Taylor and Taylorism. Public Debate and Decline in U.S. and Europe, 1900-1939

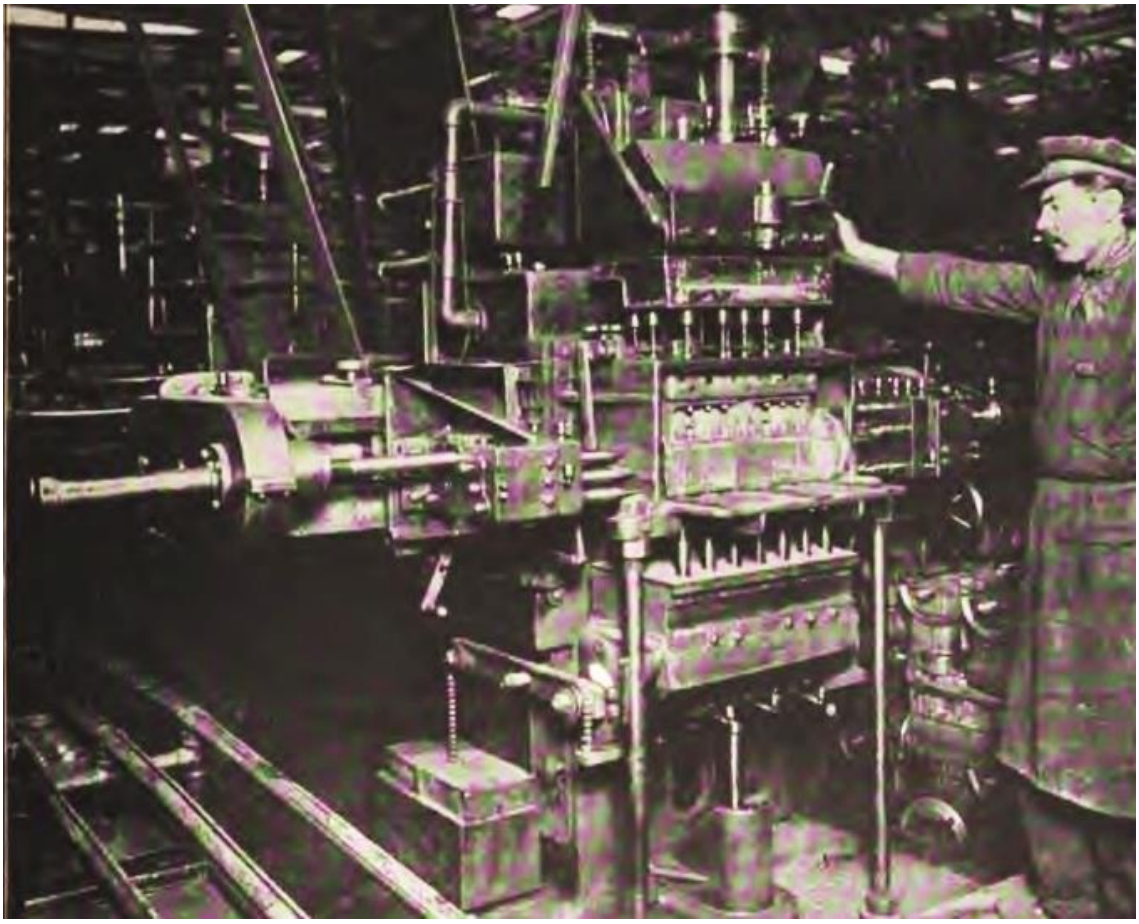

Figure: A worker at a machine at Fordworks Highland Park in 1913. According to Arnold and Faurote in 1919, p. 26.

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Introduction of Walter Volpert und Richard Vahrenkamp (Eds.):
Frederik Winslow Taylor: Die Grundsätze wissenschaftlicher Betriebsführung,
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Revised Introduction 2018.

Content

1 List of figures

2 Summary

Beyond the perspectives of labour science and industrial sociology, in which extensive deepening of the division of labour can be crystallized as an element of consensus under Taylorism, the concept of Taylorism found its way into general intellectual history. In 1954, the German-American management expert Drucker ranked scientific management among the most important contributions of the USA to Western culture. The dissemination of the concept of Taylorism in Western culture outlined here points to a high rank of Taylor's persons in the history of science and industry. The 3rd chapter reflects the economic and ideological conditions for the emergence of Taylorism at the turn of the century 1900 in the USA in the industrial environment of Philadelphia and Pennsylvania with its steel works and machine shops. It mentions two of the developments in economic history of USA: the monopolisation and the emergence of the new assembly-oriented industries. The industrial milieu of Philadelphia, where Taylor was to gain his first industrial experience, greatly favoured the development of his later ideas as is shown.

It also seems appropriate to look back and to reflect on Taylor's actual achievements and place them in the general history of industry. This is the subject of the 4th chapter. Here Taylor's efforts to put his ideas into practice and their acceptance by industry and the public are critically presented. Taylor must be taken at his word and the somewhat beautifully coloured picture that he draws of his personal efficiency and the success of his management system in his publication “The Principles of Scientific Management” must be corrected by confrontation with the traditional history of early Taylor. This procedure, as a by-product, throws away some material on the history of technocratic movements that has so far remained largely unknown.

In the 5th chapter Taylor’s system of work organization is shown. A deepening of the division of labour in the manufactory was his programme, an extensive administrative organisation of the company his means with which he prescribed detailed work to the part-worker and thus sought to achieve the continuity of a factory operation under the conditions of one-off or small-series production. In a word: instead of capitalist mechanization, Taylor set a narrow-minded bureaucratization. His system led to exaggerated bureaucratization. The conflicts Taylor provoked in the Bethlehem steel mills – a leading steel mill in the United States – highlight his technocratic outsider position in the factory world of capitalist rule. The Bethlehem management perceived Taylor's efforts to reorder the power structures of the company as a dangerous attack on its very own

positions, even as a "revolution", and threw Taylor out again in 1901 after three years of consulting work.

Chapter 6 shows how Taylor’s ideas fell on fertile ground of the Conservation Movement and the Effectiveness Movement. Effectiveness became the magic word to cushion middle-class fears of the threat of declassification. Taylor's writing principles were entirely geared to this. Taylor has based his principles as an ideological masterpiece entirely on the instincts of the American middle class, as can be seen from his working-class image. The worker is lazy by nature and deliberately restrains his work. Only through the hard work imposed upon him by the Taylor system can he purify himself into a better person. All publications of the Effectiveness Movement had in common that they did not regard the punch card technology of Herman Hollerith as leading rationalization technology of that time used by many steel works and railway companies. Chapter 7 portrays the broad debate on the nature of Taylorism in industrial context, for example the hearings on Taylorism in the Congress and the position of the trade unions.

This paper is a translation from the German introduction of Walter Volpert und Richard Vahrenkamp (eds.): Frederik Winslow Taylor: Die Grundsätze wissenschaftlicher Betriebsführung, Weinheim 1977 and includes recent literature. It is based on the evaluation of Taylor’s writings in the Transactions of the American Society of Mechanical Engineers, on his books and on biographical studies on Taylor. The German source “Technik und Wirtschaft” is also used, a journal edited by the German association of engineers (VDI) to reflect the acceptance of Taylor’s ideas in Europe.

3 Introduction

All economic historians and automotive historians agree that it is not enough to rely solely on Ford's autobiography “My Life and Work” (1922) to adequately assess Ford's achievements in automotive engineering and economics.

But it's different in the Taylorism debate. Many theorists rely solely on Taylor's Principles of Scientific Management without reflecting their socio-economic conditions of origin. Walter Hebeisen, for example, happily pointed out in 1999 that he had no knowledge of Copley's Taylor biography. Taylor's Principles contain crisp statements that can be wonderfully dissected and are therefore an attraction for many unhistoric theorists. This unreflected use of Taylor's Principles is to be countered in its place by their socio-economic conditions of origin.

To speak of Taylorism has become established in many areas of Western culture. The concept of Taylorism is given various meanings, just as the evaluation of Taylorism is not uniform. Since Taylor is generally regarded as the forefather of ergonomics, Taylorism is primarily used as an ergonomics term. Volpert advocated this view of Taylorism in labour science when he described it as "models of working time and performance-related wage setting."[1] A more general classification of Taylorism in the methods of management was made by Harry Braverman. For him, Taylor possessed "the role of the prophet of modern management," whose three principles still determine management today: first, the emptying of the individual worker's work execution of special skills and knowledge. Secondly, the separation of planning and execution. Thirdly, the management's monopoly on knowledge, which enables it to control the work process and the way it is carried out.[2]

However, Taylorism was early rejected as too narrow an approach by corporate personnel policy as part of management tasks and by the social sciences. In 1962 the sociologist Dahrendorf criticized Taylorism as "social-mechanistic" and remarked with regard to industrial sociology: "This discipline developed through the refutation of Taylor's false assumptions." Special criticism of Taylorism in the debate about the "Humanization of Labor" that emerged in the Federal Republic of Germany in the 1970s is voiced by almost all social groups and also on an international scale. In 1973, a semi-official government study from the USA described Taylorism as "anachronistic". Under Taylorism, she

understood the measures to "simplify, dismember, divide and place under permanent supervision operations".[3]

Beyond the perspectives of labor science and industrial sociology, in which an extensive decomposition of labor executions can be crystallized as an element of consensus under Taylorism, the concept of Taylorism found its way into general intellectual history. In 1954, the German-American management expert Drucker ranked scientific management among the most important contributions of the USA to Western culture. In their history of Operations Research, appeared in 2005, Saul Gass and Arjang Assad see Taylor as a forerunner of Operations Research. In 1960, the later nobel prize winner Herbert Simon stated, that Taylor laid the concept of modern management.[4] In 1948, the French Bourbaki mathematics group described the axiomatic method as the Taylorism of mathematics[5]. Here the decomposition of connections with the term Taylorism is proven in the figurative sense. In a similar way, but with critical intent, the Psychological Bruder in 1971 understands instructional psychology as a "Taylorism of teaching. "In 1970, Alfred Sohn-Rethel gave a philosophical interpretation of Taylorism as "steps towards the full socialization of labor," without further explaining this term.

