



# ASABE

*Engineering a Sustainable Future*

## HISTORIC AGRICULTURAL & BIOLOGICAL ENGINEERING LANDMARKS

*A brief summary of ASABE Historic Commemorations*

\* These sites were recognized before the current ASABE Historic Landmarks Program was formalized.

- \*1. **Ives Hall** - The Agricultural Engineering building at The Ohio State University in honor of Frederick Walter Ives for his outstanding accomplishments in establishing the Department at The Ohio State University, Columbus, Ohio. Dedicated on Feb. 3, 1926. A new plaque was dedicated on Nov. 20, 2003, and now is located at the southwest exterior wall of the Agricultural Engineering Building, The Ohio State University, 590 Woody Hayes Dr., Columbus, Ohio. Rededicated November 20, 2003.
- \*2. **Agricultural Engineering Building, University of Wisconsin, Madison** - To commemorate the founding of the American Society of Agricultural Engineers in that building on December 27, 1907. Re-dedicated June 22, 1982.
- \*3. **John Johnston Farm**, Geneva, New York - To commemorate the work of John Johnston, who in 1835 was the first person in the United States to lay tile to drain wet soils on a farm field. By 1856 he had laid over 51 miles of drain tile on his farm, enabling wheat yields to be doubled. (Dedicated October 9, 1935)
- \*4. **Cyrus McCormick Walnut Grove Farm**, Steel's Tavern, Virginia - To commemorate Cyrus McCormick's development of the reaper in the mid 1800s, which revolutionized grain harvesting. (Dedicated June 28, 1972)
- \*5. **Davidson Hall** - The Agricultural Engineering laboratory at Iowa State University, Ames, Iowa, was renamed Davidson Hall and the building was cited as a landmark to honor J. Brownlee Davidson, ASABE'S founder and first president. He was also head of the Agricultural Engineering Department at Iowa State University from 1905 to 1946. (Dedicated November 14, 1975)
- \*6. **Site of the First Pit Silos for Ensiling Corn in the United States** - To recognize the accomplishments of Francis Morris, who in the late 19th century built the first pit silos to preserve corn silage on his farm, in Oakland Manor, Maryland. (Dedicated October 23, 1976)

- \*7. **John Deere's Blacksmith Shop**, Grand Detour, Illinois - To commemorate the development of the first self-scouring steel moldboard plow by Deere in 1837. (Dedicated November 16, 1976)
- \*8. **Moore-Hascall Combine** - To recognize the accomplishments of Hiram Moore and John Hascall, who developed a machine for mowing, winnowing, and threshing grain in 1836. ASABE's plaque is located in Farrall Hall on the Michigan State University Campus, East Lansing. A model of the original machine is housed in the Michigan State University Museum. (Dedicated March 22, 1978)
- \*9. **Scoates Hall, Agricultural Engineering Building, Texas A&M University**, College Station, Texas - To honor Daniels Scoates, who designed the building and who was Head of the Agricultural Engineering Department from 1919-1939. (Dedicated May 16, 1978)
- \*10. **Old Red, First Commercial Spindle Cotton Picker** - Dedicated at National Museum of History and Technology, Smithsonian Institution, Washington, D.C. Old Red was one of four mechanical pickers that moved across the San Joaquin Valley's west side in 1943, ushering in the biggest change in the cotton industry since the cotton gin. Producers Cotton Oil Company, the original owner, had the machine rebuilt and then donated it to the Smithsonian Institution in 1970. (Dedicated October 20, 1978)
- 11. **World's First Successful Automatic Pickup, Self-Tying Hay and Straw Baler** - Dedicated at Sperry New Holland, Pennsylvania, and honoring the Lancaster County farmer who put together a field machine to form and tie hay bales under compression. In 1940 the New Holland Machine Company agreed to build his design, which led to the modern hay baler. (Dedicated August 8, 1979)
- 12. **Farmall Tractor**, Burr Ridge, Illinois - Dedicated at the International Harvester Agricultural Equipment Engineering Center to commemorate the site where the world's first successful row-crop tractor was operated and tested in 1923. (Dedicated May 1, 1980)
- 13. **Ann Arbor Baler**, Shelbyville, Illinois - To commemorate the site of the developer and manufacturer of the world's first pickup baler in 1929. (Dedicated May 3, 1980)
- 14. **Nebraska Tractor Test Laboratory** - This "consumer watchdog" facility for farm tractors, located in Lincoln, Nebraska, was the first of its kind in the world. First performance tests for tractors were conducted here in 1920. (Dedicated July 25, 1980)

