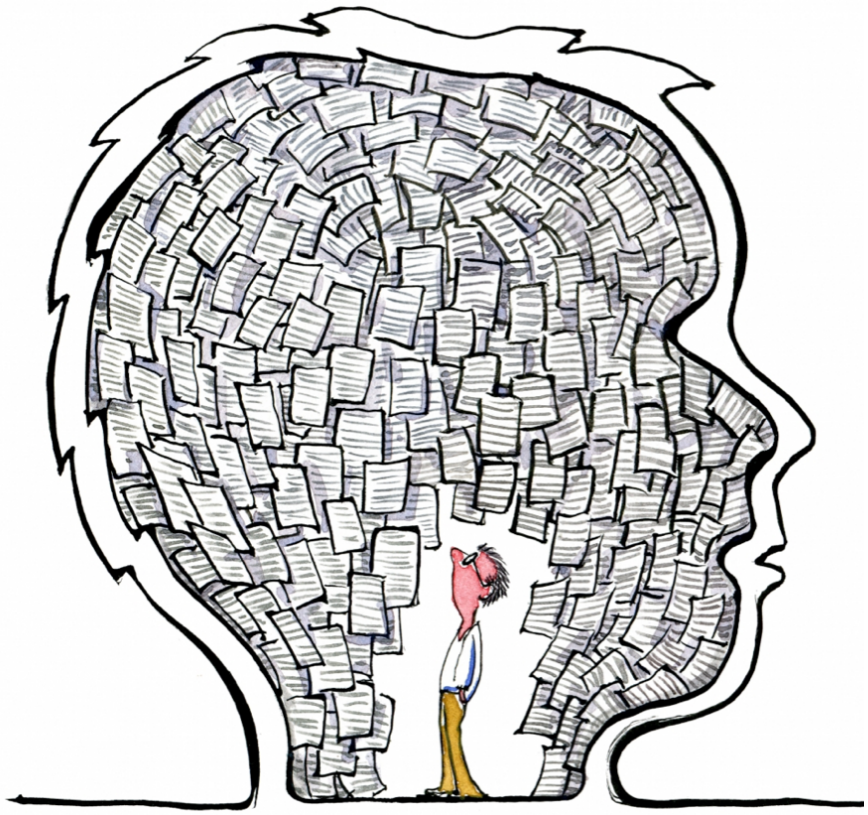
Theories of Work: Origins of the Design and Management of Work



By David Joyce

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— Chapter Four —

Scientific Management!

A Mental Revolution

Design and Management

— Concepts —

- Command and Control; A Global Management Mental Revolution.
- The Efficiency Expert.
- The Bonus System.
- Gantt Charts; Planning Work, Presenting Facts about Progress, and Scorecards.
- Getting Work Done on Time, Standard Times, and Service Levels
- Time and Motion Studies.
- Removing Idleness and Waste.
- Moving the Work to the Workers (the Moving Assembly Line).
- Task Cards and Time Clocks.
- Worker Report Cards, Inspection of Performance, Performance Reviews, Removing “Dead Wood” and Laggards.
- Forced Employee Ranking; the “Bell Curve”.
- Inspection of Workers, Supervisors and Executives.
- Vacation Schedules and Records of Absence.
- Quick Fix Change Programs.
- Functions with Department Heads and Targets.

Design and Management

— Concepts —

- Quality Inspection
- Activity Based Accounting
- Mass Management Education, Courses and Literature.
- Documented Best Practices, Codification of Method, Written Documentation and Instructions.
- Assessing Job Applications Through Tests.
- Breaking Work Down into Components, and Specialized Departmental “Factories”.
- Scientific Management Applied to the Office.
- The Head Office
- Technology to Aid Efficiency
- Fordism.
- Flow Production, Routinized and Intensified Labor, Analysis and Documentation of Processes.
- Consumerism; Build, Market, Sell, Service.
- International Operations and Franchising Systems.
- The 8 Hour Day and 5 Day Week.
- Company Discount Schemes.

THE MENTAL REVOLUTION

At the end of the previous chapter we heard management guru Peter Drucker's thoughts on Taylor's influence; ranking him with Freud and Darwin as a maker of the modern world.[286]

Biographer Robert Kanigel summed up Taylor's importance by stating:

> "His ceaseless quest for "the one best way" changed the very texture of twentieth-century life. [286]"
>
> Robert Kanigel

Image: **Robert Kanigel** in Ballyferriter, Ireland in 2008. Photo by Sarah Merrow. Public Domain. en.wikipedia.org/wiki/File:RobertKanigel.jpg

The question is, how did Taylor's ideas have such a profound impact on the world today?

Yes his ideas were revolutionary at the time, and yes they solved problems of that time, but why do his theories of work still prevail today?

At the time, Taylor called for a "mental revolution" among "workmen ... and ... management" for scientific management to take hold.[284]

How did this mental revolution occur, how did these ideas spread around the globe, and how did they take hold in so many companies?

This chapter is to provide answers to these questions.

[286] THE ONE BEST WAY: Frederick Winslow Taylor and the Enigma of Efficiency, Robert Kanigel www.robertkanigel.com/_i__b_the_one_best_way__b___frederick_winslow_taylor_and_the_enigma_of_efficienc_57916.htm

[284] Gary Hamel: Management Revolution, Posted by Doug Goldstein pksimplex.blogspot.com/2009/10/gary-hamel-management-revolution.html

In the last chapter we discussed how scientific management caught the attention of the periodical press, popular as well as technical.[334]

As Holden A. Evans wrote in "Cost Keeping and Scientific Management" (1911):

> "*In recent hearings before the Interstate Commerce Commission, the testimony of such engineers as Gantt, Emerson, Going, Gilbreth and others that tremendous improvement can be made in all classes of industrial work by scientific methods, startled the newspaper and magazine world.*
>
> *The newspapers and magazines have given the work of Mr. Taylor, and other progressive engineers who have followed his methods, wide publicity, and this has excited the interest, not only of engineers, but also of the general public, in scientific management.*

> *This will materially aid in the advancement of the cause of scientific management and it is probable that more progress will be made in the next five years than has been made in the past twenty years.*" [318]

We also discussed that the first books on scientific management had been published, and that Taylor began a series of lectures on the subject.

But was this enough to change the world as Kanigel suggests? Could one man, through books, lectures and press coverage cause a mental revolution?

[334] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 3-8 archive.org/details/frederickwtaylor01copl

[318] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 134-137 archive.org/details/costkeepingscien00evan

TAYLORS LEGACY

Henry R. Towne, whom we met in the previous chapter as one of the pioneers of scientific management, was convinced:

> "I regard him as having done more as an American engineer in a generation to leave an impress, which will last for all time, in founding a new system than any other man." [457]
>
> Henry R. Towne

[457] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p. 78 archive.org/details/frederickwtaylor02copl

How right he was.

The Society to Promote the Science of Management, now called the Taylor Society [330] after Taylor's death, was also convinced of Taylor's legacy.

It became their role to ensure his ideas and methods would spread, and to document the usage of scientific management in industry.

Their principal objective was:

> "*... to interpret and expound scientific management in its applications and reactions to a changing environment.*" [360]

[360] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, Foreword and Preface archive.org/details/scientificmanageootayl

[330] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers archive.org/details/frederickwtaylor02copl pp. 382-383

Image: **Henry Robinson Towne** (1844-1924), Class of 1865, portrait photograph, Date: circa 1900, Source: University of Pennsylvania, Author: Unknown, Permission (Reusing this file) PD-US en.wikipedia.org/wiki/File:Henry_Robinson_Towne.jpg

TAYLORIZATION AND GLOBAL EFFICIENCY

After Taylor's death in 1915, his followers continued to develop and promote his ideas through the Taylor Society.[335]

Moreover, the ideas of Taylor and his followers spilled out of the factory to fuel the "efficiency craze" of the 1910s.[335] [458]

The attempt to apply his principles across the whole of society … became known as the Efficiency Movement, … and the application of his methods was known as Taylorization.[266]

In addition to its spread in America, Taylor's mental revolution started to spread globally after the publication of his papers.

[335] Work in America: An Encyclopedia of History, Policy, and Society
By Carl E. Van Horn (Editor), Herbert A. Schaffner (Editor), Ray Marshall (Foreword)
Publisher: ABC-Clio Inc (December 2003) p.539

[458] Haber, S. (1973) Efficiency and Uplift. Scientific Management in Progressive Era 1890-1920. Chicago: University of Chicago Press. pp. 52-59

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

Frank Barkley wrote in "Frederick W. Taylor, Father of Scientific Management" (1923):

> *" Shop Management (1903), On the Art of Cutting Metals (1906), and The Principles of Scientific Management (1911) were translated into other languages.*
>
> *In the case of his last paper … within two years of its book publication by Harper & Brothers, it had been translated into French, German, Dutch, Swedish, Russian, Lettish, Italian, Spanish, and Japanese.*
>
> *In each case the translation was undertaken on his own initiative by some native or resident of the country where the language concerned was spoken.*
>
> *And after its author's death there came to this country a copy of The Principles translated into Chinese by a Chinese."* [459]

[279] www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

[459] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. xx - xxii archive.org/details/frederickwtaylor01copl

In France, Le Chatelier translated Taylor's work and introduced scientific management throughout government owned plants during World War I.[281]

With the prevalence of US branch plants in Canada and close economic and cultural ties between the two countries, the sharing of business practices, including Taylorism,[281] was common.

In the early 1920s, the Canadian textile industry was re-organized according to scientific management principles.[281]

In 1928, workers at Canada Cotton Ltd. in Hamilton, Ontario went on strike against newly introduced Taylorist work methods.[281]

[281] en.wikipedia.org/wiki/Frederick_Winslow_Taylor

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

Mussolini set up a propaganda arm of his government to promote Taylorism.[275]

In the Soviet Union, Vladimir Lenin was very impressed by Taylorism, which he and Joseph Stalin sought to incorporate into Soviet manufacturing.[281]

Image: **Vladimir Ilyich Lenin**, Date: circa 1920, Author Photograph by Soyuzfoto, Permission (Reusing this file) PD-old-70 en.wikipedia.org/wiki/File:Lenin_CL.jpg

Taylor's ideas inspired Lenin's director of the Central Institute of Labour, poet Andrei Gastev, to write Factory Whistles, Rails and Tower based on the ideal of "subordinating people to mechanisms and the mechenisation of man".[275]

In its issue of April 28, 1918, Pravda, the official Soviet organ, published a long article by N. Lenin on "The Urgent Problems of the Soviet Rule," and under the heading, "Higher Productivity of Labor," Lenin wrote: [459]

> *"We should immediately introduce piece work and try it out in practice. We should try out every scientific and progressive suggestion of the Taylor System. ...*
>
> *To learn how to work - this problem the Soviet authority should present to the people in all its comprehensiveness.*

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

The last word of capitalism in this respect, the Taylor System, as well as all progressive measures of capitalism, combined the refined cruelty of bourgeois exploitation and a number of most valuable scientific attainments in the analysis of mechanical motions during work, in dismissing superfluous and useless motions, in determining the most correct methods of work, the best systems of accounting and control, etc.

The Soviet Republic must adopt valuable and scientific technical advances in this field.

The possibility of socialism will be determined by our success in combining Soviet rule and the Soviet organization of management with latest progressive measures of capitalism. We must introduce in Russia the study and the teaching of the new Taylor System and its systematic trial and adaptation." [459]

[459] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. xx - xxii archive.org/details/frederickwtaylor01copl

The Soviet Union's famous five-year plans that set goals for industrial productivity and economic growth were a direct result of scientific management principles.[245] [285]

A Japanese engineer translated The Principles of Scientific Management (in Japan it became Secrets for Eliminating Futile Work and Increasing Production).[288]

Published in 1911, in Japan it was a bestseller - a foretaste of the Japanese willingness to embrace the latest Western thinking.[288]

It sold more than a million copies in 10 years.[563]

[285] Wren, Daniel A. (1980) Scientific Management in the U.S.S.R., with Particular Reference to the Contribution of Walter N. Polakov, Academy of Management Review Volume 5 Number 1, January, 1980 p. 4

[288] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 228-230 Copyright © 2002, John Wiley and Sons

[563] Balázs Vaszkun, One Hundred Years of Management American Paradigms and the Japanese Management "Reloaded", p.80 Institute of Management Department of Management and Organization, © Balázs Vaszkun, 2012, Corvinus University of Budapest Management and Business Administration Doctoral School

[301] Manufacturing Ideology: Scientific Management in Twentieth-Century Japan, By William M. Tsutsui, Publisher: Princeton University Press (February 1, 2001) p. 32

As a result, Japanese industry also began adopting Taylor's techniques.[245] [296]

Although Scientific Management in 1920s Japan appeared mainly in large, highly mechanized factories and was spread primarily by company engineers with overseas experience, Taylorism also flourished in a number of smaller firms which employed "efficiency experts" to rework their managerial methods.[301]

The first and most prominent of these Taishō managerial consultants was Ueno Yōuici, who in 1920 agreed to reorganize the Lion Toothpowder Company's chronically inefficient packing department.[301]

[245] ONE HUNDRED YEARS OF TAYLORISM: IS IT STILL RELEVANT TODAY? Dimitrios Nikolaou Koumparoulis, Anathalia Vlachopoulioti, Academic Research International Vol. 3, No.2 September 2012 www.ugsm-monarch.com/wp-content/uploads/2012/11/Valchopoulioti-Taylorism-20123.2-55.pdf

[296] Tsutsui, William M. (2001) The Way of Efficiency: Ueno Yoichi and Scientific Management in Twentieth Century Japan, Modern Asian Studies, Volume 35 Number 2 p.446

Ueno was hired by the Lion Toothpowder Company, where he increased the productivity of its packaging department by 20 percent while reducing the area of working space by 30 percent and cutting work time by one hour per day.[245] [296]

Yoichi has been called the "father of Japanese administrative science".[297]

Uneo became a leading proponent of scientific management in Japan, in the years leading up to the Second World War, many in Japanese industry embraced Taylorism.[245] [296]

As in other countries, Scientific management had taken hold in Japan.

[245] ONE HUNDRED YEARS OF TAYLORISM: IS IT STILL RELEVANT TODAY? Dimitrios Nikolaou Koumparoulis, Anathalia Vlachopoulioti, Academic Research International Vol. 3, No.2 September 2012 www.ugsm-monarch.com/wp-content/uploads/2012/11/Valchopoulioti-Taylorism-20123.2-55.pdf

296 Tsutsui, William M. (2001) The Way of Efficiency: Ueno Yoichi and Scientific Management in Twentieth Century Japan, Modern Asian Studies, Volume 35 Number 2 p.446

Staying with Japan, Dr. Shigeo Shingo was a Japanese industrial engineer who considered himself as the world's leading expert on manufacturing practices and the Toyota Production System.[299]

Starting in 1956 what Dr. Shingo taught at Toyota for period of twenty years was a series of specific industrial engineering concepts that he blended together.[300]

Dr. Shingo clearly states in his books that he was influenced by many before him such as Taylor.[300]

We will return to Japan in Part two, to discuss how they alone were able to eschew scientific management after the Second World War, whilst the West remained enchained.

