

Part 2. Timeline in the Development of Agricultural Field Implements, Related Apparatus, and Equipment

Note: the italic letters at the end of each entry refer to the references.

70 A. D. Elder Pliny reported to Roman leaders the use of a wooden cart with comb-like bars pushed by animals for reaping wheat. In first century A. D. in Gaul, in perhaps a monument to the world's first agricultural engineers, a harnessed mule is shown pushing a wooden harvester through a field of wheat, a model of which is at ASABE headquarters, courtesy of Wayne Worthington. The German Society of Agricultural Engineers constructed a similar model of a stripper-reaper from remnants they could identify from stone carvings.

Based on a display at ASABE Headquarters

1545 Universal joint designed by Italian Geronimo Cardano, 1501-1576. *SWABI*

1566 Seed drill patented by Venetian (Italian) Camillo Torello. *EAM*

1653 First known treatise on plow construction, *The English Improver Improved*, by Walter Blith in England, printed for J. Wright. *EAM NUC WABI*

1701 Practical machine seed drill, consisting of a cylinder and regularly spaced holes that caught the seeds from the hopper above and dropped them into a special furrow below, developed by Englishman Jethro Tull, 1674-1741. *BDPE EAM MWBD*

1720 First English patent for plow, by Englishman Joseph Foliambe. *HFP*

c. 1730ff. Mechanical principles applied to plow design; the cast iron curved moldboard developed by James Small, Berwick, England. *EAM*

1731 Horse-drawn cultivator introduced to English farming by Englishman Jethro Tull, 1674-1741. Patented in 1733. *CLAA DNB*

1731 Improved seed drill and cultivator introduced to English farming by Englishman Jethro Tull, 1674-1741. *CLAA*

1732 Origin of the threshing machine to separate grain from the straw and chaff attributed to Scot Michael Menzies, ?? -1766. *WABI*

1734 Flail threshing machine developed by Scot Michael Menzies, ?? -1766. *BDPE DNB*

1740 Plow with cast iron moldboard and wrought iron plowshares invented by Scot James Small at his Blackadder Works (date of 1763 in *DID*). *STF*

c. 1760 Draining plow designed by Englishman Cuthbert Clarke, fl.1777. *DAB EAM*

c. 1770 Winnowing machine developed by James Sharp (according to dated engraving). *EAM*

1777 Scythes, sickles, hoes, spades, shovels, and millstones found ready market in USA. *AH(Jan1937) CLAA*

- 1782** Spoon-feed drill, with dropping cups and coulters, patented in England by James Cooke. *EAM*
- 1783** Factory for making plows established in England. *STF*
- 1784** An iron plow invented by Scot James Small, Berwick, England. *AH(July1966) CLAA*
- 1785** Tempered cast iron plowshares patented by Englishman Robert Ransome, 1753-1830, and in 1808 plows with detachable parts built. *DID STF WABI*
- 1786** Threshing machine of rotary drum type developed by Scot Andrew Meikle, 1719-1811, East Lothian. It used a fan to separate chaff from grain and became a standard for this operation. *BDPE EHT EAM STF SWABI*
- 1788** Useful threshing machine of undershot design using drum and concaves invented by Scot Andrew Meikle, 1719-1811. *BDPE DID GH*
- c. 1790** Mole plow developed by Mr. Vaisey in England. *EAM*
- 1793** Cotton gin consisting of spikes in a wooden cylinder invented by Eli Whitney, 1765-1825, patented in 1794. Recent investigations question the validity of the statement that Eli Whitney invented the first cotton gin. Claims are made that Hogden Holmes should be credited with invention of the early cotton gin, believed to have been patented later (see 1796). *BDPE CLAA HL1986 NC4:495 SA247(1982) WOI*
- 1793** Moldboard for a plow based on scientific principles invented (not patented) by Thomas Jefferson, 1743-1826, of Virginia. *AH(Apr1942) CLAA*
- 1796** Improved cotton gin patented by Hogden Holmes, and later annulled (date in question) (see 1793). *EB HFP*
- 1797** One-piece cast iron plow, not including beam and handles, patented in USA by Charles Newbold, 1780-??, of Burlington County, NJ. Developments preceded in England with patents to Joseph Foljambe in 1720, Scot James Smith in 1767, and Englishman Robert Ransome in 1785. *AOAA CLAA EB FFFR FIMA LP SA247(1982) STF*
- 1799** Patent on a reaping machine by Englishman Joseph Boyce of London. *EAM (has 1800) GH*
- 1799** Seeding machine for corn and small seeds patented. *LP*
- early 1800s** Tedder for hay introduced to turn grass and forage, developed and introduced by Robert Salmon, 1751 or 1752-1821, Woburn, England. *DNB EAM*
- 1803** Patent for American reaping machine mounted on three wheels awarded to Richard French and John T. Hawkins of New Jersey. *GH STF*
- 1805** Reaper (another version) developed by Englishman Thomas James Plucknett, Deptford. *EAM*
- 1807** Device for cutting forages consisting of an oscillating clipper with a row of smooth shear blades introduced by Englishman Robert Salmon, ?? -1821. *DNB GH*
- 1808** All-metal plow with interchangeable parts patented by Englishman Robert Ransome, 1753-1830. Ransome Co. formed in Ipswich, England. *BDHT*
- 1810** Invention of a threshing machine by American Isaiah L. Jennings. *NCE:462*

- 1811** Disc reaping machine developed by several people. Mr. Smith produced a horse-drawn machine that cut the grain with a moving disc turning level with the ground. *WABI*
- 1812** Patent on a horse-drawn mowing machine by Peter Gaillard, fl.19th century, Lancaster, PA. *AAI BDPE CLAA STF*
- c. 1812** Steam threshing machine invented by Englishman Richard Trevithick, 1771-1833. *DID*
- 1814** Reaping machine patented by Englishman James Dobbs. *GH*
- 1814, 1819** Cast iron plow with an improved moldboard in which wearable parts could be replaced invented and patented in 1819 by Jethro Wood, 1774-1834, in Scipio, NY. *AOAA BDPE CLAA FFFR HFP LP NC11:360 SA247(1982)*
- 1816** Cast iron plow with wrought iron point, invented and patented in 1819 by Stephen McCormick, 1784-1875, Auburn, VA. Credited, along with Jethro Wood, with introducing the cast iron plow in the USA. *BDPE DAB MEA NC25:161*
- 1820** Reaping-sheafing machine pulled by horses, rather than being pushed, invented by Englishman Brown. *WABI*
- 1820** Hay tedders that turned cut grass developed by Englishman Robert Salmon, ??-1821. These replaced by side-delivery rakes beginning in the 1830s. *WABI WOI*
- 1820** Cultivator that was horse-drawn produced in USA by Henry Burden, 1791-1871. He also invented a horseshoe machine. *STF WWWW*
- 1820** Horse-drawn revolving hay rake came into use. *LP*
- 1821** Masticator, made of rubber strips to shred materials, invented by Englishman Thomas Hancock, 1786-1865. *STF*
- 1822** Mowing machine that used a horizontal cutting disc, for cutting hay and grass, invented and patented by American Jeremiah Bailey. *LP WABI*
- 1822** Digging machine (plow) patented in England by Mr. Roberts (possibly Richard Roberts, 1789-1864). *EAM HT*
- 1823** Subsoil plow that combined subsoiling and drainage developed and used by Scot James Smith, Deanston, Scotland. *EAM*
- 1823** Revolving hay rake patented by Samuel Pennock. *AH(Oct1956) CLAA*
- 1826** Reaping machine based on use of rotary blades developed, not patented, by Patrick Bell, 1799-1869, Angus, Great Britain. *DNB GH HFP PS WABI*
- 1826** Reaper with reciprocating knife invented and used on one of first successful reaping machines, pushed from behind with horses, by Scot Patrick Bell, 1799-1869, with improvements introduced as the Beverly Reaper. *BDPE DNB EI GH*
- 1827** Hay rake manufacturing business established by William Stedman, with greatly expanded production of hay rakes and other implements (1887ff.) by son Marshall W. Stedman, 1859-1935. *NC26:192*
- 1828** A cutting device based on scissors principle developed. This was part of a reaping implement pushed in front of horses, built and demonstrated, not patented, by Patrick Bell,