The dissemination of the concept of Taylorism in Western culture outlined here points to a high rank of Taylor's persons in the history of science and industry. This position of Taylor will be examined in detail on the following pages. Biographical data on his person can be taken from his publications and also from the two-volume work of his biographer Copley from 1923 and the biography of Kanigel 1997. The authors Samuel Haber and Edwin Layton put Taylor in the context of the technocratic movements in the USA around the year 1910, which is referred to here. Furthermore, Taylorism can be placed in the context of various expert movements in the 20th century, such as the rationalization debate in Europe in the 1920s and the automation debate in the USA and Europe around 1960.[6]

Paradoxically, the analysis presented here will show that Taylor can by no means be understood uninterruptedly as a "modern" theorist, suggesting the widespread use of the term Taylorism. Rather, it seems more correct to interpret Taylor as a thinker of the transition from manufacture to industry. This transitional period in the history of industry will be presented in the first chapter. Here it is useful to start from the concept of the mixed late form of manufactory. This term is developed at the end of the introduction.

The second chapter presents Taylor's biographical data, especially his first experiences in industry, which laid the foundation for his later ideas. The third chapter then outlines Taylor's thoughts on work organization in the historical context of the transition period.

This paper is based on an evaluation of the journal “Transactions of the American Society of Mechanical Engineers”, and of some biographical studies in the Taylor literature. For the European debate, also the German journal “Technik und Wirtschaft”. It also seems appropriate to look back at the breadth and diversity in which the concept of Taylorism is used and to reflect on Taylor's actual achievements and place them in the general history of industry. This is the subject of the fourth chapter. Here Taylor's efforts to put his ideas into practice and their acceptance by industry and the public are critically presented. Taylor must be taken at his word and the somewhat beautifully colored picture that he draws of his personal efficiency and the success of his management system in his publication “The Principles of Scientific Management” must be corrected by confrontation with the traditional history of early Taylor. This procedure, as a by-product, throws away some material on the history of technocratic movements that has so far remained largely unknown. The American authors Haber and Layton have worked through the technocratic movements in the USA around the turn of the century 1900, in which Taylor also belongs. Use is made of this in the following.

Two further comments should be made on the procedure. First of all, it has to be emphasized that in this work many things can only be sketched and therefore Taylor cannot be treated exhaustively. In the literature on Taylorism, a position has already been taken to a large extent on its continuity, i.e. it has been shown how the subordination of the worker under the command of a dictatorial management of Taylor has been formulated in principle and has propagated into modern management theories, in ergonomics and in operational practice. In the present critique of Taylorism, therefore, this point need not be elaborated further, and the emphasis was placed on the discontinuity of Taylorism, i.e. the transformation of Taylorism from Taylor's management concept before 1914 to Taylorism in the mechanized industry after 1920 is to be presented here.

Secondly, Marx's conceptual analysis of the transition from manufactory to industry is to be used here to explain the announced concept of the mixed late form of manufactory. The essence of the manufactory consists in an operational grouping of craftsmen, each of whom does his or her own

partial work in a combined work process. The overall work is divided into partial tasks. "The combined total worker, who forms the living mechanism of the manufactory, is made up of a number of... unilateral partial workers[8]." The individual partial workers master their partial work using special hand tools, which they guide manually. Machines are available for heavy work, "but the machinery plays a minor role."[9] Therefore, the manufactory has "no skeleton independent of the workers" and "craftsmanship remains its foundation".[10] In contrast to classical craftsmanship, the manufactory is capitalistic. It serves the production of added value and is under the command of a capitalist. The craftsmen have no journeyman status but are wage labourers who are confronted with the factual conditions of production as foreign property, as property of the capitalist. Only on the basis of the manufactory can the transition to a specifically capitalist factory take place. The factory characterizes Marx as "a structured system of working machines."[11] The individual machine of this system "takes the place of a mere tool", in which "the actual tool is transferred from the human being to a mechanism". In which now in this way the tools pass from the craftsmen to the machinery, "the factory exists as a dead mechanism independent of them, and they are incorporated into it as a living appendage."[12] The work of the craftsmen is disqualified. In the factory, simple handiwork prevails. The division of labour in the factory is not subjective according to the special abilities as in the manufactory, but objective on the basis of the mechanization of individual processes. "Here, the entire process is viewed objectively, in and of itself, analyzed in its constituent phases, and each sub-process is mechanized.[13]

If Marx's criteria are applied to the history of 19th century industry[14], it is probably only the textile industry that fulfils the conditions of a fully developed factory system. In part, the chemistry would have to be added. For Marx strongly emphasizes the system character of the factories with the "continuity of the special processes, where the work object goes through a coherent series of different step processes, which are executed by a chain of different but complementary machine tools."

The textile industry had already developed into an almost fully automatic operating system very early in the 19th century and therefore fulfils Marx's criteria for factory operation in every way. In fact, Marx also primarily chooses his examples of factory operation in the chapter "Machinery" of his work Das Kapital from the textile industry. In the general development towards a factory, the textile industry is far ahead of the other branches of the economy.

In particular, general mechanical engineering, from the production of durable consumer goods to the production of machine tools, did not develop the characteristics of factory operations until late in the 19th century. For a long time, important prerequisites for ensuring continuity of the production process and the use of simple manual labour were lacking. At first the series size of the products was relatively small, so that one could hardly speak of mass production, and thus by the constant alternation of the work no continuity was possible. On the other hand, the precision of the individual parts was low, so that the production remained dependent on the skill of craftsmen. The production of exchangeable individual parts did not become established until the 20th century.[15] Under these circumstances it seems justified to characterize the organizational form of production of large parts of 19th century industry by the term manufactory, because industry employed wage-dependent craftsmen. However, the 19th century industry used machines on a large scale in contrast to the classical manufactory. But in certain cases, the operation of the machine tools also required a special skill, which was not inferior to that of the classical craftsmen. This applies in particular to the operation of the lathe, the most important machine in mechanical engineering. The machine system of early industrialization therefore produced a new class of skilled workers similar to the craftsmen. Therefore, the organizational form of work in large parts of 19th century industry can be described more precisely as a mixed form between factory and manufactory, as a manufactory with machine tools, and this form can be described as a mixed late form of manufactory. It was characterised by workshop work, which already contained many elements of the later developed factory operation in terms of machine equipment but was less advanced in the division of labour than the classical manufactory, whose division of labour could be based on the precise knowledge of traditional production processes for well-known products. On the other hand, the general mechanical engineering sector produced novel products that were subject to rapid technical change using novel processes.

The experimental character of the production process and the relatively small series size gave little cause for a deep division of labour in the mixed late form of the manufactory. It was only at a late stage in German mechanical engineering in the narrower sense that the semi-artistic work of skilled workers was largely forced by mass production methods, such as standardization and precision manufacturing, into simple manual work. This happened in the 1930s.[16]

4 Economic and ideological conditions for the emergence of Taylorism at the turn of the century 1900 in the United States

Taylorism was born at the turn of the century in 1900, when all the ramifications of capitalist civilization had been taken into account. Deep changes in production conditions have required new methods of administration and work organization. The socialization of production in its capitalist form grew in scope and intensity by leaps and bounds. Two of the developments mentioned by the United States until 1930 should be emphasized here: the monopolisation and the emergence of the new assembly-oriented industries.

The monopolization process encompassed the classic basic industries of the 19th century, such as chemicals, coal and steel, which merged to form monopolies and cartels, controlled by financial capital.[17] In the United States, where Taylorism was to emerge, the railways were also players in monopolisation, exploiting their transport monopoly to bring independent small producers and farmers under their dictates. "We live in this country in the time of trusts," Taylor reflected in 1903.[18]

The concentration process posed new management and administrative problems. The anonymous capital gained the dominion over the personally ruling capitalist. This meant that the administration of the companies had to be objectified. Individual knowledge of the business and mutual trust as the basis for cooperation during the 1870s were replaced by a functional bureaucracy. The administration was divided into three major departments: commercial, technical and operational.[19] Administrative officials were assigned such limited and standardised functions that they were easier to replace. In 1874 Alfred Krupp gave his Prokura the famous instruction to build up a functional bureaucracy: "What I want to strive for is that nothing should be independent of the life or existence of a certain person, that no knowledge and no function escape with the same."[20] Taylor took up this objective tendency by saying in 1911: "So far personality has been the first priority, in the future organizations and the system will come first."[21] But this tendency had not yet taken hold. In France until 1914, the word of a Parisian factory owner was as valid as a whole bunch of notarially certified documents.[22]

The concentration of capital has not only had an impact on the forms of management.[23] The accompanying expansion of production, supported by the boom period before the First World War,

called into question the traditional work organization in the production plant. In the first step, monopolization had so far only covered the financial capitalist side of the capital relationship, but had left the organization of labor manufactural. However, there were signs of a transition in the organisation of work according to large-scale industrial standards. One finds, Taylor said in 1903, "that some of the country's most extensive and important industries are still 20-30 years back today in terms of their workshop management." The transformation of the work process should limit the craftsmen's disposal of their work and put management in charge. The lever for this was mechanization, which replaced craftsmen with easily trainable machine operators and as a result productivity increased rapidly.

