical evidence suggests, the examiners' written admissions notes show explicitly. Psychiatrists and psychologists at the traffic clinic did not believe that individuals who deviated from social norms could be safe drivers. In some cases, the decision about driving ability was uncontroversial. A few patients were nearly blind or dangerously psychotic. But physical ability and sanity alone were not sufficient criteria for a patient to earn or keep the driving privilege. As the statistical evidence indicates, clinicians believed that driving should be limited to those individuals who were honest, literate, of at least average intelligence, and who felt secure with themselves. The good driver also showed maturity, level-headedness, and sociability.

"He is poor material at the wheel," read the admission note of one driver who was examined shortly before the war. A man in his thirties, he had immigrated from the United Kingdom and had been living in Detroit for seven years. Three traffic tickets appeared on his record, settled by fines ranging from four to 25 dollars. He had been charged with, though not yet convicted of, reckless driving. The examining psychologist found "no specific abnormality of behavior, in speech, mood, or stream of thought." The patient showed no signs of phobias, psychosis or compulsions. But he was "surly... unreliable, egocentric, [and] irritable." These qualities alone led to a recommendation that his license be suspended. In like manner, a black physician examined in the 1950s had his license suspended because of his feelings of inferiority — he felt inferior, according to the clinicians, because he was black. These feelings were believed to have led to egocentricity and a disregard for others, which resulted in a charge of reckless driving for speeding.

The patients' origins and racial background inevitably colored the psychiatric assessment of them. Most African Americans seen at the clinic were from the Deep South. In the early 1950s the report on a middle-aged man from Alabama noted that, "He comes from the deep South where the standards were primitive and the opportunity for education limited." Similarly, the reticence a white man of Finnish-born parents who had suffered a single-car accident was accounted for by his background. The report reads, "This patient is... within the rather common pattern of many Finns of being very uncommunicative and withdrawn."

As was characteristic of psychiatric and other medical write ups of the era, examiners saw fit to describe the patient's dress and hygiene when these deviated from accepted norms. Here again, the bias of the clinicians toward whites of northern European descent is clear. In general, the look and composure of whites was not noted. When it was, the examiner gave only identifying information, such as "he has brown eyes and brown hair," or "this is a Caucasian male." More often, the interviewer commented on the physical characteristics of Jews, Arabs, and patients with connections to southern Europe. Psychiatrists did not claim that physical characteristics alone could diagnose an individual's personality. Nevertheless, these physical descriptions influenced subsequent psychiatric findings. The following comments are typical of the opening lines of the admission notes. Of one Jew, "He has a body odor;" of another, "This is an unpleasant, dark haired Jewish boy with thick lips and a long nose." Also recall that Arnold Bailey, a Roman Catholic with a Syrian-born father, is described as "a swarthy individual who is not too pleasant looking." Finally, the physical characteristics of African Americans came in for more scrutiny than native-born and northern European whites. "This is a baby faced Negro," began the admission note of one man before the war. "He has dark brown skin, typically Negroid features...[and] his kinky wool is cut short," was the description of a drunk driver after the war. These more colorful descriptions characterize the admissions notes of African Americans.

Finally, clinic workers wanted to know about the subject's recreational habits, family dynamics, and sexual proclivities. The inquiry into recreation was to determine the patient's social adjustment, but particular attention was paid to alcohol use and gambling — both

vices which warned of potential traffic trouble, the clinicians felt. Sexual habits were of particular concern following the dictates of Freudian theory. Yet sexual problems were rarely found. Nevertheless, all patients were asked when they had begun to masturbate, when they had had their first intercourse, and if they had any homosexual tendencies. Homosexuality was diagnosed as a disease — as it was throughout the medical profession at the time. Sexual deviance made for dangerous drivers in the eyes of the clinic staff. For instance, reckless driving by one white woman was attributed in part to her sexual deviance, including homosexual relations and "all sorts of sexual experiences, including intercourse with Negroes." Lowell Selling explained the reasoning behind keeping sexual deviants off the road when he wrote for a psychiatric journal in 1940:

> "...the homosexuality and the sex maladjustment per se do not mean that these individuals are dangerous in traffic... but unfortunately these conditions were also accompanied by other more serious characterological deviations so that their presence was an aggravation rather than a mere characterization.

In other words, sexual deviance — as with other vices — was a litmus test for one's ability to drive safely. The belief that vice was related to dangerous driving continued from the earliest days of the clinic into the 1960s.

Conclusion

How did safe driving come to be connected to sexual deviance, the color of one's skin, or the details of the driver's personality? Why did a simple technological problem— the deadliness of rapid deceleration — become a social problem of the highest order?

To answer these questions, we need to suspend belief in the current approach to traffic safety, which relies on federal standards for road and vehicle construction to physically separate traffic and to protect passengers in the inevitable event of a crash. We focus on a few dangerous behaviors, such as drinking and driving, or failing to wear a seat belt. In short, the current approach is not aimed at human error, or the "nut behind the wheel." Instead, it is epidemiological. Some argue that the early network of traffic safety experts were mere dupes of a powerful industrial lobby. Without being naive about the political power of the automakers, I have found that the earlier approach to traffic safety — which relied heavily on controlling the driver — was rooted deeply in the philosophy of Progressivism.

Rapid urbanization and industrialization had created an enormous amount of anxiety in the native-born white middle class. They feared the ever expanding, and increasingly brutal reach of big business, they feared the apocalyptic machines of the Great War, and they feared waves of new immigrants. New urban residents, blacks from the deep South, and swarthy immigrants from southern and eastern Europe, brought with them to the cities cultures which offended Progressive sensibilities. Moreover, their very presence awakened fears of miscegenation and racial degeneration. To restore order, Progressives relied on legal coercion and reeducation.

The automobile was the quintessential Progressive machine. It undercut transit monopolies, was cleaner than the horse it replaced, and decentralized what Progressives saw as a corrosive urban core. But with its enormous freedom came responsibilities that African Americans and new immigrants could not manage, according to Progressives, because of genetic inferiority. Because they were simply unable to drive responsibly, these groups would have to be removed from the road.

Using the new "science" of Freudian psychoanalysis, municipal traffic courts began examining drivers who were considered unsafe. Their definition of the "good driver" was simply a refined and narrower definition of the characteristics of the "good citizen." The dangers inherent to automobility required a high degree of mental and physical health and social responsibility. Many Americans could not drive safely because of mental disease — disease which was far more likely to occur in non-whites. Progressives therefore felt that they, as an educated elite, should separate the first-class citizen, the driver, from the second-class citizen, or mere pedestrian. In so doing, they hoped to make automobility safe for those who shared their outlook on an increasingly chaotic world.

This history of the Recorder's Court Clinic suggests that we should reconsider much of what we believe about the history of the automobile. Most historians have emphasized the remarkable freedom that the car provides. Here one can see control, new forms of control which reflect the attitudes of a narrow subset of society.

The story of the court clinics is particularly relevant today. The current paradigm of traffic safety, which began in 1966, is nearing its end. We have reached the point of marginal utility in our efforts to protect the driver in the event of an accident. The recent debate over airbags is but a bit of evidence that the current paradigm is under attack. In July 1997, the Secretary of Transportation reported that one-third of all accidents are caused by "road rage," which he defined as failing to signal, passing on the right, honking, flashing headlights, following too closely, and obscene gestures. A professor of psychology then testified that road rage can only be curbed by beginning driver education in the early years of elementary school.

Clearly, safety experts, having achieved all that they can out of seat belts, air bags, crumple zones, and limited access highways, are returning to a focus on the driver. One wonders what criteria they will use to weed out the "bad driver." In an age when violations of the traffic code have become commonplace, one must wonder what we think of ourselves as drivers. Are we "good drivers?" What separates us from Arnold Bailey, an icy January, and a charge of negligent homicide?

Author's Note:

This story is derived from clinic reports and news accounts. All identifying material has been omitted or altered. The Traffic Court Clinic Record's are in the Detroit Recorder's Court Psychiatric Clinic's files and available with permission from the court. I am indebted to clinic Director Dr. William Scott, Recorder's Court Administrator George Gish and the judges of the Recorder's Court for allowing me access to these confidential files. I would also like to thank the staff of the court and the clinic for their kind support and help during the research.

UNIONIZATION EFFORTS AT NASCAR

by Harry Carpenter III

The 1960s were a decade of change for the National Association for Stock Car Automobile Racing (NASCAR). During those years, the organization shifted its focus from national to regional, exiting the East and Midwest and firmly establishing itself as a successful Southern regional sport. In addition, car manufacturers returned to sponsoring teams in NASCAR, after an absence of five years, and major tracks such as Charlotte Motor Speedway and Alabama International Motor Speedway in Talladega began operations. Symptomatic of the changes within NASCAR were the two unsuccessful attempts to unionize the drivers during the decade. Both of these unionization efforts were drivers' responses to the leadership style of NASCAR, to the economic structure of NASCAR, and to the changes that NASCAR was undergoing.[1]

William ("Big Bill") France, Sr., figures prominently in the history of NASCAR; some say he was NASCAR (Fig. 1). In 1953, the writers of *Business Week* cast doubt on the ability of stock-car racing to survive as an organized sport, arguing that the promoters and drivers were not making enough money to keep the sport alive. Without France, *Business Week*'s prediction could have proved accurate. Some contend that France created the system that allowed the promoters to make substantial profits, thus reinvigorating the sport and eventually allowing the drivers to make huge sums of money. France was the founding president, driving force, and major stockholder of NASCAR, Inc.[2]

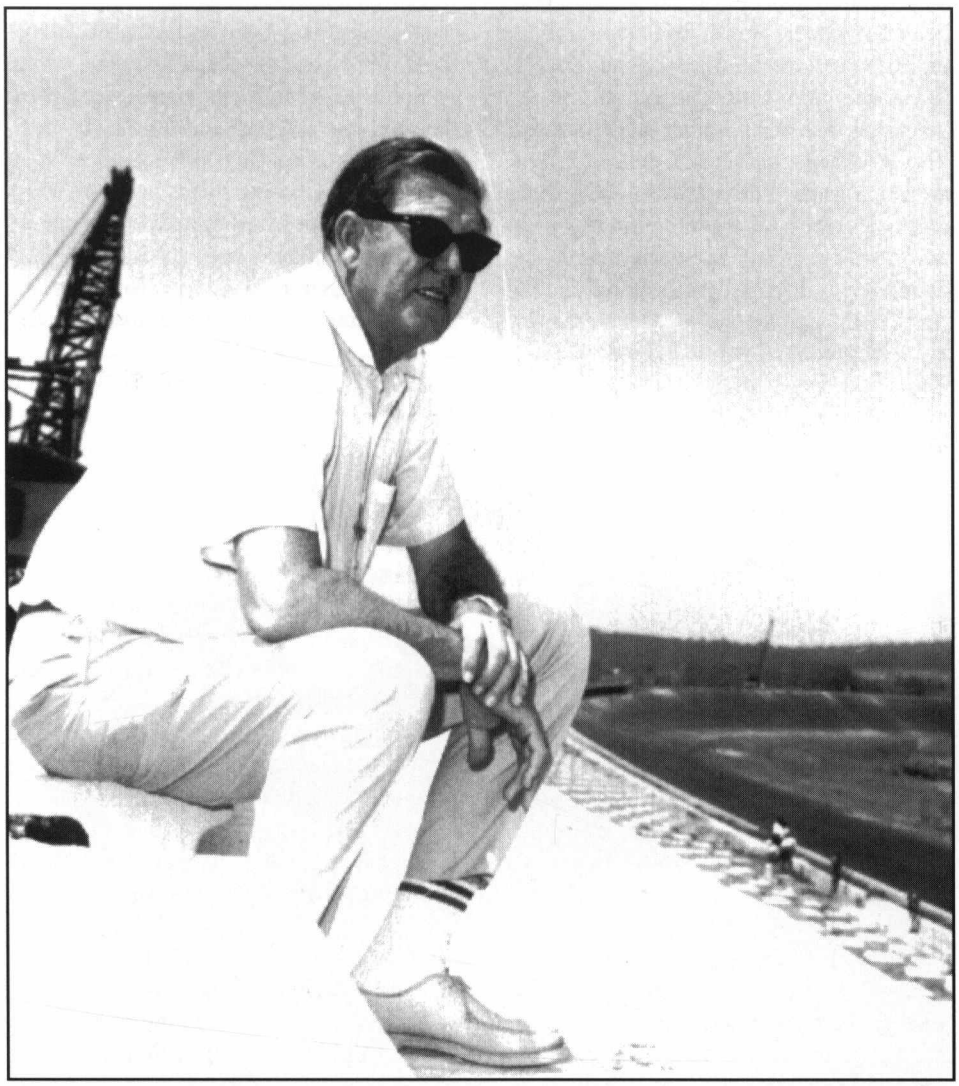

Fig. 1 - William "Big Bill" France, Sr., President of NASCAR, overlooking the construction of the Alabama International Motor Speedway.

