Krombholz, Klaus

Who wrote the first agricultural engineering textbook in Germany?

The book from Albrecht Thaer about "Description of latest and most useful farming utensils", issued at the beginning of the 19th century, can be seen as the first short textbook of agricultural tools and implements in Germany. The author describes there different farming implements, mostly of British origin, and transfers their possible usability into former prevailing conditions in Germany. Emil Perels established approximately 60 years later a complete overview on state of the art about Agricultural Machinery.

Keywords
Historical agricultural engineering, Albrecht Daniel Thaer

Abstract
Landtechnik 68(6), 2013, pp. 424–427, 6 figures, 7 references

In 1803, a brochure was issued by the publishing house Gebrüder Hahn in Hanover under the title "Description of latest and most useful farming utensils" [1]. The author, Dr. Albrecht Daniel Thaer had started his work for the King of Prussia in 1804 involving the continuation of theoretical and practical developments on the farm "Gut Möglin" which he had already been carrying out successfully over three decades on his own farm near Celle where he had established his by then widely recognised expertise in this field. In 1806 an "agricultural academy" was founded at Gut Möglin. From 1819 this became the "Königlich Preußische Akademische Lehranstalt des Landbaus" (Royal Prussian Academy of Agriculture), a model for similar institutions at that time.

Thaer – agricultural and agricultural engineering scientist

Thaer's great success was that he encouraged the transition within agricultural instruction whereby the branch became a science in its own right for which he simultaneously developed important basic principles of theory and practice. Below are listed some of the principles involved:

- The definition of different soil types and respective yield potentials.
- The description of humus and fertiliser properties including those of mineral fertiliser.
- The description of crop rotations.
- The feeding value of crop plants including feeding value of hay.
- The definition of requirements in soil tillage and other fieldwork with the necessary hand tools and implements involved along with basic manuals covering the theory and operation of the equipment.

Dr. Thaer's major work was doubtless his four-volume publication issued between 1809 and 1812 "Basic rules of rational agriculture", reprinted and reissued in 2011 by the "Fördergesellschaft Albrecht Daniel Thaer" (The Albrecht Daniel Thaer Appreciation Society) [2].

The publication "Description of latest and most useful farming utensils" showed that Thaer was not only a pioneer in agriculture, but also active in agricultural engineering.

Volume 1 was issued in 1803, volume 2 in 1804 and volume 3 in 1806, all three being later combined into a single volume.

British models for German Agriculture

When Thaer was writing about farm implements there was no manufacturing industry that could produce agricultural machinery in Germany. Farming tools and equipment were made, usually by village blacksmiths, as single pieces or, at the most, as very small production series, mostly for farmer customers reflecting their respective requirements and experiences.

The situation in Britain at that time was a little further ahead because industrial manufacture had already taken its first steps with production for sectors other than agriculture. So developments in agriculture machinery manufacture were then possible under industrial conditions with subsequent distribution of the results all over the country.

Thaer describes the situation in volume 3 of his work in 1806 (pp. 4, 6 and 7) with the words: "Whereas in Germany the usefulness of tools for manpower savings in manufacturing or in factories is recognised, the same argument fails to be accepted in agriculture and connected businesses. Most people see manpower as the only solution in this environment with any savings though improved tools appearing as not cost effec-

tive. [...] The mind-set in Britain is open to the idea of good tools and improved results for agricultural, too. They have invented unlimited variations of agricultural equipment and every year many new models appear. [...] I do not assert that introduction of new farming implements can be achieved easily and rapidly, nor that this can be done without careful thought. Where the "working class" is raised under conditions akin to slavery, change in this direction can seldom occur."

Based on these conditions and knowledge, it is clear that Thaer looked to England for his ideas in development of agriculture and agricultural engineering, and found them there. Therefore his description of the "latest and most useful farming utensils" relates to those of British origin. It refers to ploughs – he favoured the "Smallschen" plough (almost completely made from iron and with concave mouldboard) for northern German conditions, as well as seed drills based on Ducket's developments. Included is a number of implements for secondary cultivations, rowcrop tillage, potato cultivations and, last but not least, his own seed drill development. The table of content for all three volumes presents an overview of the variations mentioned (**Figure 1**).