1799-1869, of Scotland. Bell claimed earlier invention of reaper but could not compete with reapers of Cyrus H. McCormick, 1809-1884, and Obed Husey, 1792- 1860. *EAM GH*

1828 Combine harvester (combines cutting and threshing) patented by Samuel Lane of Maine but not operational until 1836. *AOAA STF WABI*

1830 Cylinder-cutting lawn mower developed and patented by Englishmen Edwin B. Budding, c. 1796-1846, and John Ferrabee. *BDHT BF03 DID*

1830 Power hemp break invented by Robert McCormick, 1780 -1846, father of Cyrus H. McCormick. *AH(Apr1963) AOAA CLAA CR*

1830 Threshing machine patented by Hiram A. Pitts, 1799-1859, and twin brother John A. Pitts, 1799-1859. *NC13:252*

1830-1840 Shift from blacksmith to specialized factories to manufacture reapers, plows, threshing machines, and other farm implements. *AH(Jan1956) CLAA*

1830ff. Hay-making implement called tedder or kicker developed, which lifted and tossed the hay; improved by Mr. Wedlake, Essex, England (see 1820). *EAM*

1831 Mechanical reaper with serrated cutting bar that moved back and forth introduced, invented by Cyrus H. McCormick, 1809-1884, Walnut Grove, VA, son of Robert McCormick, 1780-1846, patented in 1834. He followed the work of his father. The business moved from Virginia to Chicago in 1847; his son Cyrus H. McCormick, Jr., 1859-1936, led the McCormick Harvesting Machine Co. after his father's death in 1884. *ATEN CLAA DAB
FH FIMA FTOY HL1972 GH NC21:78 SA247(1982) STF WABI WWWA*

1831 Side-hill plow patented by Cyrus H. McCormick, 1809-1884. *MEA*

1832 Manufacture of mowers licensed to Ransomes, Great Britain, by Edward B. Budding, c. 1796-1846, and John Ferrabee. *BDHT*

1832 Steam plow, using steam engine and cable, developed by Britishers John Heathcoat, 1783-1861, and Henry Handley. *BDPE*

1833 Grain reaper having cutting bar with coupled blades operating like a scissors developed and patented by Obed Hussey, 1792-1860. *AOAA CLAA GH HFP NC11:361*

1833 Steel plows with strips of steel over wood moldboards, not patented, first manufactured by blacksmith John Lane of Lockport, IL; later improved by his son John Lane, 1824-1897, Chicago, IL. Steel plow separately patented by John Deere, Moline, IL. *CLAA HFP MWBD SA247(1982) WABI*

1833 Cable for plowing invented by E. C. Billinger of South Carolina (see 1832). *FPMA*

1833 Reaper patented and first machine sold in Ohio by Obed Hussey (1792-1860), manufactured in MD. *CLAA CR GH JEH NC11:361 SA247(1982)*

1833 Grass and grain mower patented with slotted guards through which the sickle moved for cutting. *AOAA*

1834 Corn planter patented in USA by Henry Blair, 1804-1860, black inventor. *BDPE BI B195 NBAS*

1834 First operational grain combine harvester developed by Hiram Moore, 1801-1875,

and John Hascall, patented in 1836, driven by a ground wheel and pulled by a team of 20 horses, built in Climax, MI. The combine was transported to California for demonstration and testing. *AH(Jan1958) AOAA ASABECAL CLAA GH HL1978 STF WABI*

1834 Chain band for power transmission developed by Hiram Avery Pitts, 1799-1859. *BDPE*

1835 Clay tile (open bottom) drainage installed in Geneva, NY, claimed to be the first in USA, by John Johnston, 1791-1880, followed by installation of round tile in 1840. He was considered the father of tile drainage in USA. *AE16(1935) ASABECAL BDPE HL1935*

1836 Cotton seed planter patented in USA by Henry Blair, 1804-1860, black inventor. *BDPE BI BI95 NBAS*

1837 Steam plow (steam engine pulling a cable) patented by John Upton In England. *DID*

1837 Combined thresher-winnower, steam powered, built by twin brothers Hiram A. Pitts, 1799-1859, and John A. Pitts, 1799-1859, originally of Maine. *DAB NC13:252 WABI WWWA YA1940*

1837 Pitts steam-powered mechanical thresher and fanning mill introduced and patented by twins Hiram A. Pitts, 1799-1859, and John A. Pitts, 1799-1859, of Maine. Formed Pitts Agricultural Works in 1837, later named Buffalo Pitts Co. in 1877, Buffalo, NY. *AOAA BDPE CLAA FH NC13:252 SA247(1982) WWWA*

1837 Deere & Company founded, beginning with the invention and patenting of a steel plow with saw-blade steel and smooth wrought iron by John Deere, 1804-1886; built in 1838. The company became the largest combine manufacturer in North America, and expanded into a full line of tillage and planting equipment. *AOAA ASABECAL CLAA GH HL1976 NC20:63 SA247(1982) STF WABI*

1838 Horse-drawn hay rake invented by (Gen.) Lewis Swift, 1784-1846, manufactured by his son Lewis Swift, 1820-1913. *NC4:302 WWWA*

1838, 1839 Combine harvester similar to the Moore-Hascall unit (see 1834) developed in Australia by H. V. McKay. *WABI*

1839 Two-row horse-drawn corn planter patented by D. S. Rockwell. *AOAA CLAA*

c. 1841 Self-raker called Atkins Automaton Raker introduced to public, patented in 1853, by Jearum Atkins, fl.1840-1880, with 5000 units sold in 1856. *DAB FIMA MEA*

1841 Improved hoe drill for sowing grain patented by Moses Pennock and Samuel Pennock. *AH(Oct1936) CLAA*

1843 Head-stripping cereal harvester, called the Australian stripper, produced by John Ridley, 1806-1887, Adelaide, Australia, invented by John W. Bull in 1843. *GH*

