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Milestones of Agricultural Engineering

Since 1987, innovations in agricultural engineering have been presented here in this contribution which changed agriculture at their time or at least meant significant progress. If one follows the mechanization of agriculture back along the milestones of agricultural engineering 25, 50, 75 years and longer, one will be astonished to notice that many ideas and solution proposals are not as new as they may seem.

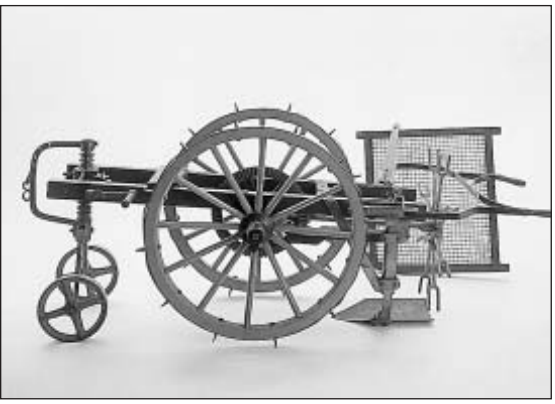

Fig. 1: Potato digger system Hanson, a model of the German Agricultural Museum in Hohenheim

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Keywords

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George Washington is ascribed the statement „Agriculture is the healthiest, most useful, and noblest occupation of a free man". The first American president thus expressed his high esteem for the farmer's work. If one assumes that at Washington's time three farmers together were able to supply just one city dweller with food, this appreciation of the farmers is rather surprising because their work was not efficient by today's standards. At present, things are different. Meanwhile, one single farmer feeds 140 city residents. Nevertheless, the farmers are often pilloried in the public opinion. One speaks of „image problems", but the reasons for the change in esteem for agriculture are more comprehensive. In particular, it has not been possible to keep the magnificent achievement of the peaceful way out of hunger present in the awareness of the citizens.

1730

This problem is not new. Jethro Tull from Berkshire experienced it exactly 275 years ago. His three-row sowing implement, which consisted of a cylinder featuring cavities for seed scooping, two shares placed behind each other, and a harrow for levelling, led to drill culture, which has meanwhile for long been a matter of course, but the innovation did not bring the inventor any luck. In 1840, Tull died impoverished in debtor's prison. Walter Blythe has also largely fallen into oblivion. His swinging plough, however, which followed Dutch models, met with wide acceptance under the name „Rotherham plough". The implement, which was equipped with iron draught regulators, a coulter, a share, and a mouldboard, has made a significant contribution towards the superiority of British agriculture, which lasted far into the 19th century.

1780

James Watt is generally considered the father of the steam engine. Since, however, nothing comes from nothing, James Watt also had predecessors. Nobody, however, disputes that James Watt discovered agriculture as a field of application for the new steam power. When he applied for a patent for steam ploughs 225 years ago, he was ahead of his time, but 75 years later his vision became reality. Capel Lloft from Berry St. Edmonds also had visions. He took up a suggestion of the Society for the Encouragement of Arts, Manufacture and Commerce and designed the first mowing machine, which, however, has not been conserved for posteriority.

1805

200 years ago, new agricultural engineering ideas were realized in particular in the motherland of industry. John Ball from Norfolk was granted the patent for a threshing machine with a threshing unit open at the top. It counts among the predecessors of the „English threshing machines", was shown at the early exhibitions of the Royal Agricultural Society and found acceptance in eastern and northern England. The mowing machine of the toolmaker Thomas James Plucknett from Deptford, which was also patented in 1805, was an original invention as well. He had fitted several sickle-shaped cutting blades to a rotating steel disc driven by the ground wheel, which proved superior to cutters in practical operation.

1830

175 years ago, English flail threshers feared that they might become unemployed due to machines. Under the leadership of an ominous Captain Swing, Luddite riots broke out which caused the destruction of approximately 400 threshing machines. The reaction of the government was harsh: 19 rioters were sentenced to death, and another 498 were deported to Australia. In Germany, the construction of agricultural machines established itself. Among the craft businesses which initiated offer-oriented agricultural machinery production was the company C. Jaehne & Sohn, which began gin production in Landsberg/Warthe and later evolved into a respected machinery factory.

1855

Two brothers, David and Thomas Robert Hay Fisken from Hartlepool, deserve the merit for having constructed the balancing or tipping plough together with the blacksmith Rodgers from Stockton on Tees. The plough consisted of two mirror-inverted ploughs featuring several shares, which were atta-