Description of latest and most useful farming utensils – an agricultural engineering textbook

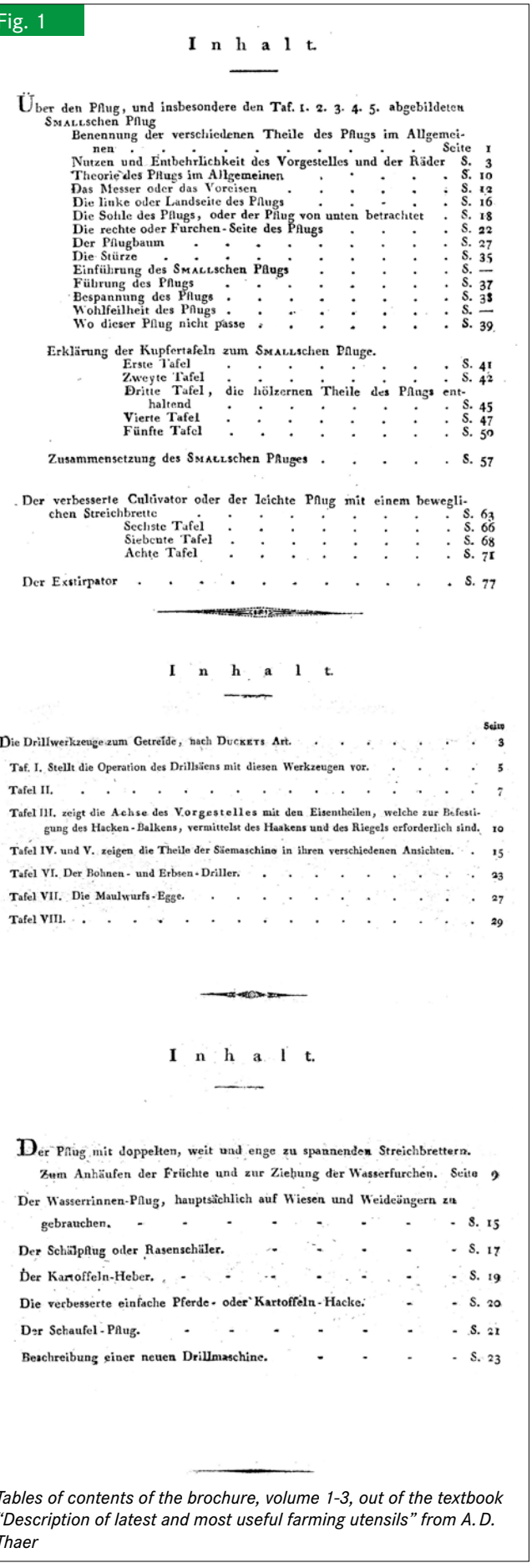
Regarding his presentations, Thaer mentioned the following criteria in the preface of volume 1: "My intention is, and will be, not to produce any illustrations of tools/utensils unless I have been personally convinced of their utility, having seen them applied in practical conditions to my complete satisfaction. From such tools I will then produce mathematically correct and complete drawings of the whole and individual parts so that a craftsman experienced in the use of the revised scales and of compasses and set squares, and with the required application, must be able to produce the required products from the drawings."

Because of the high engineering and technological input in many of his texts and illustrations, Thaer's expectations are fully justified. The author feels that this approach gives his published work the character of an agricultural engineering textbook. This is especially clear in the very comprehensive section concerning the plough. He begins with the definition of ploughing work that is still applicable today, described by Thaer as follows (vol. 1, pp. 10 and 11):

"The plough is applied to slice a strip of soil of a certain breadth and depth on the one – usually left – side, and to separate this strip from the ground below to the right-hand edge , to push this strip onto its side and to invert it and, where possible, also to break the strip up and loosen it. [...] The plough carries this out as a wedge, more exactly a half-wedge, with two right-angled sides and a sloping one."