1843 Making of commercial fertilizer, superphosphate, developed by Sir John Lawes. *CLAA YA1938*

1844 Implement (drill) invented for sowing cotton seeds by Richard Jordan Gatling, 1818-1903. *BDPE BEST NC4:158*

1844 Mowing machine patented by William F. Ketchum, followed by a series of patents on mowers. *CLAA SA247(1982) YA1975*

- 1844** A grain header, horse pushed, patented by George Esterly, 1809-1893. *CLAA
MEA GH*
- 1844** Barbed wire patent issued to Joseph F. Glidden, 1813-1906, who with Isaac Ellwood, 1833-1910, formed Barb Fence Co. in 1874, in Illinois. *ASABECaI BDPE*
- 1846** Cast steel for plows made by William Woods at the steel works of Jones and Quigg, Pittsburgh, PA, and plows made by John Deere, Moline, IL. *FFFR*
- 1847** Pitts threshing machine built in many shops in USA under license from twin brothers Hiram Avery Pitts, 1799-1859, and John A. Pitts, 1799-1859. *ATEN NC13:252 WWWW*
- 1847** McCormick Reaper Works established by Cyrus H. McCormick, 1809-1884, in Chicago, IL. *GH OYIH*
- 1847** Massey Works established at Newcastle, Ontario, Canada, by Daniel Massey, 1798-1856. The company name was changed to H. A. Massey (Hart A. Massey) in 1855, who remained head until 1896. *GH*
- 1847** Disc plow developed in Australia by John Shearer, available in USA, but market did not develop until 1893. *BDPE LP STF WABI*
- 1847** Revolving disk harrow (similar to disc plow) patented in USA by George Page. *AE7(1926) ASABECaI CLAA NC29:288 STF*
- 1848** Combined threshing and dressing machine made by Charles Burrell & Sons, Telford, UK. *EAM*
- 1848** Nichols & Shepard Company (USA) initiated production of a threshing machine that evolved into the popular Red River Special. The company became a part of Oliver Farm Equipment Co. in 1929. *OHP*
- 1849** Mann reaper introduced in USA by Jacob J. Mann, Cumberland, England. *BDPE*
- 1850** Cotton harvesting device (called by some a cotton picker) patented by S. S. Rembert and J. Prescott, Memphis, TN. *LP WOI*
- 1850** Mowing machine developed by William Manning in 1831, manufactured by the firm of Obed Hussey. *WABI*
- 1850** Transportable threshing machine that could be taken to the fields developed by Englishman Tasker. *WABI*
- 1850** Patent of device for twine binding of sheaves (binder), tied manually, for reaper by John E. Heath, Warren, OH. *GH*
- 1850** Hemp-breaking machine invented by Richard Jordan Gatling, 1818-1903. *BDPE BEST*
- 1850** Hand-dump hay rake made of iron or steel teeth introduced. *LP*
- 1850s** Shaker or vibration principle employed to separate grain from the straw for some harvesting and threshing machines. *LP*
- 1851** Force-feed grain drill seeding implement patented and developed by what later became a part of International Harvester Co. *LP OYIH*

- 1851** Hiram A. Pitts, 1799-1859, moved to Chicago, IL, where threshers and other farm equipment were built. *NC13:252*
- 1851** Self-binding reaper patented by Edward Sabine Renwick, 1823-1912, with Peter H. Watson. *BDPE MEA NC11:102*
- 1851** Combined reaper and mower patented by John H. Manny, 1825-1856, first developed by Manny & Co. in 1856 in Rockford, IL, and later by Walter A. Wood, 1815-1892, who made improvements and commercialized device. *BDPE DAB
MEA NC6:398 NC11:486*
- 1851** Mole draining plow developed, exhibited, and used by John Fowler, 1826-1864. *EAM*
- 1852** Obed Hussey, 1792-1860, and Cyrus H. McCormick, 1809-1894, entered reapers in field trials at Perth, Scotland, pitted against the Bell reaper by Scot Patrick Bell, 1799-1869, which was established in Great Britain. This resulted in much publicity on use of reapers (see 1826). *BF03 FIMA NC11:361*
- 1852** Self-rake added to reaper patented and manufactured by J. S. Wright Co., Chicago, IL. *FPMA*
- 1852** Massey acquired the Canadian rights to produce the Ketchum mower (see 1844). *GH*
- 1852** Cable used for plowing most used by John Fowler, 1826-1864, of England. Steam power applied by cable to draining plow in 1853, followed by use for cultivation in 1855 and for other agricultural equipment made by Ransomes, Ltd. With Jeremiah Head developed a prize-winning steam plowing system in 1858. *BDPE EAM FPMA*
- 1853** Hay baler (hay press) invented by American Horace L. Emery, ?? -1892, of Albany, NY; produced bales weighing approximately 250 lb. Baler enhanced by Peter K. Dederick, 1838-1911, with continuous production introduced in 1872. *LP MEA NC19:131 WABI*
- 1853** Manny mower/reaper developed by John H. Manny 1825-1856, manufactured with improvements by Walter A. Wood Mowing and Manufacturing Co., Hossick Falls, NY (Walter A. Wood, 1815-1892). *GH MEA NC6:398 NC11:486*
- 1853** Widely used corn planter patented by G. W. Brown. *AOAA CLAA WWT*
- 1853** Horse-drawn digger patented by Robert Romaine, Peterborough, Canada. In 1857 produced as Romaine-Crosskill digger with 14 hp steam engine. *EAM*
- 1853** Chilled-iron plow developed, patented in 1857, with an annealing process, became one of the most used plows in USA. Made by the Oliver Chilled Plow Works, by James Oliver, 1823-1908. *DID HL2008 NC12:522 WWWW*
- 1854** Bell reaper designed by Scot Patrick A. Bell, 1799-1869, and built later. *DNB EAM GH*
- 1854** Two-wheeled jointed or flexible cutting-bar mower that could cut on uneven ground invented and patented by Cyrenus Wheeler, 1817-1899. *CLAA LP NC12:98*
- 1855** Grinders with iron burrs introduced in USA by what became IHC. *OYIH*
- 1855** Check-row planter for corn and beans invented by Samuel Johnston, 1835-1911, Brockport, NY. *BDPE NC24:75 WWWW*

- 1856** Self-raking device used for reapers invented by Samuel Johnston, 1835-1911, Brockport, NY. *BDPE NC24:75 WWWW*
- 1856** Patent for wire-tying binder, hand operated, by C. A. McPhitridge of Missouri. *GH*
- 1856** Two-horse straddle-row cultivator patented by George Esterly, 1809-1893, generally available in 1870s. *BDPE CLAA LP MEA*
- 1857** A steam plow pulled by cable invented by Richard Jordan Gatling, 1818-1903, who was famous for developing the Gatling machine gun. *BDPE EB NC4:158*
- 1857** Plowing engine developed by Marquis of Tweeddale, who was Arthur Hay, 1824-1878. *DNB EAM*
- 1857** Cultivating machine consisting of a huge corrugated drum that crushed the clods, followed by a harrow, introduced by Messrs. Blackburn, Derby, UK. *EAM*
- 1857** A. Harris and Son established implement manufacturing and sales company in Beamsville, Ontario, Canada (Alanson Harris, 1816-1894, and son John Harris). The company was renamed the Massey Manufacturing Co. in 1878, and moved to Toronto, Canada. *GH*
- 1858** Marsh harvester that gathered grain in bundles, a binder attached to a reaper, a forerunner of the binder, invented by Charles W. Marsh, 1834-1918, and his brother William W. Marsh, 1836-1918, Shabbona Grove, IL. *BDPE CLAA FH FTOY LP MEA NC11:268*
- 1858** Self-tying device to bind sheaves of straw with twine developed by John F. Appleby, 1840-1917. After 1878 binders made by Deering Harvester Co. (William Deering, 1826-1913) used Appleby tying devices. *GH BDPE MEA WABI*
- 1858** Revolving hay rake invented by Harvey Freeman Gaskill, 1845-1889. *BDPE MEA NC23:187*
- 1859** Steam plow patented and built in Pennsylvania by John W. Fawkes. *FPMA*
- 1860** Grain drill with depth control invented by American Hiram Moore, 1801-1874. *BDPE GH*
- 1860** Steam plowing apparatus patented by Englishman John Fowler, 1826-1864. *BDPE EAM*
- 1861** Mowing machine developments invented by Abel G. Goldthwait, 1837-1907. *BDPE MEA*
- 1861ff.** Hay making implements, such as tedders and rakes, invented by Joshua C. Stoddard, 1814-1902. *DAB NC7:53*
- 1863** Wire binder for reaper built in large numbers. Wire binder adapted to Marsh harvester in 1872 (see 1858). *LP*
- 1863** Controllable hay rake patented by Samuel Johnston, 1835-1911, Brockport, NY. *NC24:75*
- 1864** Two-wheeled sulky plow, including seat for operator, patented by Americans F. S. Davenport and Robert Newton of Illinois, replaced by the Flying Dutchman, the three-wheeled sulky plow produced by Moline Plow Co., USA in 1884. *CLAA LP STF WABI*