15. **Massey-Harris #20 Combine** - The first commercially successful self-propelled combine used to harvest small grains under a wide variety of conditions worldwide. Located in the Ford Museum, Dearborn, Michigan. (Dedicated April 23, 1982)
16. **Track-Type Tractor** - The huge 'grandfather' of a variety of off-highway construction equipment and of the familiar military tank; developed and patented by the Holt Brothers of Stockton, California. Located in the Haggin Museum, Stockton, California. (Dedicated January 13, 1983)
17. **Holt Brothers Combine** - A unique combine design developed in response to the need for a method of speedily harvesting grain on the steep but fertile hillsides of California, Washington, and Idaho. Located in the Holt Exhibit, Haggin Museum, Stockton, California. (Dedicated June 13, 1983)
18. **First Tower Silo in America** - Farmer Lewis Hatch and son Fred designed and built the first vertical silo, a design that provided basic technology leading to the tower silos that now accent the US countryside. Located at the Lyle C. Thomas Park and Landing in Spring Grove, Illinois. (Dedicated May 19, 1984)
19. **Parshall Measuring Flume** - Invented by Ralph L. Parshall in 1922, the flume revolutionized irrigation measurements and is still used worldwide. This Historic Landmark plaque is mounted on the northeast corner of the Lory Student Center at Colorado State University, Fort Collins, at the site of the original Hydraulics Laboratory where Parshall carried out his research. (Dedicated July 1, 1985)
20. **Cotton Gin** - Eli Whitney developed his first hand-operated cotton gin on the Gen. Nathaniel Greene plantation, near Savannah, and obtained a patent on 14 March, 1794. The gin was responsible for the survival of the cotton industry in the south. A plaque honoring the development is located at the Cotton Exchange Commission Building in Savannah, Georgia. (Dedicated July 25, 1986)
21. **ROPS (Roll Over Protective Structure)** - Roll-over protection for operators of farm tractors was developed by Lloyd H. Lamouria, Ralph R. Parks, and Coby Lorenzen at UC-Davis in 1956. Warren Hansen equipped tractor mowers with ROPS for the North Dakota Highway Department in 1959. The first commercial ROPS was offered by Deere & Company through efforts of Charles S. Morrison. Plaques recognizing ROPS are located at the John Deere Product Engineering Center, Waterloo, Iowa; the Bonanzaville USA Historic Museum, West Fargo, North Dakota; and at the Agricultural Engineering Building in Davis, California. (Dedicated September 25, 1986)