[299] en.wikipedia.org/wiki/Shigeo_Shingo

[297] en.wikipedia.org/wiki/Yoichi_Ueno

[300] The legacy of Dr. Shingo and his influence on TPS, By Art Smalley, President, Art of Lean, Inc. www.artoflean.com

Despite the popularity of Taylor's papers, books, and lectures, more was needed for the mental revolution to take hold.

In addition to Taylor, there were many others who either continued, disseminated, implemented, published, enriched, or modified, his scientific management principles and methods.

The rest of this chapter discusses this topic, and it is here, where we will see many other of today's design and management of work norms arise.

TAYLORS DISCIPLES

In our last chapter, in addition to Taylor, we have already discussed the work of Towne, Halsey and Metcalfe; discussing how they influenced the creation of scientific management.

In this chapter our next protagonist we shall discuss is Henry Laurence Gantt.

Image: **Henry Laurence Gantt** (1861 - 1919), Date: 30 November 2008, Source: www.gannt-chart.com/gnImages/H_L_Gannt.jpg and en.wikipedia.org/wiki/File:Henri_Gannt.jpg

GANTT

At Midvale, in 1887, the company hired Henry Gantt as an assistant for Taylor.[263]

At the beginning of his work at Midvale, he won Taylor's confidence by promptly solving a mathematical problem which had baffled Taylor.[308]

Thus in this year there came together two young men (Taylor was then thirty-one and Gantt twenty-six), who, though they were temperamental opposites in some respects, formed a professional association that was destined to continue for many a year.[308]

In fact, Gantt's association with Taylor lasted 30 years.[280]

[308] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 251-252 archive.org/details/frederickwtaylor01copl

[309] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p. 23 archive.org/details/frederickwtaylor02copl

If Taylor's slogan was "no responsibility without authority," Gantt told you that as a consulting engineer he wanted neither responsibility nor authority; it was his method to have you come to him that he simply might advise you what to do.[309]

It was Taylor's instinct to say, "What ought we to have?" It was Gantt's instinct to say, "What can we do with what we have?" [309]

Taylor was thoroughgoing; Gantt did not wish to go any farther than you were willing to have him.[309]

Taylor was profound, revolutionary; Gantt adaptable, opportunist. The fact would appear to be that such difference of temperament as there was between Gantt and Taylor was creditable to each.[309]

[280] Henry L. Gantt and Frederick Taylor: The Pioneers of Scientific Management, Peter B. Darmody, PSP, 2007 AACE International Transactions, p.1

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

Taylor resigned from Midvale in 1890 but early in 1899 [Taylor] … again reached out for Henry L. Gantt, and induced him to come to Bethlehem.[309]

After Taylor left Bethlehem, Gantt continued to innovate and modify Taylor's system of scientific management.

In 1917 Clarence Bertrand Thompson published "The Theory and Practice of Scientific Management" in which he stated:

> *"Gantt has made the most noticeable modifications.*
>
> *Mr. Gantt sometimes installs a system with the aid of his own staff of men, whom he moves from plant to plant, while the other members of the Taylor group usually do their work personally and alone, getting their subordinates entirely from within the existing organization."* [304]

[322] Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe p. 64
archive.org/details/cu31924013854132

We will spend the next part of this chapter looking at these modifications.

MANAGEMENT INEFFICIENCY

Gantt was frustrated at the lack of quality in management positions. As he wrote:

> *"Our most serious trouble is incompetency in high places. As long as that remains uncorrected, no amount of efficiency in the work-men will avail very much."* [322]

Gantt was disturbed by the inefficiency of management. He described what he called the difference between an "Unprepared" and "Prepared" workshop, the former of which he stated was down to lack of management competency.

[309] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p. 23
archive.org/details/frederickwtaylor02copl:

[304] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company p. 49
archive.org/details/theorypracticeof01thom

Explaining the pictures on the left he stated:

> *" The pictures ... do not show anything concerning the efficiency of the individual workman, but they are a sweeping condemnation of the inefficiency of those responsible for the management, and illustrate the fact, so well known to many of us, that our industries are suffering from lack of competent managers, - which is another way of saying that many of those who control our industries hold their positions, not through their ability to accomplish results ..."* [322]

Interestingly Gantt's "Unprepared" and "Prepared" workshop bear a remarkable resemblance to what some consultants today call 5S, which is a work organization method.[503]

[322] Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe p. 64
archive.org/details/cu31924013854132

[503] en.wikipedia.org/wiki/5S_(methodology)

Image: **Unprepared and Prepared Shop**, Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe p.62
archive.org/details/cu31924013854132

FIG. 4.—UNPREPARED

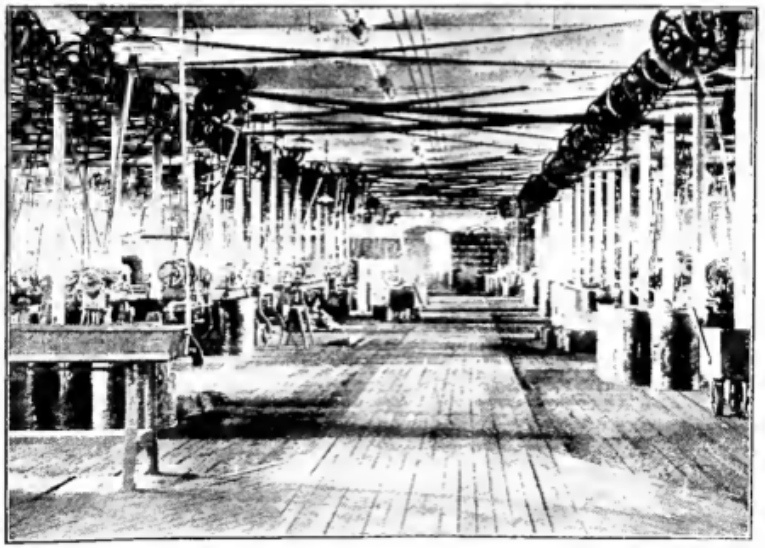
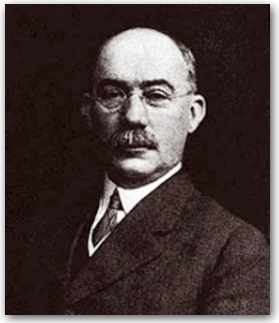


FIG. 5.—PREPARED

Two views of the same shop doing substantially the same work, taken from the same point. The lower view was taken about a year after the upper.

Often top management were reluctant to implement scientific management outside of the shop floor. Gantt would sum this problem up:

> "Among the obstacles to the introduction of this system is the fact that it forces everybody to do his duty.
>
> Many people in authority want a system that will force everybody else to do his duty but will allow them to do as they please." [310]
>
> Henry L. Gantt



However, Gantt went on to produce a series of innovations which management could not ignore.

THE BONUS PLAN

In chapter three we discussed Taylor's differential system; Taylor proposed a set of differential rates at Midvale that would be set "scientifically," with higher rates per piece paid above certain production standards established by management.[263]

It was intended to provide individual employee productivity incentives.[267]

[310] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 318-319 archive.org/details/frederickwtaylor02copl

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

[267] Questions on Organizational Behavior Stephen W. Hartman, Ph.D. iris.nyit.edu/~shartman/mba0299/120_0299.htm

Image: **Henry Laurence Gantt** (1861 - 1919), Date: 30 November 2008, Source: www.gannt-chart.com/gnImages/H_L_Gannt.jpg and en.wikipedia.org/wiki/File:Henri_Gannt.jpg

Under differential piece rate system, a standard output was first fixed. Then two wage rates were fixed: [274]

A high price per piece in case the work is finished in the shortest possible time and in perfect condition, and a low price, if it takes a longer time to do the job, or if there are any imperfections in the work.[273]

The difficulty of bringing a plant to the necessary perfected degree of administration and the apparent severity of the differential piece rate led … Gantt, to develop a different form of premium system, which retained, however, the essential element of an accurate time-study basis.[305]

This method, known as the "Gantt bonus plan," [was] a time-rate method.[305]

[273] Cost Keeping and Scientific Management, Evans, Holden A, Published By: McGraw-Hill Book Company, New York, 1911 pp. 109-110 archive.org/details/costkeepingscienooevanrich

John C. Duncan wrote in "The Principles of Industrial Management" (1920):

> "*Gantt's scheme differs from the differential system in that it is not a piece-rate system, yet it is like the Taylor system, in that it does set a definite task for the person to perform.*
>
> *If the individual performs the task within the given time, he is paid his regular hourly rate and a certain stipulated bonus.*
>
> *The result is that if a man in the course of a day doubles his output, he will get a day's wage plus the bonuses, which are attached to the separate jobs he has performed.*
>
> *If he fails to do the work within the allotted time, he gets only his day's wage.*" [312]

[274] F. W. Taylor's Scientific Management Theory - kalyan-city.blogspot.com/2011/06/frederick-taylor-principles-of.html

[305] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company pp. 183-185 archive.org/details/theorypracticeof01thom

[312] The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company pp. 29-230 archive.org/details/principlesofinduoodunc

Alexander Hamilton Church in "The Science and Practice of Management" (1918) explained in more detail:

> *"The Gantt method of piece remuneration consists, in essence, of what may be termed a truncated piece-work price.*
>
> *It sets back the time limit in such a way that the early stages of increased speed on the part of a worker do not yield him small results, but no results at all beyond his ordinary day wage.*
>
> *On the other hand, when this increased speed has, so to speak, acquired sufficient momentum, and has attained a certain predetermined efficiency, the worker finds himself in possession, all at once, of a substantial reward, the proportion of which, relative to his day wages, continues to be an increasing quantity as long as he continues to reduce the allotted time.*

> *In the Gantt method a time limit, or allowance, is set as in all other methods of payment by results; and precisely as in ordinary piece work, any reduction of this limit goes entirely into the pocket of the worker.*
>
> *Thus if a task of 14 articles per day be set and the worker receives $2 a day, day wages, then for 10, 11, 12 or 13 articles he receives day wages, but on attaining 14 articles he begins to be paid the bonus of (say) 40 per cent, making the equivalent of a piece-work price of 20 cents each, thus jumping to $2.80 per day."* [311]

At the time this method was revolutionary and proved to be extremely popular.

That popularity remains; today tasks and bonuses are commonplace.

[311] The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 461-466
archive.org/details/sciencepracticeooochur

In 1901 Gantt read his paper, A Bonus System of Rewarding Labour to the ASME.[359]

Holden A Evans wrote in "Cost Keeping and Scientific Management" (1911):

> *"The bonus system was devised by Mr. H. L. Gantt, and has been employed by him in a number of plants with great success.*
>
> *In a paper read before the Society of Mechanical Engineers Mr. Gantt describes the system as follows:*
>
> *"Under this system each man has his work assigned him in the form of a task to be done by a prescribed method with definite appliances and to be completed within a certain time.*
>
> *The task is based on a detailed investigation by a trained expert of the best methods of doing the work; and the task setter, or his assistant, acts as an instructor to teach the work-men to do the work in the manner and time specified.*

> *If the work is done within the time allowed by the expert, and is up to the standard for quality, the workman receives extra compensation in addition to his day's pay. If it is not done in the time set, or is not up to the standard for quality, the workman receives his day's pay only."*
>
> *The Task and Bonus system of pay is really a combination of the best features of both day and piece work.*
>
> *Our method of payment then is piece work for the skilled, and day work for the unskilled, it being remembered that if there is only work enough for a few, it will always be given to the skilled. This acts as a powerful stimulus to the unskilled, and all who have any ambition try to get into the bonus class."* [315]

[359] Management theory, John Sheldrake, Thomson Learning; 2nd Revised edition edition (19 Dec 2002) p.37

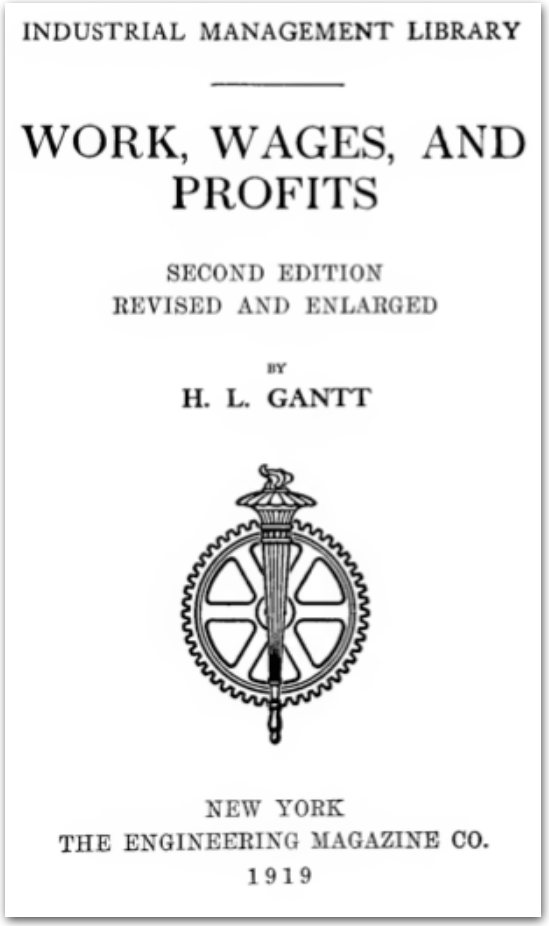
[315] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 107-108 archive.org/details/costkeepingscienooevan

Here we can see the birth of the notion of extrinsic motivation through the use of a bonus, which again is commonplace today.

Clarence Bertrand Thompson wrote how Gantt's Task and Bonus system complimented scientific management:

> *" Mr. Gantt points out how by the ordinary methods of management the cost of production, ... follows a vicious circle of higher wages to meet higher cost and increased cost as the result of higher wages. The way out is to manage production in such a way that higher wages bring a decreased cost; and this is the aim of scientific management.*
>
> *Mr. Gantt has published a large number of articles on the subject, the best of which, together with his own development of the relation of scientific management to some of the human problems involved, have been collected in one volume."* [305]

That volume, published in 1910, was called "Work, Wages and Profits".


INDUSTRIAL MANAGEMENT LIBRARY

WORK, WAGES, AND PROFITS

SECOND EDITION
REVISED AND ENLARGED

BY
H. L. GANTT

NEW YORK
THE ENGINEERING MAGAZINE CO.
1919

[305] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company pp. 183-185
archive.org/details/theorypracticeof01thom

Image: **Work, Wages, and Profits** (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. Title Page
archive.org/details/cu31924013870724

It was a seminal book which well received by Gantt's contemporaries.

Thompson would state:

> *" This book of Mr. Gantt's is one of the best that has appeared on the subject and is entitled to rank with Mr. Taylor's Shop Management and The Principles of Scientific Management, as one of the standard authorities.* [305] *"*

In 1918 Alexander Hamilton Church wrote:

> *" Mr. Gantt's book on "Work, Wages and Profits", ... must be regarded as one of the most important contributions yet made to the subject, the philosophy underlying his method is brought out in detail."* [311]

[305] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company pp. 183-185
archive.org/details/theorypracticeof01thom

[311] The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 461-466
archive.org/details/sciencepracticeooochur

STANDARDIZATION OF WORK

An important element of Gantt's bonus method was standardization of work.