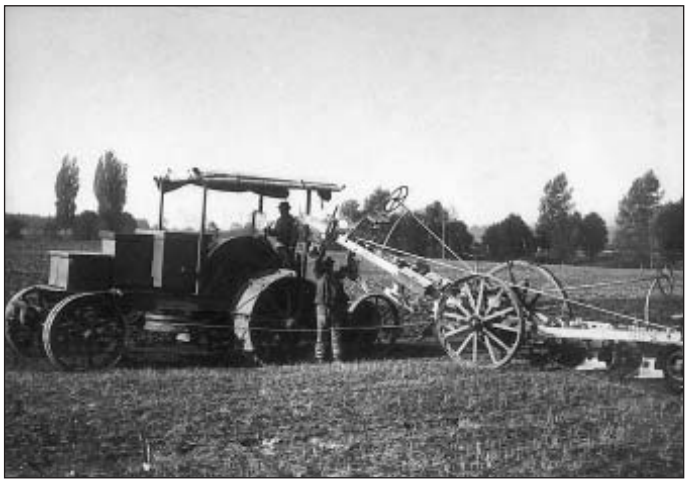

Fig. 2: Electro-plough, based on Siemens patent of 1880

ched to a central wheel frame and allowed for bidirectional ploughing without turning. This implement made the two-machine steam-plough system suitable for practice. On 19 July 1855, the Fisken brothers obtained the patent, which they sold to John Fowler, Leeds, four years later. The patent for a potato harvester granted to Scotsman J. Hanson also significantly influenced the development. The machine, which was equipped with rotating digging forks, became the model for numerous rotary digger variants built in the entire world (*Fig. 1*). Finally, blacksmith Heinrich Bäthmann founded an agricultural machinery workshop in Hornberg near Halberstadt. This workshop became famous for the Hornberg ploughs, which were particularly suitable for deep ploughing, along with other products.

1880

125 years ago, Karl Krebs from Vogelsdorf near Neuenhagen developed a planting hole machine, which mainly consisted of a lattice drum with a holing bolt. The implement, which was very useful for potato planting, was cheap and robust. The Viennese enterprise Friedländer & Frank also specialized in potato technology. Their potato sorter „Dominik" allowed the potatoes to be separated into two compartments with the aid of a cylinder and a wide-meshed screen. Werner v. Siemens along with his cousin and father-in-law, Hohenheim professor Carl v. Siemens, travelled new avenues. Their patent for an electric plough was an agricultural vision (*Fig. 2*). However, its practical realization failed. Thomas Darby experienced similar difficulties. His steam spade plough built by McLaren did appropriate gardening work, but it proved too heavy and ungainly. Newcomers to the agricultural machinery business were Geiger & Rüede, Eislingen, Carl Geringhoff, Ahlen, Mathias Hatz, Ruhstorf, Lythall, Neubrandenburg, and A.J. Tröster, Butzbach, whose products were well known under the brand name „Hassia".

1905

The design of agricultural machinery became an academic subject. Professor Alwin Nachtweh introduced it as a subject of instruction at the Technical College of Hannover. E. Würl obtained an Austrian patent for a technique for the production of durable briquets of dried plants. He thus paved the way for the later development of hay briquetting. The municipal estates of Berlin employed a different technique of forage conservation. On sewage fields, they produced artificial hay by cutting sewage field grass, which was dried artificially. The result was presentable. The protein content of the „artificial product" was twice as high as that of natural hay. W. Siedersleben & Co., Bernburg, designed the first beet topping machine and thus drew the attention of agricultural engineers more towards root crop harvesting. Manor owner Chr. Ortmann from Schepfendorf proved that also practical farmers have always counted among the innovators in agricultural engineering. His precision slurry distributor consisted of a distributor pipe with openings controlled by slide valves. Underneath the pipe openings, bundles of brushwood caught the slurry in order to let it drip to the ground as rain. H. & W. Fritzen, Coesfeld, could have celebrated their 100th company anniversary. In the past, their threshing machines had an excellent reputation, but they quickly disappeared in the combine age.

1930

Claas, Harsewinkel, began development work for the first European combine (*Fig. 3*). Designer Walter Brenner planned a front cutter on top of a 30 hp Lanz Bulldog as a carrier vehicle. Max Holzer, who came from Metzingen at the foot of the Suevian Alb, also travelled new avenues. His single-axle tractor powered by a 6.5 hp engine facilitated the first steps towards mechanized agriculture for many small and medium-sized farms. In Häusern near Biberach, professor Adolf Münzinger started the RKTL's attempt to promote the mechanization of small farms through machinery sharing. The „Committee for Farm Construction" (ALB) was also established on the initiative of the RKTL. Until today, the work of the ALB focuses on the improvement of farm construction and ways to make it cheaper.

1955

In West Germany, 98,538 tractors were newly registered, among them not even 500 having an engine power of more than 60 hp. The number of milking machines reached approximately 75,000, which meant that every 6th cow was milked electrically. In Dethlingen, future developments were initiated. The goal was the continuation of the development work for machines and implements of potato cultivation. The company Hans Käser, Erding, presented a forage harvester where the comminution unit was situated in the area of the suction opening of the impeller blower. As a „cutting loader", the machine was imitated numerous times. The combine type 141 H built by IHC also evolved into a type model. Self-regulation provided slope compensation in both length and width.

1980

The great agricultural machinery exhibitions in Paris and Hannover largely focused on the topic „energy and agriculture". The spectrum offered ranged from the milk warming pump and the straw boiler to the biogas plant for large-scale use. Engines for alternative fuels were also being worked on intensively. Fendt, for example, presented a 75 hp tractor with an alcohol engine, which, however, was unable to fulfill the expectations placed on it. The fast gear option with an overdrive was more successful. 40 km/h guaranteed a gain of time while saving fuel. The Federal Institute for Milk Research considered the trials for the automatic attachment of milking units a check for the future. Patents from East Germany and Japan had shown that the way to the automatic milking system was difficult, but by no means without chances.

Fig. 3: Pilot study for the first European Combine Harvester by August Claas and Walter Brenner