There follows the definition and identification of the plough's individual elements, the description of their functions and requirements, the demands on their design durability through to instructions and requirements for the manufacturing process.

Fig. 1



I n h a l t.

Über den Pflug, und insbesondere den Taf. 1. 2. 3. 4. 5. abgebildeten Smallschen Pflug

I n h a l t.

I n h a l t.

Tables of contents of the brochure, volume 1-3, out of the textbook "Description of latest and most useful farming utensils" from A. D. Thaer

Fig. 2

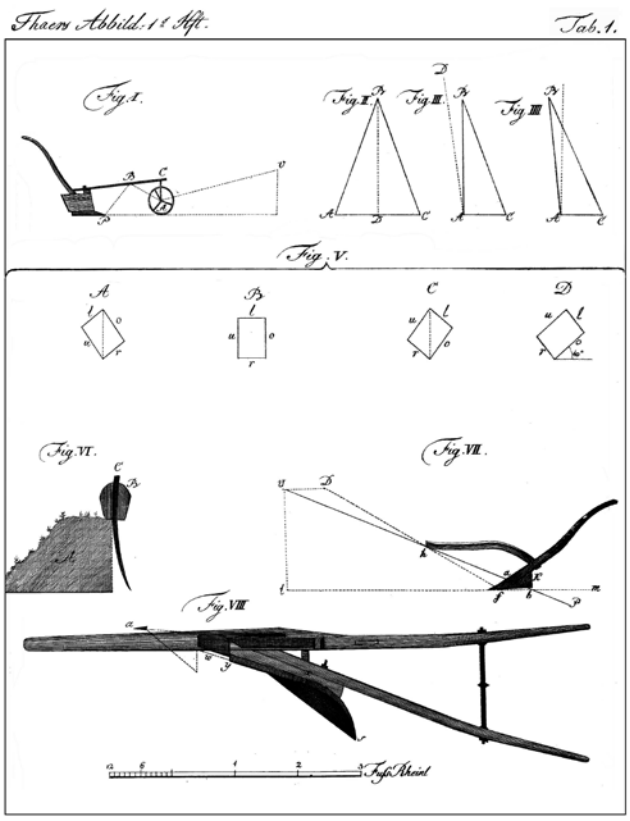


Table 1 about the function and force effects of the "Smallschen Plough" out of volume 1 [1]

Fig. 3

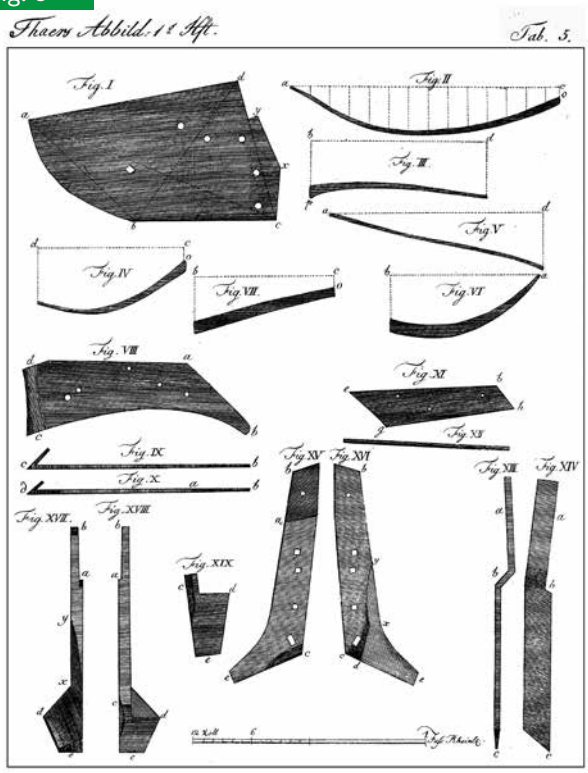


Table 5 about the working areas of the tools for "Smallschen Plough" out of the brochure of volume 1 [1]