The American steel industry, in which Taylor gained decades of experience as an engineer, was the first industry to undertake this transformation of the work process in the period 1890-1905, which was studied by Katherine Stone (1974).[24] Originally, a kind of partnership of capital and craftsmanship prevailed. The craftsmen concluded contracts with the capital, which provided the equipment and operating resources, on the scope and type of steel production, which they carried out on their own under the contract system. A trade union was their organisational form, in which the heaters, smelters, foundrymen and waltzers had joined together and which regulated all company matters, such as distribution of work, apprenticeship system, recruitment of unskilled workers and wage rates. But this type of work organization prevented capital from rapidly expanding production. New processes made steel a relatively cheap article in the 1880s. Demand was stormy. The Carnegie Stahl Trust made the decision to break the power of the steel union and gain control of the work organization itself. After thorough military preparations, Carnegie provoked a strike at the Homestead factory in 1892, which ended with their complete defeat. Carnegie now had a free hand for a comprehensive mechanization of steel production and for the rule of labor. With the mechanization of material transport, auxiliary workers disappeared to a large extent, and with the mechanization of material conversion processes, most craftsmen fell down to machine attendants. Instead of the classical dichotomy of craftsman-auxiliary workers, a more homogenized workforce emerged, which was able to acquire the necessary special knowledge in just a few days. This qualification structure gave the management a considerable increase in power; strike breakers could only be trained in a few days.

The homogenization of the working class, however, posed a new danger to the management of the development of proletarian class consciousness and the union to strike. This had to be counteracted

with an institutionalized personnel policy that was intended to awaken company loyalty and individualizing competition among the workers. This was done through measures such as piecework wages, wage differentiation, internal promotion programmes, profit-sharing and capital-sharing plans, welfare facilities, etc. When Carnegie brought its steel company into the US Steel Corporation in 1901, which was dominated by the banker Morgan, financial capital expressly supported this new personnel policy against the resistance of the old managers, who wanted nothing more than open violence against the workforce. This new positive personnel policy became a trend-setter for large companies par excellence. Henry Ford was also to learn from this later.

Centralisation and concentration of capital were not the only characteristics of the economic history of the turn of the century. The capitalist expansion extended rather to completely new branches. This change in industry structure should raise its own problems of coordination and governance. 19th century industry was dominated by process-oriented industries such as chemicals, textiles, railways, iron and steel. In these industries a small number of raw materials of products were processed. The production process was already characterized by semi-automated processes of material conversion - especially in the textile industry. The finished products consisted of homogeneous bulk goods which, as stacked goods, only required a slightly developed distribution apparatus in order to be marketed.

The new industries, which emerged at the end of the 19th century and whose production processes are characterized by assembly processes, offered a much more intensive coordination of production and sales.[25] In these assembly-oriented industries, a large number of different raw materials and preliminary products were processed, which had to undergo a large number of material deformation processes on machine tools before they could be assembled into a complex product. The design and production of these products were neither technologically nor economically clearly defined, but could be varied within wide limits. This circumstance stimulated the desire of the founding capitalists to experiment, to develop the profitable processes, gave up a wide field for a corresponding layer of experts among independent engineers, including Taylor. In the assembly-oriented industries, the marketing of their highly differentiated products, which were subject to fashion trends and rapid technological change, became the work of a ramified sales organization that had to ensure distribution, customer service and spare parts.

These are the general characteristics of the newly emerging industries, whose processes have been described by the slogan mass production and of which the most important are to be mentioned: Clothing and durable industrial consumer goods, starting with the sewing machine - the first durable industrial consumer good of the general population. As early as 1885, the Scottish branch factory of the American company Singer produced 8000 sewing machines per week. The bicycle boom followed in the 1890s, and from 1910 the automobile industry, which was to become the paradigm of mass production, began to rise. Among the new industries were the various branches of mechanical engineering, such as the production of agricultural machinery, from which powerful impulses for economic growth emanated from 1860 onwards, and from 1900 onwards the production of office machinery, which was of particular importance for the management of the huge realms of financial capital, the construction of telephone and electric motors, the manufacture of lifting and conveying equipment for material transport in the factory and finally the highly specialised machine tool industry, whose products achieved a high degree of precision through the exclusive use of the new cheap steel.

The expansion of production called into question the traditional organisation of work in assembly-oriented industries. It was still at the discretion of craftsmen who had organised themselves in the subcontractor system. The workshop master was responsible for the entire administration of production. Under these conditions, management had no means of intervening in the work process in order to increase productivity. However, the expanding production volume exerted constant pressure on management to look for new ways to increase productivity. The low precision of the individual parts made the assembly processes a real feat. The node distribution of the machine tools caused large stagnations in the material flow. With the abolition of the subcontractor system and the restriction of the competence of workshop managers, the human resources system was centralized and its principles uniformly regulated. The individual work processes of the craftsmen were dismantled and mechanized piece by piece. The high precision of the individual parts made assembly a routine and significantly reduced production time. The internal material transport was mechanised and made more effective by moving from the knot-shaped to the linear arrangement of the machine tools. The assembly line became the organisational form of the assembling work processes.[26]

The two tendencies of the turn of the century, the concentration of capital and the emergence of assembly-oriented industries, created problem areas which were reflected by the simultaneously developing science of business management. She worked out solutions of line problems in the

company. Taylor wasn't by a long shot the only one thinking about this. In the United States, the systematization movement attempted to restore the balance disturbed by rapidly growing businesses through centralized control. The military provided the model for hierarchy and discipline, as did the human body for the interaction of productive organs.[27]

In addition to these organisational problems of production, special ideological influences on the design of the Taylor system must also be taken into account. These influences are examined below. In the scientific reception of the newly emerging leadership problem, Taylor was methodically based on the positivism that constituted the dominant way of thinking at the turn of the century. With the unprejudiced analysis of facts one believed to be able to eliminate all metaphysics and to uncover the true laws of nature and society. The task of scientific management, Taylor said, is "to gather all the traditional knowledge that was previously in the possession of individual workers, to classify and tabulate it, to make rules, laws and forms out of that knowledge." Quantification as a specific process has made itself felt in all areas of the social economy, not only in scientific management. In economics, the work of Jevons and Walras advances mathematical ways of thinking.[28] At the same time as Wundt in Leipzig, Galton established a laboratory for experimental psychology in London in 1879. There he develops approaches to quantifying differences between individuals - the scientific armament of social Darwinism - and establishes a scale of points for the beauty of landscapes as well as a scale for mental abilities, thus becoming the ancestor of the qualified concept of intelligence.[29] At the same time, the engineer Taylor made several 10,000 experiments on machine tools to find out the laws of the highest working speed.[30] A nodal point of positivist thinking was the concept of energy in physics, which had crystallized in the middle of the 19th century.[31] With the law of energy all movements of nature, finally also of society, could be reduced to a quantity. The forms of energy became the universal explanatory pattern of bourgeois culture at the turn of the century. The leader of the German positivists, Wilhelm Ostwald, represented "the application of the second law of energetics to all events, in particular to all human actions." The concept of energy became particularly appealing to the bourgeois social image, for with it the work of the proletariat could be reduced to an alleged natural size.[32] Thus the proletariat no longer appeared as a social class, but merely as a force of nature - comparable to the steam engine. As early as 1870, the English economist Jevons undertook 238 individual experiments to determine the maximum lifting capacity of a human being.[33] Taylor thus entered into a recognized tradition when, in the 1890s, he set himself the goal of finding out "how many metre kilograms a worker is reasonably able to carry out in one day.“[34]

Quantification as a method and the energy formula formed the general background of Taylor's thinking. As ideological peculiarities in the United States, to which Taylor referred, now two tendencies are to be emphasized, on the one hand the populist Conservation movement of the middle class, on the other hand the technocratic movement of the engineers. The Conservation movement was a reaction of the traditional middle class of small entrepreneurs and farmers to inflation, unbridled urbanization and industrialization that challenged their traditional rural lifestyles and their ideals of personal independence. Inflation and bloodsucking monopolies, such as railway companies that derisively rejected the requirements of social responsibility, weakened the economic position of the middle class. Taylor joined the Conservation movement in its introduction to the book “Principles of Scientific Management”, which advocated social control of monopoly capital, demanded the protection of raw materials and landscapes, glorified rural life and abhorred class struggle. It was here that the Conservation movement met the technocratic movement of engineers organized in the American Society of Mechanical Engineers, which included Taylor among its members and which also sought to consciously shape society, but not in a democratic form but as the rule of experts. The existing grievances were attributed to the inability of big business management, but the structure, power and ideology of the business world remained recognized. Due to their dependent position in the newly established large company, many once independent engineers saw themselves subjected to similar declassification processes as medium-sized companies. From the technocratic ideology of the management of society on a scientific basis, they could expect an increase in influence and prestige. This ideology therefore had a considerable attraction for them.[35] Among the existing grievances, the engineering movement also subsumes the trade union movement, which Taylor regarded as an "obstacle to the prosperity of both sides", so that wage rates "could be regulated much better by scientific time studies."[36] Many engineers were even extremely hostile to the unions; Taylor's close associate Barth compared them to the devil.[37]

5 Taylor - a young gentleman at the steel mill.

The industrial milieu of Philadelphia and Pennsylvania with its steel works, machinery shops, railway works and coal mines, where Taylor was to gain his first industrial experience, greatly favoured the development of his later ideas. Midvale was a steel mill specializing in quality steel, located in Philadelphia near the port Richmond of the Delaware River, from where it could be supplied with high-quality anthracite coal. In 1872, the mill put steel production on a scientific footing with the hiring of chemist Charles Brinley and supplied the Navy with guns and armor plates.[38] Midvale's scientific orientation was an ideal environment for Taylor's research into high-speed steel, which he was able to patent. When he started an apprenticeship at the Midvale Steelworks in 1878 at the age of 22, the time had come for a conscious and scientific design of the traditional production processes and working conditions - also at Midvale. Taylor brought with him the scientific distance to things and the social distance to the workforce necessary for this redesign.[38A]