In chapter three we talked about Taylor's method of standardizing work, and the resulting "instruction cards" which were used both to instruct and to control new workers.[257]

As Taylor stated:

> *" In many cases the greatest good resulting from the application of these systems is the indirect gain which comes from the enforced standardization of all details and conditions, large and small, surrounding the work ... the task idea cannot be carried out without them."* [316]

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

[316] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 112-113
archive.org/details/costkeepingscienooevan

Evans wrote in "Cost Keeping and Scientific Management" (1911):

> *"Mr. Gantt says, "The fact, so repeatedly emphasized by Mr. Taylor, that tasks should be set only as the result of a scientific investigation, has proven of an educational value hardly to be over-estimated, for the scientific investigation of a process that has been developed without the assistance of science almost always reveals inconsistencies which it is possible to eliminate, thus perfecting the process and at the same time reducing its cost.*
>
> *It is this scientific investigation that points to improvement in methods and educates owners and managers."*
>
> *To make real and permanent progress, the expert must be able to standardize appliances and methods and write up such instructions as will enable an intelligent workman to follow them.*

[316] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 112-113 archive.org/details/costkeepingscienooevan

> *Such standards become permanent, and if the workman is paid a proper bonus for doing the work in the manner and time set, he not only helps maintain the standards, but soon begins to exert his influence to help the progress of standardization."* [316]

This sounds similar to Taylor's staff suggestion schemes we discussed in previous chapter. Gantt too was an advocate of this method as he wrote in his book:

> *"If after having performed his task a workman wishes to suggest a quicker or better method for doing the same work, he is given an opportunity if possible to demonstrate his method. ..."* [371]

[371] Work, Wages, and Profits (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. pp. 158-159 archive.org/details/cu31924013870724

> *"If the suggested method really proves to be quicker or better, it is adopted as the standard, and the workman is given a suitable reward."* [371]

However Gantt made one important addition:

> *"No workman, however, is allowed to make suggestions until he has first done the work in the manner and time specified."* [371]

Here we can see an example of Gantt's Time and Bonus card taken from "Work, Wages and Profits".

The card allowed for the recording of the worker, the time allowed and time actually taken for a piece of work, a description of the work breakdown, whether it had passed inspection, and any resulting bonus earned.

If a bonuses was earned, it would be given to the worker, to the speed boss and the gang boss.

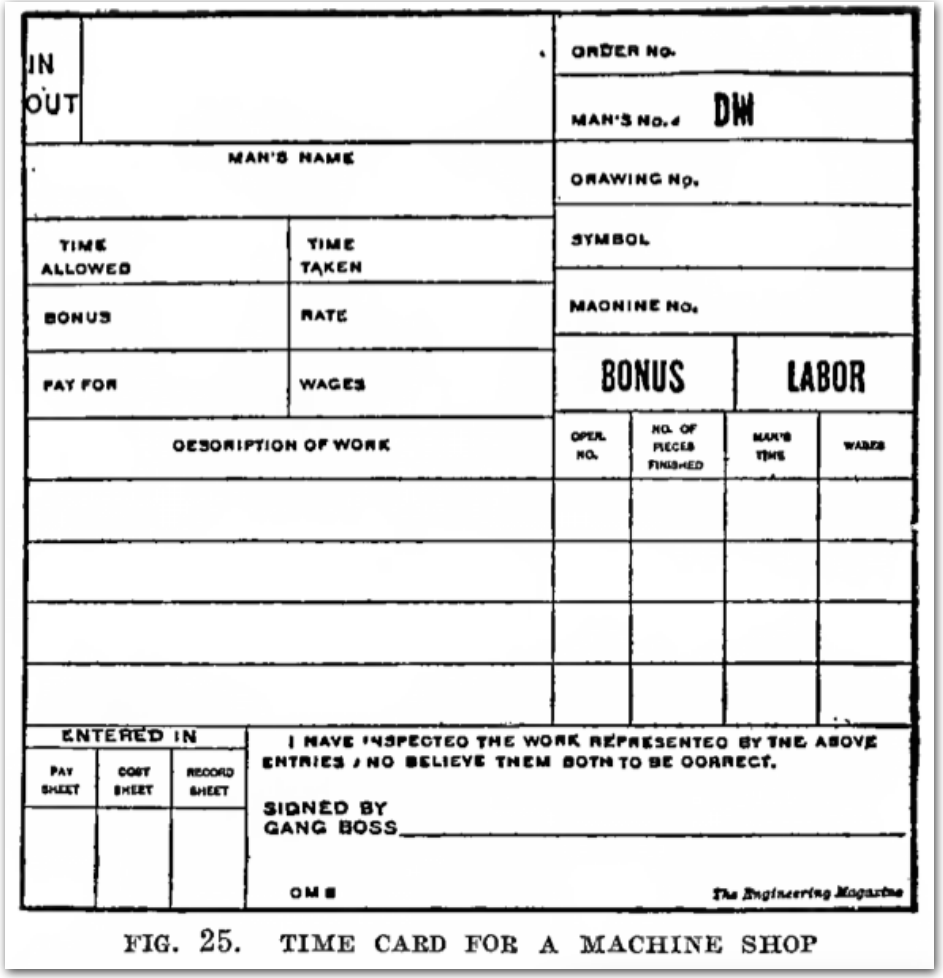

IN
OUT
ORDER No.
MAN'S No. DW
MAN'S NAME
DRAWING No.
TIME ALLOWED
TIME TAKEN
SYMBOL
BONUS
RATE
MACHINE No.
PAY FOR
WAGES
BONUS
LABOR
DESCRIPTION OF WORK
OPER. NO.
NO. OF PIECES FINISHED
MAN'S TIME
WAGES
ENTERED IN
PAY SHEET
COST SHEET
RECORD SHEET
I HAVE INSPECTED THE WORK REPRESENTED BY THE ABOVE ENTRIES, AND BELIEVE THEM BOTH TO BE CORRECT.
SIGNED BY
GANG BOSS
OMS
The Engineering Magazine

FIG. 25. TIME CARD FOR A MACHINE SHOP

[371] Work, Wages, and Profits (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. pp. 158-159 archive.org/details/cu31924013870724

Image: **Time and Bonus Card**, Work, Wages, and Profits (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. p. 282 archive.org/details/cu31924013870724

WORKER PERFORMANCE RECORDS

In chapter two we discussed Robert Owen's innovation, in the early 1880s, of highlighting quality of workmanship and monitoring worker performance; where above each machinist's workplace, a cube with different coloured faces was installed[177] and that depending on the quality of the work and the amount produced, a different colour was used. The worker then had some indication to others of his work's quality.[177]

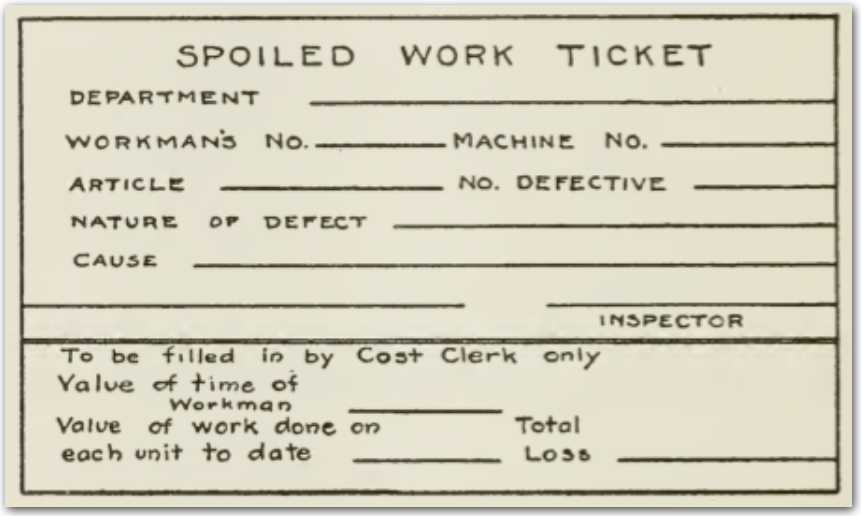
Many years later, under the umbrella of scientific management, John C. Duncan in his book "The Principles of Industrial Management" (1920) wrote about recording worker performance and quality:

> *" A good way to know accurately of a man's spoiled work and mistakes is to have a spoiled work slip made out for this work.*

[314] The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company pp.255-256 archive.org/details/principlesofinduoodunc

> *This should be signed by the workman and the inspector with the reasons for the rejection and slip filed as an original record.*
>
> *At the end of the month the slips can be summarized, and a record made on his individual report card."* [314]

We can see an example of a Spoiled Work Ticket here. The workman and the nature and cause of the defect could be recorded, along with the lost time, value and total loss.


SPOILED WORK TICKET

DEPARTMENT _____

WORKMAN'S NO. _____ MACHINE NO. _____

ARTICLE _____ NO. DEFECTIVE _____

NATURE OF DEFECT _____

CAUSE _____

_____ _____ INSPECTOR

To be filled in by Cost Clerk only

Value of time of Workman _____

Value of work done on each unit to date _____ Total Loss _____

[177] en.wikipedia.org/wiki/Robert_Owen

Image: **Spoiled Work Ticket**, The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company pp. 256 archive.org/details/principlesofinduoodunc

Similar defect cards are in use today in both manufacturing and office work. Inspection of quality after production is the norm. The given today is that something needs testing, we inspect quality out.

Duncan went on to explain:

> *"These individual cards soon indicate to the foremen the inefficient subordinates, who should gradually be weeded out of their departments, and deserving ones promoted as opportunity occurs.*
>
> *At the end of each year the general average of the man, as shown by his output record ... should be entered on the back of his Permanent Record Card filed in the Employment Bureau's office."* [314]

These end of year Permanent Record Cards are similar in nature to what we would recognise today as the annual appraisal records.

[314] The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company pp.255-256 archive.org/details/principlesofinduoodunc

We will return to what Duncan described as methods for "weeding out"[314] employees later in this chapter.

Gantt would take the ideas of inspection further.

One of Gantt's greatest contributions to scientific management was the procedure of using inspection, by means of the information yielded by progress records, as a device for improving conditions and methods, through publicity of results and reasons, as well as for maintaining them; whereas Taylor had used it mainly as a device for maintenance of conditions and methods which had been discovered, designed and established chiefly through other procedures.[303]

[303] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers p. 388 archive.org/details/scientificmanageootayl

THE GANTT CHART

Gantt adopted and extended this principle of inspection, in fact, made it the corner stone of his technique of development of scientific management; and for its wider application he devised graphical forms of recording performance to which have been given the name Gantt Charts.[303]

Today millions of people across the world use Gantt charts, yet very few will be aware that they were invented over 100 years ago, or what problems Gantt was trying to solve at the time, which led to their invention.

Gantt produced several types of charts, each to solve a different problem.

[303] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers p. 388 archive.org/details/scientificmanageootayl

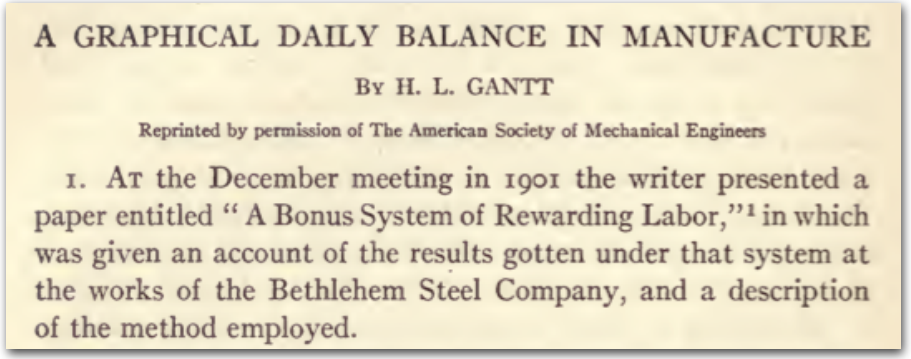
Image: **A Graphical Daily Balance in Manufacture**, Scientific management; a collection of the more significant articles describing the Taylor system of management (1914), Author: Thompson, Clarence Bertrand, Publisher: Cambridge, Harvard university press p.420 archive.org/details/scientificmanageoothomuoft

We will spend the next part of this chapter discussing each.

In 1901 Gantt presented a paper to the ASME, entitled "A Graphical Daily Balance in Manufacture" to show how a daily balance scheme can be used to facilitate getting work turned out by a department.[313]

It was published in 1903.[313]

The advantages of his daily balance scheme, as he presented it, are that it aids the foreman by showing him at a glance what is to be done, and what he has already done.[313]



A GRAPHICAL DAILY BALANCE IN MANUFACTURE

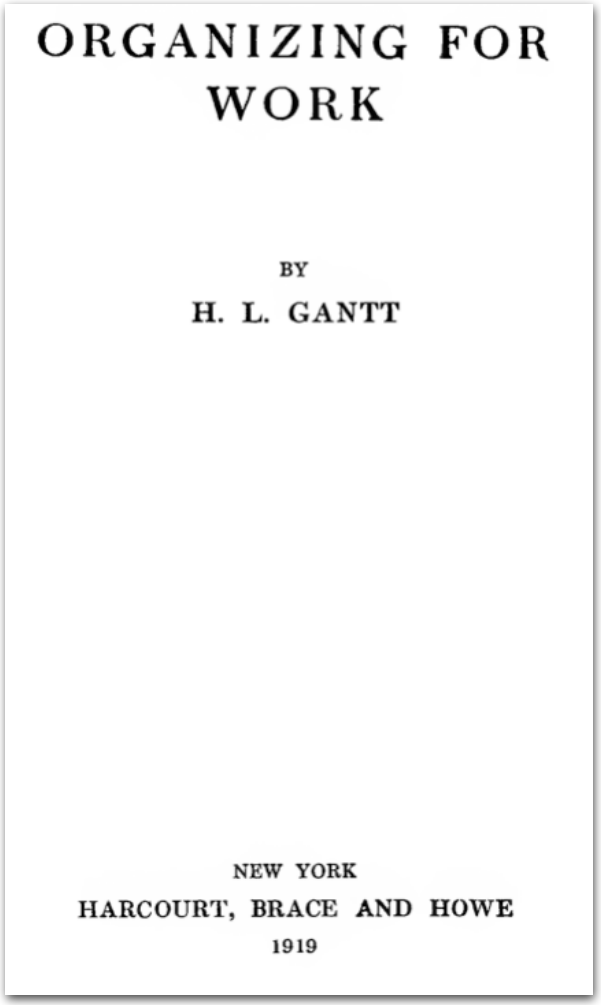
By H. L. GANTT

Reprinted by permission of The American Society of Mechanical Engineers

1. At the December meeting in 1901 the writer presented a paper entitled "A Bonus System of Rewarding Labor,"[1] in which was given an account of the results gotten under that system at the works of the Bethlehem Steel Company, and a description of the method employed.

[313] The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company p. 310 archive.org/details/principlesofinduoodunc

Gantt took his ideas further and in 1919 he published another seminal text entitled "Organizing for Work".