- 1864** Popular check-row corn planter patented by John Thompson and John Ramsey of Illinois. *CLAA*
- 1864** Hay tedder marketed by manufacturing company of Edward P. Bullard, 1841-1906. *FIMA MEA NC31:332*
- 1865ff.** Presses (balers) invented for hay and cotton by Peter K. Dederick, 1838-1911. In 1872 he invented wire-tied baler. *EAM NC19:131 WABI*
- 1867** Twisted wire used for fencing patented (but did not include method of manufacture) by Lucien Smith, USA. Patent for a type of barbed wire for fencing issued the same year to William D. Hunt, Scott County, NY, USA (see 1844, 1873). *AH(Oct1939) CLAA STF*
- 1868** Deere & Co. formed by John Deere, 1804-1886, in Moline, IL. *BDPE MEA MWBD NC20:63*
- 1869** Process developed (patented in 1873) to make hard-faced plow called the Oliver Chilled Plow, by James Oliver, 1823-1908. *ASABECaI BDPE CLAA EWB LP NC15:522*
- 1869** Wire-tying binder patented by John F. Appleby, 1840-1917. He changed to twine tying in 1874, at which time he formed the Appleby Reaper Works, followed by commercial use on the McCormick binder. *GH MEA NC11:268*
- 1869** Spring-toothed harrow patented by David L. Garver of Michigan. *CLAA LP STF WOI*
- 1870** Seed sower (drill) invented and patented by William Painter, 1838-1906. *BDPE MEA NC31:129*
- 1870** Differential gear for mowing and reaping machines developed by Rudolph Eickemeyer, 1831-1895. *BDPE NC1:184*
- 1870** Double plow with subsoiler patented by Head & Jefferies, Ltd., England. *EAM*
- 1870s** Disk harrow developed (see 1847). *WOI*
- 1871** Johnston Harvester Co. established by Samuel Johnston, 1835-1911, Brockport, NY. It made reaping machines, including self-raking devices (1856ff.), and patented rotary and disc harrows. This company succeeded Johnston, Huntley & Co., Syracuse, NY. *BDPE DAB MEA NC24:75*
- 1871** McCormick reaper works in Chicago, IL, destroyed by fire, then rebuilt and enlarged in 1872. *ASABECaI NC1:361*
- 1871** Possible peak activity for farm implement patents issued in USA; in this year recorded 13 corn huskers, 160 reapers and mowers, 72 threshers and separators, and 160 plows and attachments. *FIMA*
- 1871** Wire-tying reaper binder patented by American Walter Wood, 1815-1892. A twine-tying knotter reaper was invented in 1858 by John F. Appleby, 1840-1917, but was not developed further because of the cost of twine. Appleby tying devices were used on binders made by Derring from 1878 (see 1869). *MEA NC11:268 WABI*
- 1871, 1873** Wire-tie balers developed by Sylvanus D. Locke, 1833-1896, followed by self-tie binders in 1875ff. *BDPE MEA*

- 1871** Cotton stripper (or sled) patented by John Hughes, New Berne, NC. *AH(Jan1957)*
CLAA LP
- 1872** Windrow hay loaders introduced by Keystone Manufacturing Co., Rock Falls, IL, acquired by International Harvester Co. in 1904. *OYIH*
- 1872** Hay baler providing continuous production of bales developed by Peter K. Dederick, 1838-1911, followed by many improvements. *LP NC19:131 WABI WOI WWWW*
- 1872** Automatic wire-tying device developed and in production in 1873, made to fit the Marsh Harvester by John H. Gordon. *GH LP*
- c. 1873** Hay tedders and hay loaders built by Ames Plow Co., New York City, NY. *FIMA*
- 1873** Machine capable of producing barbed wire in large quantities patented by Joseph F. Glidden, 1813-1906, De Kalb, IL, followed (1874ff.) by commercially successful production. He worked with Isaac L. Ellwood, 1833-1910, who also patented barbed wire fence. During this era several patents advanced for barbed wire fences, followed by numerous legal challenges. *AIM BDPE MWBD STF*
- 1874** Machine invented to gather grain stalks from harvester to form and tie bundles by Hector A. Holmes, 1829-???. *NC10:479*
- 1875** Automatic check row for planting corn, usually in hills, developed using knotted cord (later wire) for tripping dropping of seed. *EB LP*
- 1875** Horse-drawn hay rake patented by Charles E. Lipe, 1851-1895. *BDPE MEA*
- 1875** Hay loader developed by American Keystone, which later became a part of International Harvester Co. *OYIH WABI WOI*
- 1877** Empire Drill Co. formed; purchased by the American Seeding Machine Co. in 1903. *OHP*
- 1877** Disc plow, known as the Sovereign plow, gained prominence; built by John Shearer and Sons in Australia. *LP WABI*
- 1877** Omnium self-raking reaping machine patented by Mr. Samuelson. *EAM*
- 1877** Self-dumping hay rake invented by John A. Sherman, 1852-??, manufactured by Ames Plow Co. He also invented an ensilage cutter. *NC13:23*
- 1877** Field manure spreader developed in USA with endless chain apron to move manure from the bed. *LP*
- 1877** Brantford Plow Works founded in Brantford, Canada, to build tillage implements by family of James G. Cockshutt, c. 1853-1885. Company named Cockshutt Plow Co. Ltd. in 1882 and expanded into tractor production, building the first tractor with live PTO in 1924. *CSTGH*
- 1877ff.** Series of efficient digging machines (plows) designed by Thomas Churchman Darby of Pleshy, Essex, England, manufactured by W.& S. Eddington. *EAM*
- 1878** Twine knotter to be attached to binder to tie the cut grain into bundles patented by John F. Appleby, 1840-1917, and adapted to Marsh harvester. *CLAA LP MEA SA247(1982)*
- 1878** Ohio Cultivator Co. founded by Harlow Case Stahl, c. 1850-1941, who is credited

- with perfecting the riding cultivator, established in Fremont, OH, and later moved to Bellevue, OH. CCS
- 1880** Corn picker patent considered important to industry. LP
- 1880** Commercial spraying machine for crops introduced. ETCT
- 1880** Marsh reapers built at Marsh factory in Plano, IL, which later became the firm of Gammon & Deering, controlled by Elijah H. Gammon, 1819-1891, and William Deering, 1826-1913. CR DAB NC11:268 NC23:178
- 1880** Lister, two-mounted plows with reversible moldboards set side by side, one row, walking, pulled by horses, served as planting tool and harvesting tool. LP
- 1881** Appleby-type twine-knotter binder launched by McCormick, invented by John F. Appleby, 1840-1917, supported by William Deering in 1877, and licensed to other companies. CR GH NC11:268 WABI
- 1882** Meinard Rumely, 1823-1904, bought interests of M & J Rumely (John Rumely, 1853-1931) and established M. Rumely Co. Began manufacturing threshing machine in 1911. M. Rumely Co. acquired the Advance Thresher Co., established in 1885, and the Gaar-Scott & Co., Richmond, IN, established in 1836, and formed the Advance Rumely Co. in 1915. Allis-Chalmers Co. acquired most of the assets of the Advance Rumely Co. in 1931. BDPE EASTE MEA
- 1883** William Deering & Co. formed to manufacture farm implements, after being Deering Harvester Co., organized in 1880. In 1902 the company became a part of International Harvester Co. NC11:268-269
- 1883** McCormick switched from wire to twine binders, advanced by Cyrus H. McCormick, Jr., 1859-1936, starting intense competition with William Deering & Co. DAB GH OYIH
- 1883** Superior Drill Co. formed, then absorbed by the American Seeding Machine Co. in 1903 and became a part of the Oliver Farm Equipment Co. in 1929. OHP
- 1884** Check-row corn planter developed by W. E. Waterman based on designs of August Lindgren, manufactured by Moline Plow Co. (see 1875). MMT
- 1884** Three-wheeled sulky plow, called the Flying Dutchman, produced by the Moline Plow Co. in USA (see 1890). LP WABI
- 1884** Tobacco screw press patented by John P. Parker, 1827-1900, black inventor who developed a series of presses. DANB
- 1884** Steam-powered continuous-production balers introduced in which bale was ejected automatically and manually tied with wire. SWABI
- 1884** Sprayer prototype built by Frenchman Vermorel, based on idea put forth in 1781 by Father Rosier. WABI
- 1885** Corn husker-shredder appeared on USA market. LP
- 1885** Parker Pulverizer for smoothing soil for farming invented by John P. Parker, 1827-1900, black inventor. BDPE DANB
- 1886** Sugar beet lifter invented by A. Bajac. ETCT HT