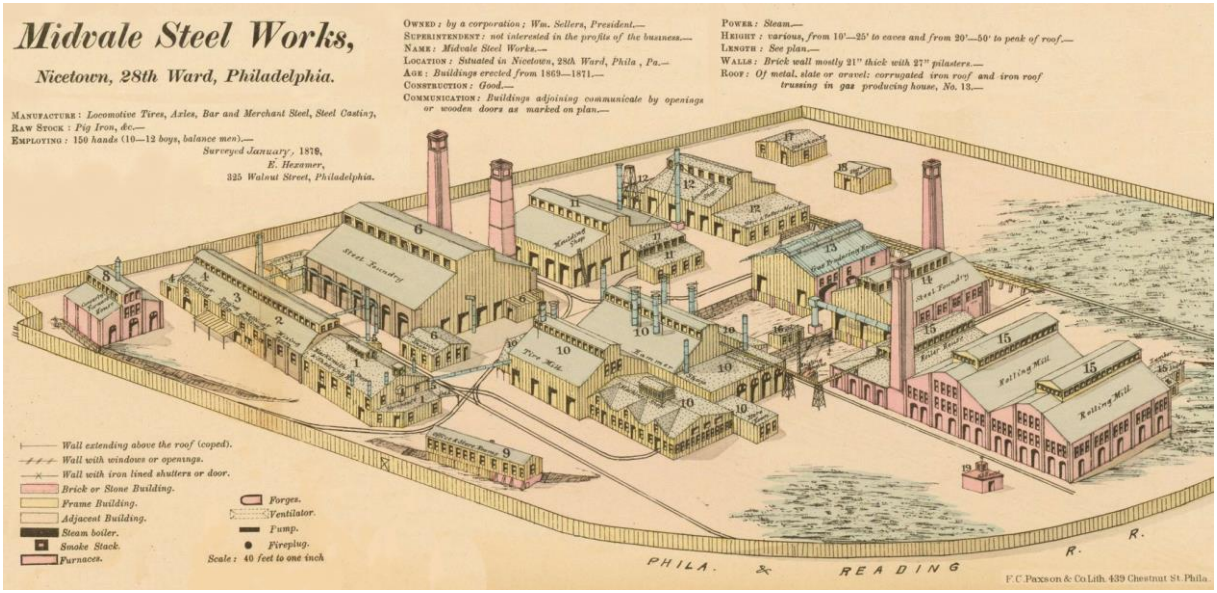

Figure 1: Midvale Steel Works Aerial View, 1879 (Source: Wikipedia)

He came from a wealthy and long-established family in Philadelphia and, following his father, was supposed to become a lawyer. However, Taylor broke with the family tradition, apprenticed to a model joiner at the age of 18, but did not have a formal education at an engineering school. He made a rapid ascent at Midvale from apprentice to chief engineer within six years, of which he himself bears witness to his principles.[39] The fact that one of Midvale's main shareholders, the banker Clark, had a close social relationship with the Taylors family through friendship, neighborhood and marriage

was certainly not a minor factor in this success. This gave Taylor a wide social distance from the ordinary workforce. Already after a short time he was able to appear as a young gentleman, who always stood on the side of the management, as he himself reports.[40] But Taylor, the personified man of success, did not want anything as a gift and demanded a lot from himself. At Midvale, he worked from 6:30 in the morning until 17:10 in the evening, working numerous unpaid overtime hours and studying engineering at home during the night.

Taylor's ascetic and obsessive attitude is ascribed by his biographers to his mother's role model and also to a not insignificant tradition of the US upper class, which is to form their descendants through hard physical work. Likewise, Taylor's unadapted social behaviour - commonly regarded as an eccentric - as well as his abstract notions of justice, which run like a red thread through his writings, especially on the issue of wages, may be traced back to his mother, who may have favoured such attitudes with her activities in the anti-slave and women's movements.

During his tenure at Midvale, then a technology leader in the United States, Taylor retained a formative impetus for industrial experimentation. Midvale's second major shareholder, William Sellers, was regarded as one of the most respected machine builders in the United States and ran his own machine factory. Sellers pursued the mechanical engineering concept of "functional aesthetics" by attempting to eliminate all superfluous elements on the machines - the parallel to Taylor's later efforts to eliminate superfluous movements in work cannot be overlooked. But Taylor learned a second lesson from Sellars, namely how to optimally set up tools on the machines. Sellers had adopted these best practices from his best machinists and condensed them into standards by empirical determination, which he then prescribed as binding in his factory. From here a direct line leads to Taylor's own experiments with machine tools, about which he reports in detail in his book “Principles of Scientific Management” - originally published in 1911 - and which he recorded in the book “On the Art of Cutting Metals”, 1907.

Finally, at Midvale, Taylor was able to gain experience of how management consciously asserted itself vis-à-vis the workforce on production organisation issues when it replaced traditional practices with theoretical processes. Against the will of the old steelworkers, the metallurgically trained management introduced new steelmaking processes and converted the entire factory to piecework wages.

Thus, it turned out that important occasions of Taylor's later ideas had already been set in the industrial milieu of Philadelphia, such as: a place of experimentally oriented curiosity and the claim to radically question the outdated, the repression of the influence of the workforce on work organization and a planned organization of work by the management, and finally the introduction of piecework wages.

6 Taylor as theorist of work organization.

In the assessment of Taylorism, as conceived in Taylor, he is to be seen as a thinker of upheaval. This circumstance poses some problems for Taylor's interpretation, since he is neither clearly to be understood as a theorist oriented towards modern industry, nor, on the other hand, as one who exclusively sings a hymn of praise backwards to the vanishing manufactory. Rather, the principles of both forms of production are confused at Taylor. The two strands, the modern and the traditional, must be disentangled and represented separately in the following.

Taylor's progressive approaches, which show entrepreneurs the way into the future, consist in the recognition of the traditional organizational form of the assembly-oriented industries, which remained at the stage of the manufactory and stood in the way of a rapid expansion of production, as the boom before the First World War dictated. He diagnoses: "In an industrial enterprise that employs, say, 500 - 1000 workers, there will usually be at least 20 - 30 different branches of industry. The workers in each of these trades, through oral tradition, have adopted skill and knowledge as a product of decades or even centuries of development of their trade".[41] In view of this "confused mass of rules of thumb and inherited knowledge" of the workers, the company management must capitulate. It has no detailed theoretical knowledge of the production process and therefore no leverage for increasing productivity. Even the foremen and masters who are still in close contact with work know better than anyone that their knowledge and personal dexterity are scarcely weighed against the sum of the knowledge of the dexterity of all workers combined. The most experienced workshop managers are therefore happy to let their workers solve the problem of how best to carry out their work in practice".[42] This is Taylor speaking from his own experience; he himself had worked for many years at the Midvale steelworks as a foreman. From his Taylor diagnosis, he concludes that the greatest obstacle to entrepreneurial expansion is "the influence of the workers themselves on the time of creation", aptly describing management's emerging access to work organization, which accompanied the transition from assembly-oriented industry to mass production.[43]

In his analysis of the leadership problem using the example of most positions, Taylor also proves to be a pioneering theorist. He recognized the functional overload of the master in the machine factory, who was responsible for the entire administration and which had led to the collapse of the "master economy" around the turn of the century 1900.[44]

Although Taylor is a progressive theorist in his diagnoses of frictional losses in the production process, his concrete solutions for management have proved to be impractical. His ideas about the reorganization of the production process remained largely oriented towards the manufactory: a tightly managed manufactory with machine tools was his ideal. Taylor was theorist of the technological status quo, which aimed at "the most economic possible exploitation of workers and machines".[45] In order to achieve this, he pleaded for extensive experiments to find out a "best method" and "the best tool".[46] His instruments were the film camera (cf. figure 2) for motion studies of workers and the stopwatch to measure the time a worker needs for movements of his tools. He tried to overcome the lack of the manufactory, the poorly developed division of labour, without questioning the principle of the manufactory at all. A deepening of the division of labour in the manufactory was his programme, an extensive administrative organisation of the company his means with which he prescribed detailed work to the part-worker and thus sought to achieve the continuity of a factory operation under the conditions of one-off or small-series production. In a word: instead of capitalist mechanization, Taylor set a narrow-minded bureaucratization. Taylor lacked theoretical training at an engineering school; he had qualified as a foreman at the Midvale steel mill and idealized this educational path when, at the American Society of Mechanical Engineers (ASME) meeting in Detroit in 1886, he compared 6 months of experience as a worker in a machine shop as being more valuable than 2 years of study at an engineering school.[46A] Because of this lack of theoretical training, he had only a narrow understanding of innovation and thus arrived at his bureaucratic approach to innovation.

Taylor aimed primarily at improving the performance of craftsmen and is therefore a theorist of the manufactory. Its first principle is the selection of first-class workers, whose efficiency and dexterity, after preparatory training, were far above average.[47] Energy formula, time and motion studies were his tools to determine the work performance, "so high that only first-class people can accomplish the performance".[48] Those who can't keep up, meet the fate of dismissal. The remuneration is to be based on the piece of basic principle with a premium surcharge of 30-60 % for dutiful performance.