ORGANIZING FOR WORK

BY

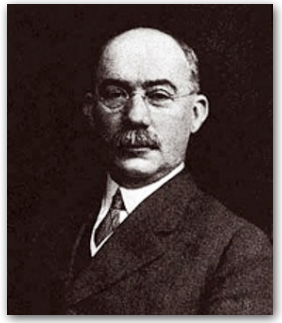
H. L. GANTT

NEW YORK
HARCOURT, BRACE AND HOWE
1919

Image: **Organizing for Work** (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe Title Page archive.org/details/cu31924013854132

In his book Gantt asked:

> "What is our expense for idle labor? [320]"
>
> Henry Gantt



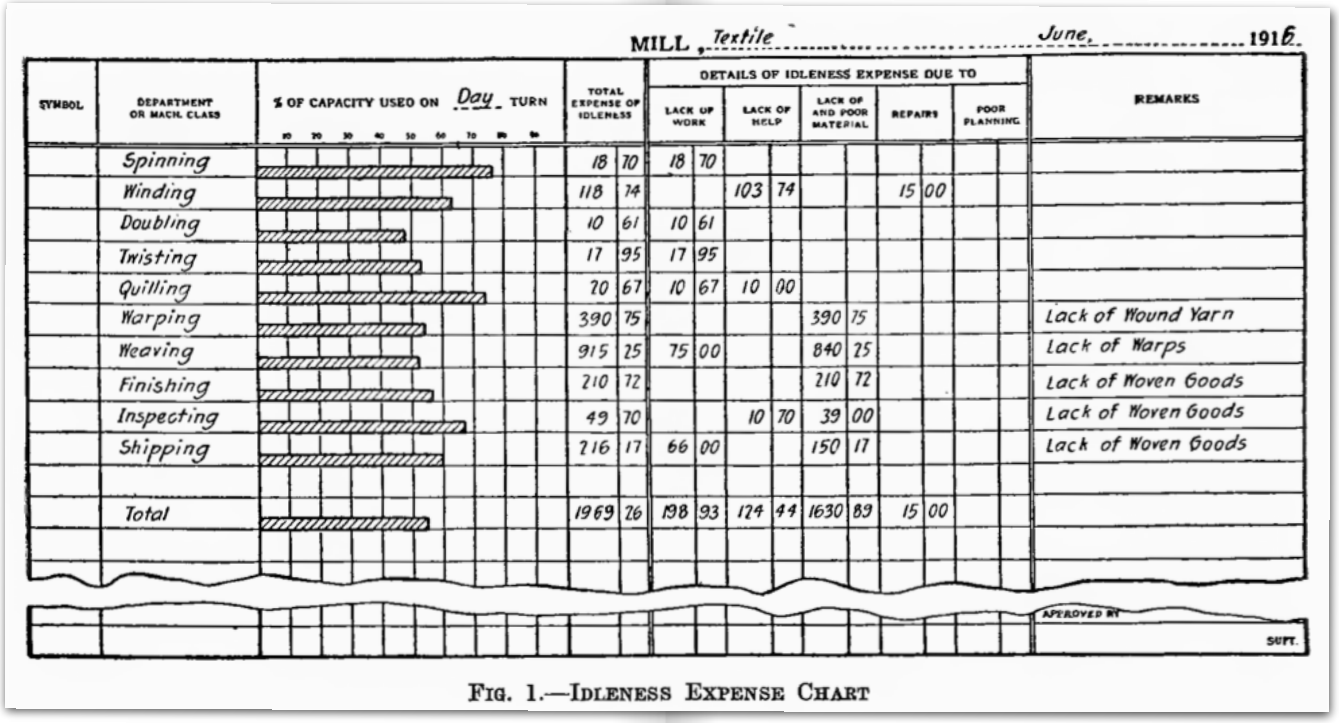
To answer this question he created his Idleness Expense Chart.

In "Organizing for Work" he described the purpose of the chart.

[320] Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe pp.25-26 archive.org/details/cu31924013854132

Image: **Henry Laurence Gantt** (1861 - 1919), Date: 30 November 2008, Source: www.gannt-chart.com/gnImages/H_L_Gannt.jpg and en.wikipedia.org/wiki/File:Henri_Gannt.jpg

> *The scheme for the selection of the efficient, of which much had been made, was now found to need supplementing by one for forcing the idler to work and training the inefficient.* [320]
>
> *Fig. 1 illustrates this subject most clearly, and is an indication of the efficiency of the management as contrasted with that of the workmen* [321]
>
> *It is interesting to note that charts of this nature, which are being made monthly in several large plants, have already had a very educational influence on the managers of those plants. ...* [321]



MILL, Textile June, 1916.

SYMBOL	DEPARTMENT OR MACH. CLASS	% OF CAPACITY USED ON Day TURN	TOTAL EXPENSE OF IDLENESS	DETAILS OF IDLENESS EXPENSE DUE TO: LACK OF WORK	LACK OF HELP	LACK OF AND POOR MATERIAL	REPAIRS	POOR PLANNING	REMARKS
	Spinning		18 70	18 70					
	Winding		118 74		103 74		15 00		
	Doubling		10 61	10 61					
	Twisting		17 95	17 95					
	Quilling		70 67	10 67	10 00				
	Warping		390 75			390 75			Lack of Wound Yarn
	Weaving		915 25	75 00		840 25			Lack of Warps
	Finishing		210 72			210 72			Lack of Woven Goods
	Inspecting		49 70		10 70	39 00			Lack of Woven Goods
	Shipping		216 17	66 00		150 17			Lack of Woven Goods
	Total		1969 26	198 93	124 44	1630 89	15 00		

APPROVED BY

SUPT.

FIG. 1.—IDLENESS EXPENSE CHART

[320] Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe pp.25-26 archive.org/details/cu31924013854132

[321] ibid., pp. 44-48

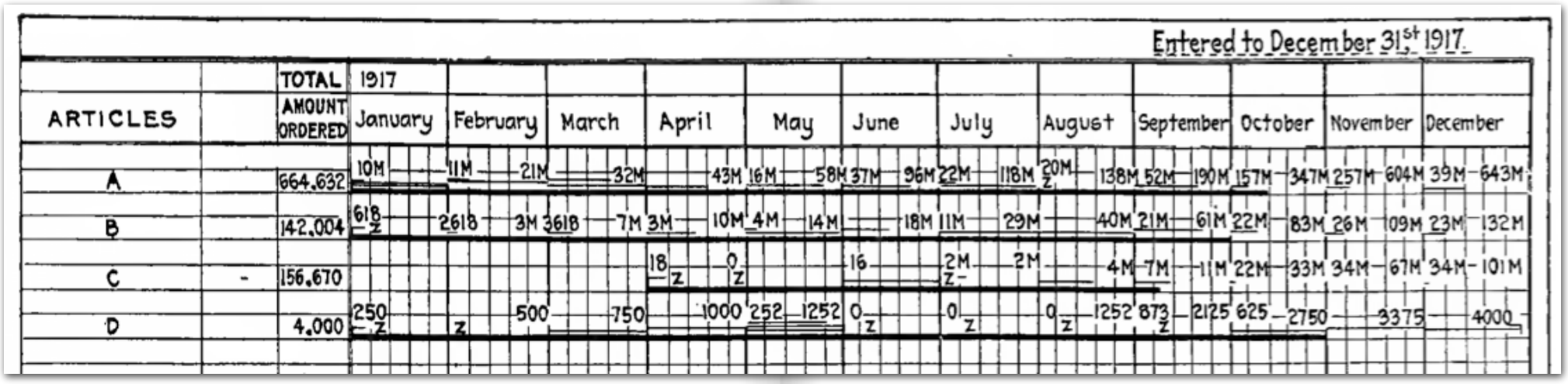
Image: **Idleness Expense Chart**, Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe p.44 archive.org/details/cu31924013854132

If now the cause for idleness is ascertained each day we can find the expense of each cause of idleness as shown on the chart.

We can hardly claim that such a chart gives us a measure of the efficiency with which the above functions are performed, but it certainly does give us an indication of that efficiency." [321]

Gantt was determined that no worker should be idle, otherwise, an organization will suffer the resulting loss in profits. This is classic activity based accounting, with a fixation on utilisation, that is still so pervasive today.

Next in "Organizing for Work" Gantt described his "Progress Chart".



Entered to December 31st 1917

ARTICLES		TOTAL AMOUNT ORDERED	1917 January	February	March	April	May	June	July	August	September	October	November	December
A		664,632	10M	11M	21M	32M	43M	16M	58M	37M	96M	22M	118M	20M	138M	52M	190M	157M	347M	257M	604M	39M	643M
B		142,004	618 z	2618	3M	3618	7M	3M	10M	4M	14M	18M	11M	29M	40M	21M	61M	22M	83M	26M	109M	23M	132M
C	-	156,670						18 z	0 z	16	2M z	2M	4M	7M	11M	22M	33M	34M	67M	34M	101M		
D		4,000	250 z	z	500	750	1000	252	1252	0 z	0 z	0 z	1252	873 z	2125	625	2750	3375	4000				

[321] Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe pp. 44-48 archive.org/details/cu31924013854132

Image: **Progress Chart**, Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe p.82 archive.org/details/cu31924013854132

Explaining the advantage of these types of charts Gantt stated that:

> *" The great advantage of this type of chart, known as the straight line chart, is that it enables us to make a large number of comparisons at once.*
>
> *From the illustrations given, the following principles upon which this chart system is founded are easily comprehended:*
>
> *First : The fact that all activities can be measured by the amount of time needed to perform them.*
>
> *Second : The space representing the time unit on the chart can be made to represent the amount of activity which should have taken place in that time.*
>
> *Bearing in mind these two principles, the whole system is readily intelligible and affords a means of charting all kinds of activities, the common measure being time."* [323]

A version of the Straight Line Chart was what Gantt called a "Man Record Chart" also taken from his book "Organising the Work". The purpose of the chart was explained as follows:

> *" The purpose of the Man Record Chart is to show whether or not a man does a day's work and, if not, the reason why.*
>
> *The foreman readily sees the advantage of making an estimate of the time it should take before the work is actually begun.*
>
> *On the chart the foreman indicates by a line drawn through the daily space how the work done by each man compares with his estimates. "* [376]

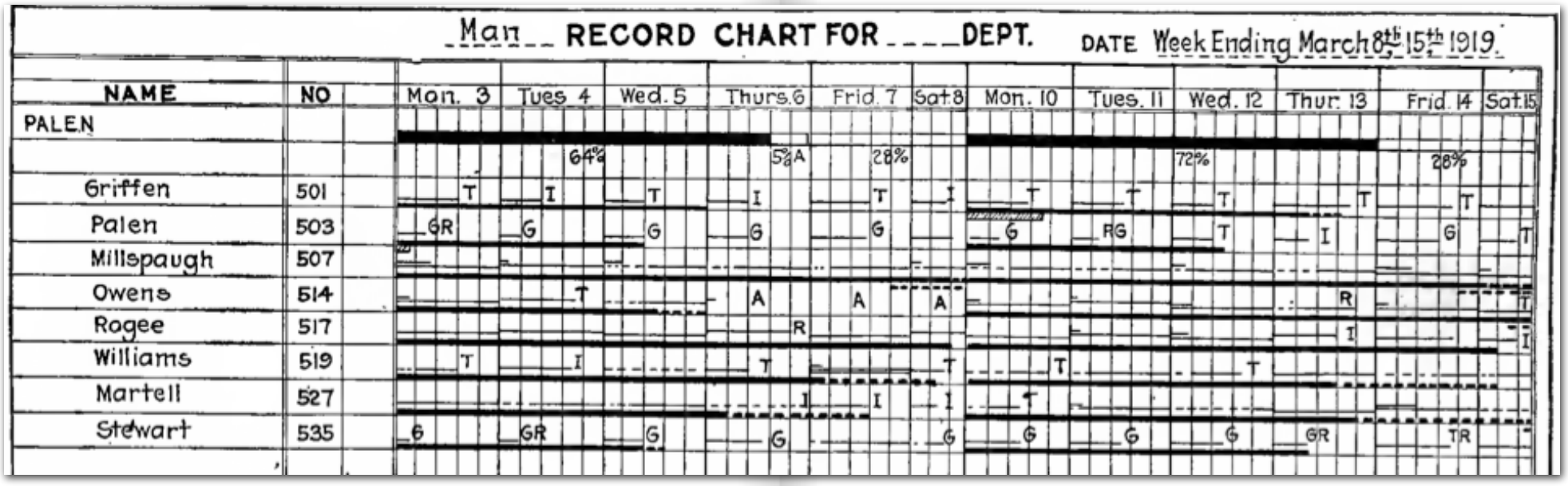
323 Organizing for work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe pp. 82-83 archive.org/details/cu31924013854132

376 The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, Publisher: New York, Ronald Press, pp. 35-37 archive.org/details/ganttchartworkinooclaruoft

" The foreman watches the first line of his chart because it shows him how his department as a whole is living up to his idea of what it should do.

The charts are so simple that they can be understood by anyone - even by a foreigner who cannot read the language in which they are written.

When his line and those of his companions are pointed out to him, he can see how his work compares with that of others." [378]



[378] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp.40-41 archive.org/details/ganttchartworkinooclaruoft

Image: **Man Record Chart**, Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe p.88 archive.org/details/cu31924013854132

Here we can see the Key for the Man Record Chart as taken from Gantt's book.

It states; "*The daily space represent the amount of work a man should have done in a day, and also the time taken to do the work*". It also states; "*The portion of daily space which no line is drawn shows how much the man has fallen behind what he was expected to do*".[324]

The reasons for his falling behind are indicated in the Key; "Absent, Defective Work, Green Operator, Lack of instruction, Lack of or defective material, Tool troubles, or lack of tools, Holiday, Reason not clear".[324]

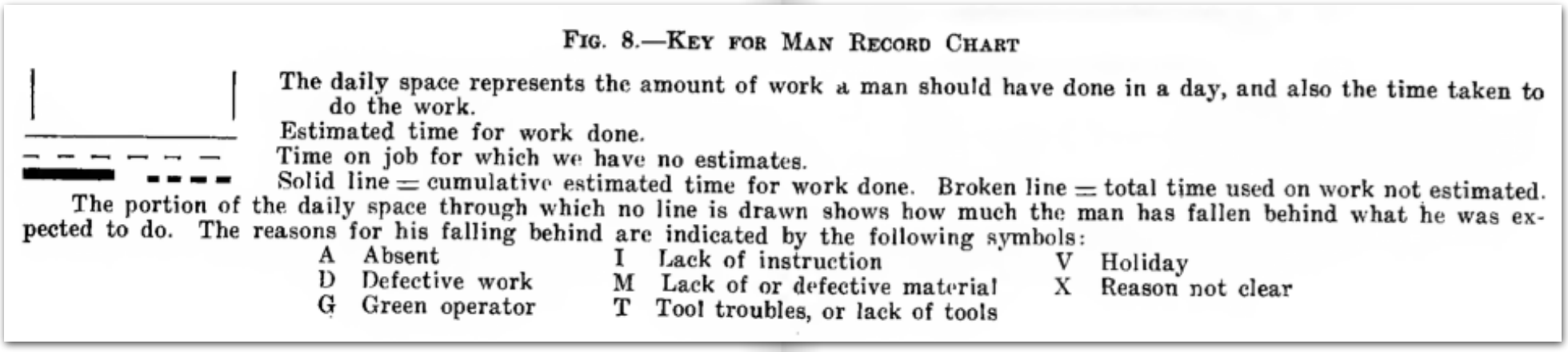


FIG. 8.—KEY FOR MAN RECORD CHART

The daily space represents the amount of work a man should have done in a day, and also the time taken to do the work.
Estimated time for work done.
Time on job for which we have no estimates.
Solid line = cumulative estimated time for work done. Broken line = total time used on work not estimated.