- 1886** Operation of world's first self-propelled (using straw-burning steam boiler) combine (patented in 1887 in USA) with a PTO using steam from the traction engine to drive the harvesting mechanism, by George Stockton Berry, 1847-1917, built and operated in Lindsay, Tulare County, CA. *HL2007 RS11(2007)*
- 1889** Mechanical power-sprayer commercially available. *WABI*
- 1889** Haseley tedder or kicker for hay manufactured by a number of British firms; soon to be replaced by the swath turner and side-delivery rake. *EAM*
- 1890** Rotary hoe invented, entered commercial production about 1912, assisted greatly in cultivation and breaking crust of the soil and for weed control. *LP*
- 1890** Manufacture of manure spreaders began, one of which was the popular Flying Dutchman manufactured by the Moline Plow Co. *FIMA*
- 1891** Massey-Harris Co., Ltd., formed, merging the Massey Manufacturing Co., Toronto, and Alanson Harris, Son & Co., Ltd., Brantford, Canada, with headquarters in Toronto, Canada. Several company acquisitions followed the merger. *FTOY GH*
- 1891** Sidehill combine introduced by Stockton Wheel Co., CA, by Holt Brothers, led by Benjamin Holt, 1849-1920. *BDPE HL1983*
- 1891** Field hay chopper patent issued to William J. Conroy (see 1932). *ASABECal*
- 1892** Field corn silage harvester patented in USA by Charles C. Fenno, Grinnell, IA. *ASABECal GEA HL1992*
- 1892** Self-binding corn binder patented. *LP*
- c. 1892** Luebben hay baler developed (see 1903 for round baler). *HL1993*
- 1893** Disc plow reappeared in USA after its first introduction in 1847, but not used at the time. *WABI*
- 1895** Corn binders manufactured and sold by William Deering and Co. and McCormick Harvesting Machine Co. *CR OYIH*
- 1895** Heavy-duty, deep tillage chisel available to penetrate subsoil of irrigated land. *LP*
- 1895** Spindle-type cotton picker patented by August Campbell, 1834-1920, who later worked with Theodore H. Price, 1861-1935, who had a similar patent in 1912, and sold their interests to International Harvester Co. in 1924. *CLAA DAB NC44:523 WOI YA1962*
- 1896** Successful disc plow invented in USA by Mr. Hardy. *BDPE*
- 1897** Patent considered of importance for a cotton picker granted to Peter Haring. *OYIH*
- c. 1900** Side-delivery rake began replacing the hay tedder. *FIMA*
- 1900** Riding single-row stalk cutter introduced. *LP*
- 1901** Allis-Chalmers Co. formed by the merger of Edward P. Allis Co. (formed after death of Edward P. Allis, 1824-1889) by Edward P. Allis, Jr., 1849-1918, and Chalmers & Co. (formed by father of William J. Chalmers, 1852-1938) and other companies. *DAB NC2:524 NC36:89*

- 1901** Stripper-harvester combine designed by Australian, manufactured in Toronto, Canada, and sold primarily in Australia. *GH*
- 1902** International Harvester Co. formed, incorporating William Deering & Co., Chicago, IL; McCormick Harvesting Machine Co., Chicago, IL; Plano Manufacturing Co., Plano, IL; Milwaukee Harvester Co., Milwaukee, WI; and Champion Reaper Works. Eventually eight companies made up the merger group. The IHC market share of the total farm machinery was 85 percent. After forming IHC, several new lines acquired including Minneapolis Harvester Co., whose first harvester was built in 1883, in 1903; Weber Wagon Co., IL, acquired in 1903; David M. Osborne & Co., NY, and Aultman-Miller Co., Canton, OH, acquired in 1904; the Keystone Co., Rock Falls, IL, hay tools and corn shredder (originally introduced in 1872); and Kemp manure spreader. *CR FIMA FTOY GH NC35:9 OYIH*
- 1902** Commercially manufactured gasoline-engine driven mower by Ransomes, Sims & Jeffries, Ltd. in England. *BF03*
- 1903** Luebben round hay baler patented by Hugh Luebben and his sons Melchior and Ummo, Sutton, NE (see 1970). *HL1993*
- 1905** Red River Special, a popular and successful thresher, introduced by Nichols & Shepard Co., Battle Creek, MI (John Nichols). *PHAT*
- 1907** Portable equipment systems (attached to tractors) for agriculture introduced in France by Monsieur Tourano. *WABI*
- 1909** Corn picker built commercially. *HYMP LP*
- 1910** Rod weeder for fallow land farming introduced. *HYMP LP*
- 1912** Rotary hoe produced commercially. *HYMP LP*
- 1912** Hay conditioner invented by German Hermann Bartsch (see 1928, 1965). *AE(Sept1990)*
- 1912** Cotton picker device patented by Theodore H. Price, 1861-1935, who later joined with Angus K. Campbell, 1834-1926, selling their rights (from Price-Campbell partnership) to International Harvester Co. in 1924. *DAB OYIH*
- 1914** Reel-type side delivery rake introduced. *HYMP LP*
- 1914** Land leveler introduced for irrigation farming. *LP*
- 1915** Improved field-corn harvester patented, based on work of Charles C. Fenno, Grinnell, IA, and Joseph Weigel, SD, and further developed by Andrean and Adolph Ronning, Boyd, MN. *HL1992*
- 1916** Garden tractors, so identified, introduced. *LP*
- 1917** Centrifugal threshing machine invented by Thomas Forster, 1870-1946. *GH* has G. F. Nye for centrifugal thresher with no date listed. *NC34:322 GH*
- 1918** International Harvester Co. introduced portable equipment systems for equipment-supporting tractors. *OYIH WABI*
- 1918** Attempt to control insects using airplanes, followed in 1921 by a specially equipped airplane for dusting crops, initially for cotton, and in 1924 by a specially designed airplane