22. **Forage Harvester** - The first commercially successful pickup forage harvester was developed by Chief Engineer Erwin W. Saiberlich and sold in 1932 by Fox River Tractor Company of Appleton, Wisconsin. Prof. Floyd W. Duffee at the Agricultural Engineering Department, University of Wisconsin, had designed earlier models. A similar device was patented by William J. Conroy of Aylmer, Quebec, in 1891, but never commercialized. One plaque, dedicated in 1989, is located at the University of Wisconsin Agricultural Engineering Laboratory. A plaque, in French and English, to replace the original Aylmer plaque, was dedicated in 2004 and is displayed in front of the Symmes Inn, Aylmer neighborhood, City of Gatineau, Quebec, Canada. (Dedicated March 16, 1989 & August 2, 2004)
23. **Design for Vegetated Waterways** - Engineers of the Soil Conservation Service developed procedures for vegetating waterways to prevent erosion at an outdoor laboratory near Spartanburg, South Carolina, in 1935. These concepts, developed under W.O. Ree's leadership, have led to design of over 500,000 miles of waterways that now safely convey runoff from millions of acres. A plaque recognizing this development was dedicated in Stillwater, Oklahoma, near Lake Carl Blackwell, where the laboratory is now located. (Dedicated October 19, 1990)
24. **Rain Bird Sprinkler** - The invention of the Impact Sprinkler Head by Orton Englehardt in Glendora, California, in 1933 contributed greatly to the expansion of sprinkler irrigation. Commemorative plaques, dedicated in 1990, are located at Glendora's Heritage Park (near the original Englehardt shed where the sprinkler was invented) and at the corporate office of Rain Bird, which commercialized the development. (Dedicated October 30, 1990)
25. **Tillage and Traction Equipment Design Criteria** - A development that led to new tillage tools. The pioneering work in soil dynamics initiated in 1922 by Dr. Mark L. Nichols, Professor of Agricultural Engineering at Auburn University, is commemorated with a plaque at the Farm Tillage Machinery Laboratory (now the National Soil Dynamics Laboratory) in Auburn, Alabama. (Dedicated October 12, 1990)
26. **Corn Silage Harvester** - Charles C. Fenno of Grinnell, Iowa patented the first field corn silage harvester. Andrean and Adolph Ronning, of Boyd, Minnesota, patented further improvements in 1915. Two plaques were dedicated to recognize two corn silage harvester developments. Plaques dedicated in 1992 are located on the Poweshiek County Fair Grounds in Grinnell, Iowa, and in the Biosystems and Agricultural Engineering Building on the Twin Cities campus of the University of Minnesota. (Dedicated November 19, 1992)

27. **FMC Continuous Rotary Pressure Sterilizer** - The food canning industry was revolutionized in 1920, when the continuous rotary pressure sterilizer was introduced by Albert R. Thompson. Thompson was chief engineer for the Anderson-Barngrover Co. of San Jose, California, now the FMC Corporation. The plaque was dedicated in 1992 at the FPSD manufacturing plant in Madera, California. (Dedicated February 13, 1992)
28. **Slow Moving Vehicle (SMV) Emblem** - The Slow Moving Vehicle (SMV) Emblem, which has made a significant contributions to agricultural and highway safety, was developed, 1961-63, by Kenneth A. Harkness, of the Department of Agricultural Engineering at The Ohio State University. The emblem became the first ASABE Standard (1964) to be ratified by the American National Standards Institute and become an Occupational Safety and Health Administration regulation. The plaque was dedicated in 1992 in the Agricultural Engineering building at The Ohio State University. (Dedicated September 4, 1992)
29. **Hume-Love Floating Cutterbar and Pickup Reel** - The flexible floating cutter bar and the tined pickup reel, patented in 1932 and 1935, were developed by James E. Love and Horace D. Hume near Garfield, Washington, and are used extensively for harvesting peas, lentils and soybeans. The plaque is located at the Horn Scholl Safety Rest Stop on U.S. Highway 195 near Rosalia, Washington (30 miles south of Spokane). (Dedicated June 24, 1993)
30. **Center Pivot Irrigator** - Frank Zybach, farming near Strasburg, Colorado, patented a "Self-Propelled Sprinkling Irrigating Apparatus" in 1952, starting an industry with several manufacturers, including Valley Manufacturing, who first commercialized the irrigator. The irrigator is commemorated by a plaque located at Pioneer Village in Minden, Nebraska. (Dedicated September 18, 1993)
31. **Luebben Hay Baler** - The Luebben round hay baler was developed by Hugh Luebben of Sutton, Nebraska, with sons Melchior and Ummo. The same basic design is used on modern large round balers. It is commemorated with a bronze plaque at Pioneer Village in Minden, Nebraska. (Dedicated September 18, 1993)
32. **Pole-Frame Building** - In the mid-1940s, "B.G." Perkins of Doane Agricultural Services introduced a new pole-frame construction that revolutionized the way barns were built and gave birth to the pole-frame construction industry. A plaque recognizing the pole-frame building was commemorated in St. Joseph, Missouri, and is located in the headquarters of the National Frame Builders Association in Lawrence, Kansas. (Dedicated April 8, 1995)