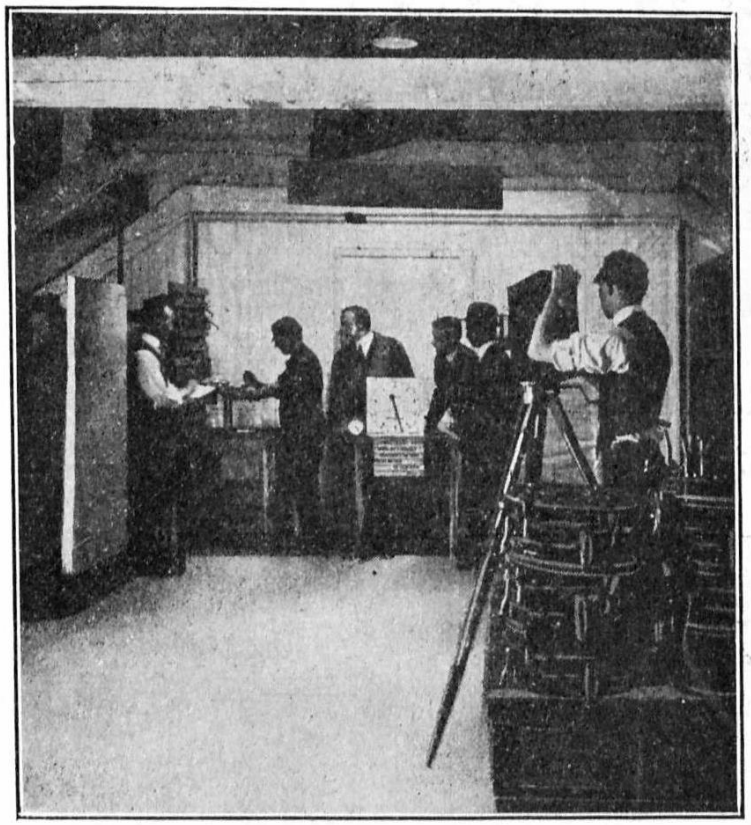

Figure 2: Recording movements of a work man by a film camera (from: The present State of the Art of Industrial Management, Transactions of the American Society of Mechanical Engineers, vol. 34, 1912, p. 1184).

This Taylor system of overtime expulsion was entirely aimed at small businesses in metropolitan regions, where there was a broad recruitment field for the selection of a narrow elite of particularly skilled workers. This system is completely impracticable for a large company that only absorbs average workers - this, however, on a massive scale. The method of Ford's mass production is reported to have "made the search for particularly capable mechanics superfluous.[49]

Figure 3: Crowd waiting for employment in front of Ford’s factory (from Arnold/Faurote 1917, p. 52)

Taylor's manufactually oriented thinking can be clearly seen in his ideal of the individualized fragmentation of the work context. Taylor saw the reason for the evil of insufficient productivity in too close cooperation. For cooperation makes the individual incentive to perform more difficult or even prevents it, so that the performance of a working group drops to the level determined by the slowest worker. This was Taylor's consideration. So, it was only logical for him to propose the workload as a measure to increase productivity. Each individual worker was to be prescribed a certain amount of work every day, which he had to do alone. As a result, the workplaces were to be set up as individual workplaces so that each worker could complete his workload and develop his performance independently of the others. When he worked as an adviser to the Bethlehem steel works in 1898, a leading steel works located in 50 miles distance to Philadelphia, Taylor ordered that each ore wagon be unloaded by one worker with a shovel alone rather than by a group, and that the whole plant be subject at times to the rule that no more than four workers in a group may work together.[50] In relation to Ford's mass production system, the absurdity of such measures becomes apparent: in Ford, the workers stood shoulder to shoulder on the assembly line.[51] Taylor did not only aim at increasing the performance of the skilled workers' elite of the craftsmen. His system of bureaucratic instruction heralded the disqualification of craftsmen, which at the time had just begun in the

assembly-oriented industries and had already been preexercised by the Carnegie Steel Trust in the 1890s.

So, Taylor was up to date when he thought in 1903: "It would be bad to exploit the advantages of the system if we didn't employ lower paid workers on almost all machines instead of trained skilled workers."[52] Finally, Taylor turned to the analysis of simple handwork. The examples that he himself gave of the successful introduction of his system with loading works made him appear again as a theorist of unfinished mechanization and in so far as he was a representative of low-capital small-scale production. At the same time that Carnegie style trusts were mechanizing material handling, Taylor was still studying the scientific principles of shoveling and carrying steel blocks.[53] The praise of his colleague Gilbreth's analysis of the work on the wall also points in a small-capitalist, manufactory direction But Taylor didn't see himself as an apostle of the manufactory. He certainly reflected on the relationship between mechanization and manual labor, where again in a petty-capitalist manner, by continuing and supplementing his system of analysis of manual labor as a continuation and addition of machine methods primarily practiced in the textile industry, he considered to increase productivity. "Over the past 100 years, for example, the introduction of machines to replace manual labor has been the most influential factor in increasing production to greater prosperity for the entire civilized world.... The same results will be the result of the introduction of scientific management and working methods, as sure as they were due to the introduction of machine work.[55] Here Taylorism clearly appears as an alternative to the continuation of mechanization. Taylor, as a true machine builder, only distinguished himself with his invention of the high-speed steel, for which he received 128,000 dollars in patent fees and provided him with a financial basis as an independent consultant.

The turn of the century saw the collapse of the master economy, and in this respect, Taylor is quite contemporary when he argues in his paper “Shop management” for a functional bureaucracy instead of the traditional one-dimensional military hierarchy. At that time, the functional division of the company into the commercial, technical and operational parts was a general trend. The peculiar turning point in Taylor's thinking now lies in his limitation to the work process in the company alone, while largely eliminating overarching cost aspects. In the production plant he tried to reproduce the functional bureaucracy under the direction of a work office. But Taylor is ambivalent on this point as well. For his limited approach was in line with a more general development: the engineers of the time laid the foundations for an operational knowledge of cost accounting, from which later business

administration emerged. A detailed cost calculation for the concrete construction was already worked out by Taylor in 1912.

For the reorganization of small businesses, however, Taylor's bureaucratization intentions turned grotesque: there should be a master for fixtures, one for speed, one for inspection, one for maintenance, a work distributor, a briefing officer, a time and cost officer, and a supervisor. The latter should ensure discipline. Tabor Manufacturing Corporation, a Taylor sample factory, had 73 employees, including 28 civil servants and 45 workers. The company "threatened to collapse under the burden of the effort involved in introducing the Taylor system and struggled to reach the now albeit perfect state," wrote an observer in 1913.[56] One should not believe that the company had voluntarily introduced the Taylor system. Rather, Taylor had to buy into the company, which was on the verge of bankruptcy, in order to realize his ideas. The exaggerated bureaucratization of the Taylor system becomes clear when one compares the Loewe Berlin machine factory, which in 1906, with 1,800 workers and 35 employees (without technicians and master craftsmen), managed to manage without relying on Taylor and still proceeded according to its two principles of calculating working hours and piecework pay.[57]

The restriction of the competence of the workers by the "complete separation of the intellectual and prescriptive work from the executive work in the workshop"[58] was not new in 1900, since already in 1870 the English government had reserved all intelligent functions in the civil administration to the management personnel, which consisted of generally educated gentlemen, while the executive functions of registering, organizing, diary keeping, accounting and copying had to process simple, low-paid administrative employees without chances of advancement.[59] Taylor's attitude of separating the planning from the executive work and propagating productivity as a rationalization strategy in companies is perfectly in line with the current development trends of the American economy at that time. Only, the capitalist solution of the productivity gap consisted in mechanization, in the transfer of "intelligence" to machinery. Mechanization in the steel industry was a good example of this. Taylor's idea, on the other hand, pursues the bureaucratization of the workshop.

As a result of this narrow perspective, Taylor's workers served by the book. They were surrounded by tool lists and instruction cards. Each individual handle was precisely specified in a work plan. The work office operated this programming down to the smallest detail. Accordingly, the conversion of

one farm to the Taylor system was lengthy and took years. Each tool and each activity were examined in terms of how it could be "best" designed. The numerical records required under the new system in an ordinary machine factory, for example, fill thousands of pages," Taylor reported enthusiastically.[60] He thus appears as a compulsive character, whose urge for the best organization, even of the smallest detail, and whose formal description, while suppressing any initiative of the workers, brought with it a pronounced sluggishness and hostility to renewal. Flexibility and redundant diversity were lost as a requirement for the functioning of organisations. Taylor was biased by the rule of 19th century scientific law. In his social mechanistic attitude, he could not find any taste in improvisations and innovations that questioned what had once been achieved. In this respect, the theorist Taylor was quite the opposite of the founding capitalists, whose impetuous urge did not stop at any "law". Carnegie's maxime said, "Always break orders to save money."[61] Ford saw an obstacle in "overly conscientious written records", because "hardly a week passes without any progress being reported in the machines or in the production processes, which sometimes even stands in direct contrast to the best manufacturing methods commonly used" - a clear side blow to Taylor.[62]

Figure 4: View into Ford's Factory at Highland Park 1915 (from Arnold/Faurote 1917, p. 143)

Looking at the curiosity of the Taylor management system, it is hardly surprising that Taylor as a whole was not very successful. His ignorance of the operational power structures contributed quite a bit to this. In an almost classic technocratic way, Taylor sought to transfer power from capitalist management to a staff of experts who, as a kind of "work office", would regulate company affairs and have autonomy from management.[63] Taylor legitimized this broad claim with the argument that

scientific procedures are more effective and fairer in regulating the business matter than the personal arbitrariness of the capitalist or his representatives: "Whether high or low, everyone in the business is subject to such scientific laws". This is how Taylor's biographer sums up his ideas.[64] So it's no surprise that Taylor's attitude to managers meant more enemies than friends.

Figure 5: Bethlehem Steel Works, a watercolor by Joseph Pennell, depicting Bethlehem Iron Company, May 1881, from Wikipedia.