The portion of the daily space through which no line is drawn shows how much the man has fallen behind what he was expected to do. The reasons for his falling behind are indicated by the following symbols:

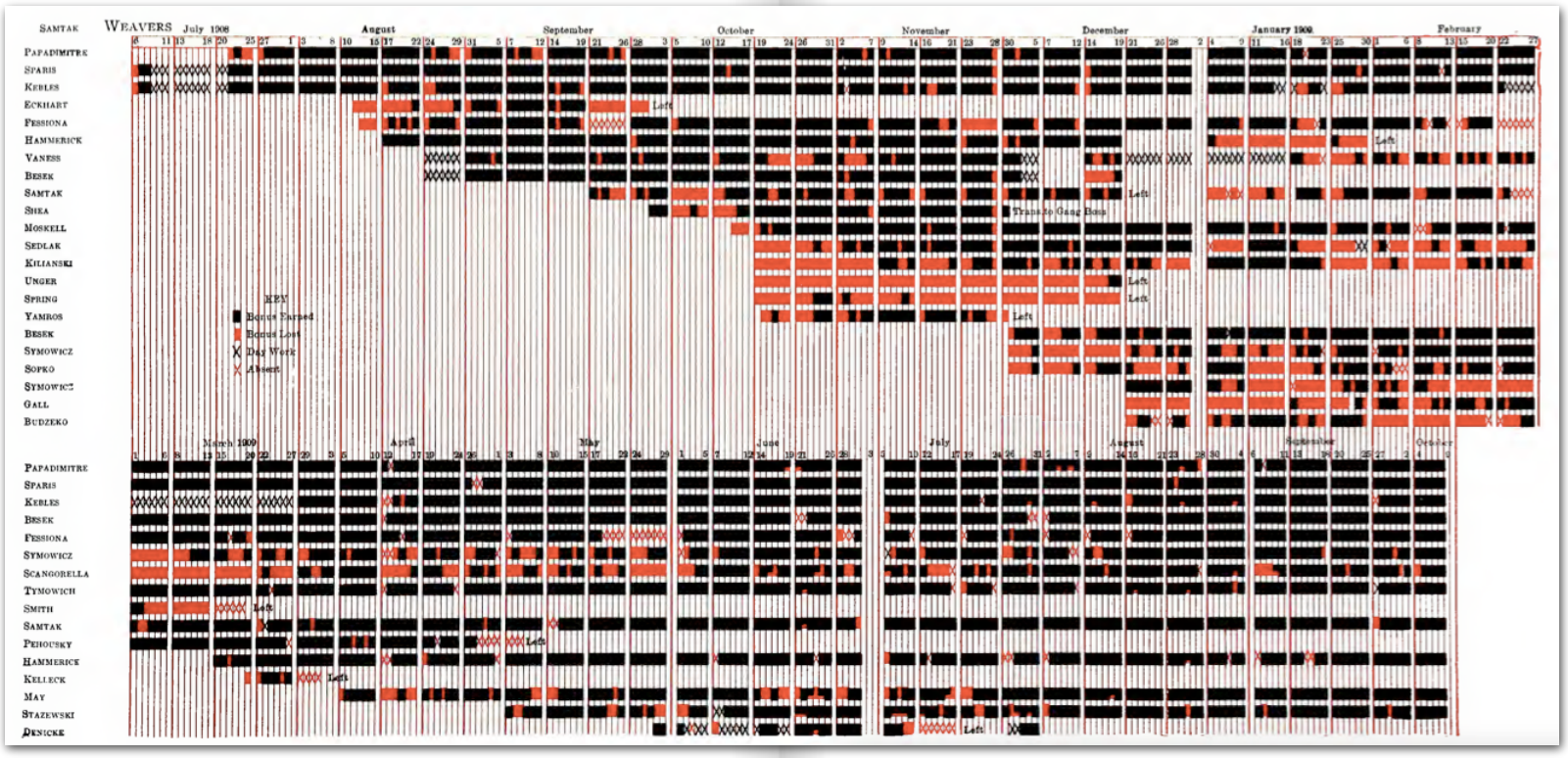
A	Absent	I	Lack of instruction	V	Holiday
D	Defective work	M	Lack of or defective material	X	Reason not clear
G	Green operator	T	Tool troubles, or lack of tools		

[324] Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe pp. 87-88 archive.org/details/cu31924013854132

Image: **Man Record Chart Key**, Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe p.88
archive.org/details/cu31924013854132

Below we have another example of Gantt's charts, depicting "*Task and Bonus System in a Weave Room*". *Two charts of sequential months are shown on the same page, under which he denoted; "Note the increase of black (meaning task achieved and bonus earned) as time progresses*".[548]

He would show other examples of the same chart in his book, denoting underneath; "*Note disappearance of the habit of slack work on Mondays*" [548] and "*Note Disappearance of slack-saturday habit*" [548] and "*Note improvement following establishment of bonus to head weavers; early in July*".[548]



[548] Work, Wages, and Profits (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. pp. 182-190 archive.org/details/cu31924013870724

Image: **Task and Bonus System in a Weave Room**, Work, Wages, and Profits (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, The Engineering magazine co. p. 182 archive.org/details/cu31924013870724

No one was left out of Gantt's sights:

> "*Just as the line representing the average of all the workers is a measure of the foreman, so a line representing the average of all the foremen is in some degree at least a measure of the superintendent.*" [324]

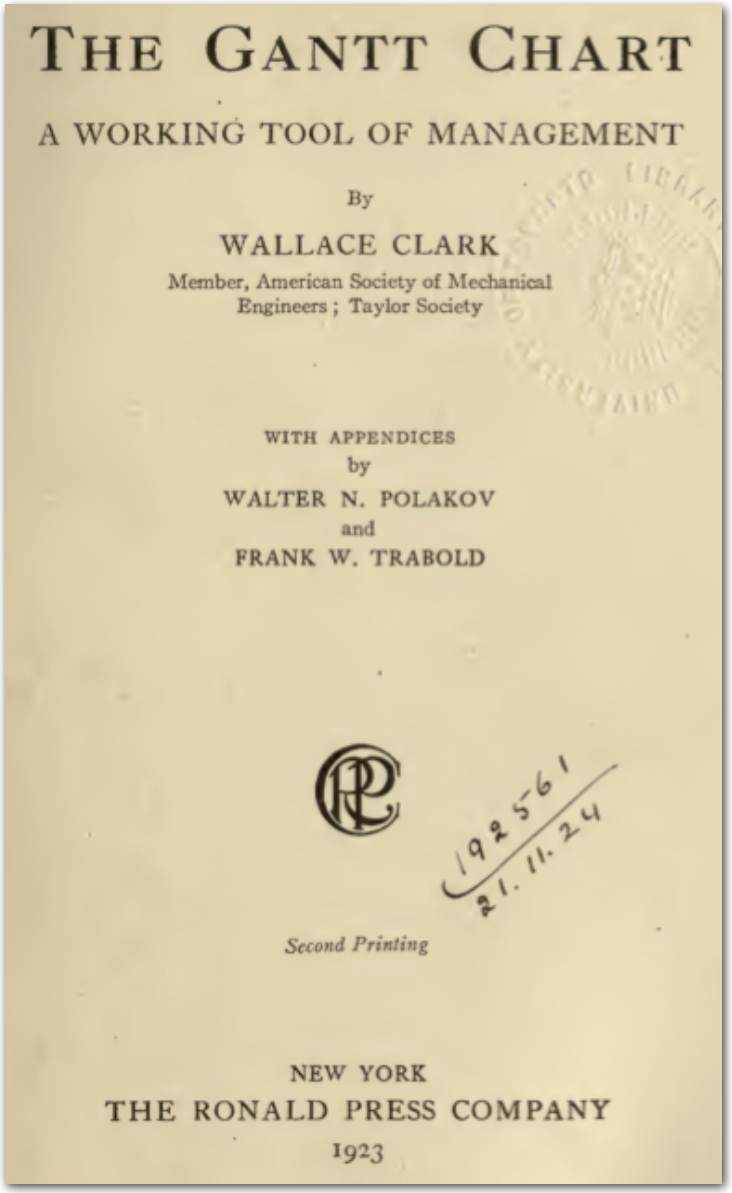
Gantt's charts proved popular, leading to a book by Wallace Clarke called "The Gantt Chart, A Working Tool Of Management" to be published in 1922 by ASME and the Taylor Society.

The book described the general benefits of Gantt's charts:

> "1. *A simple and effective method of planning work. ...* [382]

[324] Organizing for Work (1919), Author: Gantt, Henry Laurence, 1861-1919, Publisher: New York, Harcourt, Brace and Howe pp. 87-88
archive.org/details/cu31924013854132

[382] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 139-140
archive.org/details/ganttchartworkinooclaruoft


THE GANTT CHART

A WORKING TOOL OF MANAGEMENT

By

WALLACE CLARK

Member, American Society of Mechanical Engineers ; Taylor Society

WITH APPENDICES
by
WALTER N. POLAKOV
and
FRANK W. TRABOLD

1925-61
21.11.24

Second Printing

NEW YORK
THE RONALD PRESS COMPANY
1923

Image: **The Gantt Chart, A Working Tool Of Management**; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, Title Page
archive.org/details/ganttchartworkinooclaruoft

2. *A way of presenting facts so that they can be easily understood.*

3. *A means of eliminating idleness and waste.*

4. *A method of getting things done on time."* [382]

In the book it stated:

" *The Gantt chart simplifies a complex situation or problem and points to the action which should be taken.*

The principle of the Gantt chart can be applied to any human activity, but up to the present time it has been applied most extensively to industrial production." [377]

There was a section entitled "The Broad Field for the Gantt Chart". It read:

" *The value and adaptability of these charts is recognized by all progressive engineers.*

[382] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 139-140 archive.org/details/ganttchartworkinooclaruoft

[377] ibid., pp.17-20

H. K. Hathaway, industrial engineer, says:

For continuous flow production such as this I know of nothing better for recording output and comparing performance with capacity or what ought to be produced, than the straight line charts developed by Mr. H. L. Gantt

Dean Herman Schneider of the University of Cincinnati to General C. B. Wheeler, then Chief of Ordnance. Referring to the Gantt charts in use in the Ordnance Department, he said:

Each production section has production and progress chart systems. ... The charts give a picture of the progress of the whole Ordnance program including lags and the causes therefor. Combined in one office and kept up to date, they would show the requirements as to workers, ... materials, transportation, accessory machinery and all the factors which make or break the program. ... [377]

In the leading editorial in Industrial Management for February, 1918, entitled "Master Control of American Industries for War Man or Method?" L. P. Alford said:

> *How are we to obtain master control of the efforts of these millions of people who are engaged, or to be engaged, in manufacturing, of the production equipment that they operate, of the business organizations of the country? - in short, how are we to control the industry of the United States?*
>
> *The solution of this problem involves the complete organizing of American industry,*
>
> *Once organized, all of this industry must be coordinated ...*
>
> *Fortunately, a suggestion is at hand based upon work already done. ...*

377 The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp.17-20
archive.org/details/ganttchartworkinooclaruoft

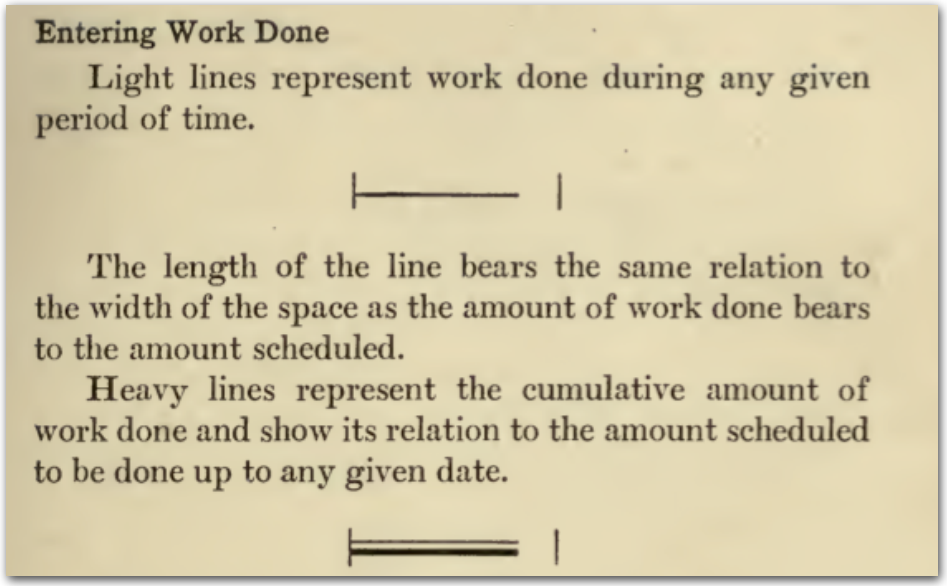
> *Plot all of the Government requirements of materials of every kind on Gantt charts ...*
>
> *That is, bring under graphic analysis all of the facts in regard to the production of Government material necessary to give managerial control.*

Walter N. Polakov, in a paper on "Principles of Industrial Philosophy," presented at the annual meeting of the American Society of Mechanical Engineers, December, 1920, said:

> *The achievement of Gantt offers a means of measuring the human or social efficiency of industry. ...*
>
> *Gantt's method has made it possible to ascertain the cause of the diseased industry just as blood analysis established the cause of malaria. ...* [377]

(Gantt) charts ... are kinetic, moving, and project through time the integral elements of service rendered in the past toward the goal in the future." [377]

Detailed instructions on how to create a chart were included in the book. An example is shown here describing what each line on a chart should represent.



Entering Work Done

Light lines represent work done during any given period of time.

The length of the line bears the same relation to the width of the space as the amount of work done bears to the amount scheduled.

Heavy lines represent the cumulative amount of work done and show its relation to the amount scheduled to be done up to any given date.

Image: **Instructions for Creating a Gantt Chart**, The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.15
archive.org/details/ganttchartworkinooclaruoft

Throughout the book each of Gantt's charts where described along with examples of their application and usefulness.

Gantt's "Progress Chart" came with the following explanation:

"*The purpose of the Gantt Progress Chart is to show what progress is being made in the execution of a plan or program.*

One of the fundamental principles of management was formulated by Gantt when he said: "The authority to issue an order involves the responsibility to see that it is executed".

It is obvious, therefore, that when an executive, i.e., anyone who has control over others, has issued instructions that certain things are ... [381]

[377] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp.17-20
archive.org/details/ganttchartworkinooclaruoft

[381] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 81-84
archive.org/details/ganttchartworkinooclaruoft

to be done, his next step is to provide a mechanism which will at all times keep him advised as to whether or not his orders are being carried out and, if the progress is not satisfactory, will tell him the reason why.