33. **Agricultural Aviation** - Agricultural aviation began in 1921 when C.R. Neillie used a military plane to dust catalpa trees near Troy, Ohio. B.R. Coad, C.E. Woolman, G.B. Post and Delta Air Service improved on the development, such that the quality and safety of foods, fiber and the health of people worldwide have been greatly improved. A plaque was dedicated at the National Aerial Applicators Association meeting in Mobile, Alabama, and is located in the National Agricultural Aviation Association Museum in Jackson, Mississippi. (Dedicated December 7, 1995)
34. **Rubber Tires on Tractors** - Hoyle Pounds in Florida in 1926, Hessel Roorda in Iowa in 1929, and Harry Merritt, of Allis-Chalmers, in Wisconsin in 1932 pioneered the developments that led to rubber tires on almost all farm tractors by 1940. Plaques recognizing those developments were commemorated on March 29, 1996, at the Orange County Historical Museum in Orlando, Florida; October 3, 1997, in Centennial Park in Rock Valley, Iowa; and October 3, 1997, in Stonefield Village, Cassville, Wisconsin.
35. **Internal Combustion Tractor** - In 1902, C. W. Hart and C. H. Parr, produced and sold the first Hart-Parr tractor. By 1940 tractors with internal combustion engines had largely replaced horses and steam engines. A plaque commemorating the internal combustion tractor was dedicated at the Floyd County Museum in Charles City, Iowa, February 18, 1999.
36. **Shielded Snapping Rolls for Corn Harvesting** - Following early developments in the mid-1800s, C. Morrison, of Deere & Co., harvested corn with a combine using shielded snapping rolls in 1952, leading to domination of corn harvests by combines with safe, efficient, shielded snapping rolls. A plaque commemorating shielding snapping rolls was dedicated at the John Deere Des Moines works in Ankeny, Iowa, September 24, 1998.
37. **Slotted Inlet Ventilation** - A crucial step in the evolution of modern animal agriculture was the development of mechanical ventilation methods for animal housing. In the late 1940s W. F. Millier, working at Cornell University with Prof. C. Turner, developed the concept of the slotted inlet, which is now widely used for mechanically ventilated agricultural buildings. A plaque commemorating slotted inlets was dedicated at Cornell University, Ithaca, New York, November 23, 1998.
38. **Graham-Hoeme Chisel Plow** - Fred Hoeme, of Hooker, Oklahoma, developed a heavy-duty chisel plow in 1933. He made and sold about 2000. In 1938, W.T. Graham, Amarillo, Texas, purchased manufacturing and distribution rights. About half of American Great Plains farmers have owned chisel plows, using them to control wind erosion. Commemorative plaques were dedicated in Hooker, Oklahoma, May 27, 2000, and Bushland, Texas, October 17, 1999.

39. **Grain Aeration** - Studies of aeration systems to cool and dry harvested grain were begun in Kansas in 1930 and continued in other states. The first commercial system was used in Arkansas in 1949-1950. Aeration is essential to maintaining an adequate supply of quality grain to feed the world's people. Plaques honor this historic landmark at the following four sites: Davidson Hall, Iowa State University, Ames, Iowa (March 1, 2001); Seaton Hall at Kansas State University, Manhattan, Kansas (November 2, 2001); the Agricultural and Biological Engineering Building at Purdue University, W. Lafayette, Indiana (April 19, 2001); and the Agricultural Museum in Stuttgart, Arkansas (August 25, 2001).
  
40. **Cotton Module Builder** - The Cotton Module Builder, which revolutionized the cotton industry, is commemorated with an historic landmark plaque housed in Scoates Hall on the campus of Texas A&M University in College, Station, Texas. (Dedicated May 29, 2002)
  
41. **Universal Soil Loss Equation** - Development of the Universal Soil Loss Equation (USLE), with a national effort led by Walter H. Wischmeier and Dwight D. Smith at the USDA National Runoff and Soil Loss Data Center at Purdue University. A dedication ceremony was held on April 25, 2003, at Purdue University, and the permanent location for the landmark plaque will be at the USDA-ARS National Soil Erosion Research Laboratory (NSERL) at Purdue University. (Dedicated April 25, 2003)
  