- for crop dusting (see 1921). CLAA YA1960
- 1918** Osborne Co. line of equipment, primarily leaders in the development of mowers, reapers, and binders, originated by David M. Osborne, 1822-1866, sold to International Harvester Co. OYC
- 1918** Ronning Harvester, horse-drawn, manufactured by American Harvester Co., Minneapolis, MN. GEA
- 1919** Grain binders among first implements adapted to tractor PTO operation. LP
- 1919** Four-furrow Key-Conqueror disc plow manufactured in England by Ransomes, Sims & Jeffries, Ltd. EAM
- c. 1920** Combined swath turner and side-delivery rake produced by Englishman Mr. Jarman. EAM
- 1920** Equipment built as attachments for tractors: snow blowers, plows, soil scoops, terracing and dozer blades, trenching machines, grass mowers, and equipment for use with hydraulic hitch for Ford tractors by the Arps Corp., incorporated in 1923 as Farm Specialty Co., New Holstein, WI, by Bruno Frederick Arps, 1890-1965. NC51:689
- 1921** Aviation used for aerial crop dusting using World War I Curtis JN6H plane by C. R. Neillie, Troy, OH. The first airplane designed specifically for crop dusting used in 1924. CLAA GEA HL1995 WABI YA1960
- 1921** Tool-bar method for attaching implements on tractor introduced. HYMP LP
- 1922** Horse-drawn combine harvester with an auxiliary engine marketed by Massey-Harris, Ltd. WABI
- 1922** Axial-flow grain harvesters patented by Felix Schlayer in Germany, although earlier stationary axial-flow threshers were patented by Gregor & Gregor in 1886 in Germany. GH
- 1922** Parshall Measuring Flume invented for measuring flow of water in open channels for irrigation, published by Ralph L. Parshall, 1881-1959, Colorado State University, Ft. Collins, CO. HL1985 NC49:87-88
- 1922ff.** Tillage and traction equipment design criteria developed that led to new tillage tools. Work pioneered by Mark L. Nichols, Auburn University, AL, and the National Machinery Tillage Laboratory, now named the National Soil Dynamics Laboratory, Auburn, AL. HL1990
- 1924** Mounted-type tractor implements introduced by several manufacturers. LP
- 1924** Soybeans harvested by combine in Illinois. GH
- 1924** Offset disk harrow introduced in USA. HYMP LP
- 1924** International Harvester Co., having acquired rights to the Price-Campbell spindle-type cotton picker, experimented with mechanical cotton harvesters, which became commercially available on large scale in 1943 (see 1941, 1943). AH(Jan1950) CLAA RS(Jan2000)
- 1924** The Gleaner name became a trademark for combine-harvesters, involved the Baldwin family. The Gleaner Baldwin and Baldwin Gleaner combine patented and developed over the following years as a wrap-around (mounted on a Ford tractor) and became the first

combine in North America to offer a corn head. Members of the Baldwin family were mainly responsible, with Curtis C. Baldwin, 1888-1960, principally involved. The Gleaner Harvester Works acquired by Allis-Chalmers Co. in 1955. *GH*

1925 Air-blast type field and orchard sprayer introduced. *LP*

1926 Cotton stripper built commercially for use in high plains area of USA. *HYMP*

1927 Tractor-carried plows patented produced by manufacturers, one of which was the French Huguet-Huard. *WABI*

1927 Mechanical-spindle cotton picker, invented by John D. Rust, 1892-1954, and Mack D. Rust, 1900-1960, put cotton pickers in the field; patent issued in 1933, self-propelled in 1929. First produced by Rust Cotton Picker Co., Memphis, TN, in 1936, followed by Ben Pearson Co. and by Allis-Chalmers Manufacturing Co. in 1944 (see 1944). *CLAA DAB
FFFR NC42:613 SA247(1982) WWWW*

1928 Two-row tractor-mounted corn picker driven by PTO manufactured by New Idea Co. *HYMP*

1928 Hay conditioner independently developed by E. B. Cushman in California. After WWII a few Cushman-type machines were manufactured by John Bean Co., now FMC Corp. (see 1912, 1965). *AE(Sept1990)*

1929 Oliver Farm Equipment Co. absorbed Hart-Parr Tractor Co. (see Tractors and Power Units), Nichols & Shepard Threshing Machine Co. (formed in 1886), and American Seeding Machinery Co. (formed in 1850). The Cleveland Tractor Co. was absorbed in 1944, and the Oliver Farm Equipment Co. was absorbed by the White Motor Co. in 1945 (Cal Sivright, 1886-1946, W. King White, 1901-1947, Rollin H. White, 1872-1962, and his brother Clarence White). *ATEN FIMA NC34:338 NC36:386 NC52:365 OHP PHAT*

1929 Ann Arbor Baler, considered world's first pick-up baler, introduced and manufactured by the Ann Arbor Manufacturing Co. originally in Ann Arbor, MI, commemorated at Shelbyville, IL. Became part of Oliver Farm Equipment Co. in 1953, and later the White Motor Corp. *ASABECal HL 1980 OHP*

1929 Two-row, mounted, corn picker introduced. *LP*

1929 Airplane seeding of rice initiated in California. *AE(Feb1930) CLAA*

1929 Prototype of fully floating cutterbar built, leading to formation of Hume-Love Co., Garfield, WA (1930-1941), Horace D. Hume and James Edward Love (see 1932, 1935). *GH*

1929 Minneapolis-Moline Power Implement Co. formed with the merger of three companies: Moline Plow Co. (1870-1929), Minneapolis Steel & Machinery Co. (1902-1929), and Minneapolis Threshing Machine Co. (1874-1929). *MMT*

1930 Fleming-Hall baby combine, first having a 5-ft. cut and later a 40-in. cut, PTO-driven, invented by Robert Fleming and Guy H. Hall. Commercially produced by Allis-Chalmers Co. under the direction of Harry C. Merritt, built at LaPorte, IN plant, later known in 1934/1935 as All-Crop Harvester. *CLAA EHT GH LP YA1960*

1930s Rotary-blade mowers introduced. *BF03*

1932, 1935 Hume-Love Floating Cutterbar and Pickup Reel patented in 1932 followed by

improvements, particularly the pick-up reel by Horace D. Hume and James Edward Love who formed a partnership (Hume-Love Co., Garfield, WA) in 1930; designed particularly for harvesting lentils, pea beans, dry peas, and soybeans but used more widely (see 1929).

HL1993 GH

1932 Pick-up baler manufactured by Ann Arbor Machine Co., Shelbyville, IL, based on design by Raymond McDonald. *GEA*

1932 Commercially successful pick-up forage harvester developed by Erwin W. Saiberlich and manufactured by Fox River Tractor Co., Appleton, WI. Earlier models had been designed by Floyd W. Duffee, University of Wisconsin, and William J. Conroy, Ayllmer, Quebec, Canada. *HL1989,2004*

1933 Heavy-duty chisel plow, which helped control wind erosion, invented by Fred Hoeme, Hooker, OK (see 1938). *HL2000 RS(Jan2000)*

1933 Horizontal-arm, driven, impact-sprinkler head introduced, patented in 1935, by Orton H. Englehart, manufactured by Rain Bird Sprinkler Co., Glendora, CA. *ASABECaL
HL1990 RS(Feb2000)*

1934 Dust storms originated in midwest and surrounding area resulting in Dust Bowl. To counteract dust storms several government programs involving plowing, tillage, erosion control, land use, plants and trees, and related practices were developed to counteract dust storms. *CLAA YA1960*

1934, 1935 All-Crop harvester (combine) for one-man operation with 5 ft. width and low power requirements (two-plow tractor), PTO-driven, introduced by Allis-Chalmers Co. *CLAA EHT GH LP YA1960*

1935 Lift-type mounted plows introduced and gained in availability. *LP*

1935 Research on conservation tillage initiated by Frank Duley and associates at the University of Wisconsin and with the USDA. *GEA*

1935 Caterpillar Co. discontinued the combine business and sold combine line to Deere and Co. *GH*

1935 Design of vegetated waterways by engineers of the Soil Conservation Service, Spartanburg, SC, under the leadership of W. O. Ree. *HL1990*

c. 1935 Design for vegetated waterway, called the Nichols terrace, developed at the Alabama Agricultural Experiment Station, Auburn, AL, credited to the leadership of Mark L. Nichols, 1888-1971. *HL1971 WWWW*