The Gantt Progress Chart gives this information clearly and concisely and, since the facts are presented in their relation to time, the chart induces action.

Its use makes a definite plan necessary and presents that plan so clearly that it can be readily understood in detail and as a whole by the executive's associates and subordinates.

It shows what part of the work has been done in accordance with the schedule and emphasizes the reasons why performance has fallen short of the plan, fixing responsibility for its success or failure.

[381] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 81-84
archive.org/details/ganttchartworkinooclaruoft

This method makes it unnecessary for the general manager of a manufacturing plant, for instance, to wade through volumes of reports or to go the rounds of his superintendents or foremen in an attempt to find out what work is not progressing satisfactorily. "[381]

In chapter two, we discussed McCallum's reports as the birth of reports serving the hierarchy. Similarly Gantt's progress charts allowed for management to remain in their offices and rely on these charts, prepared by a separate office, as an indicator of progress.

Progress, project and program reports are commonly used by today's mangers to solve the same problem described back in 1923:

" *The Progress Chart also enables the general manager to know whether or not he will be able to live up to whatever promises of delivery he has made ...* " [381]

The text explained how to draw a Progress Chart:

"*Angles opening to the right and to the left indicate respectively when the work is to be begun and completed.*

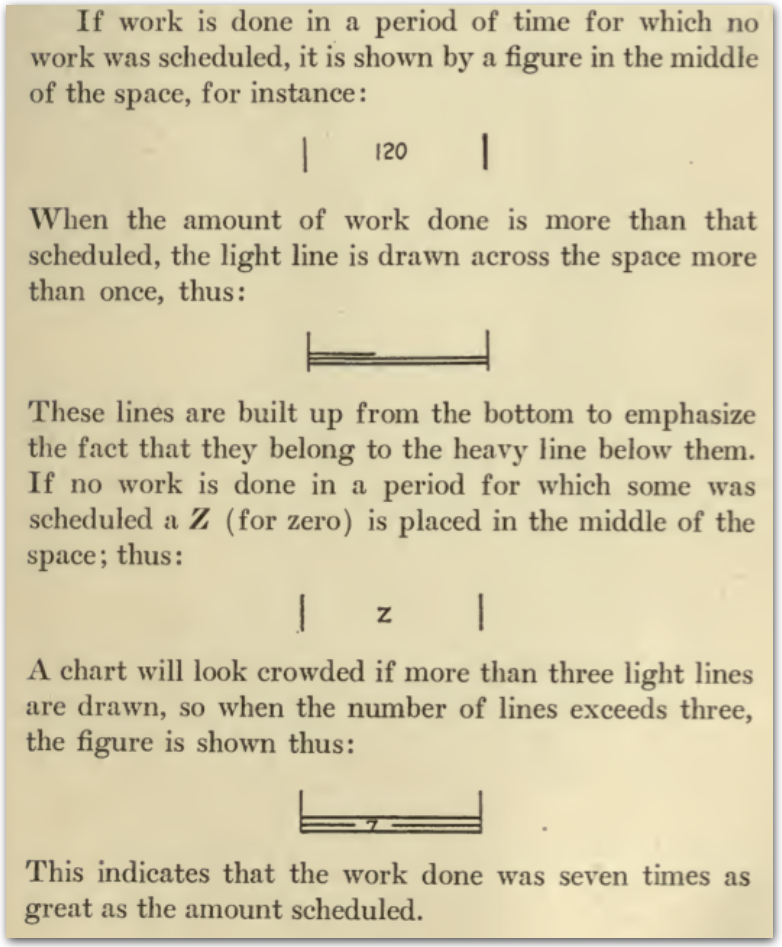
The amount of work scheduled is shown by a figure at the left of the space and the amount to be done to date by a figure at the right of the space; light lines represent work done during any period of time and heavy lines the amount done to date ...

If work is done in a period of time for which no work was scheduled, it is shown by a figure in the middle of the space ...

When the amount of work done is more than that scheduled, the light line is drawn across the space more than once ...

[501] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 85-86
archive.org/details/ganttchartworkinooclaruoft

If no work is done in a period for which some was scheduled a Z (for zero) is placed in the middle of the space ... " [501]



If work is done in a period of time for which no work was scheduled, it is shown by a figure in the middle of the space, for instance:

| 120 |

When the amount of work done is more than that scheduled, the light line is drawn across the space more than once, thus:

These lines are built up from the bottom to emphasize the fact that they belong to the heavy line below them. If no work is done in a period for which some was scheduled a **Z** (for zero) is placed in the middle of the space; thus:

| Z |

A chart will look crowded if more than three light lines are drawn, so when the number of lines exceeds three, the figure is shown thus:

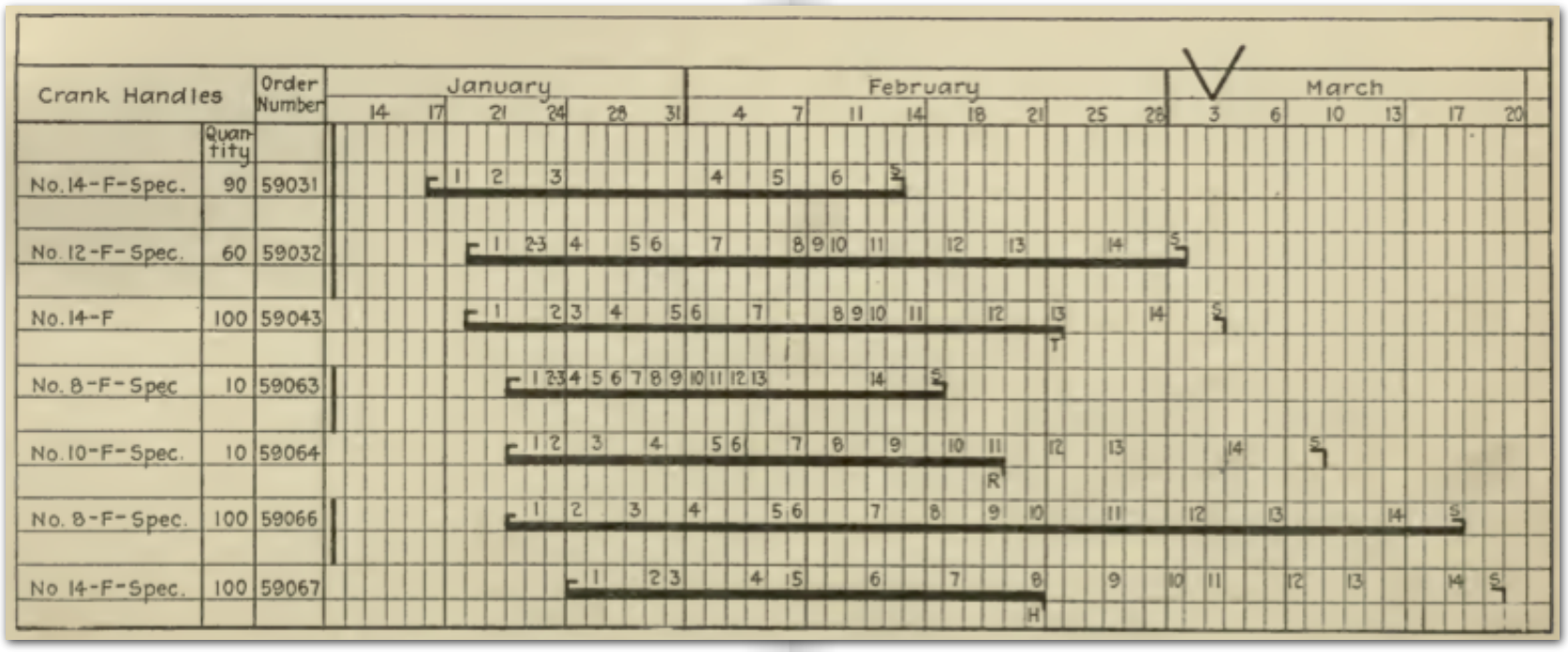
7

This indicates that the work done was seven times as great as the amount scheduled.

Image: **Gantt Progress Chart Explanation**, The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.85
archive.org/details/ganttchartworkinooclaruoft

The text recommended the use of symbols to denote if work is behind schedule, on schedule or ahead of schedule:

> *" In this chart the angle opening to the right indicates the date on which the material was to be issued from stores; the figures indicate the operations to be done on the order and are placed under the dates on which they were to be begun; the angle opening to the left indicates the date on which the parts were to be shipped. The heavy lines show what operations have been done; and the letters under the lines indicate the reasons for delay. The V indicates that this chart was reproduced on March 3. "* [501]



[501] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 85-86 archive.org/details/ganttchartworkinooclaruoft

Image: **A Gantt Progress Chart**, The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.86 archive.org/details/ganttchartworkinooclaruoft

The Progress Chart is what is still in use today, albeit a shiny computerized version of the same Gantt chart.

Many project managers, still ask workers to estimate how long a work task will take, they then place those estimates in Gantt charts, to then question, and apply pressure, if those times are not adhered to.

Have you used a Gantt chart recently? Is it not astounding that it was invented in 1903, and yet the computer you used it on wasn't!

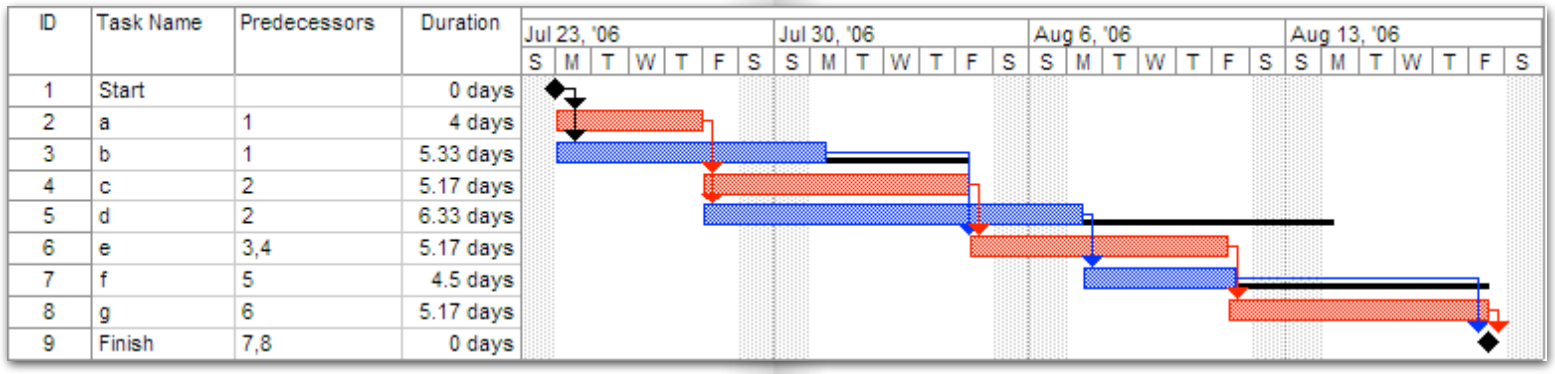
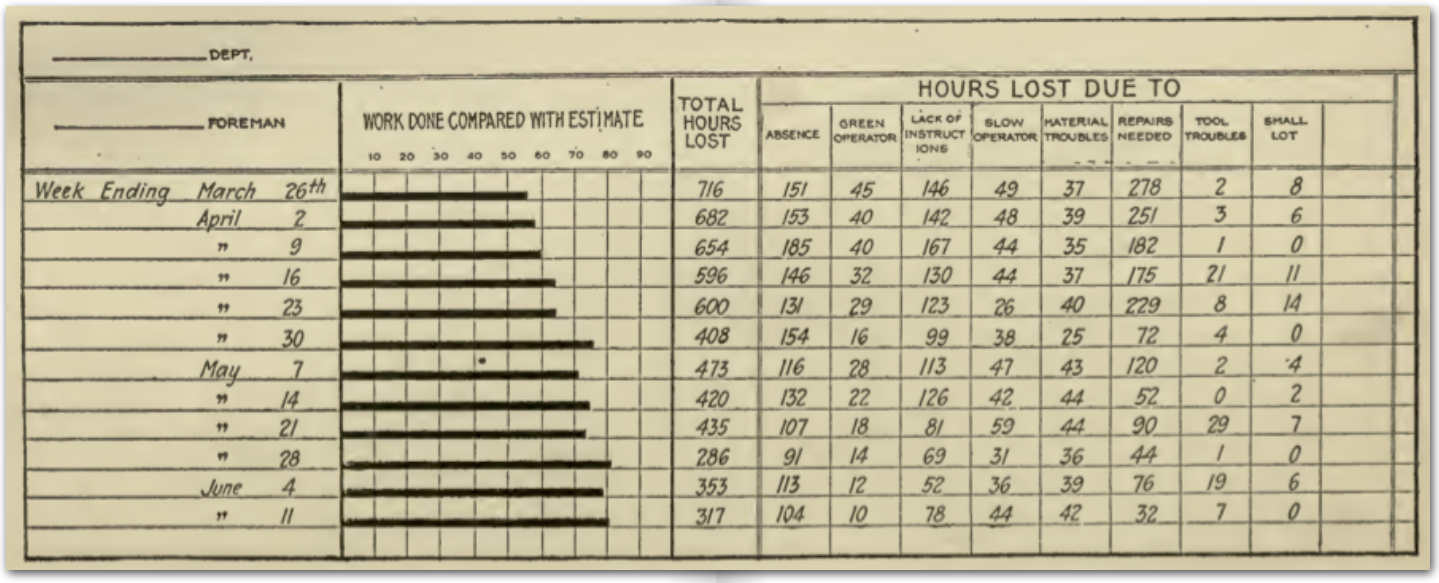


Image: **A Gantt chart created using Microsoft Project** (MSP). en.wikipedia.org/wiki/File:Pert_example_gantt_chart.gif

We discussed Gantt's "Man Record Chart" earlier in this chapter. An additional chart, "The Man Record Summary Chart", was described in this later book in the following way:

> *" It is easy to see from this chart that the average production per man in this department was increased from 55 to 80 percent, and also to see what causes of delay were removed and what were not.*
>
> *The delays due to slow operators had not been changed to any great extent, that is, the men who were naturally slow on the kind of work assigned to them had not been able to show much improvement and it had evidently been impossible for the foreman to transfer them to work for which they were better fitted.*
>
> *Such a summary chart enables a good foreman to show the results of his work and to get credit for it. "*[375]



_____ DEPT.

_____ FOREMAN	WORK DONE COMPARED WITH ESTIMATE (10 20 30 40 50 60 70 80 90)	TOTAL HOURS LOST	HOURS LOST DUE TO							
			ABSENCE	GREEN OPERATOR	LACK OF INSTRUCTIONS	SLOW OPERATOR	MATERIAL TROUBLES	REPAIRS NEEDED	TOOL TROUBLES	SMALL LOT
Week Ending March 26th		716	151	45	146	49	37	278	2	8
April 2		682	153	40	142	48	39	251	3	6
" 9		654	185	40	167	44	35	182	1	0
" 16		596	146	32	130	44	37	175	21	11
" 23		600	131	29	123	26	40	229	8	14
" 30		408	154	16	99	38	25	72	4	0
May 7		473	116	28	113	47	43	120	2	4
" 14		420	132	22	126	42	44	52	0	2
" 21		435	107	18	81	59	44	90	29	7
" 28		286	91	14	69	31	36	44	1	0
June 4		353	113	12	52	36	39	76	19	6
" 11		317	104	10	78	44	42	32	7	0

[375] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.47 archive.org/details/ganttchartworkinooclaruoft

Image: **A Man Record Summary Chart**, The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.46 archive.org/details/ganttchartworkinooclaruoft

We can see similarities for what is in use today, with a focus on understanding and reducing delays, moving what is commonly termed today as "dead wood" onto other "more suitable" tasks, and a summary of performance passed up the line as an example of a job well done if performance has improved.