An automobile mechanic by trade, France moved his family from Washington, D.C. to Daytona Beach in the 1930s. He ran a few races as a driver, then in 1938 he began promoting races at Daytona Beach. The demands and shortages of World War II interrupted competition, but France resumed race promotion in 1946. Within a year, he recognized an opportunity for a new organization to promote and rationalize stock-car racing. Too many fly-by-night promoters disappeared with the gate money as soon as the race started, leaving the drivers with nothing. The rationalization of stock-car racing competition resembled the rationalization of other professional sports such as baseball, football, and basketball.[3]

On December 14, 1947, after three days of meetings with other track owners and race promoters, NASCAR was incorporated, rules and guidelines written, and the first officers elected. NASCAR planned to sponsor three divisions in 1948, a "Strictly Stock" division, a modified division, and a roadster division. France and his cohorts recognized the opportunity for stock-car racing to gain a large following. Because of a post-World War II shortage of late-model automobiles, NASCAR limited competition to the modified division in 1948, featuring cars with more powerful than stock engines. The following year, the "Strictly Stock" division began and was renamed the Grand National Circuit in 1950.[4]

France ran NASCAR with an iron hand, especially when it came to the drivers. He did not hesitate to disqualify competitors who skirted the rules, whether the rules were designed to promote safety or competition. It could be argued that France disqualified drivers to get extra publicity for the organization knowing that when a disqualification occurred, the sports sections of

newspapers repeated the race results, thus giving NASCAR twice the publicity. Two-time Grand National Champion Tim Flock's problems with France and NASCAR illustrate France's despotic and paternalistic approach to managing NASCAR (Fig. 2). In 1948, Flock was disqualified after the race at Daytona Beach for using a wooden roll bar. Flock asserted that France approved the roll bar before the race. Again in 1954, Flock was

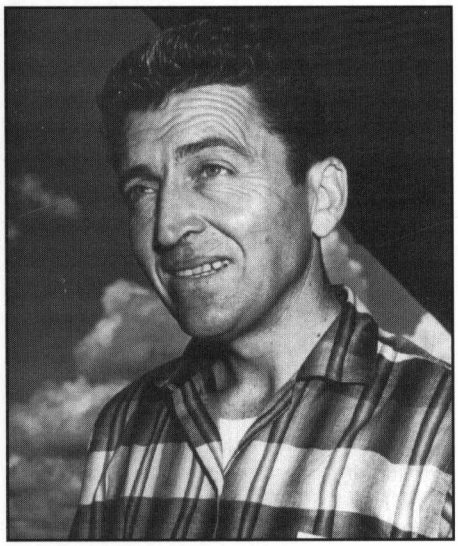

Fig. 2 - Tim Flock, a key figure in the first union effort in 1961 and banned from NASCAR by Bill France.

disqualified after winning the Daytona Beach race. This time NASCAR claimed that Flock illegally modified his Olds 88. Flock denied this charge and accused France of wanting to favor Chrysler over Oldsmobile.[5]

Ned ("Gentleman Ned") Jarrett's financial difficulties while successfully competing in NASCAR are illustrative of the problems that drivers faced in the early 1960s, thus helping one to understand the financial issues that contributed to the unionization effort of 1961. Jarrett joined the Grand National Circuit in 1959. Without any factory support, he won five races in 1960 and finished fifth in the point standings, losing $1500 while taking no salary. He was able to continue competing because of a $10,000 loan he received from a local businessman. In 1961, after switching from Ford to Chevrolet because Chevrolet offered him unofficial sponsorship money, Jarrett took the points championship. The next year Ford openly sponsored drivers and offered Jarrett sponsorship, so he switched back to Ford. Even with factory backing, Jarrett could not repay the $10,000 loan until 1963.[6]

One of the leading actors in the effort to organize the drivers of NASCAR in 1961 was Curtis ("Old Lead Foot") Turner (Fig. 3). A Floyd, Virginia native, Turner began automobile racing in 1946 in Mount Airy, North Carolina, and entered NASCAR competition in 1949. By 1960, Turner recognized the potential of a large, fast track in the Charlotte area. O. Bruton Smith, a Ford dealership owner and race promoter in Charlotte, and Turner began independent efforts to build a large speedway near Charlotte. They pooled their resources and built the Charlotte Motor Speedway (CMS), a 1.5 mile oval track just outside nearby Concord. The costs of constructing the Speedway exceeded all estimates, and in spite of a successful opening in 1960 and profitable races in 1961, CMS accumulated debts in excess of $850,000. Both Turner and Smith failed to raise the funds needed to avoid bankruptcy for the Speedway and were forced out of the operation of CMS by other stockholders.[7]

Financial difficulties and arbitrary rulings from NASCAR help explain the drivers' interest in unionization, but to understand the Teamsters' interest in organizing the NASCAR drivers, we need to examine the legal and organizational problems of the Teamsters at the time. The International Brotherhood of Teamsters was the largest union in the United States. Because the Teamsters touched almost all aspects of the American economy, the union spread into many industries, organizing workers not directly related to the hauling of freight. Aggressive and constantly looking for opportunities to expand, as early as 1905 the Teamsters addressed the issue of membership for owner-operators. Should an employer or potential employer be allowed to join the union? Could a union fight for higher wages and better benefits if employers belonged? A compromise was reached allowing owner-operators to join if they owned only one team or vehicle. Later, owners of multiple vehicles were allowed to become members if they were drivers themselves and accepted union scale and working conditions.

In the 1930s and 1940s the issue of owner-operators became even more complicated. Many companies pressured their drivers into buying the trucks they drove, thus becoming self-employed and allowing the companies to avoid the expenses of social security taxes, vacation pay, unemployment insurance, and workman's compensation. To eliminate undercutting of unionized drivers, the

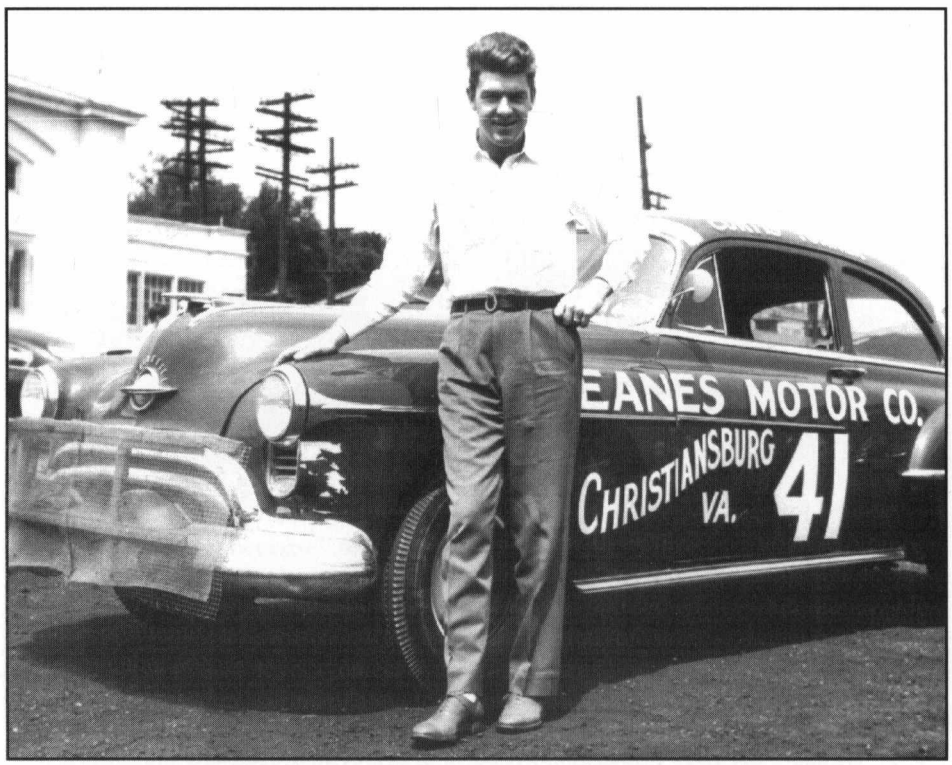

Fig. 3 - Curtis "Old Lead Foot" Turner, in front of his car #41. He was the other key figure in the 1961 unionization effort.

Teamsters organized these so-called independent owner-operators by offering them an opportunity to protect themselves and maintain employee benefits. But legislation and common law was unclear on the issue of organizing the self-employed, creating doubts about the legality of the Teamsters' efforts. Conflicting federal and state court rulings did not clarify the matter.[8]

By the late 1950s the Teamsters were a troubled union under the leadership of Jimmy Hoffa. They had been kicked out of the AFL-CIO in late 1957 and had come under the scrutiny of the U.S. Department of Justice. Moveover, The National Labor Relations Board had asserted its right to determine union jurisdiction in any interunion conflict in late 1960. This ruling created concern within the Teamsters leadership that their opportunities to expand would be limited. In an attempt to maintain their traditional stance as an aggressive organization, the Teamsters Executive Board declared jurisdiction over any unorganized workers in early 1961.[9]

The Teamsters saw professional sports as an excellent opportunity for expansion. Race drivers, especially, seemed analogous to owner-operator truck drivers, and appeared receptive to organization. In 1946-1947, a group of West Coast drivers and car owners seeking better conditions at tracks and a larger share of the prize money organized the American Society for Professional Auto Racing (ASPAR). ASPAR threatened a boycott of the Indianapolis 500, and many ASPAR drivers sat out the race in 1947. The organization quickly faded and was not a factor in the 1948 Indy 500, but the precedent of organizing drivers was set.[10]

Largely due to the growing discontent in the ranks of drivers, NASCAR became a target of an organizational effort by the Teamsters in 1961. The drivers were unhappy about the lack of growth in the purses of most of the races, the inadequate health, accident, and life insurance, and the lack of any kind of pension plan. Negotiations between Turner and the Teamsters started in Chicago in the summer of 1961.