Fig. 4

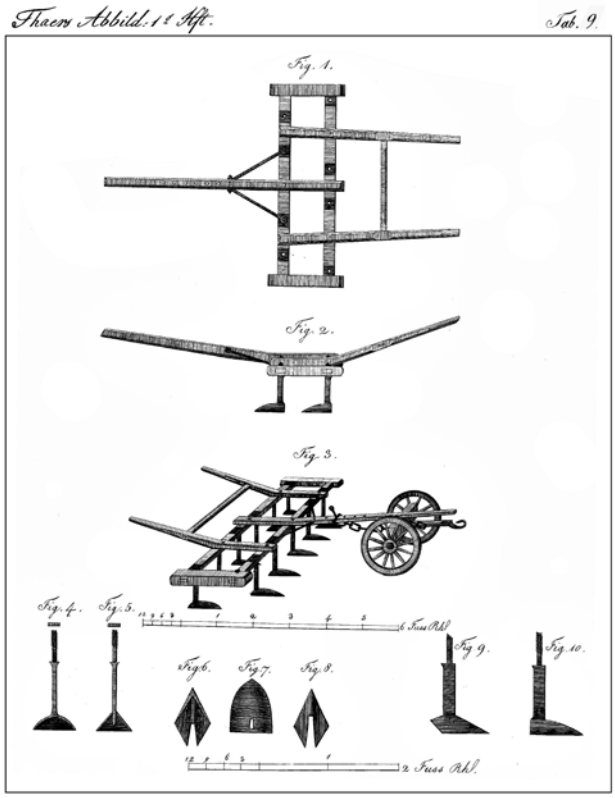


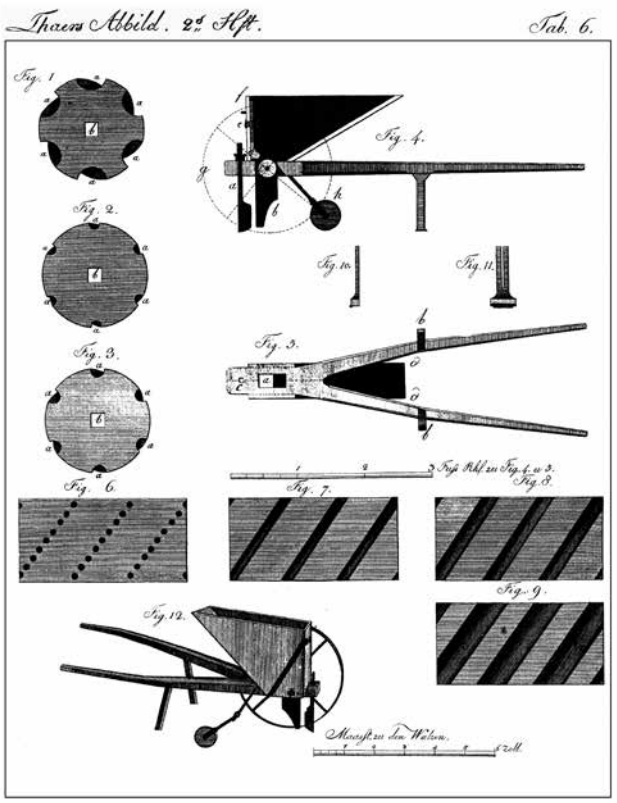
Table 9 about the "Cultivator" out of volume 1 [1]

Also given are comprehensive statements as to practical application and handling, as well as price-benefit relationships. The drawings are impressive. Among other things, these include the lines of force. The scale drawings are so detailed that an exact production is possible from them (**Figure 2** and **3**).

Even where the theoretical presentation of the other implements are a little less detailed, all of them fulfil the above-mentioned requirement of Thaer, especially the graphic presentations (**Figure 4**, **5** and **6**). In total, the publication contains 26 detailed drawings from which five have been selected for presentation here.