Next was Gantt's "Layout Chart":

> *"Idleness of men and machines is usually the greatest source of waste ... and yet it is possible to take definite steps to prevent its recurrence by presenting to the management in such detail as to fix responsibility, the reasons for idleness ...*
>
> *This is done by planning work sufficiently far in advance to advise each individual concerned what he is to do and when.*
>
> *Usually a department has to turn out a great many different parts to be used in the assembling of a varied product.*

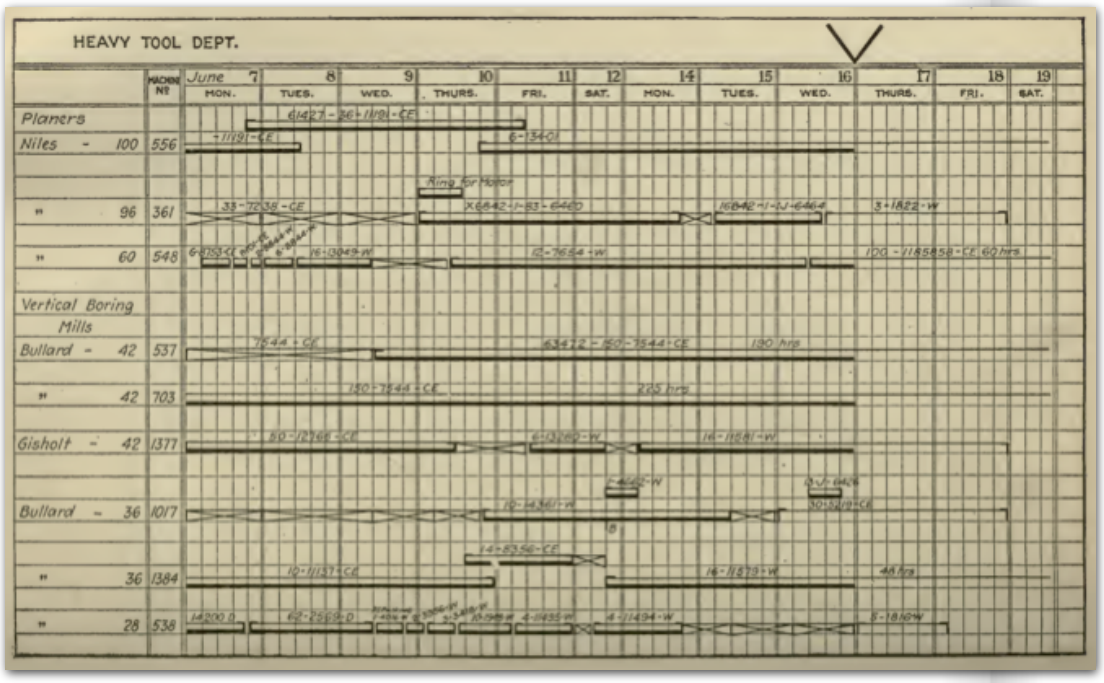
> *Moreover, it is probable that these different parts are worked on in other departments also.*
>
> *It therefore becomes necessary for the foreman to plan carefully the work to be done on each machine in his department and also for the superintendent or manager to plan the work to be done in all the departments of the plant.*
>
> *The Gantt Layout Chart is used in working out a plan to get the orders in hand done when they are wanted and to make the best possible use of the available men and machines.*
>
> *No method of doing this can be satisfactory unless it emphasizes above everything else when jobs are to be begun, by whom, and how long they will take."* [379]

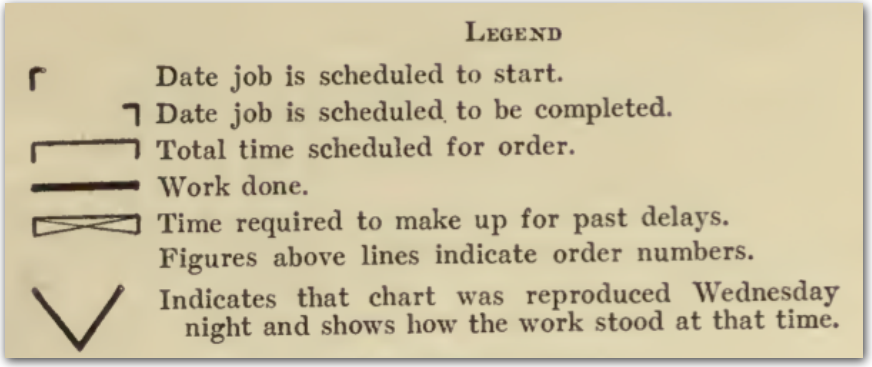
[379] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 53-55
archive.org/details/ganttchartworkinooclaruoft

“ The Gantt Layout Chart helps to get work done because it makes clear who is to do any piece of work, when it is to be done, and how long it will take.

It can be successfully made out only by one who knows what is to be done, how it can be done, and how long it will take.

Instructions based on this chart will, therefore, create confidence in the mind of the one who is to do the work. It is possible through this chart to assign definite tasks, and the more definite the task the easier it is to get it done.” [380]





[380] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p. 66 archive.org/details/ganttchartworkinooclaruoft

Images: **Gantt Layout Chart**,and **Gantt Layout Chart Legend**, The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.58 archive.org/details/ganttchartworkinooclaruoft

The Taylor Society reported that "the Gantt Charts have become famous".[372]

In fact, in "The Gantt Chart, A Working Tool Of Management" it was stated:

> *"The Gantt chart, because of its presentation of facts in their relation to time, is the most notable contribution to the art of management made in this generation."*[502]

The fact that Gantt charts are still in use over 100 years later makes this statement remarkably prescient.

[372] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 389-397 archive.org/details/scientificmanageootayl

[502] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.3 archive.org/details/ganttchartworkinooclaruoft

[307] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 111-112 archive.org/details/frederickwtaylor01copl:

[318] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 134-137 archive.org/details/costkeepingscienooevan

EFFICIENCY EXPERTS

Gantt had a big impact on how today we design and manage work. There were notable others, each of whom contributed to the mental revolution. In the next pages we will explore each in turn.

Frank Copley wrote in "Fredrick W. Taylor: Father of Scientific Management" (1923):

> *"To this day the path of the scientific expert is not easy. As H. L. Gantt was wont to say, "the usual way of doing a thing is always the wrong way" and to the scientific expert falls the task of breaking this news which no one hears with joy and gladness."* [307]

In Cost Keeping and Scientific Management (1911) Holden Evans wrote:

> *"It will also be difficult to find competent men to introduce scientific methods. It requires not only ability but also long experience to become an expert in Scientific Management. ...* [318]

Mr. Taylor in his paper on "Shop Management" states, 'The first step after deciding upon the type of organization, should be the selection of a competent man to take charge of the introduction of the new system; and the manager should think himself fortunate if he can get such a man'. " [318]

The regime was maintained by a new class of employee: the so-called 'efficiency experts' or 'work-study men'.[266]

Needless to say, these men were disliked and distrusted by the operatives, particularly when they first made an appearance.[266]

INDUSTRIAL ENGINEERS

In time, Taylor's 'work study' would be absorbed into the inherited managerial culture and become less crude in its impact.[266]

After his death, two famous efficiency experts, Frank and Lillian Gilbreth, modified it to create 'method study'.[266]

From that time on, the emphasis would be more on improving working methods and less on making people work harder.[266]

Allowances would also be made for fatigue and other contingencies.[266]

This softer approach being more acceptable to the workforce, relations between the efficiency experts and the shop-floor became warmer. It was then that, to mark the shift, the 'efficiency experts' adopted for themselves the less aggressive title: 'industrial engineers'.[266]

[318] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 134-137 archive.org/details/costkeepingscienooevan

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

TIME AND MOTION STUDIES

Frank Gilbreth (husband of Lillian) discovered scientific management while working in the construction industry, eventually developing motion studies independently of Taylor.[281]

[281] en.wikipedia.org/wiki/Frederick_Winslow_Taylor

Image: **Frank Bunker Gilbreth**, Source: Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes, archive.org/details/OriginalFilm_2 This movie is part of the collection: Prelinger Archives

These logically complemented Taylor's time studies, as time and motion are two sides of the efficiency improvement coin. The two fields eventually became time and motion study.[281]

In 1907, Frank Gilbreth met Frederick Taylor and soon became one of Taylor's most devoted advocates.[254]

His starting point was outside of the factory.

Gilbreth documented the different ways that individuals laid bricks and from these observations, determined the most efficient way to carry out this task.[438]

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

[438] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 64-65

As Taylor wrote in his Principles of Scientific Management:

> *"[Gilbreth] made an intensely interesting analysis and study of each movement of the bricklayer, and one after another eliminated all unnecessary movements and substituted fast for slow motions.*
>
> *He experimented with every minute element which in any way affects the speed and the tiring of the bricklayer."*[433]

Here is a film produced by Gilbreth on the studying of bricklaying.

In the film you can see the efficiency experts observing the work, together with their time clock. Several studies were done on the optimal height of the scaffolding along with experiments of implements to make the bricklaying work more efficient.

Watch video vimeo.com/75215981

The film ends with a contrast between old and new methods; from 18 motions per brick to 5, number of bricks laid per hour from 175 to 350, and that productivity increased by 200%

[433] The Principles of Scientific Management (1911), Author: Taylor, Frederick Winslow, Publisher: New York, London, Harper & Brothers p.77 archive.org/details/principlesofscieootaylrich:

Video: Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes. This movie is part of the collection: Prelinger Archives. archive.org/details/OriginalFilm_1

Frank turned his attention away from construction, and extended his interest in motion study (similar to Taylor's time study) to the general field of management.[254]

Additionally, the Gilbreths did research on fatigue study, the forerunner to ergonomics.[436]

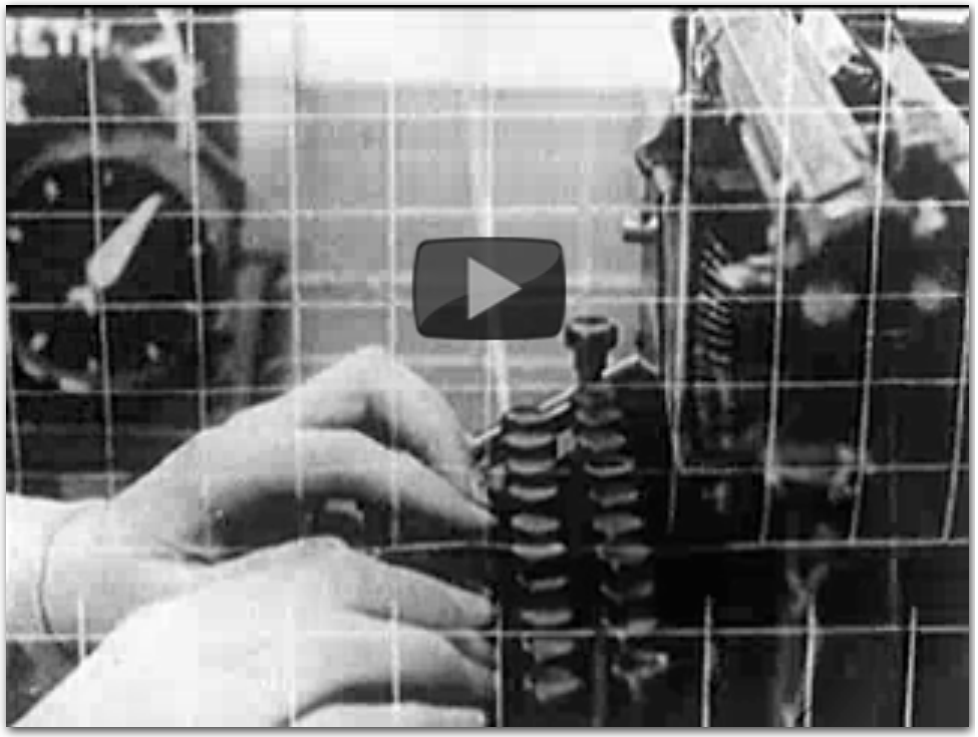
Frank and Lillian were partners in the management consulting firm of Gilbreth, Inc., which performed time and motion study.[436]

They performed time and motion studies on a range of occupations in a variety of places; labeling cartons, packing soap, conveyer feeds, stores for parts and stock, process and flow of materials in a factory plant, cutting, filing, drilling, layout and assembly, and office work and typists.[549]

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

[436] en.wikipedia.org/wiki/Lillian_Moller_Gilbreth

Watch video vimeo.com/75215978



In this film we can see what he called a "champion typist".

Time and motion studies are still used in offices today.

[549] Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes. This movie is part of the collection: Prelinger Archives. archive.org/details/OriginalFilm_1

Video: Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes. This movie is part of the collection: Prelinger Archives. archive.org/details/OriginalFilm_1

Gilbreth made many films to train World War I soldiers leading to quicker and more efficient means of assembling and disassembling small arms, a method which is still used by today's armed forces.