The conflicts Taylor provoked in the Bethlehem steel mills – a leading steel mill in the United States – highlight his technocratic outsider position in the factory world of capitalist rule. The Bethlehem management perceived Taylor's efforts to reorder the power structures of the company as a dangerous attack on its very own positions, even as a "revolution", and threw Taylor out again in 1901 after three years of consulting work.[65] It is not only this technocratic claim that makes Taylor find it difficult to implement an idea. Other factors also played a role. Once Taylor appeared little conciliatory and showed considerable stubbornness in pursuing his ideas. "He called for "iron will" in the reorganization of the companies.[66] Surely this attitude was rather a hindrance to the dissemination of his ideas. In addition, capitalist management at the time showed little interest in advice from scientific experts who wanted to improve the organizations, but rather proceeded with unrestricted self-assertion.[67] The reader of the Principles will not fail to notice that Taylor does not reveal anything about his inglorious end at Bethlehem Steel, but paints an optimistic picture of his successes.[68] This shows that an interpretation of Taylor based on the mere text of the book is inadequate and can even lead to misinterpretations. In the entry of Wikipedia on Bethlehem Steel

Mill a glorious picture is painted on Taylor's success to reorganize the work in the mill (access on 3rd December 2022).

Besides this failure, however, Taylor gained influence in the American Society of Mechanical Engineers (ASME), which he joined in 1886. As early as the 1896 ASME convention in Detroit, he presented a paper proposing a labour system that later became known as the Taylor system. There he advocated the idea of harmonizing the interests of capital and labour through fair profit-sharing, and gained widespread support from the assembly. At the 47th ASME meeting in Saraloge, New York, in 1903, he presented a paper on shop management, which was published in the Transactions of the ASME a short time later under the title Shop Management. ASME President James Dodge considered the paper to be very important.[67A]

7 Taylor as a technocrat and in the effectiveness movement

After his failure at the Bethlehem steel mills in 1901, Taylor could easily gain independence and promote his management system with the $128,000 in patent fees he had received for his invention of the high-speed steel; he still had virtually no followers of his ideas. He was only known as the inventor of the high-speed steel.[69] It was only through personal relationships in his hometown of Philadelphia that he gained the influence to reorganize two small businesses: Tabor and Link-Belt. As a result of his earlier activity in weapons production at Midvale, he found contact with the Generality and was able to win supporters in its circles. However, the American Society of Mechanical Engineers, which was oriented towards the interests of big business, was reserved towards its member Taylor. Although he was president of the ASME in the years 1906 and 1907, the ASME only intended to appoint a suitable man to reorganise the New York office of the Society. Taylor was disappointed![70] The resistance which he himself encountered in his own society is evident from the fact that in 1910 the Society refused to publish his manuscript “The Principles of Scientific Management” and commented on its rejection with the ironic remark that even as a former president he possessed only the rights of simple membership.[71]

Figure 6: Taylor as president of the American Society of Mechanical Engineers 1906 (from the Transactions of the American Society of Mechanical Engineers, vol. 28, 1907)

As a result, Taylor changed his behavior to propagate his ideas. The silent expert in business administration became a publicist for the general public. He joined the populist reform movement of the middle class in order to make his system public as a reform strategy for business and society. In 1911 he published his “Principles” in sequels in American Magazine with a circulation of 340.000 [71A] and as book with the publishing house Harper in London, also in 1911. The years 1910 to 1912 mark

the height of the efficiency movement in the U.S., and other efficiency movement notables came out with their books. There was Harrington Emerson's Twelve Principles of Efficiency (1912), Henry L. Gantt's Work, Wages, and Profits (1910) and Frank Gilbreth's Motion Study (1911). So, Taylor's book was not the only one efficiency book. But all books mentioned had in common that they did not regard the punch card technology of Herman Hollerith as leading rationalization technology used by many steel works and railway companies.

Taylor began his book "Principles" by underlining the importance of the Conservation movement with a quote from President Roosevelt, thus placing his ideas in the context of this then predominant middle-class ideology. In particular, he emphasized the general character of his principles which were applicable "to the administration and management of the household and the farm, to the management of the craft and factory, to the management and administration of churches, welfare institutions and universities, and even to the various departments of the state government".[72] Taylor's claim, which seems strange today, fell on the fertile ground of the effectiveness movement. The years 1911-1915 experienced in the United States a public effectiveness debate without equal.[73] Taylor's advice was taken seriously - but not in the factories. The Ladys Homejournal published references to scientific housekeeping, the churches formed committees for church effectiveness, the Boy Scouts set up effectiveness courses, Henry Ford also delighted his staff with an effectiveness club, Secretary of State Brian gave an effectiveness reception to the diplomatic corps, New York experienced an effectiveness exhibition with Taylor as a keynote speaker. His friend Cook was commissioned by the Carnegie Foundation to write a report on the effectiveness of the universities, which the professors rejected with an angry outcry. With the newly founded post of school administrator, the scientific management moved into the schools. At the political level, the thinking of effectiveness showed signs of technocratic rule on the part of the experts; labor camps for useless rabble were demanded.

Effectiveness became the magic word to cushion middle-class fears of the threat of declassification. Taylor's writing principles were entirely geared to this. It showed the middle class the way out of the following economic dilemma: how could it maintain its standard of living in the face of inflation without affecting the interests of capital and labour, which it recognized as legitimate, in a just profit and a just wage? Taylor provided the solution: by increasing productivity, all interests could be satisfied. Each class should get more. Prosperity for all through high productivity with Taylor's solution. I believe he said that "the third party - the people - the more they know the true facts, the

more vigorously they will demand that all three parties become equal rights. It will demand the greatest benefit and the best advantageous use of material power from employers and employees."[74] Here lies the economical core for the stormy reception of efficiency in the middle class. But also in every other respect, Taylor has based his principles as an ideological masterpiece entirely on the instincts of the American middle class, as can be seen from his working-class image. The worker is lazy by nature and deliberately restrains his work. Only through the hard work imposed upon him by the Taylor system can he purify himself into a better person. In return, he receives a 30-60 % surcharge. You can only earn through moral conduct!

Taylor's model worker Schmidt personified the middle class values of ascent orientation, land acquisition and home building. With this quest for higher things and social advancement, Taylor addressed the middle class's longing to escape the "worker question". If ascent ladders are ready, the "workers' question" is solved all by itself. Every worker can become something better. "With the help of the well developed science and the instruction of his teachers every worker is able to do a higher, more interesting, more educational and also more profitable job than he could in former times.[75] The day laborer can become simple machine worker, the more intelligent lathe operator function master, etc. " to the highest positions. Taylor thus also referred to promotion opportunities for the declassified middle class, as he pleaded for values of professionalisation and expertise at the same time. The middle class as controllers and the workers as controlled, that was his formula.[76] "Young students" were supposed to use the stopwatch to raise working hours.[77] Taylor insists several times that workers are actually not in a position to discover scientific laws.[78] This is the task of the experts. This made Taylor attractive to the technocratic movement of engineers, who perceived their dependent position in the newly formed companies as a declassification and sought independent consultancy. Together with the populist middle class, they advocated social control of monopoly capital, government and state.[79] Taylor's claim that his system is applicable in all areas of society is also aimed in this direction. Of course, Taylor, as a theorist of small-scale production, also exerted his fascination on the middle class and conservation movement.

8 The controversy over Taylorism

At this point, the broad social debate about Taylorism in the United States and Germany will be presented. Taylor's book "Principles" became an international bestseller and was translated in various languages, as Japanese, Russian and Chinese. In 1913 a German edition appeared.[79A] If it has been suggested above that Taylor's ideas have not been taken up within the factory, this is now to be discussed in more detail. Taylor himself states the number of 50,000 workers working under his system.[80] This figure is small compared to the 38 million employees in the United States at that time. Furthermore, there is no evidence that the Taylor system has been introduced in any large company. The Taylorism of Taylor was only realized in smaller medium-sized companies.[81] The early historian of Taylorism, Drury, can also enumerate only a few plants where this was the case. The main characteristic of Taylor reception in the American public was an emotionally charged debate about the pros and cons of the Taylor system. The entire Taylor literature of the period 1910-1930 contains references to the "struggle" fought for Taylorism[82]. The US Congress held hearings on the nature of Taylorism. There the fear became loud that Taylor's model worker Schmidt had worked himself to death under the Taylor system. Taylor tried to rebut these allegations with medical evidence.[83] The populist lawyer Brandeis fought with arguments of Taylorism in a sensational way against the high tariffs of the railway monopolies. In the National Association of Manufacturers, an association of medium-sized companies at the forefront of the fight against unions, was sceptical of Taylor. They saw Taylorism as a useful weapon against the trade unions. However, they feared that the Taylor system of experts could undermine the values of free enterprise.[84] The educated America rejected Taylor's ideas; it saw culture endangered in it. The Socialists were divided. Some were fascinated by Taylor's engineering praise of utility value and his criticism of one-sided profit thinking. They recognized Taylorism as an instrument of social planning. Others criticized Taylorism as a weapon of exploitation. Upton Sinclair, who became known as a socialist writer, addressed a letter to Taylor in American Magazine and ironically asked what the scientific justification was for his model worker Schmidt working 362% more but earning only 61% more.[85] Taylor went out of his way to answer. The trade unions fought Taylorism where they could and won a partial victory. In 1915 they enforced a law in Congress prohibiting the use of stopwatches in state weapon factories. Taylor's individualization strategy was recognized by the unions as a dangerous attack on their solidarity. As unreal, they rejected Taylor's promise of high wages.[86] In 1911, the President of the International Association of Machinists wrote in a circular the position of his union on Taylorism: "Whenever this system was introduced, there was unrest among the workers, or the system failed or destroyed the organisation

of the workforce. It pushed the men down to slavery and led to low wages. And it has spread such an atmosphere of mistrust among men that everyone regarded the other as a possible traitor or spy.

