

## En route to the German computer - a historical calculating machine by Prof. Wolfgang Hohenadl

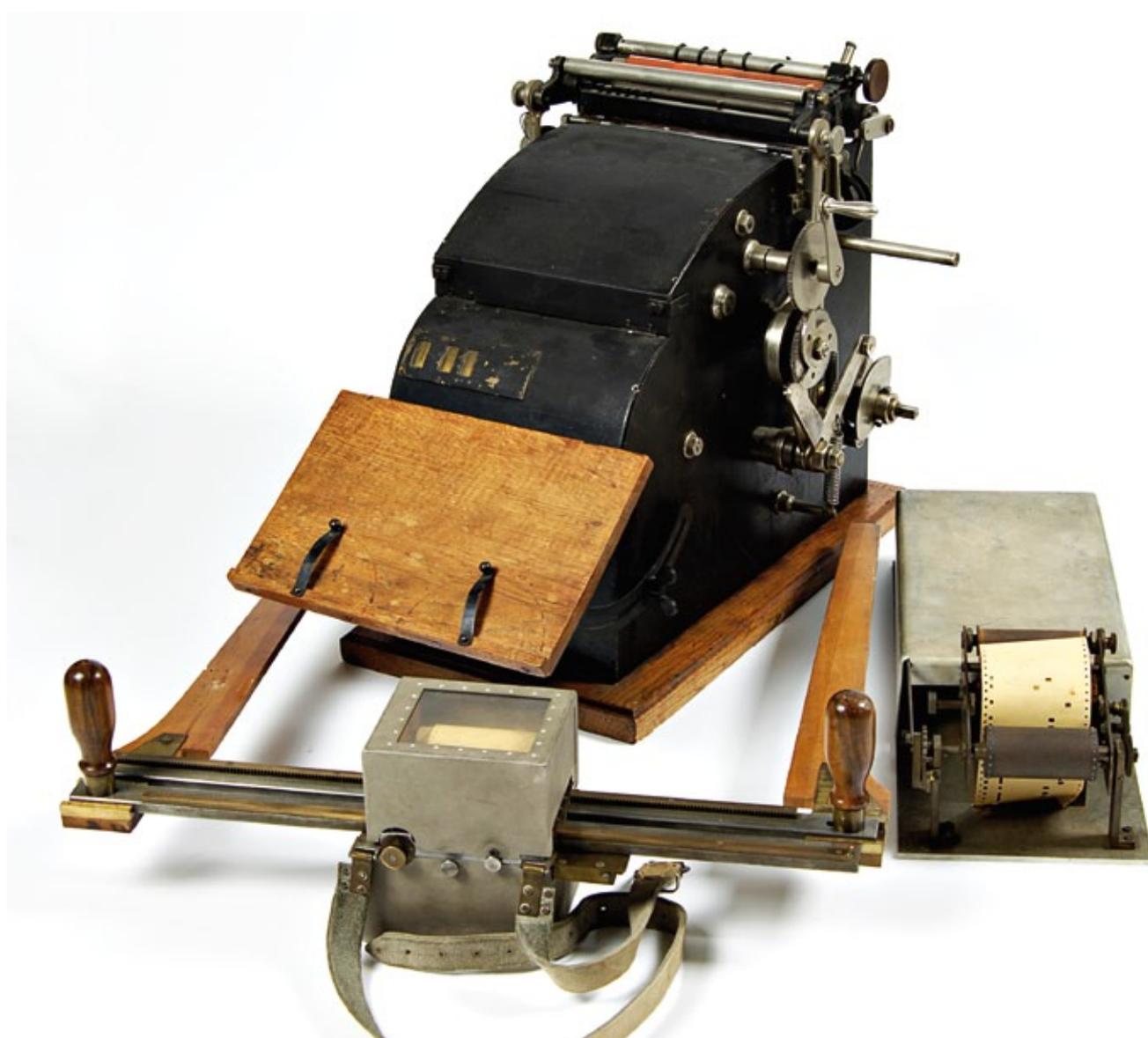
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In a letter dating from November 1980 which is kept in the Deutsches Museum in Munich, Konrad Zuse, the great German pioneer of computer science, enquires about a calculating machine he had seen nearly 40 years earlier in Oberstdorf, and which he had given to him a short while after

writing his letter. Researching the fate of a missing part of the machine two years later, he was informed that the part was probably in the possession of Riefler in Nesselwang ...



## Zuse – Riefler – Hohenadl

What kind of machine is this - most likely hardly anyone knows of it, but decades after it was made it still brought two of the most famous names in the history of German engineering together - Zuse and Riefler. In his 1970 autobiography „Der Computer – mein Lebenswerk“ Zuse describes the time he spent in Hinterstein in the Allgäu region after the war:

„Earlier on I said that I lived in Hinterstein far away from all things technical but I must qualify this a little. The forest warden Hohenadl I mentioned before has a brother in Oberstdorf who has worked on the automatic processing of measuring and recording tree populations. The result of this was an automatic calliper, a device to measure the diameter of a tree. It created a punch tape that was inserted into a calculating machine that works logarithmically, most probably the only logarithmic digital calculator in the world. The brother Hohenadl showed his machine to me, but his superiors had no interest in it. Even today taking stock of the tree population is



difficult for forest administrators and there is no adequate solution for it. The construction of Hohenadl’s calliper was fairly simple. Today we have enough computers to evaluate its figures. Hohenadl’s machines still exist and I hope that it will eventually be possible to present them to the public adequately.“

The „calliper“ he mentions is basically an oversized slide gauge to measure the diameter of tree trunks; it is probably the device in the possession of Riefler in Nesselwang - as a measuring instrument it was in good hands with this maker of drawing instruments, even if most people are more likely to think of top quality precision pendulum clocks when they hear the name Riefler.