By early August, when Bill France learned of rumors of an effort to unionize, he and NASCAR executive director Pat Purcell went to Chicago to investigate. On August 9 the rumor proved true when Nick Torgeshi, a representative of the Federation of Professional Athletes (FPA), and Turner, now an officer of the federation, announced that a majority of the NASCAR drivers had signed union applications and paid their $10 dues. They asserted that efforts were underway to organize the drivers for USAC and the Midwest Auto Racing Club (MARC). The union elected Glenn ("Fireball") Roberts president, with the vice-president coming from the MARC. Turner claimed that only one NASCAR driver failed to join. The union sought larger purses, a pension plan, and increases in hospitalization, medical, and death benefits. Turner pointed out that the top prize for a 100-mile race had not increased in ten years, while the expense of fielding a car had more than doubled. The race at Bristol, Tennessee, two weeks earlier grossed $200,000 while the total purse paid to drivers was only $15,000, of which manufacturers supplied $4,000.[11]

France reacted quickly. He spoke with the drivers in Winston-Salem, North Carolina, for an hour before a race on August 9. Ten drivers immediately signed cards cancelling any union application and committing not to join any labor organization. France announced that NASCAR would ban any driver belonging to the union before the race. He vowed to plow up his race track before accepting a union, accused Turner of planning to introduce parimutuel betting in racing, and threatened to shoot any union drivers that tried to defy his ban. France argued, moreover, that unionization of the drivers would eliminate any chance at factory support of NASCAR. This was one of his weakest arguments, especially because the automobile manufacturers were unionized themselves. He went on to accuse Turner and Roberts of being paid by the Teamsters to sign up drivers. Turner answered with a charge that France and NASCAR were in violation of the Sherman Anti-Trust Act and announced that Hoffa and the Teamsters would seek an injunction to stop all NASCAR races until the organization recognized the union. Turner promised strike benefits to all drivers who did not race.[12]

Undeterred by Turner's threats, France took further steps to combat the FPA. First, he lined up the other track owners in opposition to the union. Nelson Weaver, president of Atlanta International Speedway, Duke Ellington, vice-president and general manager of Charlotte Motor Speedway, and Bob Colvin, owner of Darlington Speedway, all announced their opposition to the FPA. Next, France sought to answer the accusation that he was dictatorial in his method of running NASCAR by setting up a representative Grand National Circuit advisory board, consisting of two Grand National drivers, two car owners, two promoters, and two NASCAR officials. He offered the board a choice of four different pension plans and increased medical and death benefits. The board created an outlet for drivers, car owners, promoters, and NASCAR to air their differences without giving up any real power for France. It was still, after all, advisory in nature.[13]

The unionization effort collapsed when Roberts resigned as president and Turner's antitrust suit against NASCAR and France failed. The status of drivers as independent contractors rather than employees gave France the leverage he needed, while denying the drivers the legal protection that any fledgling union required. Turner and Flock were banned from NASCAR racing until 1965. The movement was unsuccessful, but it took a massive effort by France to kill the drivers' challenge to his authority.[14]

A second unionization effort in 1969 was substantially different from the effort in 1961. This time the union, the Professional Drivers Association (PDA), was an independent organization with no national affiliation. The drivers came together in mid-August 1969 and elected Richard ("King Richard") Petty, the all-time leader in victories and earnings at the time, president (Fig. 4). Cale Yarborough, the leading money winner in 1968, and Elmo Langley, one of the top independent (no factory backing) drivers, were the vice-presidents. On the executive committee were such top drivers as Lee Roy Yarbrough, David Pearson, Donnie and Bobby Allison, Buddy Baker, Pete Hamilton, Charlie Glotzback, and James Hylton. They hired Lawrence Fleisher, the general counsel for the players' organization of the National Basketball Association, as their general counsel. Petty stated that the immediate goals of the PDA were

improved fringe and financial benefits and improved working conditions for drivers and crews. Bobby Allison enumerated the complaints of the union to sports writer Clyde Bolton. He protested that purses were too low compared to the gate receipts at big races, that drivers lacked a pension plan and suffered from inadequate insurance benefits, that NASCAR's arbitrary scheduling unnecessarily burdened drivers and crews, and finally that NASCAR did not provide adequate facilities for drivers and crews at the tracks.[15]

Bill France reacted relatively calmly to the announcement, stating that NASCAR, "will post our prize money and if these boys want to run,okay. If not, there are no contracts between the drivers and NASCAR." He also added that he felt NASCAR treated the drivers well.[16]

The immediate cause of the drivers' concerns was the Alabama International Motor Speedway (AIMS) in Talladega, Alabama, a new superspeedway that opened in the fall of 1969 with Bill France as its president. From the first practice runs, it was evident that AIMS was a fast track. On August 21, Buddy Baker set an unofficial stock-car speed record of 195.250 mph in spite of drizzle that caused him to slow down in turns. The facility, however, had problems. Drivers' complaints about the track's rough surface induced France to repave sections. Other drivers experienced dizziness and blurred vision caused by high G forces induced by bumps and known to aerospace engineers as the "POGO" effect.[17]

On September 13, 1969, the day before the inaugural Talladega 500, Petty announced that the executive board of the PDA had voted without dissent to boycott the race. All factory drivers, except for defending champion Bobby Isaacs, were members of the PDA and expected to stay away. Petty cited tire problems (tires were inadequate for speeds approaching 200 mph and were being torn up in rough sections of the track) as the reason for the boycott. France countered that the race would be held and that any fan could use his ticket stub from the Talladega 500 for free admission to the next race at AIMS or at Daytona Beach.[18]

The boycott did not stop the race. France encouraged drivers from the Grand Touring division, the second division of NASCAR, to replace the boycotting drivers. Sixty-four thousand fans attended the race, less than the predicted one hundred thousand. Richard Brickhouse, a former member of the PDA, won the race; his first victory in the top Grand National Division.[19]

Fig. 4 - Richard "King Richard" Petty, with his car #43. He was the President of the Professional Drivers Association.

Compared to his actions in 1961, France responded moderately to the AIMS boycott. Commenting about the boycotting drivers, he announced, "They won't ever run for me again without posting a substantial bond. How can you depend on them? That's the only way I know to protect the public," alluding to sinister influences at work in the sport. He contended that the tire issue was a false one, noting that the Grand Touring Division had run a 400-mile race on Saturday with no tire changes by the winner. He failed to add that the Grand Touring cars were lighter and slower than the Grand National cars and that less tire wear was the norm in Grand Touring races.[20]

While France took a financial beating from the smaller-than-expected gate at AIMS, he must be considered the winner in the fight with the PDA. Even without its top drivers, NASCAR put on an exciting race. Sixty-four thousand fans learned that even if the top drivers fail to show up, they could still expect a thrilling and competitive race. NASCAR would stand firm even if the PDA continued the boycott.

The boycott was not as well thought out as it could have been. Announcing it on Saturday reduced the effect, because many fans were already in Talladega or on their way for the Grand Touring race. Not all the top drivers supported the boycott because they favored unionization. Many of them feared the dreaded "POGO" effect would lead to accidents and injuries and the boycott provided a face-saving way to avoid the race. As the season continued, the PDA faded into oblivion as drivers turned their attention to racing and winning. The second attempt to unionize the drivers of NASCAR failed.

Comparing the two efforts to unionize the drivers of NASCAR lends insight into changes in the organization and its drivers during the 1960s. France had the upper hand by taking drastic actions during the first unionization effort, intimidating most drivers into quitting the union and banning the two drivers he could not intimidate. France used scare tactics, absurd allegations, and questionable legal tactics to defeat the

FPA. He placated the drivers with meaningless advisory committees and vague promises of increased benefits.

The second unionization effort produced a more measured reaction from France, even thought the boycott of the Talladega 500 cost him money directly. France knew the boycott was related to problems at AIMS that he needed to address eventually. He kept quiet about the "POGO" effect problem at AIMS until a few days after the race when fewer people were paying attention. All along, France took the high ground, claiming to be looking after the fans interests and putting the boycotting drivers in a bad light with the racing public. By defeating the PDA without drastic action or even powerless advisory committees, France demonstrated that he was in an even stronger position at the close of the 1960s than he had been at the beginning. By the end of 1969, NASCAR was a popular regional sport on solid financial ground run by a benevolent dictator who knew what was best for promoters, drivers, and racing fans.

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ABSTRACTS OF OTHER PAPERS PRESENTED

The Evolution of the American Automobile

by Richard P. Scharchburg

The history of the American automobile goes a lot further back than most people believe. Part of the failure to recognize the early origins of self-propelled vehicles comes as a result of disagreement regarding the answers to such questions as: What is an automobile? Does the source of power have bearing on the subject of dating the origins of self-propelled vehicles? Who is be credited for inventing the automobile and when did it take place? This situation, combined with the fact that early inventors kept poor records, confounds the problem of creating accurate automotive history.

For purposes of this discourse let us agree, self-propulsion with the use of an engine, whether steam, electric, gasoline, diesel or any combination thereof, should be sufficient to render the vehicle an "automobile" without any other qualification.

As far as we know at present, the first man to actually take up the task of a self-propelled vehicle in the United States was Nathan Read (1759-1849) of Salem, Massachusetts. In 1790 he was granted a patent for a steam carriage and constructed a model of a four-wheeled vehicle. Read's work stopped at the model stage.

Next came Oliver Evans of Wilmington, Delaware, and later Philadephia, Pennsylvania. As early as 1772 Evans developed plans to build a vehicle that would travel on the common roads under its own power. In 1792 he was granted a U.S. patent on a boiler "to give motion to engines and in particular to land carriages." Other patents recognized his plans to use steam engines "to propel boats and land carriages." In 1805, in Philadelphia, he built a land carriage — actually a dredge.

A successful run of his carriage-dredge (Orukter Amphibolos, see e.g. *AHR* No. 31) was made in mid-July of that year around Philadelphia's Market Square. According to contemporary newspaper accounts the demonstration was highly successful and a fee of 25 cents was collected from all who came to see its operation. Apparently the demonstration lasted several days and it could be asserted that the first automobile advertisement and first automobile show should be credited to the "City of Brotherly Love" and the genius of Oliver Evans. Automotive historian L. Scott Bailey remarked, "If America is to have a father of the automobile, it must surely be Oliver Evans.

By the 1860s the idea of a land carriage had gained many advocates. Were it not for the outbreak of the Civil War, motor transportation would undoubtedly have reached a higher state of development earlier.

Among those associated with use of a steam engine for road locomotion beginning in the mid-1800's were Richard Dudgeon, Sylvester Roper, Frank Curtis, James S. Batchelder and William Weitner, James F. Hill, Henry Taylor, Enos Clough, J.W. Carhart, George Long, Lucius Copeland, E.F. Fields and Frank Cranshaw, to name only a few.

The first "automobile" race occurred in Wisconsin (not Chicago!), from Green Bay to Madison, in 1871. The contest was won by the steam-powered "Oshkosh," built by J.W. Carhart, which covered the 201-mile course in 33 hours and 27 minutes. There was only one other entry in America's premiere race, the "Green Bay." It broke down early and did not finish.

Throughout most of the 19th Century —and beyond— a "battle" of power sources dominated American automobile development. Advocates of steam power predominated, but, intertwined were those whose fuel of choice was liquid hydrocarbon. The names of Samuel Morey (Fig. 1), George Brayton, Henry Nadig (Fig. 2), Charles Black, John Lambert, William T. Harris, Sephaniah Reese, and John S. Connelly all conducted experiments using internal combustion engines.

The early pioneers using steam and internal combustion engines were joined by inventors who were equally adamant in their advocacy of electric power for automobiles. Some of the many famous electric vehicles included: Morrison,

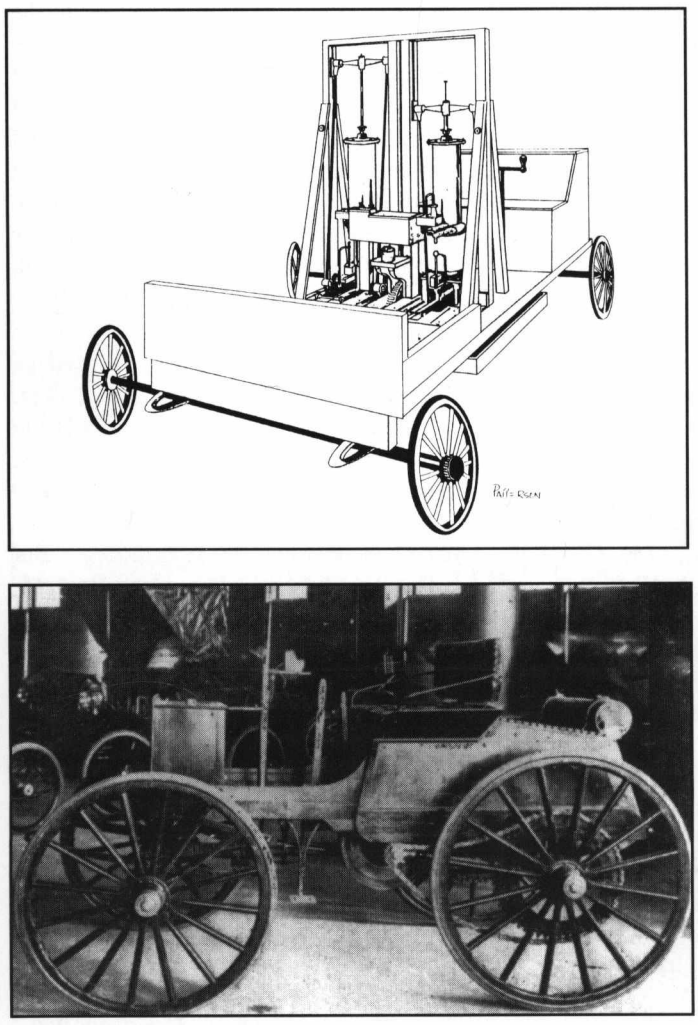

Fig. 1, Fig. 2 - Two early efforts from Pennsylvania: an artist's rendering of the Morey vehicle made in Philadelphia c. 1828-29, and the 1893 Nadig of Allentown.