The introduction of the Taylor system in the country means one of two things: either the machinists will successfully destroy the practicability of this system through resistance. Or the system would mean the annihilation of our craft and our nation with the consequence of low wages, life-destroying hard work, long working hours and generally intolerable conditions". Taylor quoted this newsletter as an example of how trade unions would misunderstand his system.[87] In fact, the unions' assessment of the consequences of Taylorism in practice was probably more realistic than Taylor's views on it, because the absence of wage increases under the Taylor system, which on the contrary led to wage cuts, is confirmed in Hoxie's 1915 government report on the Taylor system in practice.[88]

Apart from Taylor's direct followers, of course, no entrepreneur thought of wage increases for the introduction of Taylor methods. Rather, the stopwatch was used as a convenient instrument to quickly increase profits, which the unorganized workers felt particularly strongly. All of Taylor's warnings that the new procedure should only be thoroughly prepared were pushed aside by the entrepreneurs.[89]

Finally, Taylorism is to be understood as only a small part of the general changes in the personnel policy of the US economy in the period 1900-1915. The general tendencies consisted in cleaning up the confusing structure, introducing piecework wages and bonuses, internal selection and advancement programs and accelerating work, which had challenged many strikes.[90]

Even before the war, Taylor enthusiasm reached Europe. James Dodge, President of the Link-Belt Co. and Chairman of the Taylor Society founded in 1911, gave a lecture on the Taylor system at the Annual General Meeting of the Association of German Engineers in Leipzig in 1913. Taylor's works have been translated into European languages.[91] In 1912, the French Renault car factory experimented with time studies "in a hurry that seemed little scientific". The raising of labor standards created unrest among the Renault workers, whose mood against American methods of time division was fuelled by the following anecdote: when the English engineer Fraser visited Pittsburgh, "he was amazed that he met only young and strong workers, and he asked the American

who led him around: Where are the old workers anyway? At first, the American didn't answer; then, when Fraser asked again emphatically, he offered him a cigar and said, by the way, "Take a cigar, and while we're smoking, let's have a look at the cemetery."

Outraged, the Renault workers went on strike, undermining Taylor's reputation in France because "the public's attention had been embarrassingly aroused.[92]

In the United States, however, time passed Taylor by. Taylor had insufficiently reflected the main trend of the epoch - the replacement of craftsmen's work by machines. The dismantling of the production process into partial operations and their mechanization had already pre–excised the textile industry in true decay in the first half of the 19th century.[93] The remaining industries, especially the assembly-oriented ones, caught up with this development in the period 1890-1930. Nor can Taylor find any concrete indications of the impending transition from knot-shaped production flow to linear flow production. This transition, together with mechanisation, should become the predominant method of rationalisation.[94] Taylor could only criticize the knot-shaped organization for overloading the master's functions.[95] Taylor may be too late to appear as an assembly line theorist. When Ford experimented with the assembly line in 1913, Taylor was 57 years old; he died in 1915. Speaking to automobile manufacturers in Detroit, Taylor could only express his admiration that the capitalist self-made Detroit men had found "expert help" in methods of work decomposition.[96]

A comparison with Ford methods exemplifies the limited perspective of Taylor's Taylorism. Just like Taylor, Ford separated management and execution of the work and, in an even more radical way, dismantled the individual work steps with the assembly line into the smallest sections. But unlike Taylor, Ford had neither piecework nor bonus pay. Time studies played a minor role. Because of the rhythm of the integrated machine system, "all the workers were practically forced to do a certain amount of work".[97] Mass sales in the unsaturated automotive market with high price elasticity of demand gave Ford the economical way to pursue a simple productivity criterion: the progressive replacement of manual labour by machines regardless of the cost of invested capital.[98] The special economic constellations in the United States in the period 1910-1925 favoured Ford's mechanisation strategy of fully exploiting the mechanisation potential offered by the state of the art at the time; by European standards, machines were "in abundance" in the United States.[99]

The experts of the Taylor movement were also unable to find access to punch card technology, which simplified the administration of large companies and can be regarded as the most modern office technology at the time. Herman Hollerith used the punch card technique for the first time in the census of the United States in 1890. In 1896 Hollerith founded his Tabulating Machine Company in New York and won railways, department stores and stables as customers. In Taylor's writings, the punch card technique is completely ignored, as indicated by the most recent Taylor biography of Kanigel (1997). While investigating the unloading of ore wagons with the low tech instrument shovel at the Bethlehem steel mill, Bethlehem was already a Hollerith customer applying the high tech tabulating machine, which also indicates the backwardness in Taylor's thinking. The rationalization movement in Germany in the 1920s was also very reticent about punch card technology.[100] The failure to regard to rationalization potential of punch card technology could be traced back to Taylor's lack of a theoretical education at an engineering school.

Ford left the Taylor system far behind as a mechanization. In 1927, an observer concluded that "there is nothing at Ford that could resemble this system".[101] Ford also took other paths in personnel policy and learned from Carnegie instead of Taylor. While Taylor still followed the primitive image of the worker as homo economicus in his theory, Ford knew how to take advantage of the psychological and sociological conditions of a disciplined and contented workforce. In addition to high wages, internal advancement programs, factory community spirit, and patriarchal social welfare gave the workforce, recruited primarily from southeastern European immigrants in the Detroit slums, the feeling of belonging to an "industrial elite. Ford became the "ruler of the souls" of the workers.[102]

But it remains to be noted that it was Ford's relatively large, but also rapidly merging advantage over his competitors that gave him the financial leeway to treat his workforce in a philanthropic manner and impose welfare measures on them in an authoritarian manner. After all, Ford achieved profit rates of over 100% before the war, and even the spirit of the reform era prevailing at that time may have prompted him to take these measures. But the wartime inflation soon eroded the high forest wages, which were no longer exceptional as early as 1917. In the 1920s, Ford's profit rate quickly fell below 10%, and all that remained of the social measures was an authoritarian factory system based on an extensive spy system. The internal advancement programs were only on paper. Ford thus became an ordinary company.[103]

The United States's entry into the war in 1917 gave Taylor's Taylorism the death blow. The fanatical Taylorists resigned from the public stage as management consultants and went into government service to take over central administrative activities for war production. Without lengthy research on the "best method" and without regard to costs, the industry had to increase arms production enormously. Taylor couldn't set an example for this.[104] After the war Taylorism remained little more than an arbitrary collection of advice for management to increase productivity.[105] It thus merely became an element of the now fully effective trend towards rationalisation through the transition to mechanisation and flow production and the corresponding centralisation of capital, the effect of which was extraordinary in the United States in the 1920s. Industrial productivity increased by more than 50 % in the period 1919-1927, compared to only 5 % in the 20 years before 1919.[106]

The post-war period led to a weakening of the unions for various reasons; the American Federation of Labor became more and more anachronistic as a craftsmen's organization. In these conditions the entrepreneurs had to overcome only small resistances to introduce the piecework wage and the piecework in general. The hourly wage as a war concession to the working class was again replaced by piecework, but only in exceptional cases, as with Ford, retained. This development allowed time studies to become a common procedure as a basis for piecework pay. Taylorism thus became a process of time studies in the mechanized industry.

On the other hand, neither Taylorism nor piecework wages found their way into industrial machine tool manufacturing, which was operated either as the dependency of large-scale industry or as an independent small-capitalist enterprise. An observer in 1927 stated that Taylorism had "in reality stopped at the threshold of qualified work" in mechanical engineering. Not subject to any bureaucratic instruction, the workers there worked completely independently; they drew their theoretical knowledge from obese manuals that everyone carried with them.[107] This organizational form of mechanical engineering indicates Taylor's failure. After all, his paper The Shop Management referred explicitly to mechanical engineering!

In the mechanized industry, on the other hand, chord and time studies appeared to be an adequate organizational form of work, since these industries only produced in medium-sized series with changing production programs and radical mechanization therefore proved to be less profitable than in the case of Ford, which exclusively produced a single product in large numbers.

The 2500 workers strong Cleveland White-Engine plant can be considered a typical representative of the mechanized industry. They became known for the exemplary Taylorization of the work process and therefore attracted a large stream of visitors from interested managers and students. In a way, they became an American model company - a role that Volvo played in Sweden in the 1980s as a model company for working groups and work integration in the automotive industry. About 30 timekeepers turned the White plant into an "experimental laboratory", whose "uninterrupted effort to find new ways was characteristic of continually redesigning the working process without apparently driving the workers to ever greater haste," one visitor noted. Instead of Taylor rigidity, a permanent change in technology was institutionalized. But on the other hand, the intrusive Taylor bureaucracy also asserted itself. Just as a crime is recorded in criminalistics, so an observer compared, at White every work step was meticulously documented. Even spelling mistakes were broken down into six categories and converted into wage cuts for the responsible typists. "The administrative staff in the Taylor factories has grown enormously compared to the way they are treated and the importance they attach to them" - to the displeasure of the workers.[108]

The logic inherent in the piece-work system led the workers to resort to subtle means of passive resistance, such as go slow and sabotage. These forms of resistance characterise the working conditions of the 1920s and are an expression of the weakness of the trade unions. Adamic (1931) dedicates an entire chapter in his history of class struggle in the United States to passive resistance. In 1931 Mathewson wrote an inventory of various cases of work restrictions under the piecework wage system. In a tire factory, he reported, the workers were asked why they worked so slowly. "If we do more, you'll press our chord rates," they replied. What had happened? The master found out that a man and his wife made eight dollars and six dollars a day, respectively. "He thought six dollars was way too much for women and 14 dollars too much for a family. He arbitrarily reduced the piece rates so that the woman could earn only four dollars a day."[109] A spontaneous sit-down strike by automobile workers against the piecework rush in 1929 highlighted repression at the workplace and the corresponding weakness of the trade unions.[110]

In view of the passive resistance of the workers in the 1920s, Taylorism had passed through a circle and had thus completely failed. After all, Taylor had gone out to eradicate the workers' braking, and had fought a stubborn "struggle of about three years" at the Midvale steel mills to break the workers' passive resistance.[111]

9 Taylor's fame.

The question remains: how could Taylor become famous as the theoretician of the manufactory? What do his ideas look like, so that they are not considered outdated today despite all the changes in the company's work design? One might assume that Taylor has a permanent place in history as the foundation of a science, the science of labour. But did that alone make him famous? Hardly, because which ancestor of other sciences, such as medicine, is so well known today? As the founder of industrial science, he might have been familiar only to specialists. On the other hand, millions of workers are confronted in their daily work with methods of scientific design of the workflow. In this way, Taylor was to some extent anchored in capitalist civilization and could thus become the object of public debate in industrial disputes. After all, works councils and shop stewards have to comment on objective systems of performance measurement on a daily basis.