## Predecessors of computers before the 20th century

First mechanical calculating machines were built in the early 17th century: examples are known to have been made by German astronomer Wilhelm Schickard (1592-1635) or Frenchman Blaise Pascal (1623-1662). The

first machine that mastered all basic arithmetic operations was presumably that by Gottfried Wilhelm Leibniz (1646-1716). However, it was only in the 19th century that calculating machines were produced on a larger scale and used in every day office life. Around the end of the century the first accounting machines evolved in the US, in 1879 the first cash register was developed. Punch tapes or cards also came into use - Hollerith used them for the census in the US in 1890.

At the turn of the century the increasing range of machines in various fields brought along an increasing demand in science and technology. With his calliper, the punch tape reader and the calculating machine, Hohenadl was one of the first engineers in Germany to adopt these modern methods and develop a solution for his branch that was able to comprise the complete survey process - starting with the measurements and finishing with a printout of the results. This was an achievement that was, according to Zuse, entitled to be presented in a museum for the history of German calculating machines or in a computer museum.

## **Prof. Wolfgang Hohenadl**

Wolfgang Hohenadl was born in 1856 as son of the royal Bavarian forest warden Anton Hohenadl; like his father and four of his brothers Wolfgang became a forest warden too. As a young man he was very eager for knowledge and probably a little bored by the monotonous process of ma-



king records of the tree population by measuring the trunks and then calculating the cubic metres; consequently he devoted some of this time to find a way of simplifying this task. At the same time there were general attempts to streamline the forestry industry and to use a more scientific approach for the tasks involved.

Hi research finally resulted in a German patent no. 147609 in 1902 for a „registration calliper for the determination of the volume of a forest population“ and in 1906 in Austrian patent no. 27197 for a „calculating machine with printer“. Publishing in the Forstwissenschaftliches Centralblatt, he crusades for a modernisation of the forestry industry until as late as the end of the 1940s, writing articles such as „Holzmessung und forstliche Forschung“ (measurement and science in forestry), „Die Bestandsmessung“ (survey of stock) and „Buchführung und Holzmessung in der Forstwirtschaft“ (bookkeeping and measuring the volume of wood in forestry); he mentions the „Einführung forstlicher Buchungsmaschinen“ (introduction of

accounting machines in forestry) relatively late in 1949 and describes the calculating machine patented in 1905 in great detail. The foundation of his calculations are his theories on form and composition of the tree trunks, calculating their growth under consideration of their diameter at chest height and the equations derived from this. How Hohenadl acquired the mathematical and technical knowledge needed for this is not known. Most of it is probably the result of private studies, however, in his obituary for Hohenadl, Prof. Ludwig Fabricius wrote that he sought advice from mathematician and engineering scientist Eugen Stübler, who was later a professor at the technical university in Berlin.

Wolfgang Hohenadl was married to a countess of Uiberacker and the couple had five children. He received his honorary doctorate in the late 1930 from the faculty of forestry in Hannoversch Münden. Wolfgang Hohenadl died on September 7, 1950 in Oberstdorf.



## Registration calliper, counter and accounting machine

When taking stock of the trees, the calliper is worn on a leather strap around the neck, so that it is 1.30 m above ground. The measuring arms of the calliper are set against the tree trunk and the chest pushes the transverse arm against the tree, which causes a paper strip to be punched and moved along. A later version of the calliper permitted classifying the type of wood and tree trunk as well. The resulting punch tape is placed in the counter, which pulls it inside automatically and evaluates it; the result



is the sum of pieces of a particular size, separated according to type of wood and type of trunk. Advantages of this process are not only the saving of time and workforce, but also the elimination of sources of error such as misreading or transmission faults.

The accounting machine has the size of a small cash register and works as follows: The „machine lady“, as Hohenadl called her, sets the length and the diameter of the tree trunk with two crank handles and the volume is calculated by a set formula and displayed. A third handle uses an ink ribbon and a paper roll to create a printout with a consecutive number, the measuring parameters and the calculated volume. A more modern version of the machine was intended to provide much higher flexibility with regard to parameters and the scope of calculation.

However, Hohenadl's inventions did not win much recognition - his colleagues in forestry management were not too keen on innovation. Still, even today measuring the trunk diameter at chest height is crucial for determining the volume of the wood; there are of course electronic callipers now, which allow for storing and evaluating the data on a computer.



## The auction

The auction will include all three devices that were described. The calliper with original punch tape appears complete and in working order, the counter however, seems to be missing a few parts or it is not an electric model. The accounting machine looks to be complete again except for a few lost screws in the case, a missing crank handle and a torn print ribbon. The three machines were either unique pieces or if they weren't, it is unlikely that more than two or three examples of each of them were ever produced.

As mentioned at the beginning, the calliper was with Riefler in Nesselwang around 1980. A letter written by the nephew of Hans Hohenadl, which is also in the Deutsches Museum in Munich, states that the calliper was „send to Riefler in Nesselwang again after the war for some mechanical improvements“. This implies that at least the calliper but presumably also the calculating machine was made by Riefler.

The documentation that comes with the devices is extremely interesting: There are not only some special editions of the publication Forstwis-

senschaftliche Centralblatt with the referenced articles by Hohenadl and a copy of the Austrian patent, but also a collection of hundreds of original design drafts (some of them hand-coloured) and hand-written drafts describing every single detail of the machines the nephew of Hans Hohenadl handed over to Konrad Zuse in the 1980s.

*Without any doubt this is a remarkable piece of the technical history in Germany.*