Woods, Kimball, Morris & Salom, Oldsmobile, Studebaker, Coulmbia, Pope-Waverly, Baker, Riker, Rauch & Lang, Milburn, Buffalo, Tiffany, and Detroit Electric.

As a major contender, steam-propelled cars retreated from the battle about 1915, although the Doble was available through 1931. The electric, however, was longer-lived. As late as 1938 a few Detroit Electrics were still produced on an individual-order basis, often using coachwork courtesy of Willys-Overland and Dodge.

In the 1890s, men whose names would become legend in automotive history, such as the Brothers Duryea, Stanley, and Studebaker, Percy Maxim, Alexander Winton, Albert Pope, Edgar Apperson, Elwood Haynes, Henry Ford, Ransom Olds, Harry Knox, and Charles Brady King, were working in relative obscurity unaware that so many others were struggling with the same problems in either developing suitable engines or motor vehicles.

Several of these early automobile developers and experimenters visited the famous Columbian Exposition in Chicago in 1893. On exhibit there were the latest technological developments from around the world. At the fair they would have seen a coal-burning steam car built by Achille Philion, which he used in his act on the midway. In the electricity building were two electric-powered cars: a "Sturgis Electric" built by William Morrison and an "Electric Perambulator" built by E.E. Keller and Fred Dagenhardt. There were three gasoline-powered motor vehicles from Europe, built by Gottlieb Daimler. Reports indicate that these vehicles attracted little attention, although one account asserts that Frank Duryea had "many rides in the Daimler carriages." Automobile pioneers attending the fair included the Brothers Duryea and Studebaker, William C. Durant (the Studebakers and Durant representing their carriage companies), Henry Ford, Albert Pope, Elwood Haynes, Ransom Olds, Thomas B. Jeffery, Charles B. King, George Pierce, and Alexander Winton. No record of their reaction to what they saw has been found.

Surely they must have been impressed with George B. Brayton's internal combustion engine pumping air to the huge aquarium which was one of the most popular attractions. Many types of modern machinery were also on display, including gas and petroleum engines, transmissions, gears, clutches, and most every conceivable mechanical part essential to producing a motor vehicle.

Such a munificent exhibit of the latest technology surely spurred on the efforts of the motor vehicle developers who visited the "Great White City' on the shore of Lake Michigan. This was especially true of Frank Duryea who was in the midst of designing the second Duryea car. Within two years after the fair closed, Chicago would host the Times-Herald Contest on Thanksgiving Day. More than 92 entries were received. The Duryea won the contest, being one of five entries that made it to the starting line in Jackson Park. The auto age was born that Thanksgiving Day in Chicago. Few in the United States were even aware of its arrival.

During the mid-1890s, the auto age was experiencing the first labor pains of its imminent birth. Two men, in particular, were especially eager to assist as midwives at the nativity of the new industry and a new age. In 1895, well ahead of other would-be auto manufacturers, the Duryea Motor Wagon Company of Springfield, Massachusteets, was organized and built 13 motor wagons from the same design. This accomplishment marked the birth of the American Automobile Industry. And, as is so often said, the rest is history.

The 1890 decade had begun with a small number of obscure American-made motor vehicles, which included the Nadig, the Black, the Lambert, and perhaps others. It ended with such notable names as Duryea, Haynes, Apperson, Columbia, Winton, King, Stanley, Locomobile, and Oldsmobile.

At the turn of the century, the infant automobile industry was growing stronger day by day.

Note on sources:

It is fascinating and often amusing to read the history of the motor vehicle and its manufacture from the vantage point of the late 19th and early 20th Centuries. The first of the American automotive trade publications appeared in 1895: first *Motocycle,* and then *Horseless Age.*

Before these premiere automobile publications, news of horseless carriages could be found on the pages of *Scientific American, American Mechanics' Magazine, Museum Register, Journal and Gazette, The Hub, Cycle and Automobile Trade Journal,* and *The Carriage Monthly.* Other automotive trade publications appeared here and abroad and they are chock-full of accounts of the adventures and experiences of early automobilists. *The Journal of the Franklin Institute* has not been systematically researched and needs to be done at some point.

Richard P. Scharchburg is the author of Carriages Without Horses which won the Nicolas-Joseph Cugnot Award for 1993, and a Director of the Society of Automotive Historians. He is the Thompson Professor of Industrial History, Kettering University, formerly GMI Engineering & Management Institute, Flint, Michigan.

The Automobile in the American Imagination

by Wesley Swanson

This presentation represented an abbrievated version of Mr. Swanson's dissertation which focused on the development of the unique way "automobilism" appealed to Americans. It has been fashionable to de-emphasize American uniqueness in this regard but the presentation took the opposite road. While the automobile was an international phenomonon, and much of this international spirit of the age applies to the United States, the most important elements are unique to this culture. The presentation examined the American automobile culture as reflected in advertising, magazines and novels. It traced the uses to which Americans first put their automobiles, not so much as transportation devices but as machines of personal adventure.

Wesley Swanson is a Ph.D. candidate, UCLA, Los Angeles, California. He is a member of the Society of Automobile Historians.

Recasting the Machine Age: Henry Ford's Village Industries and the Vision of Decentralized Technology for Modern America

by Howard P. Segal

Believing that they have been neglected by most automotive historians, Professor Segal has studied Henry Ford's Village Industries established in Southern Michigan between 1918 and 1944. These 19 small plants made parts for cars and trucks and were critical to the revival of their respective small communities. Although never the bastions of yeoman purity and Jeffersonian ideals described by Ford's publicity agents, they do represent successful pioneering examples of smaller-scale, geographically dispersed factories that were integrated into the huge Rouge plant in Dearborn. The fact that Henry Ford could establish both the Village Industries and the Rouge plant in the same decades and see no contradiction between them was among Professor Segal's principal themes. Another related principal theme was Ford's efforts to have his rural workers in these small plants be part-time farmers as well as full-time factory workers. A third, also related principal theme is the broader context of the Village Industries as simultaneously retreats from the large cities and large auto plants Ford condemned as impersonal, and cutting-edge factories with the latest machines and tools.

Far from dismissing the Village Industries as simply retreats from modernity or as anti-union enterprises or both — the common arguments used by critics of Ford and Ford Motor Company over the years — Professor Segal treats them as serious experiments in redirecting the auto industry toward smaller but better factories and technological communities. He does not defend them uncritically but neither does he deny their significance as components of a de facto vision of decentralized technology for modern America that Henry Ford conveyed here and in other enterprises. His conclusions are based in part on interviews with a number of former workers with varying views and experiences.

Howard P. Segal is the Bird & Bird Professor of History, University of Maine, Orono, Maine.

The Failure of Fordism: Ford and the Reform of the Automobile Repair Industry, 1913-1940

by Stephen L. McIntyre

Motorists have always loathed the automobile repair industry. From the outset of the industry customers complained that they were routinely overchaged for repairs which were poorly performed. They blamed these problems on the dishonesty and incompetence of mechanics. Much more was involved, however, in the problems which plagued motorists. Due to the lack of standardized and interchangeable parts in early automobiles, mechanics exercised a great deal of control over the conduct and pace of their work. They used this control to retaliate against overly-demanding customers — the vast majority of whom were middle and upper class in this early period — by slowing their pace and increasing the cost of repairs.

This crisis of confidence in the repair industry threatened to impede the sale of automobiles. Because Ford was committed to creating a mass market for its Model T, the company was the first to address problems with dealer repair shops in a meaningful way. Professor McIntyre examined Ford's strategy for reforming repair practices by adapting the methods of mass production used for manufacturing the Model T to the repair of the vehicle. At the heart of these efforts were flat rates which specified the time in which the mechanics should complete each repair job. He argued, however, that a strategy built on time and motion studies, standardized repair procedures, an extensive division of labor, and an incentive repair system was inappopriate for dealer repair shops which rarely employed more than 20 mechanics and were confronted by an almost infinite variety of technical problems. Ultimately, he concluded, Ford's attempt to shape dealer repair shops in the image of the factory was largely unsuccessful. Many motorists continued to abandon dealers in favor of smaller, independent repair shops whose owners were much more reluctant to embrace such reforms as a panacea for the repair industry's woes.

Stephen L. McIntyre is Assistant Professor, Department of History, Southwest Missouri State University, Springfield, Mo.

The Role of the Small Manufacturer in the American Motor Car Industry

by Sinclair Powell

A key feature of the American automobile industry during the first four decades of its life, from 1900 to 1940, was the existence of a substantial number of minor motor car manufacturers. These lesser companies dated from the very early years of the industry, and flourished for a considerable period of time. At the inception of World War II, however, they literally had vanished from the marketplace. The story of their rise, early success and ultimate decline constitutes a highly interesting aspect of automotive history.

During this four-decade period, as many as 3,000 different makes of motor vehicles appeared on the American scene. The vast majority of these were built by persons with no capital to support continued production, and thus quickly disappeared. However, a number of initially tiny operations did survive, and ultimately became viable motor car manufacturing companies. As the years went on, these concerns separated themselves into large, medium-sized, and small producers.

For much of the 1900-1940 era, the small producers (for our purposes, companies building no more than 15,000 to 20,000 vehicles in a typical year) competed vigorously and effectively for a share of the automobile market. These minor companies did particularly well throughout the period of the First World War, and even into the beginning of the 1920s. However, at this point attrition set in and their ranks were quickly decimated. Those which did survive the shake-out of the early 1920s for the most part managed to operate for an additional period with some success. By the late 1920s, though, the surviving small companies were finding the going more and more difficult, with the big conglomerates seizing a steadily-increasing percentage of automotive sales.

The advent of the 1930s saw The Depression, a sharply declining demand for automobiles, and crushing competition for the minor independent motor car builders from the major manufacturers. The combination proved to be lethal. The small producers, such as Jordan, Peerless, Stutz, Marmon, Franklin, Auburn, Cord and Pierce-Arrow, fell by the wayside, one by one, and were not replaced. The automobile industry resolved itself into three big conglomerates and a few medium-sized companies, including Nash, Studebaker, Hudson and Packard. Even these mid-level firms would finally vanish in the post-war period.

What were the factors that produced the demise of the small, independent automobile producer? Clearly, these causes did not include lack of up-to-date technology, or poor product quality. The minor manufacturers, particularly such firms as Duesenberg, Cord, Franklin, Marmon, and Pierce-Arrow, for years set the pace in engineering advances. The lesser companies also usually built carefully-crafted vehicles, which in many instances achieved superior reputations for durability.

The small firms' problems began with the introduction in the auto industry of the conveyor-type assembly line and the expensive, special purpose machine tool used to manufacture individual parts in great volume. The larger companies could afford to invest in such cost-effective items, which over time gave them a huge competitive advantage. The minor producers usually were not in a position to do this, causing them eventually to lose out in the industry's fierce price wars.

Other factors, primarily internal, created difficulties for numerous small automotive builders. In many instances, their merchandising methods were inadequate — advertising budgets often were slim, and far too many firms did not devote the time and energy needed to build strong dealer organizations throughout the nation. Failure to meet changing market conditions also produced problems for many lesser auto firms. When recessions or depressions impacted the economy, most small independents proved unable to bring lower-cost vehicles to market and suffered accordingly. The fact that many of the minor producers were located in communities far distant from the center of automobile production in Southeast Michigan meant that these firms suffered from geographic isolation, which impacted them adversely in numerous ways.

Did the purchasers of motor cars in American lose anything by the elimination of these small firms? Many would feel that their demise meant that the consumer no longer enjoyed the broad choice of product available earlier, and instead was restricted to the offerings of a very few companies. This lack of competition also may well have caused the big auto manufacturing firms to pay less and less attention to the servicing of their product, again adversely affecting the consumer.

In summary, industry consolidation and the elimination of minor independent firms thus may well have been a mixed bag, with the automotive purchaser perhaps enjoying certain benefits (such as lower initial cost), but also experiencing offsetting detriments. The small firm and its carefully-built, individualistic product has indeed been missed by many motorcar purchasers in the years since World War II.