Taylor could hardly make a name for himself as a theoretician of the division of labor, for the division of labor was already an essential feature of capitalist production and had long been dealt with in scientific literature. It is worth remembering Adam Smith in the late 18th century, Babbage and Marx in the 19th century, who basically said this. The emptying of manual labor from special skills through increasing division of labor and mechanization was also the work of the 19th century, especially in the textile industry. Andrew Ure is the relevant author here. Agar (2003) showed the strict separation of planning and executive work in the British internal administration since 1870.

Taylor falls into the period of transition problems of the assembly-oriented industries on the way to increased division of labor in connection with mechanization. The resulting disintegration of traditional craftsman organisations exacerbated the recruitment problem of suitable workers. These tasks, which had previously been carried out by the craftsmen, now had to be taken over by the plant management. For this reason, Taylor's striking emphasis on readout and instruction functions is evident. The idea of qualifying is actually quite modern, but has hardly contributed to the controversial fame of Taylor. But in a second aspect that has remained completely unconsidered, Taylor can be understood as a modern author. His quite materialistic remarks about the fact that high labour productivity is a prerequisite for the "prosperity of the nation", that rising wages can only be the result of rising labour productivity, anticipate important ideas of the social market economy prevailing today.

Here, too, Taylor is far ahead of his time as a welfare theorist. Combining wage increases with labour productivity growth was institutionalised only after the Second World War and helped to create purchasing power.[112]

Certainly not unimportant to Taylor's lasting importance was the resonance of his ideas in the public, reaching as far as Europe, which triggered a lively debate on rationalisation in the 1920s, which was repeated in the 1960 automation debate. This is how Taylor differed from the pure scholar. A special circumstance was that he appeared as theorist of the manufactory just when it had passed its end point and was in a period of transition to mechanized industry. Taylor's ideas were able to provide an interpretation pattern for the problems that arose during this planned redesign of the production, which addressed the now pending questions of the conscious design of the work organization, even if it still referred to the declining form of the manufactory. Taylor's organisational proposals gave suggestions without having to be considered binding. In this way, mechanization and Taylorism could be largely identified with each other in the course of time. Especially in Germany, after the First World War, a rapid economic recovery was expected through the adoption of modern American methods, which were described as Taylorism and Fordism.[113] Taylorism as a collective term for methods of objective performance measurement thus became a counterpart of the mechanized industry.

10 Literature

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11 Notes

1 Volpert 1974, p. 611.

2 Bravermann 1974, p. 113s.

3 Pieroth 1974, p. 40. See Vahrenkamp 2013 for the debate on the humanisation of labour.

4 Drucker 1970, p. 296. Simon 1960, pp. 14–16, Gass and Assad 2005, p. 20.

5 Otte 1974, p. 1974, p. 152.

6 Uhl 2014. Stollberg 1981. Vahrenkamp 1988. Maier 1970. Kline 2006.

7 Pieroth 1974, p. 46.

8 Marx 1968, p. 359.

9 Ibidem, p. 359.

10 Ibidem, p. 389.

11 Ibidem, p. 402.

12 Ibidem, p. 445.

13 Ibidem, p. 401.

14 Ibidem, p. 400f.

15 Landes 1973, p. 288.

16 Hauptausschuss Maschinen 1943.

17 Myers 1916. Walker 1949, chapter 27.

18 Taylor, Operations 1914, S, 1.

19 Sombart 1927, p. 901. Woldt 1908, p. 682.

20 Quoted after Sombart 1927, p. 927.

21 Taylor, Principles, reprint 1977, p. 4.

22 Dubreuil 1930, p. 112.

23 Taylor, Operations 1914, S, 3.

24 Stone 1974. On the Homestead strike, see also Adamic 1931, Chapter 9.

25 The distinction between process-oriented and assembly-oriented can also be found in Landes 1973, p. 284. For the following see ibid., p. 285-301.

26 For the enforcement of flow manufacturing, see Bönig 1993.

27 Jenks 1960. Haber 1964, p. 19.

28 Jevons 1871.

29 Liugmann 1970.

30 Taylor, Principles 1977, p. 112.

31 Breger, Energie 1981.

32 Ostwald, Imperativ, 1912, p. 83 The editor of the first German edition of Taylor's Principles (1911) refers in a footnote on page 6 to the relationship in thinking between Taylor and Ostwald. The early historian of Taylorism, Drury, describes Ostwald as the leader of Taylorism in Germany, see Drury, 1922, Vol. 1, p. 108.

33 Jevons, Political Economy, 1871, p. 195.

34 Taylor, Principles, 1977, p. 58.

35 Haber 1964, p. 14, 51, 61. Layton 1971, p. 63ff, p. 117.

36 Taylor, Operations, 1914, p. 113.

37 Palmer 1975, p. 39.

38 Kranigel 1997, p. 158. Wikipedia entry on Midvale Steel.

38A For the following see Copley 1923, volume 1, pp. 97-138. Haber 1964, pp. 4s. Kakar 1970.

39 Taylor, Principles 1977, pp. 51-58.

40 Ibidem, p. 52.

41 Taylor, Principles, 1977, p. 32.

42 Ibidem, p. 34.

43 Taylor, Operations, p. 14.

44 Ibidem, p. 45.

45 Taylor, Principles, 1977, p. 10.

46 Ibidem, p. 25.

46A Kanigel 1997, p. 138.

47 Taylor, Operations, p. 5.

48 Ibidem, p. 28.

49 Nevins, 1954, p. 534.

50 Taylor, Principles, 1977, p. 76.

51 Nevins, 1954, p. 544.

52 Taylor, Shop Management.

53 Taylor, Principles, pp. 42-80.

54 Ibidem, pp. 42-80.

55 Ibidem, p. 147.

56 Seubert 1914, p. 30-33 Taylor states with 14-17% the share of employees (supervisors, engineers, accountants, correspondents) in the total workforce of machine factories as usual. In 1912, this share was 22% at the Siemenswerke Berlin, according to Kocka 1969, p. 468.

57 Lilienthal 1926, Introduction.

58 Taylor, Operations, p. 51.

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60 Taylor, Principles, p. 40.

61 Haber 1964, p. 26.

62 Ford 1923, p. 98f.

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64 Copley 1923, volume 2, p. 146.

65 Drury 1922, p. 84.

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67 Baritz 1960, p. 18.

67A Kanigel, p. 278–284, p. 368–374.

68 Taylor, Principles 1977, pp. 42-51, pp. 63-80.

69 Copley 1923, Volume 2, p. 176.

70 Ibidem, p. 244.

71 Ibidem, p. 379. On the differences between the Taylorists and the American Society of Mechanical Engineers, which led to the spin-off of the Taylor Society in 1911, see the Taylor Society's statement in Alford 1922, p. 265.

71A Kanigel 1997, p. 439.

72 Taylor, Principles 1977, p. 6.

73 Haber 1964, p. 51s. Layton 1971, p. 144s.

74 Taylor, Principles 1977, p. 149.

75 Ibidem, p. 135s.

76 Haber 1964, p. 66s.

77 Taylor, Principles 1977, p. 58.

78 Ibidem, p. 40, 102, 110, 135.

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79A Kanigel 1997, p. 492.

80 Principles 1977, p. 28.

81 Haber 1964, p. 26.

82 Drury 1922, p. III.

83 Copley 1923, Volume 2, p. 55.

84 Haber 1964, p. 71.

85 Copley 1923, volume 2, p. 50.

86 Drury 1922, p. 98. Haber 1964, p. 66s.

87 See Transactions of American Society of Mechanical Engineers 1912, Discussion, p. 313. Nadworny 1955, p. 56.

88 See Braverman, 1974, p. 107.

89 Haber 1964, p. 69. Nadworny 1955, p. 91.

90 Palmer 1975, p. 42.

91 Dodge 1913. Drury 1922, p. 107s.

92 Dubreuil 1930, p. 90.

93 Ure remarked in 1835, p. 22: "In the system that breaks down a process into its elements and has each element executed by an automatic machine, a person of ordinary care and ability can, after brief instruction, care for each of the individual elements". For the history of the mechanization of the textile industry see Orth 1922 and 1927.

94 Landes 1973, p. 288.

95 Taylor, Operations, p. 45.

96 Copley 1923, Volume 2, p. 445.

97 Dubreuil 1930, p. 228. For a photo reportage on the Ford plant in Highland Park in 1913, see Arnold and Faurote 1919.

98 Ibidem, p. 16. Ford 1923, p. 115.

99 Dubreuil 1930, p. 16. Lange 1928, p. 320.

100 Geoffry Austrian 1982, Vahrenkamp 2022.

101 Dubreuil 1930, p. 193.

102 Nevins 1954, p. 512s. Friedrich 1924. Sinclair 1937.

103 Nevins 1954, p. 551. Dunn 1929, p. 160s, p. 216.

104 Haber 1964, p. 121.

105 Layton 1973, p. 213.

106 Alford 1932, p. 241. Gregory 1930, p. 557.

107 Dubreuil 1930, p. 15, 70, 131.

108 Dubreuil 1930, p. 95s.

109 Matthewson 1969, p. 56.

110 Brecher 1972, p. 207.

111 Taylor, Principles 1977, p. 55.

112 On the first productivity agreements with trade unions in the case of the US automotive industry, see the description by General Motors Managers Sloan (1965, Chapter 21).

113 Schalldach 1930, Stollberg 1981, Vahrenkamp 2013, Vahrenkamp 1983.