42. **Rumely OilPull Tractor** - The Rumely OilPull Tractor, developed by John Secor, chief engineer at the Rumely Company of La Porte, Indiana, was commemorated with a bronze plaque in La Porte, Indiana, Saturday, March 15, 2003. To visit ASABE's plaque commemorating the Rumely OilPull Tractor in La Porte, Indiana, look for the Rumely Historical Site markers on the lawn of the La Porte Hospital, Madison Street and Lincolnway (State Highway 2). (Dedicated March 15, 2003)
  
43. **Skid-Steer Loader** – The Skid-Steer Loader, designed and built by Cyril and Louis Keller and first used in 1957, was the first small, lightweight, three-wheel, front-end loader able to turn completely around within its own length. The Melroe Manufacturing Company in Gwinner, North Dakota, later purchased the rights to the Loader, hiring the Keller brothers to continue its development. One ASABE plaque will be located at the Bonanzaville Historic Museum in West Fargo, North Dakota, after temporary displays at the State Heritage Center in Bismark and at the North Dakota State University Agricultural & Biosystems Engineering Department. A second plaque is located at the Melroe Manufacturing plant in Gwinner, North Dakota. (Dedicated June 9, 2004)

44. **Air-Inflated Double-Layer Polyethylene Greenhouse** - Professor William J. Roberts at Cook College, Rutgers University, developed the first Air-Inflated DoubleLayer Polyethylene Greenhouse, which provided a low-cost, energy-efficient greenhouse structure for optimum year-round growing conditions. Two plaques were dedicated and are located on the Cook Campus, School of Environmental and Biological Sciences, Rutgers University. One plaque is located in the main hallway of Foran Hall, home of the Plant Biology and Pathology department, the BioTech Center, and Chang Library, and the second plaque is mounted next to the first air-inflated double-layer polyethylene greenhouse one mile away from Foran Hall. (Dedicated June 4, 2004)
45. **UC-Blackwelder Tomato Harvester** - In the 1940s, University of California, Davis agricultural engineer Coby Lorenzen began developing a mechanical tomato harvester while biologist Jack Hanna developed varieties suitable for harvest. In the late 1950s, Steven J. Sluka developed a successful vine separator at UCD. Blackwelder Manufacturing Co. commercialized the UCD design, resulting in the world's dominant tomato harvester. Harvesting of processing tomatoes in the United States changed from manual in 1963 to primarily mechanical by 1968, leading to large increases in tomato acreage and tonnage. The ASABE plaque is on display at the Western Center for Agricultural Equipment on the UCD campus. (Dedicated October 7, 2005)
46. **Noble Blade Cultivator** - In the 1930s, thousands of acres of North American prairie lands were damaged by wind erosion aggravated by drought and inadequate farming practices. Charles S. Noble, of Nobleford, Alberta, Canada, invented a cultivator that sheared stubble below the soil surface, leaving residue that reduced evaporation and prevented wind erosion. Noble's Cultivator was patented in 1937. By 1979, more than 10,000 had been built for use around the world. The ASABE plaque commemorating the Noble Blade Cultivator was dedicated at an ASABE Pacific Northwest Section meeting and is permanently displayed at the Nobleford Centennial Park. (Dedicated September 24, 2005)
47. **American Society of Agricultural and Biological Engineers (ASABE)**. Established in 1907, the American Society of Agricultural Engineers (ASABE) was managed by volunteers. In 1925, editor Raymond Olney, of St. Joseph, Michigan, was named secretary, thus establishing ASABE at that location. By 1969, with more than 7,000 members in 100 countries, an ASABE building was constructed in St. Joseph. In 2005, ASABE became the American Society of Agricultural and Biological Engineers to recognize the importance of biology in the profession. The Landmark was dedicated on April 20, 2007, at ASABE Headquarters.