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Medium-Priced Automobile Producers: Technological Change and Consolidation, 1928-1941

by Robert R. Ebert

The Depression of the 1930s created economic victims in the automobile industry. Epstein catalogs 44 builders of passenger automobiles in commercial quantities at the end of 1926. By 1941, that number had declined to nine. Exits from the industry included independent luxury-priced manufacturers such as Peerless, Pierce-Arrow, Duesenberg, and Marmon. In terms of the size of builders (as measured by annual output in the 1920s), however, major victims of the Depression were independent manufacturers of medium-priced cars.

The share of the automobile market accounted for by medium-priced cars declined from 39 percent in 1928 to 23.6 percent in 1933. By 1939, medium-priced cars were again taking 39 percent of the market. However, those cars were being built by considerably fewer firms.

The hypothesis presented by Professor Ebert is that survival in the medium-priced automobile market in the 1930s required the combining of manufacturing innovation with technological change and economies of scale. Daniel Raff has argued that the success of both Ford and General Motors was due to their large scale investment in machinery that did away with most direct production tasks (Raff, 1991). Raff and Bresnahan (1991) point out that auto producers surviving The Great Depression operated large plants at substantial volumes and employed the most modern of manufacturing techniques. Without the advantages, inherent in the implementation of cost saving manufacturing systems, the marketing efforts of firms like G.M. could not have been successful. Langlois and Robertson point out that production flexibility and its approach to vertical integration also gave G.M. an advantage in the market.

Professor Ebert's research has extended the line of reasoning advanced by Raff and Bresnahan to the medium-priced auto market which saw several firms, successful in the 1920s, fail in the 1930s. Two principal gainers in terms of market share in the medium-priced auto market in the 1930s were G.M. and Packard who employed similar manufacturing techniques. Several firms successful in the 1920s exited the industry and medium-priced market in the 1930s, including Reo, Auburn, Hupp and Graham. Several other firms, including Chrysler, Nash, and Hudson maintained approximately constant shares of the medium-priced market through the 1930s. The firms that survived in the medium-priced class during the 1930s did so primarily as a result of innovations associated with economics of scope that enabled them to apply new technologies to sharing of common components across product lines. Exiting firms either were unable or unwilling to adapt to changing manufacturing processes that enabled the survivors to weather both The Depression and weakness in the medium-priced market.

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The Hybrid Cars of the 50s and Their Influence on the American Automotive Industry

by Paul Sable

Through the 1950s, a number of limited production hybrid cars were produced. Some, like the Kaiser-Darrin, Nash-Healey, and Hudson Italia (Fig. 1), were produced by the large American manufacturers; others were produced by small manufacturers such as Dual Motor Company (Fig. 2); and still others were produced by individuals working out of small establishments which manufactured cars such as the Kurtis sport car. Also, there were individuals who designed and built their own automobiles, such as Sterling Edwards, Edward and James Gaylord, etc.

Many of these cars were instrumental in introducing the American public to both sports and (in some instances) touring automobiles, both blending very well with the economic and demographic changes America was experiencing at that time.

Fig. 1 - The 1954 Hudson Italia coupe, body by Carrozzeria Touring

Fig. 2 - The Dual-Ghia, c. 1957

These cars also brought about many styling changes (American and foreign), plus advanced engineering cues which were picked up by American manufacturers.

Dr. Sable explained the important contribution these cars made to the history of the automobile in America.

Dr. Sable is a professor at Allentown College of St. Francis de Sales (Pennsylvania), an author, a member of SAH, and an automobile collector and enthusiast.

The Arsenal of Democracy: America's Auto Industry at War

by Thomas L. Brownell

In January 1944, the Willow Run bomber assembly plant, designed by mass production genius Charles Sorensen of the Ford Motor Company, succeeded in achieving the unheard production rate of one four-engine B-24 Liberator bomber an hour. By the war's end in Europe 17 months later, over 8,000 ready-to-fly bombers had rolled off the mile-long Willow Run assembly line, a production rate unattainable by any other aircraft manufacturer anywhere in the world. The American auto industry with its enormous production capacity and tremendously efficient moving assembly line built nearly one-third of all American-made materiel supplying the Allied Forces in World War II.

Professor Brownell examined the American automobile industry's contribution to Allied victory in World War II, not only through the vast and diverse quantity of materiel that industry produced, but also at the auto industry's influence in transforming production methods in other industries, namely ship building. He focused attention on 1944 as the year the auto industry and its production methods hit their peak. Production figures speak for themselves. In 1944, U.S. industry assembled one aircraft every 5 minutes, launched 50 merchant ships a day, and completed 8 aircraft-carrying/launching ships each month (Walton, Miracle of World War II, MacMillan Co. 1956).

As asides, he discussed the transformation of the auto industry's work force through the entry of women (fully 38 percent of Willow Run's hourly-rate workers were female) and offered the view that by 1944 American industry considered the war won, as evidenced by General Motors applying in June 1944 for permission to begin converting its production facilities to civilian products.

Thomas Brownell is Professor, Automotive and Heavy Equipment Management Program, Ferris State University, Big Rapids, Michigan, and a member of the Society of Automotive Historians.

Doughboys and Grease Monkeys: American Soldiers Learn to Repair the Motor Truck, 1916-1918

by Kevin Borg

The United States Army's use of motor vehicles in World War I had the direct effect of familiarizing thousands of Amercan men and, indirectly, hundreds of American women, with the use, care, maintenance, and repair of automobiles and trucks. The return of these men and women to America's cities, town, and farmlands after the war created a large reserve pool of mechanical knowledge and experience which could be tapped to support America's emerging automobile culture. This paper, drawn from the author's dissertation research on the history of the auto repair industry, explores the type of training and depth of experience with motor vehicles that soldiers received during World War I.

When President Woodrow Wilson asked Congress for a declaration of war in April of 1917, the United States Army was woefully unprepared for modern, motorized warfare. One of the key areas where the U.S. Army lagged behind the armies of Europe was in motorization. The Army had gained valuable logistical experience with motorization during and immediately after the Mexican Expedition in 1916, but those lessons were still being digested when events in the Atlantic pushed President Wilson to seek a declaration of war against Germany. The demand for motor transportation soon became critical and skilled drivers and mechanics were in great demand.[1]

Recognizing the need for many more thousands of mechanics and technicians than could be recruited, the Army embarked on a massive training program and established the Motor Transport Schools at Camp Holabird in Maryland, Camp Jessup in Georgia, and Forts Bliss and Sam Houston in Texas. However, the Army realized that it still could not train enough mechanics and technicians at government facilities in time to meet the nation's needs. Thus, in February 1918, the Secretary of War appointed the Committee on Education and Special Training to coordinate the training of soldiers in private and public trade schools and colleges around the country. By the end of August 1918, 47,000 men, scattered among more than 300 schools, were studying various technical trades such as blacksmithing, machining, aviation, and motor repair.[2]

A detailed picture of the type of training and depth of experience that American Doughboy mechanics received during the war can be found in the voluminous records of the United States Army. The personal experience of one soldier is found in the rare wartime diary of Pvt. David McNeal who was trained as a mechanic at the Motor Transportation School, Camp Holabird. His diary chronicles the daily combination of lectures, hands-on shop work, and self study that were typical of the Army's technical courses.[3]

Outside of the formal Army organization both the YMCA and the American Red Cross relied heavily on trucks and automobiles to carry out their war welfare work. The YMCA trained many of its own personnel to handle the maintenance and minor repair of the trucks it used. Red Cross workers gained intimate knowledge of the Ford cars and trucks they used to shuttle injured soldiers between medical facilities behind the lines. On the home front, many middle class and wealthy women learned how to drive, maintain, and repair their own vehicles working for the Red Cross or for the various volunteer Women's Motor Corps established in American cities to help ease the domestic transportation crunch during the war.{4}

The post-war experiences of these war-trained mechanics were no doubt varied and the effect of the diffusion of their skills into American's hinterland cannot be precisely calculated. Yet, there can be no doubt that the net result was an increase in the human capital — the technical knowledge — which undergirds industrial society in general and the mechanical experience in particular which fortified America's nascent automobile culture at a critical juncture in its evolution.

At the time of the conference, Kevin Borg was a Ph.D. candidate and Hagley Fellow, University of Delaware, Newark, Delaware. He is also a member of the Society of Automotive Historians.

NOTES

1 On America's relative unpreparedness for motorized warfare, see John C. Speedy, III, "From Mules to Motors: Development of Maintenance Doctrine for Motor Vehicles by the U.S. Army, 1896-1918" (Ph.D. diss., Duke University, 1977), pp. 1-174; James J. Flink, The Automobile Age (Cambridge, Mass.: MIT Press, 1992), pp 73-78; Erna Risch, Quartermaster Support of the Army: A History of the Corps, 1775-1939 (Washington, D.C.: Center of Military History, 1989), pp. 595-97; and W.F. Bradley, "Organization of the French Army Automobile Service," *Automotive Industries* 39 (Dec. 26, 1918), pp. 1093-95. Also see "Chauffeurs Needed for Army Now," *The New York Times* Nov. 19, 1917, p. 6, col. 3, and Ludlow Clayden, "Must Train Military Truck Drivers . . . .", *The Automobile* 36 (Apr. 19, 1917), p. 768.

2 On the Army's early attempts at recruiting skilled mechanics see "A History of the Reconstruction Park," 772, Motor Transportation Corps, n.p. Military History Institute Unit History #1 309-772, 1919, pp. 9-15; and United States, Adjutant General's Office, "The Personnel System of the United States Army" Vol. 1 (Washington, D.C., Government Printing Office, 1919), pp. 27-31. On the establishment of a system of technical training see, United States, War Department, Motor Transportation Corps, "Report of the Chief of the Motor Transportation Corps to the Secretary of War" (Washington, D.C., Government Printing Office, 1919), p. 7; "The Personnel System of the United States Army" Vol. 1 (Washington, D.C.: Government Printing Office, 1919), pp. 528-39; "Courses to Train Technicians and Mechanics for Army Service Begun", *Engineering News*-Record 80 (May 2, 1918)): pp 882-83; "Centralization of Education Functions of War Department," *Engineering News-Record* 81 (July 18, 1918); p. 111; William T. Bawden, "Training the Fighting Mechanic," Manual Training Magazine 20 (Sept. 1918); pp. 1-10; "Engineering Colleges

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3 David McNeal's diary can be found in his file in the World War I Survey Collection at the Military History Institute, Carlisle Barracks, Pa. McNeal's diary entries relating to his training correspond closely to the curriculum guidelines published by the Federal Board for Vocational Education as Bulletin No. 10, *Emergency War Training for Gas-Engine, Motor-Car, and Motor-Cycle Repairmen* (Washington, D.C., Government Printing Office, March 1918). The intensity of his and other soldiers' repair experience is exemplified by McNeal's diary entries from overseas and by a survery of the Weekly Reports of Machine Shop Truck Unit #366, National Archives, Washington, D.C., Record Group 165, Records of the War Department General and Special Staffs, Entry 310, Box 422.

4 "Y.M.C.A. Trucks Carry Movies to Sammies," The Commercial Vehicle 17 (Oct. 15, 1917); pp. 22-23; Virginia Scharff, Taking the Wheel: Women and the Coming of the Motor Age (New York: The Free Press, 1991), pp. 89-109; "Women's Motor Corps on Call Day and Night,", *The New York Times*, April 7, 1918, sec. 7, p. 2, col. 1-4.

Nippon Ford

by J. Scott Mathews

From 1926 to 1936 Ford dominated automobile sales in Japan. Its only true competition came from Chevrolet. Datsun (Nissan) did not exist. Toyoda (Toyota) was making power looms and Soichiro Honda was still a student. The few Japanese companies making cars in the early 1920s were building them by hand, and then fewer than 100 cars a year, as well as a slightly larger number of trucks.

Initially, in 1917, Ford began operating through import-export companies in Japan, which sold completely assembled cars, largely by word of mouth. Later, the company decided to invest directly in the company and, in 1925, Nippon Ford was incorporated. In those days, the business climate was favorable as militarism had not yet taken hold and the government welcomed foreign enterprises that would provide jobs and increase the industrial base of the country. Though there was a tariff of 35 percent on imported automobiles, this did not price Fords beyond the reach of the Japanese consumer.