Thaer's publication was exceptional for the beginning of the 19th century. Not until the middle of that century did interest in agricultural engineering grow stronger in association with the increasing industrial production of agricultural implements in Germany, a development accompanied by the appropriate publications. Dominating first of all in this respect were written descriptions of agricultural machinery, these being more reports on the uses for the farm implements and not on their development and manufacture [3]. Only with the premier of Emil Perels' "Agricultural machinery handbook" in 1868 was a complete overview on agricultural machinery presented from an engineering point of view [4]. For this reason, Perels' work is regarded as the first agricultural engineering textbook and Emil Perels as the founder of agricultural engineering education in Germany [5; 6; 7].

Fig. 5



Detailed pictures of bean and pea seeder out of volume 2 [1]

Fig. 6

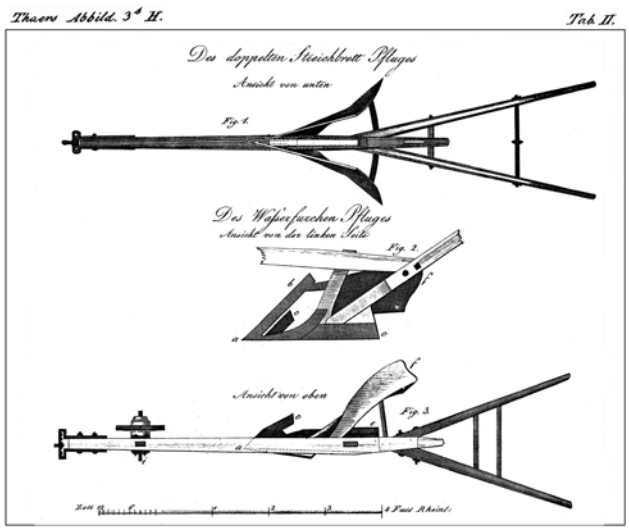


Table 2 about the plough with double, wide and narrow span of the mouldboard out of volume 3 [1]

Conclusions

At least in some aspects of agricultural engineering Albrecht Daniel Thaer had an effect a few decades before Emil Perels did. With his work, Thaer offered for the first time an overview of the state of farm machinery engineering. However, the first agricultural engineering textbook was the achievement of Emil Perels a good 60 years later. An example of this historically valuable development of Thaer's, so important to agricultural mechanisation, can be found in the Albrecht Daniel Thaer Appreciation Society museum in Reichenow-Möglin. So far, this organisation has unfortunately been unsuccessful in attracting sponsors for a reprint.

References

[1] Thaer, A. D. (1803–1806): Beschreibung der nutzbarsten neuen Ackergeräthe, Heft 1 bis 3, Verlag Gebrüder Hahn, Hannover
[2] Fördergesellschaft Albrecht Daniel Thaer (Hrsg.) (2002): Ausstellung Albrecht Daniel Thaer, Eigenverlag, Reichenow-Möglin
[3] Hamm, W. (1872): Das Ganze der Landwirtschaft, Arnoldische Buchhandlung Leipzig, Weltbild Verlag, unveränderter Nachdruck von 1985
[4] Perels, E. (1980): Handbuch des Landwirtschaftlichen Maschinenwesens, 2. Auflage, Verlag Hermann Costenoble, Jena
[5] Giessmann, E.-J. (1988): Emil Perels - Begründer landtechnischer Ausbildung. Eigenverlag, Berlin
[6] Söhne, W. (1990): Geschichte des Instituts für Landmaschinen der TU München und Entwicklung der landtechnischen Institute in der Bundesrepublik, Institut für Landmaschinen der TU München (Hrsg.)
[7] Krombholz, K.; Soucek, R.: Die Landtechnik auf dem Weg zur Wissenschaft, Jahrbuch Agrartechnik 2011, Band 23, DLG-Verlag, Frankfurt am Main

Author

Dr.-Ing. Klaus Krombholz is member of the VDI-MEG expert committee "History of Agricultural Engineering", e-mail: klaus.krombholz@t-online.de