48. **Laser Beam Automatic Grade-Control System** - The first laser-grade control was developed by agricultural engineers James Fouss and Norman Fausey of USDA's Agricultural Research Service at The Ohio State University in the mid-1960s. Other necessary designs and developments occurred through the years by various other individuals and companies. Continuous improvements and innovations have led to vastly expanded applications of laser-beam control technology to agricultural, construction, industry, and military tasks worldwide. The ASABE plaque is displayed on the campus of The Ohio State University, Agricultural Engineering Building. (Dedicated May 3, 2007)
49. **World's First Self-Propelled Combine** - George Stockton Berry (1847-1917) of Lindsay, Tulare County, California, designed, built, and, in 1886, operated the world's first self-propelled combine. The Berry design embodied many firsts that were adopted by West Coast manufacturers and have influenced the design of later combines, both self-propelled and towed. A plaque commemorating this historic landmark was dedicated on October 20, 2007, and located at the Tulare County Museum, Visalia, California.
50. **Self-Leveling Control for Hillside Combines** - In 1941, near Palouse, Washington, Raymond A. Hanson conceived of the self-leveling control for hillside combines, and the first self-leveling mechanisms were built in 1945. Hanson founded the RAHCO Company to build self-leveling control mechanisms, and since then RAHCO of Spokane, Washington, has grown into a world leader in the design and production of custom commercial machinery systems. It has been estimated that automatic leveling has saved at least three percent of the harvest on lands requiring combine leveling, representing millions of dollars' worth of grain annually. The plaque commemorating this historic landmark was dedicated on July 13, 2008 at the University of Idaho and now resides in Heritage Park, Palouse, ID. A second plaque was dedicated on Dec. 10, 2008 and resides at Hanson Industries, Inc. Spokane, WA.
51. **The Oliver Chilled Cast-Iron Plow** - On June 30, 1857, James Oliver filed a patent application for chilling the wear face of cast-iron moldboard plows. While pouring molten cast iron in sand molds he circulated hot water through chillers to regulate the rate of cooling. Oliver's control of raw material content and cooling produced moldboards with a very hard surface and softer, tough inner core for strength. By 1878, more than 170,000 Oliver chilled moldboard plows were being used around the world. In January of 1876 the Oliver Chilled Plow Works was constructed in South Bend, Indiana, and became one of the world's largest plow manufacturing plants, producing plows and tillage implements from 1876 to 1985. This historic landmark was commemorated with a plaque at the site of the Oliver Plow Works, 918 Oliver Plow Court in the 500 block of South Chaplin St., South Bend, IN. (Dedicated August 30, 2008.)

52. **The First Flaked Cereal** - In 1894, Dr. John Harvey Kellogg and his brother, Will Keith (W.K. Kellogg), were making a granola type cereal for their patients in the Battle Creek Sanitarium. This granola cereal was made from wheat that was boiled, rolled into a sheet, toasted, and ground. They accidentally left a batch of boiled wheat stand overnight before passing it through the rolls. The individual grains were subsequently pressed into flakes which were toasted to form the first flaked cereal. Two years later, W.K. Kellogg made the first corn flakes. In 1906, he formed the Battle Creek Toasted Flake Company, which was renamed the Kellogg Company in 1922. The flaking process developed by the Kellogg brothers continues to serve as a basis for modern flaked cereal manufacturing processes. This historic landmark was commemorated with a plaque located at the Willard Public Library, 7 W. Van Buren St., Battle Creek, Michigan. (Dedicated September 26, 2008).
53. **The Red Wing Project on Utilization of Electricity in Agriculture** - The object of the Red Wing Project was “to determine the optimum economic uses of electricity in agriculture and to study the value of electricity for improved living conditions on the farm.” Financial support for the Red Wing Project was derived from the Northern States Power Company, manufacturer of electrical and farm equipment. On December 24, 1923, after plans were formulated and the Burnside community near Red Wing, Minnesota was selected for construction of a test line, a ‘high line’ to carry service to nine farmers in the community was built and electricity was turned on for the first time. University of Minnesota’s Professor E.A. Stewart forged a close working relationship with the farm families on the Red Wing Line, along with farm implement and electrical equipment manufacturers and within three years of the inception of the project, individual farmers were using electric motors to cut silage, grind feed, hoist hay, pump water, separate cream, mix concrete and thresh grain. The observations and data collected by the Red Wing Project was foundational to the expansion of rural electrification. Plaques commemorating this historic landmark are located at the University of Minnesota, St. Paul, Minnesota Campus, and the Goodhue County Historical Society, Red Wing, Minnesota. (Dedicated March 26, 2009).
54. **The Circular, Corrugated, Galvanized Steel Grain Bins** – In the 1920’s, circular, corrugated galvanized steel grain bins were developed and became commercially available. The new bins were larger in size and could support greater loads, replaced prefabricated, non-corrugated steel bins. In the 1930’s, research programs advanced their use, notably research by F.C. Fenton at Kansas State College of Agriculture and Applied Science and T.E. Long at North Dakota Agricultural College. Later advances in aeration, bin filling/emptying, in-bin drying and stirring, and safety ladders/egress contributed to their success. Today it is estimated that over 500,000 U.S. farm bins with capacity of more than five billion bushels are in use. Beyond the farm, commercial bins have individual capacities as large as one million bushels. The plaque for this landmark is located in the Biological and Agricultural Engineering Department building on the campus of Kansas State University, Manhattan, Kansas. (Dedicated August 28, 2009)