Ford, with a network of 80 dealers became number one in sales the first year it started assembly of knockdown units there. Model T chassis were sold as well for installation of bodies by local shops to customer order. Two years later Chevrolet came to Japan operating in much the same manner, and Ford's market share began to fall. Chevrolet surged past Ford in 1928 and 1929, but returned to second place in 1930 and thereafter.

One reason for Chevrolet's success was its willingness and ability to finance dealer and consumer purchase of its products. Ford founded its own finance company in Japan in 1928, transferring its start-up shares to Ford USA. You could buy a Model A for 50 percent down with the remainder to be paid in six monthly installments of 6 percent. GM countered with one-third down and 10 months to pay the remainder at 6 percent. Ford matched it and every other GM counter ploy as well, regaining the sales lead.

In 1931, concerned by the dominance of Ford and Chevrolet, the Japanese government established a committee to promote the domestic auto industry. Five years later, this led to the Law Concerning the Manufacture of Motor Vehicles, which stipulated that only companies whose majority stock was held by Japanese citizens would be permitted to manufacture vehicles in Japan, specifically Nissan and Toyoda. Though Ford had planned to build a plant capable of producing 200,000 vehicles a year, under the new restrictions it was limited to 12,360 units. Ford considered a joint venture with Mitsubishi but negotiations failed because the Japanese government was not inclined to promote a third Japanese manufacturer. Ford then attempted negotiations with Toyoda but the military insisted that Nissan be included. Ultimately, Nissan offered to buy out Ford, but this deal also fell through because the law governing foreign exchange would not permit the export of such a large sum of money. Shortly after Pearl Harbor, the government arrested employees and took over the plant. In the following months, the assets of Nippon Ford were transferred to various Japanese automobile companies. The employees were eventually released.

After the war, Ford's attempt to regain its physical plant in Yokohama were stymied by the U.S. government which used it for its own purposes. State Department policy dictated that Ford reenter the Japanese market in partnership with an existing Japanese enterprise, rather than in a manner which would allow it once again to dominate the Japanese market. These attempts failed. Although the postwar Japanese government honored Ford's claims for compensation, this was paid to Nippon Ford and could not be repatriated to the United States because of the currency laws. Ford ultimately sold its properties in the 1960's.

Thus it was that Japanese protectionism with the blessing of the U.S. government prevented Ford's reentry into Japan after World War II. It is ironic that Ford was able to sell more cars in the militarist Japan of the 1930s than it would be able to in the democratic Japan of the 1950s and 1960s.

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Global Reach: The Diffusion of American Power and Influence in the World Automotive Industry, 1896-1946

by Gerald T. Bloomfield

The entry of two Duryea vehicles in the London to Brighton Emancipation Run on November 14, 1896, marked the beginning of American efforts in promoting automobiles overseas. Within a decade, the new industry in the United States was larger than the older established auto industries in France and Germany. The rapid adoption of motor vehicles created the conditions for massive growth of production and the development of new innovations in design and manufacturing. American dominance in the world industry was well established by 1910 and continued into the 1960s.

Canada was the first region to be influenced by American designs, methods and capital investment. By World War I, Britain had a Ford branch assembly plant and factories in Scotland which replicated Detroit production methods. After the war, there was widespread diffusion of corporate sales branches and assembly plants, and acquisition of overseas manufacturers by General Motors: Vauxhall in Great Britain (1925) and Opel in Germany (1929). While direct investment tended to fall off in the 1930s, American influences were important in the creation of the indigenous manufactures in Japan and the newly formed Volkswagenwerk in Germany. The widespread use of American equipment during World War II diffused vehicles to the most remote parts of the world.

American influence and power were spread by the direct activity of American corporations through exports of vehicles, local assembly of completely-knocked-down (ckd) packs, and eventually overseas manufacturing. Of equal significance were the indirect influences. Such influences included the ready availability of information in technical publications, the informal technical transfer of knowledge learned from factory visits as well as more formal transfers such as joint ventures and the licensing of component parts.

American vehicles and production methods were a powerful force in transforming the world in the first half of the 20th Century. While Fordism and Sloanism have been overtaken by new paradigms of production, the widespread use of these terms testifies to the importance of the United States automotive history.

Dr. Bloomfield is a professor in the Department of Geography, University of Guelph, Guelph, Ontario. He is a member of the Society of Automobile Historians.

Employee Empowerment at Delphi Packard Electric: Successful Union Management Cooperation

by John A. Marino

In the spring of 1982, Delphi Packard Electric, formerly known as the Packard Electric Division of General Motors Corporation, a global supplier of automotive electrical components, headquartered in Warren, Ohio, was faced with the problems of declining productivity, increasing costs, and pressures within General Motors to successfully compete with imported automobiles in the U.S. market. The choices were clear: compete in efficiency and effectiveness in manufacturing or out source to lower non-union domestic and foreign component suppliers.

Professor Marino outlined the history of employee empowerment at Delphi Packard Electric from 1982 to the present. He highlighted significant events, specifically the involvement of the labor unions, and their unique cooperation with management while maintaining their identity. He explained in detail examples of implentation of employee empowerment processes and procedures. A chronology from 1982 to 1996 was presented which covered not only the successful aspects of empowerment but also the problems encountered, The techniques that were used to maintain the vision and move toward the cultural change needed to address the efficiencies required to compete in an emerging global marketplace were emphasized.

The speaker believes that the issues addressed and techniques utilized in this successful application of employee empowerment will be helpful to management, consultants, union leaders, and students wanting to emulate successful employee empowerment in a unionized, highly automated, automotive component manufacturing environment.

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The Impact of American Manufacturers in Britain on the Decline of Indigenous Manufacturing

by Thomas G. Velek

An era ended when Rover, Britain's last indigenously owned mass producer of automobiles, was sold to BMW. Long before, Britain had ceased to be a major player in the arena of international automobile production. Formerly viable and well known manufacturers such as Rootes and Standard were gone. Yet Britain had hung on tenaciously to its great production tradition through its top-of-the-line nameplates. Now they too were gone, in a sense. First Ford bought up Jaguar, and, at the end, Rover fell to the Germans. While many would argue that the economic impact of the loss of indigenously owned automobile manufacturing was negligible for the British economy, no one can dispute the harsh psychological and social impact of its demise. It seemed that the long agonizing decline of the British auto industry had concluded in humiliating circumstances amidst national self-loathing.

The Rover buy-out sparked fierce debates in Parliament. Members of the opposition Labour Party called upon Prime Minister John Major's Conservative government to block the sale. However, without an apparent legal reason or appropriate alternative, Major approved the deal. German ownership also raised heated debate among the British people, in industry, universities, and in the pubs. For many it was a dark day for the country, for others such an end was inevitable. All, however, were in agreement on one issue: it was the final chapter in the decline of British automobile manufacturing. An industry that had once ranked #1 in Europe and #2 in the world, behind only the United States, was gone.

Despite the long-acknowledged and recognized shortcomings of the British automobile industry, there was a suspicion that the Brits had gotten the short end of the stick, been treated unfairly, and had not possessed all the advantages of the competition. This feeling was directed most vehemently against the United States, and in particular, Ford and General Motors. It was these goliaths that had destroyed the craft of British motor manufacturing in favor of a fast food, cookie cutter approach to automobiles. Much like at McDonalds, the argument went, no matter what you buy, it's basically the same: a bit of meat on a spongy bun. So it was with cars. The Americans had gutted the passion, art, and craft from the industry in favor of high sales volume based upon emotion-less "Big Mac" vehicles that were reprehensible in their utter lack of individuality. In addition, American manufacturers had used their manufacturing position within Britain to the detriment of indigenous producers. Finally, or so the argument goes, American producers had utilized their greater financial resources and political connections to stifle British production and enhance their own position.

Dr. Velek sought to address these long-neglected assertions. Did American manufacturers operating in Britain have an effect on British manufacturers? More importantly, did the American companies operate unfairly, or benefit from unfair practices and advantages? In addressing these and related questions, Dr. Velek adopted a historiographical approach.

What conclusions regarding the impact of American manufacturers can be drawn from Dr. Velek's analysis? First, in terms of major developments in the manufacture of automobiles (principally Fordism and Sloanism) the presence of American manufacturers in Britain had little effect on the nature of indigenous production. While the long-term effect of this is debatable, most experts agree that at the time and in the short term, the decision not to adopt these American production methods were pragmatic and proper. Indeed, throughout the 1920s and 1930s the British auto industry was robust, healthy, and a world leader, thus giving credence to the wisdom of more traditional British production.

Second, a variety of governmental policies almost certainly had an adverse effect on several aspects of the British industry. Yet, these policies affected American companies as well. However, the government's continued support of direct foreign investment and the rescue of Chrysler in the 1970s, put further strain on already weakened indigenous producers. In other cases, such as the delay in entering the EC, the Americans Ford and Vauxhall, with strong parent companies, were better equipped to survive the wait in a manner that the British companies were not.

Despite this general picture of limited American impact, it cannot be denied that the American companies had extraordinary competitive advantages. For example, Vauxhall's sheer existence was due to prolonged and extensive subsidization by General Motors. Ford could "captive import" half of its sales to enable it to capture market leadership and at the same time make windfall exchange rate profits. In addition, the ability to wait out European integration was possible because of wealthy parents.

In a larger context, it can be argued that the presence of foreign multinationals merely disguised underlying economic weaknesses, and delayed efforts to make indigenous business more competitive. The healthy nature of Ford in Britain masked the overall weakness of the industry. In addition, the existence of three American companies made it difficult for them, particularly for smaller Vauxhall and Chrysler, to become large enough to exploit economies of scale. At the same time, powerful US parents ruled out the likelihood of effecting industry rationalization through merger. As a result, the multinational presence in the UK motor industry affected industry performance regarding productive and allocative efficiency.

In the final analysis, whatever impact American companies had on the decline of their British brethren was minimal. Dr. Velek proposed that the demise of indigenous manufacturing would have occurred with or without the presence of American manufacturers; indeed, it probably would have occurred much sooner. After 1964, it is arguable that it was the policies of the American multinationals that formed any advantage held by the British industry. For example, the

three American companies spent more on investment, relative to their market shares, than the British companies.

Ultimately the blame for decline lay with the British firms themselsves. Amazing though it may seem, BL had no budgeting system as late as 1968. The management of BL often did not know what the true condition of the company was or how to communicate with government. The final word may be given to Orr Ewing, who worked for Ford and Leyland. He is quoted as saying that: "The world of Ford and Leyland is so utterly and completely different; we are not talking about Ford versus BMC or Ford versus Standard-Triumph, we are really dealing with the difference between Earth and the planet Mars." (from "Institutional Insularity: Government and the British Motor Industry Since 1945" by S. Wilks, p. 174; in Governments, Industries and Markets: Aspects of Government-Industry Relations in the UK, Japan, West Germany and the USA since 1945, (London, 1990))

Dr. Velek is assistant professor in the Divsion of Humanities, Mississippi University for Women, Columbus, Miss.

A History of Automotive Electrics as Seen Through Wiring Diagrams

by Frank E. Gump, M.D., FACS

The need for reliable ignition systems brought electricity into the internal combusion engine at an early age. Lighting followed, but integrated systems and wiring diagrams first appeared at the time of the first World War. It is possible to trace the development of all electrical accessories and their variations by studying wiring diagrams and this includes everything from anti-theft devices (1928) to electric horns and wipers. Magnetos, self starters and 6 vs. 12 volt debates, fusing devices, progressing all the way up to electronic engine control, can be examined through wiring diagrams.

The history of wiring diagrams is itself of interest. They started as blueprints but evolved into mixtures of schematics and component locators often unique to individual makers (Fig. 1).

Dr. Frank E. Gump is Chief, Surgical Service, Department of Veterans Affairs, East Orange, N.J. and Professor of Surgery, UMDNJ/New Jersey Medical School. He is also a member of the Society of Automotive Historians.