1936 Field forage harvester available commercially. *LP*

1937 Noble Blade cultivator patented for prairie lands. It sheared the stubble below the soil surface and reduced erosion. Invented by Canadian Charles S. Noble, Nobleford, Alberta, Canada. *HL2005*

1938 Commercially successful self-propelled combine harvester for small grains, the M-H 20, developed by Australian engineer Thomas Carroll, c. 1888-1968, first used in Argentina, manufactured by Massey-Harris Co. using a 65 hp Chrysler engine that became a leader in the field. *GEA GH HL1982 MT RS(Jan2000) WABI*

- 1938** Graham-Hoeme chisel plow introduced commercially based on research of USDA Conservation and Production Laboratory, Bushland, TX. Rights of development and manufacture purchased from Fred Hoeme, Hooker, OK, by W. T. Graham, Amarillo, TX (see 1933). *HL1999 RS(Jan 2000)*
- 1939** Insecticidal properties of DDT discovered by Swiss Paul H. Muller, 1899-1965 (see 1962). *MWBD TA*
- 1940** Tractor PTO-driven side delivery rakes commercially available. *LP*
- 1940** First successful automatic pick-up, self-tying hay and straw baler manufactured by New Holland Machine Co., New Holland, PA. Development based on work of a farmer in the area and engineers at New Holland Machine Co. *ASABECaI2007 HL1979 HYMP LP*
- 1941, 1943** Spindle cotton picker, single row, successful commercial spindle picker (*CLAA* calls this a high-drum cotton picker), developed by International Harvester Corp., Model H-10-H, after obtaining the patent rights in 1924 from Theodore H. Price, 1861-1935 (pat. in 1912) and Angus K. Campbell, 1834-1926 (pat. in 1895), who had formed the Price-Campbell partnership. This cotton picker, called the Old Red, used in 1943; Producers Cotton Oil Co. was the original owner. In 1970 on display at the Smithsonian Institution, Washington, DC. *RS(Jan2000)*
- 1941** H. D. Hume Co. established in Mendota, IL (formerly a part of Hume-Love Co.) (see 1932). *GH*
- 1941** Self-Leveling Control for hillside combines conceived by Raymond A. Hanson, Palouse, WA, with devices first marketed in 1945 by company he formed, RAHCO, Spokane, WA. *HL2008*
- 1941** Equipment for precision planting of vegetable seeds available. *LP*
- 1941** Plow and tillage implements with hydraulic system for controlling draft, developed by Irishman Harry G. Ferguson, 1884-1960. *WABI*
- 1942** Segmented sugar beet seed used for planting instead of the natural cluster of seeds. *HYMP*
- 1942** Castor bean huller-harvester developed by USDA. *CLAA YA1943-1947*
- 1942** Rationing of farm machinery, as a result of the demand for materials during WWII, delegated to USDA by the Office of Price Administration (OPA), continued until late in 1944. *CLAA*
- 1943** First appreciable use of commercial sugar beet harvesters. *LP*
- 1944** A commercially viable cotton picker, based on work of John D. and Mack D. Rust (beginning in 1927/1928), who contributed important ideas in their picker manufactured by Rust Cotton Picker Co., Memphis, TN in 1936 (see 1927). Placed in production by Ben Pearson Co., and later by Allis-Chalmers Manufacturing Co. in 1944. *AIM CLAA DAB
GEA HL1978 LP NC42:613 NC49:523 OYIH WWWW*
- 1944, 1945** Oliver Farm Equipment Corp., Chicago, IL, became the Oliver Corp. and merged with the White Co. In 1953 acquired the Ann Arbor Machine Co. (originally Ann Arbor Hay Press Co., Ann Arbor, MI, founded in 1910) and Cleveland Tractor Co., managed

by Cal Sivright, 1836-1946.

ATEN EAFT NC34:338 NC36:386

1945ff. Numerous activities in research and development of equipment for mechanical harvesting of fruits and vegetables intensified, some of which are listed herein. *AEI*

1945 Tractor-operated machine built for collecting sweet pea vines for animal feed.

CLAA YA1943-1947

1946 Self-propelled corn picker (tractor mounted) introduced by Massey-Harris Co. and came into prominent use. *GH LP*

1948 Prototype center-pivot irrigation device developed by Frank L. Zybach, 1894-1980, patented in 1952, manufactured in Nebraska. *GEA HL1993 SA234(1976)*

1950 Mechanical tomato harvester development begun by Blackwelder Machine Co., Rio Vista, CA, by Frederick L. Hill of Blackwelder (Ernest and Fred Blackwell), Coby Lorenzen, Jr., Steven J. Sluka, and vegetable crops specialist Gordie (Jack) C. Hanna of University of California, Davis, CA. The first successful machine was built in 1959 and became the dominant tomato harvester in USA. By 1968 tomatoes for processing were predominately harvested mechanically (see 1960/1961). *ATTC HL2005*

1950ff. Grain aeration systems developed by several people including those at Kansas State University, Iowa State University, Purdue University, USDA researchers, and Producers Rice Mill in Stuttgart, AR. *HL2001*

1951 Kenaf fiber planting of commercial importance at Belle Gade, FL. Kenaf fibers used as a substitute for jute and burlap. *FFFR*

1952 First attempt in USA to mechanically harvest grapes, by A. J. Winkler and Lloyd H. Lamouria in California. *CLAA STF*

1952 Helical-flow threshing cone invented by Wesley F. Buchele, Iowa State University Ames, IA, for which two USA patents issued. *JCUL*

1952 Center-pivot self-propelled irrigation system, patented by Frank L. Zyback, 1894-1980, in Nebraska. *BDPE HL1993 SA234(1976)*

1952 Shielded snapping rolls for corn harvesting developed by Charles Morrison, Deere & Co., Des Moines Works, Ankeny, IA. *HL1998*

1953 Ann Arbor wire-tied field baler rights sold to Oliver Corp. (see 1929, 1944). *OHP*

1954 Deere & Co. first company claimed to successfully market a corn-head attachment for combine, John Deere Models No. 45 and No. 10. *GEA GH*

1955 Fully leveling combine released by International Harvester Co., Model 141 H, design based on contract with Frank Farber of Moscow, ID (see 1941). *GH*

1955 Allis-Chalmers Co. phased out the All-Crop harvester models in favor of the Gleaner trademark upon purchase of the company, credited to Curtis C. Baldwin, 1888-1960, in Kansas. *GH*