55. **The Once-Over Mechanical Harvesting of Cucumbers** – The concept of once-over mechanical harvesting represented a major break-through in the practice of producing vine fruit such as pickling cucumbers. In the 1950's the cost of hand harvesting was as high as 50% of the production cost. Once-over mechanical harvesting, coupled with increasing plant production, reduced this cost to 25% thereby making production economically viable. At the heart of the once-over harvester is a mechanical pinch-roll vine-fruit separation system developed by Michigan State University researchers Bill Stout, Max DeLong and Stan Ries in 1961 with support from cucumber growers and processors. A harvester was successfully field tested in 1963. Food Machinery Chemical (FMC) Corporation, Hoopston, IL fabricated one prototype harvester in 1964 and five in 1965. FMC and other companies manufactured an estimated 230 harvesters in the 1960s and 300 through 2009. Today, once-over mechanical harvesting has become a universally adopted method of harvesting vine fruit and is used around the world. The plaque for this landmark is located in Farrall Hall, Dept. of Biological and Agricultural Engineering, Michigan State University, East Lansing, Michigan. (Dedicated April 23, 2011)
56. **Anhydrous Ammonia Application Technology** – In 1932, J. O. Smith, Agricultural Engineer at Delta Branch Experiment Station in Stoneville, MS, attached a small anhydrous ammonia cylinder to a plow in such a manner that the NH<sub>3</sub> was released in the soil. The plow, a Georgia Stock, was pulled by a gray mule named Ike. This was the first known use of anhydrous ammonia as a soil-applied crop fertilizer. The crude apparatus and the anhydrous ammonia it applied provided a much needed source of nitrogen for the otherwise rich alluvial soils of the Mississippi Delta. Agricultural engineer Felix Edwards and agronomist W. B. Andrews renewed application research in 1943, leading to the development of the anhydrous ammonia fertilizer industry. Their work established safe application techniques and equipment. It has resulted, through economical fertilization, in improved yield and quality of food and fiber crops throughout the world. Anhydrous ammonia remains a leading source of nitrogen for crops in the United States. Two plaques are dedicated to commemorate this historic landmark, one located on the campus of Mississippi State University, Mississippi State, MS, and one located at the Delta Research and Extension Center, Stoneville, MS. (Dedicated April, 2011)
57. **The USDA Small Watershed Program** - Since 1948, over 11,000 dams and associated conservation practices in more than 2,000 watershed projects encompassing 160 million acres in 47 states have been constructed as a part of the USDA Small Watershed Program. These projects have improved the quality of life and the environment in rural communities by protecting people's lives and property, conserving soil and water resources, reducing flooding, providing economic development, recreation, and water supplies, enhancing water quality, and improving wetlands and wildlife habitat. The Program established the principle of combining conservation practices in a watershed with flood control dams on tributary streams. In order to implement this program, innovations in engineering, hydraulics, hydrology, and soil mechanics were developed by USDA Soil Conservation Service (now Natural Resources Conservation Service) and Agricultural Research Service