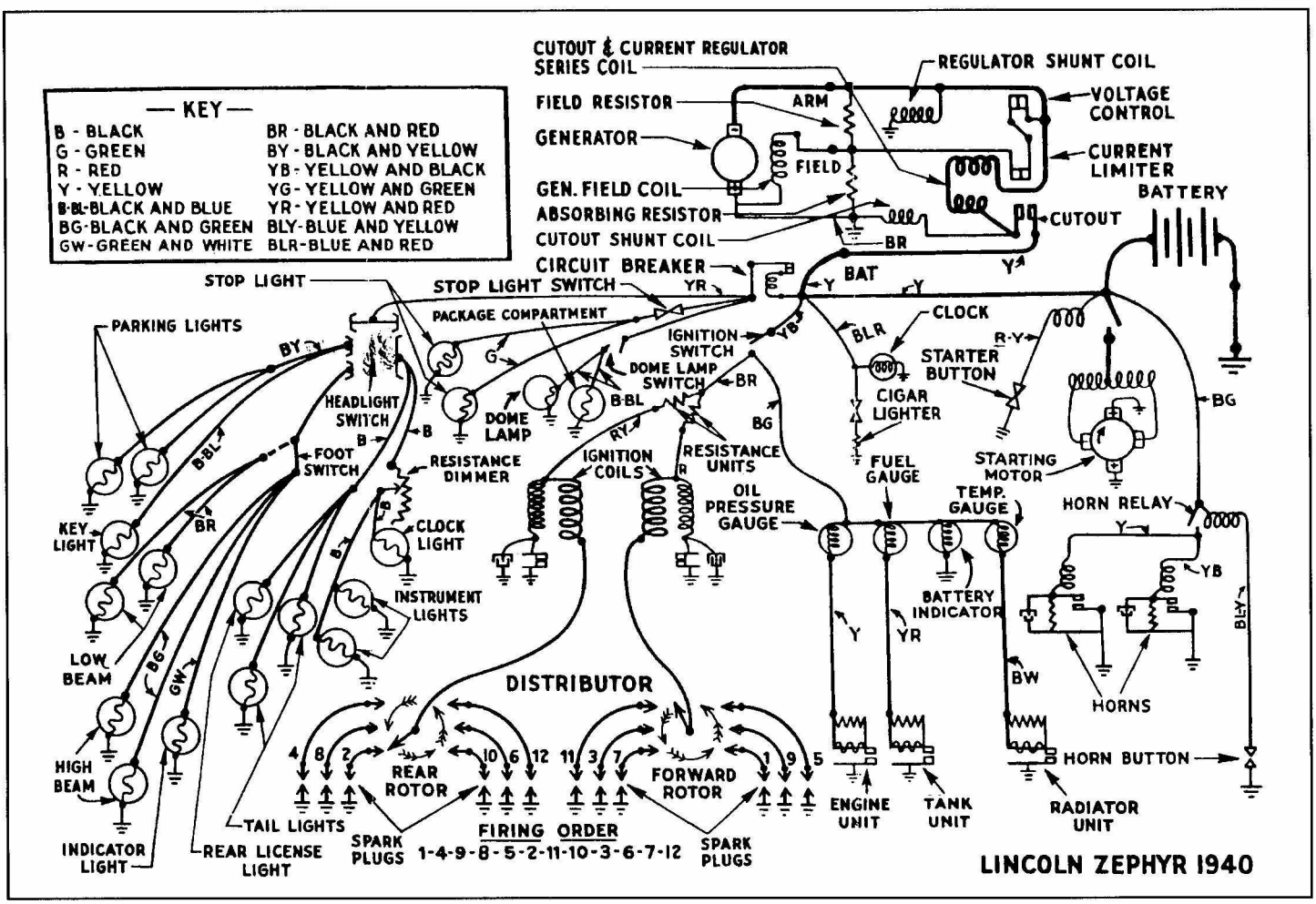

Fig. 1 - Simplified wiring diagram of the 1940 Lincoln-Zephyr, described by Dr. Gump as a "weeping willow" type.

The Development of GM's Chairmen: The Extraordinary Role and Impact of The New York Treasurer's Office 1919-1996

by William P. MacKinnon

This paper described and analyzed the extraordinary role of General Motors' small Treasurer's Office in New York (T.O.-N.Y.) since the close of World War I in the professional development of a virtually unbroken line of GM Chairmen who were assigned there during the formative years of their careers: Albert Bradley, Frederic G. Donner, Thomas A. Murphy, Roger B. Smith, and the incumbent John F. Smith, Jr. In addition to these senior executives and a disproportionate number of their immediate lieutenants, T.O.-N.Y. spawned over the decades a group of distinguished managers who left GM to lead other complex organizations, the most prominent of whom were Edward R. Stettinius, Jr. (Chairman of U.S. Steel, F.D.R.'s last Secretary of State, and a founder of the United Nations); Ernest R. Breech (Chairman of the Ford Motor Company); and Robert R. Young (CEO of the Chesapeake & Ohio Railroad and then the New York Central Railroad).

MacKinnon probed the "how" and "why of this never-studied organizational phenomenon by drawing extensively on his own unusual combination of experiences, perspectives, and resources: 25 years as a GM executive (including 10 years as a manager in T.O.-N.Y. and five years as the company's corporate personnel vice president); 35 years as a published historian; and 10 years as an independent management consultant advising the CEO's and Boards of more than 70 other companies in a variety of industries. Although GM was not involved in the development of this paper, MacKinnon's research included extensive, unprecedented personal interviews with the six men still living who have served GM as both Chairman and CEO.

The paper attributed T.O.-N.Y.'s influence within GM to five principal interrelated factors, some of which took shape in the post-World War I changing of the guard atop GM — involving William C. Durant, Pierre S. duPont and Alfred P. Sloan, Jr. — and then accelerated as the Office's alumni rose in influence and organizational responsibility to run significant parts if not all of GM in subsequent decades. These factors are:

* The decision in the early 1920s that GM Board meetings would be held in New York City and that T.O.-N.Y. would, in addition to its normal duties, "staff" the Board and its standing committees.

* A post-Durant influx of talented financial executives from the duPont company — principally Donaldson Brown and John J. Raskob — who, in turn, recruited two brilliant, highly-educated managers — Albert Bradley and Frederic G. Donner — intent on building an internal financial powerhouse through rigorous recruiting standards at demanding universities/graduate schools coupled with a relentless focus on analysis — even "pulverization" — of business problems.

* A senior management style — starting with Sloan — that viewed Finance as a full partner to discussions and decision-making in the enterprise rather than as just a staff function.

* A willingness to assign collateral, non-treasury duties to T.O.-N.Y's analysts that brought them into high-visibility contact with Directors and senior executives reinforced by a "can-do" reaching out for responsibility by the Office's leaders and analysts.

* T.O.-N.Y.'s willingness to fill on a de facto basis an educational vacuum in GM's management development traditions not addressed institutionally until the 1997 creation of an embryonic GE-inspired "GM University."

To the extent that these forces and behaviors developed into traditions, they tended also to become self-perpetuating vis-a-vis T.O.-N.Y.'s organizational influence.

Complementing this positive discussion, MacKinnon identified several phenomena constituting a "dark side" to the T.O.-N.Y. experience. A rigorous, traditional work style excessively focused on long hours and detail — some of it unimportant — that drove talent out of GM while disrupting the family life of many who stayed; the development of a competitive, even political behavior in some analysts that drew hostility from GM's operating divisions as well as the Detroit-based Comptroller's staff; and an overshadowing of GM's other (non-Finance) corporate functions that resulted in a certain efficiency but also in a somewhat one-dimensional "flavor" to the company's staff work and response to sensitive internal/external problems. Unaddressed in this paper (due to the conference's time constraints) was the important — but somewhat different — issue of the performance and effectiveness of T.O.-N.Y.'s senior alumni, a subject attracting the fascination of journalists (but not serious historians) as GM lurched toward near-catastrophe in the late 1980s and early 1990s.

William MacKinnon is president, MacKinnon and Associates, Bloomfield Hills, Michigan. He is a former vice-president of General Motors. His articles on military affairs and Western Americana have been published in more than ten journals in the U.K. and U.S.

From the "Rapid Conveyance" to the "Studebaker Salesman": Commercial Advertising and the Commerce of Democracy

by C.T. Walters and T.N. Walters

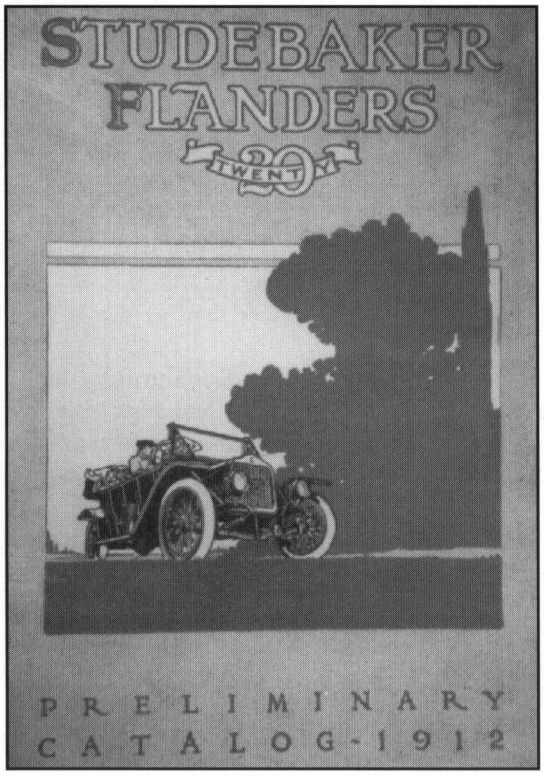

Fig. 1 - The 1912 Flanders

From Mrs. John Jacob Astor to the Peerless Beauty, from *Harper's Bazaar* to *Leslie's Popular Monthly*, the American automobile became the ultimate status symbol of The Gilded Age. Originally, the automobile was so expensive to manufacture, to purchase and to maintain, that it was reserved for millionaires' Red Devils (contemporary slang for powerful racing machines) and millionairesses' victorias. The cover of a September issue of *Harper's Bazaar* was dedicated to the annual Automobile Floral Parade at Newport. A brilliant visual essay portrays Mrs. Belmont and Mrs. Oelrichs, among other social elite, ensconced in horseless carriages bedecked with floral arrangements as elaborate, exuberant, and as ostentatious as The Breakers. In January of 1904, *Leslie's Monthly* devoted an entire issue to the automobile. Photographs, drawings, colored lithographs, even short stories and poems extolled the virtues and values of the newly developed "road machine." The automobile number was appended with a list for the informed consumer including nearly one hundred photos of gasoline carriages from the Pierce-Arrow to the Studebaker with more than ten body types from the tonneau, to the landau, to the brougham. A short story, "The Rapid Conveyance," written especially for the magazine and illustrated by a set of brilliantly conceived cartoons, satirized the adventures of a wealthy gentleman, a proper member of the genteel society, with his newly purchased auto and his vain attempts to learn how to drive as his carriage dodges milk cans, puppies, little old ladies, and children, and careens into the countryside.

During the initial decades of the 20th Century, the Studebaker Corporation of South Bend, Indiana, the single oldest company involved in the production of the automobile, initiated one of the first campaigns of commercial advertising. Carefully collected and collated, the scrapbooks in the Studebaker Archives, dated from 1910 to 1914 (the subject of the presentation), were organized to reflect virtually every mechanical, commercial and artistic aspect of the cars produced in South Bend. In intent, these advertising campaigns were democratic and inclusive. Visually, the printed materials were formed to appeal to the broadest spectrum of consumers. The purpose was to create an image for the Studebaker that would appeal to the gentleman touring town and country, or to the rural farmer who needed access to markets for his produce. The Studebaker was so carefully designed, it was pointed out, that the newly emancipated woman, illustrated wearing a hat embroidered with wings, could drive her car through a window of social restriction toward a new horizon of opportunity never available before the advent of the touring machine. This pluralism is matched by the advertising. In pamphlets and portfolios and fliers so carefully preserved, something so simple as lettering prefaced all the intricacies of the psychology of salesmanship.