1956 IHC produced its first combine with a corn head, applied to the Model 141H (see 1954). *GH*

- 1956** Air seeder that plants seeds through a pneumatic delivery system, patented in Australia, manufactured by Gyrat Co. *GEA*
- 1957** Automatic bale ejector for tossing bales into a trailing wagon introduced by Deere & Co., designed by William A. Hewitt, 1914-???. *NCL:79,80*
- 1957** Skid-steer loader designed and built by American brothers Cyril and Louis Keller, became known as the Bobcat, manufactured by Melroe Manufacturing Co., Gwinner, ND. *HL2004*
- 1958** Massey-Ferguson Co. formed by the merger of Harry Ferguson firm with Massey-Harris Co., following a brief period as the Massey-Harris-Ferguson organization. *FT1950 WABI*
- 1958** Cylindrical bale press making bales weighing about 100 lb. marketed as the Roto-Baler by Allis-Chalmers Co., leading to a cylindrical baler making much larger bales over 1500 lb. (picture in *SWABI* illustrating baler has Massey-Ferguson label). *SWABI WABI*
- 1958** Revised design standards developed for 1000 rpm PTO for implements and tractors. *HYMP ASABEST*
- 1959** Mechanical harvester known as an inertia shaker for red tart cherries introduced in USA by Jordan H. Levin and associates with the Agricultural Research Service (ARS) at Michigan State University, in collaboration with R. T. Whittenberger with the ARS at the USDA Eastern Utilization Laboratory, Philadelphia, PA. *CLAA STF YA1968*
- 1959** Mechanical tomato harvester introduced in California based on work of Coby Lorenzen and associates, including plant breeders, at the University of California, Davis, CA, and Blackwelder Manufacturing Co., Rio Vista, CA (see 1950, 1961). *ATTC CLAA*
- 1959** Revised standards approved for three-point linkage attachment for connecting implements to agricultural wheel tractors. *HYMP ASABEST*
- 1959ff.** Minimum-tillage and no-till equipment and planters began to be manufactured in large quantity, offering more conservation practices. *HYMP*
- 1959** Massey-Ferguson Co. acquired F. Perkins, Ltd., which produced diesel engines. In 1978 all Massey-Ferguson combines were diesel powered. *GH*
- 1960** Cubing or wafering machines for handling forages introduced (see 1966). *CLAA YA1970*
- 1960** Rice fissuring mechanism caused by tension when grain rewetted following sun drying enunciated by Otto Kunze, Texas A & M University, corroborating earlier work in Japan by Kondo and Okamura (1930) but ignored, changing handling of rice kernel. *RS(Apr2000)*
- 1960, 1961** Successful mechanical tomato harvester marketed by Blackwelder Manufacturing Co., Rio Vista, CA, licensed by University of California, Davis in 1959 and patented in 1965, after considerable research and experimentation by Coby Lorenzen and Steven J. Sluka in cooperation with vegetable crops specialist Gordie (Jack) C. Hanna at the University of California, Davis and Blackwelder Manufacturing Co., Rio Vista, CA. Steven J. Sluka was the originator of the first successful tomato-vine separator used in the machine with contributions from Bill A. Stout of Michigan State University. By 1970 approximately 1500 machines were produced (see 1950). *HL2005 RS2007 SA1967 SA1982 TA*

1962 Book *Silent Spring* by Rachel Carson published, influential in describing the use and effects of certain chemicals, leading to the banning of DDT in many locations and applications in the world during the 1970s. *ETCT*

1962, 1963 White Motor Co. assumed ownership of Cockshutt's farm equipment division. White had previously purchased the Oliver Corp. and in 1963 bought the Minneapolis-Moline Co., and organized these into the White Farm Equipment Co. *CCS*

1963 Rotary-drum grain-straw separation (replacing standard straw walkers) manufactured by Roto Thresh Ltd., Saskatchewan, Canada. The concept of rotary-drum threshing was developed by Frank McBain and Bill Streich in Manitoba in 1951. *GH*

1964 Automated irrigation systems widely used. *CLAA YA1968*

1964 Experimental mechanical head lettuce harvesters developed in California and Arizona. The experimental head lettuce harvester developed at the University of California by engineers R. E. Garrett and R. E. Griffin and vegetable crops specialist Mike Zahar. The experimental system for harvesting head lettuce developed at the University of Arizona by engineers B. L. Harriott, K. K. Barnes, and E. O. Finch and horticulturalist P. M. Beset.

AE(Nov1964)

1965 Hyaline mower conditioners for hay manufactured by New Holland, Inc., New Holland, PA, based on work of H. G. McCarty, Lawrence Scrooge, and Elmer Del. The machine led the way for hay harvest methods and implements (see 1912, 1928). *AE(Sept1990)*

1965 Universal Soil Loss Equation (USLE) published following the work of many people. The equation by Walter H. Wischmeier and Dwight D. Smith at the USDA National Runoff and Soil Loss Data Center at Purdue University served to measure conservation methods. Revised Universal Soil Loss Equation (RUSLE) issued in 1992 by ARS. *BDPE MEA*

RS(Feb2000)

1965 Axial-flow machines for corn combines introduced to the market by several manufacturers including International Rice Research Institute, Massey Harris, and a number of Southeast Asian companies, three French manufacturers such as ABM Rivierre-Casalis, Australian Walsh Maize Header in Queensland, International Harvester Co., and New Holland Co. *GH WABI*

1966 Deere & Co. introduced a hay cuber. *NCL:80*

1966 Electronic monitoring devices introduced by Dickey-john Manufacturing Co., providing more efficient planting. *GEA*

1966 Standards issued for full shielding of power drive lines for agricultural implements and tractors. *HYMP*

1966 Slow Moving Vehicle Identification Emblem (SMV) approved as an ASAE Standard, approved by American National Standard (ANSI) in 1971, developed under the leadership of Kenneth A. Harkness, Ohio State University. *HL1992 RS(June2000)*

1968 Laser-beam automatic grade control of a trenching machine first demonstrated at the Ohio State Farm Science Review, developed by James Fouss and Norman Faussey of the USDA ARS at the Ohio State University, with Terry Studebaker, Ted Teach, and David Studebaker. *HL2007 RS(2007)*

- 1969** Minneapolis-Moline Co. joined with Oliver Farm Equipment Co. and the Cockshutt Equipment Co. Ltd. of Canada to form the White Farm Equipment Co., Oak Brook, IL. CCS
- 1970** Giant, round hay baler invented and patented by Wesley Buchele and Virgil Haverdink, Iowa State University, Ames, IA. *CLAA JCUL YA1975*
- 1971** Forced-air corn planters introduced by International Harvester Co., preceded by electronic planter monitors introduced in the 1960s, most of which were manufactured by Dickey-john Corp. *HYMP*
- 1971-1974** Cotton module builder developed by Lambert Wilkes of Texas A & M University, with the support of J. K. Farmer of Cotton, Inc. The implement collected the cotton in the field and prepared it for direct feeding into the gin. *HL2002*
- 1972** Major manufacture of balers that make large round forage bales weighing up to 2000 lb., by the Vermeer Manufacturing Co., Pella, IA. A baler making small round bales for forages was built in the 1930s by Allis-Chalmers Co. (see 1903, 1970). *HYMP JCUL*
- 1974** Deere & Co. introduced the Max-Emerge Planter, a plateless planter, with finger-pick-up seed metering. *HYMP*
- 1975** Combine harvesters with axial-flow threshing introduced to the market: International Harvester Co. models 1440, 1460, and 1480, and the Sperry New Holland TR70, New Holland, PA. Development started in 1962. *GH*
- c. 1976** Land-leveling devices using laser controls in use (see 1968). *AE1991*
- 1977** Axial-flow combines introduced to market by International Harvester Co. *GH*
- 1977** The Roto Thresh combine manufactured in Saskatoon, Saskatchewan in 1977. *GH*
- 1980** Sales of farm equipment dropped greatly, at least 50 percent from 1979. Several companies discontinued, merged, or entered new businesses as a result of economic downturn in North America. *HYMP*
- 1985** Ford Motor Co. purchased New Holland division from Sperry Corp. and formed Ford New Holland Co., manufacturing tractors and implements. *FT1975*
- 1990** Allis-Gleaner Co. formed AGCO, originally including Deutz-Allis Corp. of North America and Klockner-Humboldt-Deutz (KHD) of Germany, including tractors and equipment, later acquiring Hesston, McConnell, White, Massey Ferguson, Tye, Flencoe, Farmhand, and other companies. *FT1975 RS(Sept2000)*
- 1993** AGCO purchased the White-New Idea line of products from Allied Products and North American Ferguson distribution. *FT1975 FTOY*
- 1996** Mechanical grape pruner, called Vinemaster, developed by Roger Dellinger, manufactured by the Valley Vine Machine Co., Richland, WA. *RS(1996)*