engineers and scientists. The program was created by the Flood Control Acts of 1936 and 1944 and expanded nationwide by the Watershed Protection and Flood Prevention Act of 1954. Oklahoma is a national leader in the Small Watershed Program with several national “firsts”, including the first dam constructed in July 1948 and the first dam rehabilitated in April 2000. Dedication ceremonies took place May 17, 2011 in Oklahoma City in conjunction with the National Watershed Coalition National Meeting. Plaques are located at the USDA-NRCS State Office in Stillwater, OK and the ARS Hydraulic Engineering Research Laboratory at Lake Carl Blackwell Unit near Stillwater, OK. A granite monument is placed at the Agricultural Building on the State Capital Complex in Oklahoma City, OK. (Dedicated May 17, 2011)

58. **USDA-ARS Experimental Watersheds** - In the mid 1930’s, the USDA Soil Conservation Service (SCS) realized the importance of hydrologic processes on agricultural fields and watersheds and determining their impact on soil erosion, floods, water resources, and the agricultural economy. In response, the SCS Hydrologic Division established experimental watersheds in Coshocton, Ohio, Hastings, Nebraska, and Riesel, Texas, and operated them until 1954 when the watersheds were transferred to the newly created Agricultural Research Service (ARS). Research at these watersheds has contributed to many significant engineering advancements including: quantification of soil erosion prevented by agricultural conservation systems; development of the SCS “curve number method”, Universal Soil Loss Equation (USLE), and watershed models such as SWAT; understanding of agronomic and environmental effects of tillage, fertilizer and chemical management alternatives such as no-till agriculture; and inventions such as the Coshocton wheel water sampler. The three original watersheds established the foundation for the vibrant, national USDA-ARS experimental watershed network that to this day produces sound science and engineering to protect and manage the world’s soil and water resources. Dedication ceremonies took place in Riesel, TX. Plaques are located at the Blacklands Experimental Watershed Riesel Watersheds, near Riesel, TX; North Appalachian Experimental Watershed near Coshocton, OH; and Central Great Plains Experimental Watershed, near Hastings, NE. (Dedicated September 23, 2013)

**59. Cooperative Program of Rural Electification** - Alabama Power Company (APC) completed its first rural line down the Whitesburg Pike in Madison County, Alabama, in June 1920, providing electricity to ten farms, a cotton gin, and a dairy. Dr. Mark L. Nichols, professor and head of agricultural engineering at Alabama Polytechnic Institute (API now Biosystems Engineering at Auburn University), began discussions in 1922 with APC on how agricultural engineers could conduct experiments and research in the use of electricity to improve the profitability of farms. The information gathered and recommendations from Dr. Nichols and other agricultural engineers convinced APC to initiate a cooperative program of rural electrification with API on December 23, 1923. The program was approved by the API trustees on January 2, 1924. This program was the first cooperative rural electrification development agreement between an agricultural engineering department and an electric power company and provided a \$24,000 grant to support the work. A cooperative program of rural electrification and development was carried out by the APC and the department for more than 50 years. The plaque is located at the Corley Building, Auburn University, Auburn, Alabama. (Dedicated April 11, 2019)

**60. Vermeer Large Round Baler** - Prior to 1971, most hay was harvested in small square bales requiring extensive manual labor to harvest, store and feed. After a friend shared his intention to get out of the cattle business because of the hardships associated with putting up hay, Gary Vermeer began the design and development of the first successful large round baler in his shop in Pella, Iowa. Just six weeks later, a prototype baler was completed that successfully produced 6-ft wide x 7-ft diameter bales. Hundreds attended demonstrations of the baler in the summer of 1971. By 1972, the 706 Vermeer Large Round Baler was introduced. The baler was covered by two U.S. patents. Throughout the years, the patents and/or designs were licensed to several agricultural equipment manufacturers. The balers allowed farmers to mow hay with less manual labor. In addition, the tightly packed round bales shed water, helping farmers maintain the quality of their hay for longer. The plaque is located at the Vermeer Headquarters in Pella, Iowa. (Dedicated October, 2021)