On the most rudimentary level, carefully drawn and arranged script created a poetry of commercial experience. Gothic Revival scripts and Art Nouveau type touted such mottos as the "Proof of the Pudding" and "Automotive Values" in

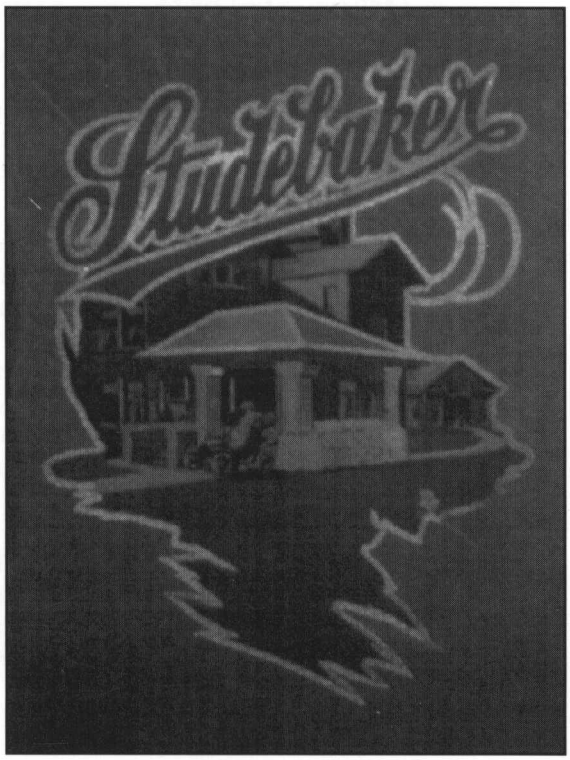

Fig. 2 - The Studebaker in front of a "Gustav Stickley" bungalow.

lettering as beautiful as the finest rare book or poster. While Studebaker advertising was based at least partially on the traditions of the illustrated book, it mirrored the finest of current painting and design. In a brochure from 1911 labeled "20,000 Reasons," a series of radiators, a mechanical product, is repeated line by line and register by register to create an arabesque suggestive of a William Morris design for wallpaper. The traditional techniques attributable to landscape painting were also adapted to create a panorama for the Studebaker. Against a silhouette of greens and blues, a 1912 Flanders speeds into the distance to the accompaniment of trees, skies and forests (Fig. 1).

The commercial advertisements that the Studebaker Corporation so carefully developed were as modern and up-to-date as the cars themselves. In their study, the Walters encountered arts of progress and design, a brilliant paraphrase of the most important designed art of the Arts and Crafts Movement. A Studebaker parks in front of a Gustav Stickley bungalow painted in the inspired appropriate earthen colors of dark browns and dark greens (Fig. 2). The newest and most advanced technology, photography and the movies, were enlisted to further instill the pride of owning a Studebaker. The archives contain a small booklet illustrated with toned photographs evocative of current fine art photography that announces the "Tour of a Motorist from New York to Venice and Return." A gentleman now made the Grand Tour of Europe not to look at Renaissance Art but rather to explore hidden byways concealing picturesue Italian villages. Even the most marvelous invention of popular culture, the silent film, was engaged to sell the automobile. One full page flier shows a stage framed by a curtain, and on the stage, a Studebaker touring car with hundreds of people in the audience. The caption reads, "Every eye focused, every mind receptive."

Perhaps of all the items catalogued in the first archives, the signifance of corporate strategy is best recounted in one final example. A double page ad shows a Studebaker at the top of a carefully illustrated podium. The platform is complied of seven levels, each one carefully labeled with a specific motto. The lettering ranges from Economic Stability to Technical Sophistication and Reliability. The steps of the platform are displayed against the Studebaker factory. As smoke spews forth, an assembled crowd cheers the Studebaker carriage that emerges from a modern industrial landscape. According to the logic of word and image, this elegant piece of commerce promises to fulfill the wants and needs of the informed modern consumer.

The message of all these ads shares a common purpose. through landscape painting, photography, architecture, and decoration, the Studebaker advertising campaign created a shared experience: the pride of owning the best automobile substantitated by the best art. According to the information visualized by the Studebaker Archives, the most splendid example of luxury at the end of one century and the beginning of another was the American automobile. It was the perfect mechanism, both beautiful and utilitarian. As one of the most important manifestations of the new consumerism, the gasoline carriage forever changed the economic and social landscape of the United States. The ads, so individualistic and artfully consolidated by the Studebaker Corporation, helped to create a new consumerism. The gasoline carriage previously reserved only for the rich forever changed the economic and social landscape of the United States. And Studebaker, with product and artistic design, helped to accomplish that change.

C.T. Walters, Department of Art/Art History, Bloomsburg University, Bloomsburg Pa.; his brother, T.N. Walters, Department of Journalism, Northeast Louisana University, Monroe, La.

The First Century of the Automobile as Seen in Showroom Sales Literature

by Torrey H. Brinkley

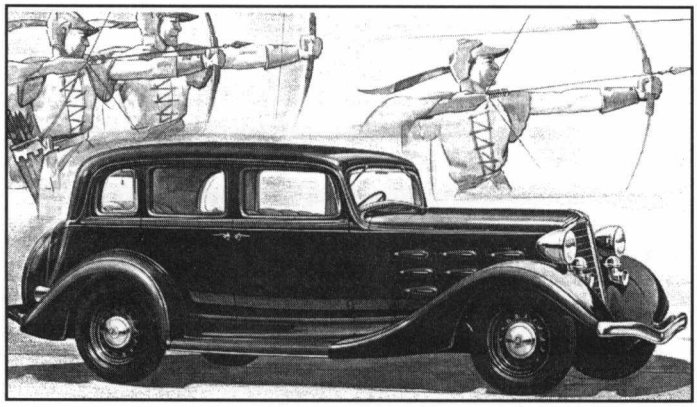

Fig. 1 - From the 1934 Reo Flying Cloud sales catalogue

The first century of the automobile can be best understood and celebrated when viewed through a collective sampling of manufacturers' showroom sales literature, which has been preserved, categorized and shared by hobby enthusiasts from around the world (Fig. 1).

A century of automobiles has produced tens of thousands of different makes and models worldwide.

Showroom sales literature printed for and by the different manufacturers significantly reflects the culture, economic conditions and technological advancements of each decade.

Auto literature collectors on every continent are those who regularly attempt to preserve the historical value of specially produced pieces for new model introductions, the unusual sports or luxury models or rare experimental cars, placing high values on certain brochures while trivializing others.

A wide variety of people are involved in sales catalogs, from those who design the catalogs themselves, those who choose special printing and binding processes, those who then distribute the brochures to prospects, the collectors who preserve them, and the wide variety of auto club folk who value them.

Torrey H. Brinkley lives in Mead, Colorado, where he runs The Literature Exchange.

Early Automobile Manufacturing in London, Ontario

by Douglas Leighton

Located halfway between Toronto and Detroit, London today is seen as a comfortable regional center with a population approaching 360,000. The local economy is mixed: education; business and finance; industry and health care provide a base for local prosperity.

Few realize that 75 years ago, the London area was a center for the manufacture and assembly of cars and trucks. Ford, Canadian Crow, Harding and the London Six produced automobiles, while Ruggles and Barton & Rumble turned out trucks. A study of these early developments aids the historical understanding of the region, its society and its industrial development.

Douglas Leighton is Associate Professor, Department of History, Huron College, London, Ontario, and a member of the Society of Automotive Historians.

"Millions of People are Wealthy": The Automobile Industry as Contested Symbol of American Progress

by Amy Bix

In the years before America's Depression, automobile companies had made impressive improvements in design, production, and sales, leading all other industries in product value by the mid-1920s. Equally important, the car had been established as primary symbol of 20th Century American progress, representing faith that Machine Age technology moved the country toward unprecedented wealth and success. The 1929 crash, however, threw such confident assumptions into confusion; taking the auto industry as barometer for national economic and social well-being, some Americans foresaw trouble.

Critics especially feared that mechanization in automaking contributed to the nation's 33 percent joblessness rate, leading to a crisis of "technological unemployment." According to the U.S. Bureau of Labor Statistics, "one man with a spot-welding machine is equivalent to eight hand riveters. An automatic enameling machine requires 30 percent as much labor as hand dipping." Milwaukee's A.O. Smith auto-frame plant became famous as the nation's most mechanized factory; its rows of punching, pressing, riveting, inspecting and finishing machines manufactured up to 10,000 frames daily. The president apologized that though the company "set out to build frames without men," they had gotten distracted and so "left a few operations to human labor." To critics such as Stuart Chase, this "iron bouncer" showed that the auto industry, like other business, was driving the United States toward economic and social disaster, while creating tension and labor trouble among auto workers.

But automobile company leaders moved to defend their industry against such accusations, calling A.O. Smith a "striking" technical achievement in industrial engineering which represented all the wonders modern technology could offer Americans. Alfred Sloan, Charles Kettering, Henry Ford and others portrayed automaking as indispensable to the "economy of plenty," creating up to 11 million new jobs in manufacture, sales, service, and associated enterprise. Far from despairing over mechanization, they contended, Depression-era Americans should appreciate that modern production technology made them the world's luckiest consumers, enjoying "an automobile standard of living" as compared with Europeans' "bicycle standard." Advertisements in 1937 showing a couple riding in a sporty roadster proclaimed "Millions of people are wealthy," while billboards of a family out for a drive read "World's Highest Standard of Living." The General Motors 1939 New York World's Fair "Futurama" exhibit dramatized the way business worked to reinforce the image of the auto as symbol of American progress, in the midst of Depression concerns.

All through the 1930s, in attempts to understand and explain the national situation, Americans turned to the auto as their main point of reference. Critics used it to explain why America's economic system had collapsed; defenders used it to validate continued faith that technology would keep America at the peak of civilization. The auto had been established as a defining standard of American life, a measure for evaluating the nation's past, present, and future. The Depression-era auto industry represented a powerful, though contested, symbol of American economic and social prospects.

Dr. Amy Bix is Assistant Professor, Department of History, Iowa State University, Ames, Iowa, and a member of the Society of Automotive Historians.

FROM THE SAH CONFERENCE PROGRAM CHAIR

When we issued the call for papers for SAH's first-ever automotive history conference, jointly sponsored with Henry Ford Museum & Greenfield Village, we had no idea what the response would be. Would we have a balanced program, exploring all aspects of our theme "The American Automobile Industry - Past, Present, Future"? Would we have a heterogeneous group of presenters, industry people and lay historians as well as academic researchers? Would the conference be interesting, to SAH members, car enthusiasts and the general public? Did we have a contingency plan to put on a "good show" if proposals for papers were disappointing?

I needn't have worried for a moment. The depth of interest became apparent as soon as the call was issued. Inquiries came by mail, telephone, and over the internet. They came from the Detroit area, all over the US, and from other parts of the globe: England, Sweden, the Netherlands, and Belarus. They represented all the constituencies noted above and a few others, including at least one high school student. And the topics on which they wished to speak covered just about every aspect of the industry.

The goal was to have a full day of interesting presentations; when all proposals were in and the selections made we ended up with a day and a half of concurrent sessions. The conference drew a very satisfying number of attendees, many of them from outside traditional SAH circles. In terms of quality and quantity, the conference was an unqualified success, and we look forward to another, "Interpreting the Automobile," to be held September 9-12, 1998, again at Henry Ford Museum & Greenfield Village, in collaboration with the Museum and jointly sponsored by the National Association of Automobile Museums.

At conference's end, we found one goal unfulfilled. We had made no provision for publishing any of the papers presented. Some authors had already submitted their work to learned journals, but the work of other presenters warranted wider promulgation in some medium. Thus it's appropriate that we devote an entire issue of *Automotive History Review* to bring this work to all members. I'm grateful to the author-presenters for making their papers available, either in full or in abstract form, and to Taylor Vinson for preparing this issue. This has been a most rewarding project.

Kit Foster
SAH Program Chair

THE SECOND AUTOMOTIVE HISTORY CONFERENCE

"Interpreting the Automobile"
September 9-12, 1998
Dearborn, Michigan

The Second Automotive History Conference will be held Wednesday-Saturday, September 9-12, 1998, at the Henry Ford Museum in Dearborn, Michigan. Jointly sponsored by the Society of Automotive Historians and the National Association of Automotive Museums, it will be conducted in conjunction with Henry Ford Museum & Greenfield Village.

Entitled "Interpreting the Automobile," the conference will be a symposium exploring the impact and meaning of the automobile in America.

The sponsors sought proposals by February 1, 1998, for papers to be presented at the conference on topics pertaining to the interpretation of the automobile, its industry, and the culture surrounding it. Potential topics of interest might be automobile manufacturing, the cultural impact of the automobile, the roadside economy, the growth of cities, or interpretive issues in presenting automotive history to the public.

If the reader wishes more information or would like to assist the sponsors in some way, please contact:

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