He even worked on standardizing surgery routines with one of his examples entitled "Study of a Tumor being removed".[549]

In order to supplement the human eye, Gilbreth used motion picture cameras, lights, and clocks calibrated in fractions of minutes to create "micromotion" study. [254]

Gilbreth also developed a list of seventeen basic motions he called "therbligs" (Gilbreth spelled backwards) to help analyze any worker movement.[254]

[549] Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes. This movie is part of the collection: Prelinger Archives. archive.org/details/OriginalFilm_1

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

Thompson in "The Theory and Practice of Scientific Management" (1917) wrote:

> *" Mr. Gilbreth has devoted a great deal of attention to the development of methods for the study and representation of motions.*
>
> *Among the ingenious appliances devised by him for this purpose should be mentioned his "chronocyclegraphs," the name he gives to photographs of motions taken by attaching small electric lights to the hands of the operators in such a way that the course of the motion is recorded by the light on the negative as a continuous line.*
>
> *By introducing a circuit-breaker the light may be made to flash at intervals of a second or any fraction thereof and the photograph of the flash indicates the direction of the motion. ...* [306]

[306] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company p. 238 archive.org/details/theorypracticeof01thom

On the basis of these photographs he has constructed "motion models," wire contrivances reproducing in three dimensions the lines in the photographs." [306]

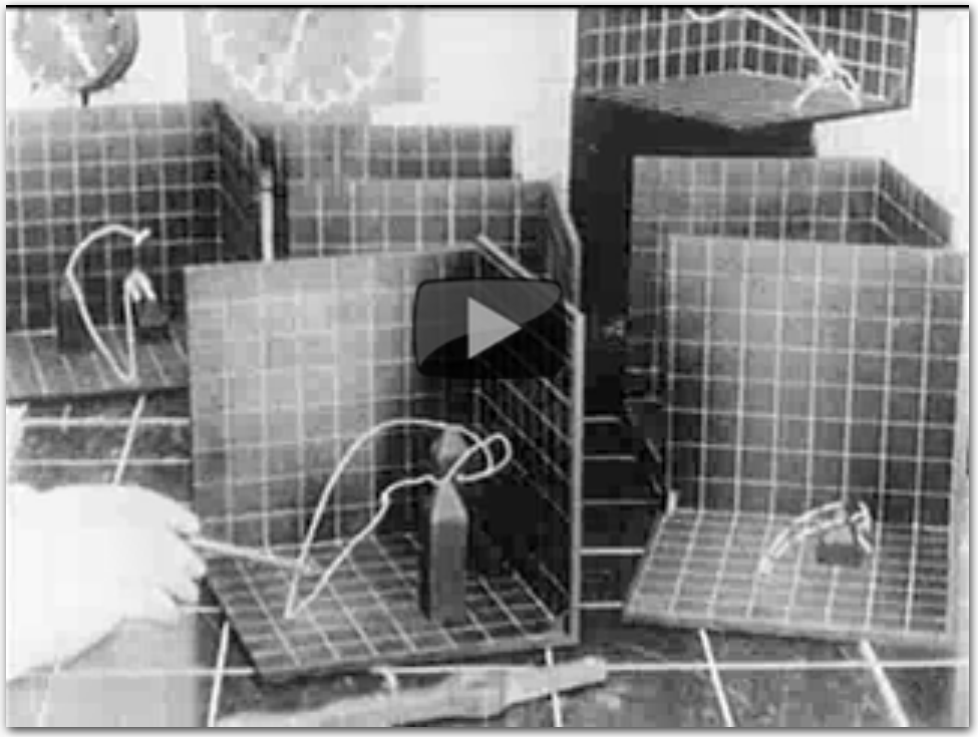
In this film you can see examples of Gilbreth's chronocyclegraphs in use.

First you can see the device used in the light, then with the lights off. You can quite clearly discern the motions.

Next we see an example of a workman performing a drilling operation, then the same work performed in semi darkness with cyclegraphs attached to the operators fingers. Finally we see the resulting 3D motion models made from the data.

Today a similar method of motion capture is used in the television, computer game and film industries.

Watch video vimeo.com/75215977



[306] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company p. 238 archive.org/details/theorypracticeof01thom

Video: Production Company: Presented by James S. Perkins in collaboration with Dr. Lillian M. Gilbreth & Dr. Ralph M. Barnes. This movie is part of the collection: Prelinger Archives. archive.org/details/OriginalFilm_1

The Gilbreths helped formulate a constructive critique of Taylorism; this critique had the support of other successful managers.[436] [437]

Unfortunately, the partnership of Frank and Lillian came to an end in 1924 when Frank died of a heart attack.[254]

Lillian continued their work through motion study seminars and consulting, later becoming a professor of management at Purdue University.[254]

Lillian was an inspirational woman. In what was very much a man's world at the time particularly in the area of engineering consulting work, which she entered with Frank - Lillian achieved an astounding amount.[438]

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

[438] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 64-65

[437] Hartness, James (1912). The Human Factor in Works Management. New York and London: McGraw-Hill. p. 159 pages. Republished by Hive Publishing Co (Hive management history series, no. 46) (ISBN 978-0879600471).

Often called 'the first lady of management', Lillian became the first woman member of both the Society of Industrial Engineer and the American Society of Mechanical Engineers.[438]

[436] en.wikipedia.org/wiki/Lillian_Moller_Gilbreth

Image: **Lillian Moller Gilbreth**, of Montclair, New Jersey, 1921, Source: Rutgers University Archive, www.scc.rutgers.edu/njwomenshistory/Period_4/lgilbreth.htm, Date: 12 November 2005 (original upload date), Source: Transferred from en.wikipedia by SreeBot, Author: Richard Arthur Norton at en.wikipedia en.wikipedia.org/wiki/File:Gilbreth_01.jpg

BOOKS AND CASE STUDIES

There were many other less well known practitioners and modifiers of scientific management than Gantt and Gilbreth.

They published books of their methods and case studies, many of which contained innovations beyond Taylor's original system.

Each of these texts helped scientific management spread and Taylor's mental revolution take hold.

We will spend the next part of this chapter looking at each of these texts and their authors.

NAVAL SHOPS

Our first author was Holden A. Evans.

[506] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 307-309 archive.org/details/frederickwtaylor02copl:

Among the naval constructors who early were impressed by [Taylor's] Shop Management was Holden A. Evans.[506]

It left a big impact, he told that: after reading this paper he felt as if scales had dropped from his eyes, for the first time in inspecting work he knew what to look for, and really saw.[506]

Whilst applying Scientific Management he quoted freely from Shop Management.[506]

With the aid of the information he obtained from Shop Management he had such success in increasing the output of his shops that he was led to write and tell Taylor about it.[506]

Writing about his success to Taylor, he said:

> *You readily understand that we have no Taylor system at this Yard. I have, however, gotten a number of fundamental principles from my study of your writings and my talks with you. ...* [506]

The most important is to analyze work and find out what is to be done and a better way of doing it. " [506]

Taylor's response to this, dated December 29, 1909, shows his broad habit of distinguishing between principles and methods: [506]

" *I note that you state that you are not using our system of management at the Mare Island Yard. Please allow me to take exception to this statement.*

The essence of modern scientific management consists in the application of certain broad general principles, and the particular way in which these principles are applied is a matter of entirely subordinate detail.

I doubt whether any man in the country has grasped the principles of modern scientific management more completely than you have.

This must be true, or you could not have accomplished the results which you have. " [506]

Evans went on to work in other shops applying scientific management.

When referring to Evans work, Bertrand Thomson wrote in 1917:

" *Evans, formerly a Naval Constructor at the Mare Island Navy Yard, deals particularly with machine-shop, smith-shop, and woodworking-shop methods, and illustrates reductions in cost accomplished by these methods in navy yards under the author's supervision. ...* [505]

[506] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 307-309 archive.org/details/frederickwtaylor02copl:

[505] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company pp. 231-232
archive.org/details/theorypracticeof01thom

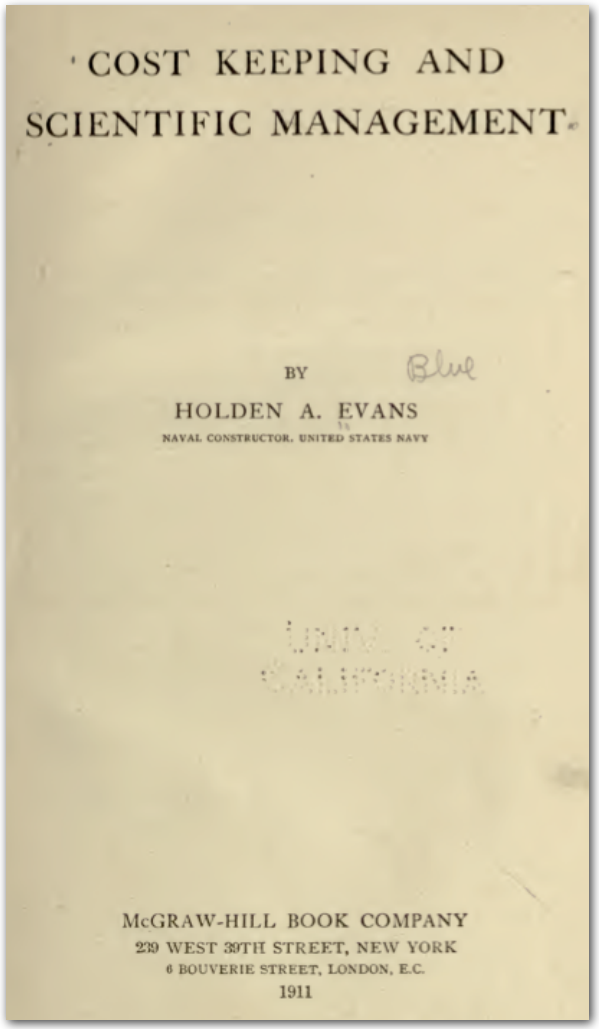
In addition to its treatment of costs, it is concerned mainly with such developments in the direction of scientific management as may be undertaken by a manager not specially trained in the Taylor methods. [505] ”

In 1911 Evans wrote a book called “Cost Keeping and Scientific Management”. In the Preface he stated:

“ *The efficiency of a large plant under my supervision has been greatly improved by adopting and following the principles of management advocated by Mr. Fred W. Taylor.*

I believe that in thousands of shops marked improvement will be made if these principles are followed.

The methods described in the chapters devoted to management should be of assistance to the manager who wishes to take the first steps towards Scientific Management.” [504]


COST KEEPING AND
SCIENTIFIC MANAGEMENT

BY

HOLDEN A. EVANS

NAVAL CONSTRUCTOR, UNITED STATES NAVY

McGRAW-HILL BOOK COMPANY
239 WEST 39TH STREET, NEW YORK
6 BOUVERIE STREET, LONDON, E.C.
1911

[505] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company pp. 231-232 archive.org/details/theorypracticeof01thom

[504] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company p. preface archive.org/details/costkeepingscienooevan

Image: **Cost Keeping and Scientific Management**, Evans, Holden A, Published By: McGraw-Hill Book Company, New York, 1911 Title Page archive.org/details/costkeepingscienooevan

TRACKING CYCLE TIME

In the previous chapter we discussed Captain Henry Metcalfe's work at the Frankford Arsenal. Metcalfe described a new system of timecards and work orders:

> *... the workman goes to work in the morning, he gets his book from the foreman, and when he leaves work he returns it to him, made out so as to indicate the distribution of his time during the day.*
>
> *If the work receives the inspector's approval, he punches the service card and forwards it with the other cards.*
>
> *The cards go to the Cost Clerk and the time is then entered in the time book.*
>
> *The cards corresponding to each order number are then placed in a pigeon hole bearing the number of the order.*

343 The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe Publisher: John Wiley & Sons New York (1890) pp. 152-155 archive.org/details/costofmanufacturoometc

> *Each pigeon hole shows at a glance what labor has been done on the job it represents, when, and by whom. Every empty pigeon hole testifies to a job so far untouched, and so on.*
>
> *When the order ticket comes back "completed", the cards corresponding to it are taken out."* 343

Evans took the idea of Job Cards further, explaining what was in use in his plants, along with pictures to help the reader understand the methods and implement them in their own operation:

> *Upon the completion of the job represented by the card, the workman will remove the card ... [and] note the time of its completion on its face.*
>
> *After the work has been moved, the move man will initial the card and return it to the planning department, this serving as a notice to this department that the work is at the next machine. ...* 319

319 Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 202-207 archive.org/details/costkeepingscienooevan

This method will be continued from machine to machine until the work is inspected and ready for delivery.

While each man has a definite duty to perform the result of his work must be passed along to the next man, and the next, until the job is complete.

In the system outlined this is accomplished; the duties of each man are definitely fixed, and the duties of the man who follows cannot be accomplished until those of the preceding man have been satisfactorily completed; each forces the other to do his work, and if this is not done the fault is immediately revealed." [319]

[319] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 202-207 archive.org/details/costkeepingscienooevan

Image: **Holder for Instruction Cards**, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company p. 203 archive.org/details/costkeepingandsooevangoog

FIG. 22. HOLDER FOR INSTRUCTION CARDS ISSUED TO THE WORKMEN. TIME TICKETS ARE SHOWN ON HOOKS ABOVE THE HOLDER.

Evans explained the benefits of time studies:

> *"Time studies bring to the attention of the manager faults which he does not believe exist, faults so grave that he does not believe it possible for them to exist in his establishment.*
>
> *Without these studies these faults may continue undiscovered for years.*
>
> *With these investigations, the faults are brought to light and the remedy stands out, as bright as the noon-day sun."* [318]

The Shop Record Cards were used for recording observation times and average times as taken from the Time Tickets.[565]

Here we can see one of these Shop Record Cards from Evans book.

[565] and Image: **Shop Record Card**, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company p. 206 archive.org/details/costkeepingandsooevangoog

[318] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 134-137 archive.org/details/costkeepingscienooevan

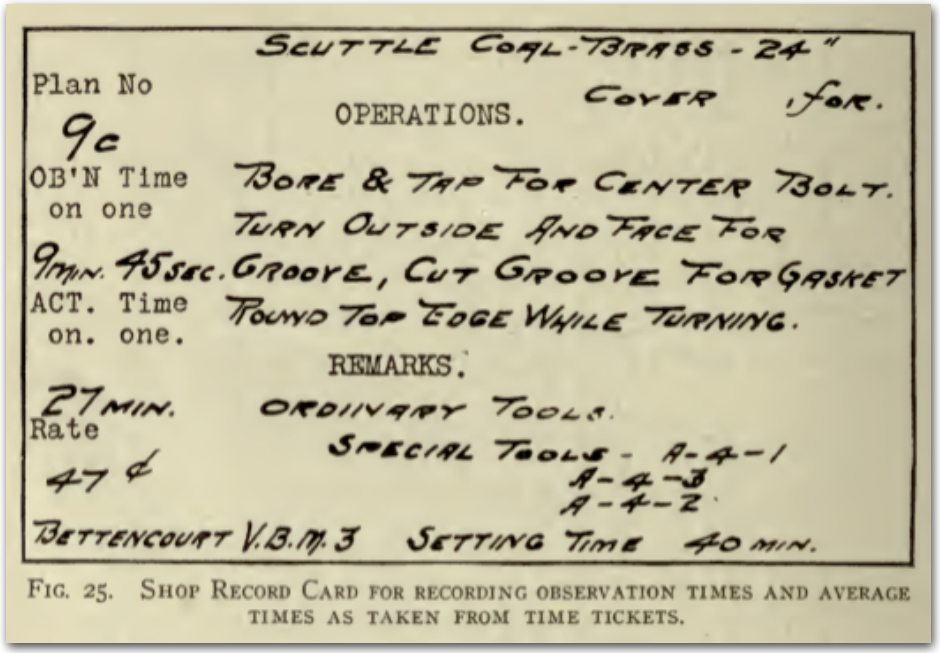

SCUTTLE COAL-BRASS - 24"
Plan No 9c
OPERATIONS.
COVER FOR.
OB'N Time on one 9 MIN. 45 SEC.
BORE & TAP FOR CENTER BOLT.
TURN OUTSIDE AND FACE FOR GROOVE, CUT GROOVE FOR GASKET
ACT. Time on. one. 27 MIN.
POUND TOP EDGE WHILE TURNING.
REMARKS.
ORDINARY TOOLS.
Rate 47 ¢
SPECIAL TOOLS - A-4-1 A-4-3 A-4-2
BETTENCOURT V.B.M. 3 SETTING TIME 40 MIN.

FIG. 25. SHOP RECORD CARD FOR RECORDING OBSERVATION TIMES AND AVERAGE TIMES AS TAKEN FROM TIME TICKETS.

GRAPHICAL REPRESENTATION OF WORK

Taking the recorded observation and average times, Evans produced graphical representations of the work accomplished and the time wasted, which became another innovation in the use of graphical representation of efficiency, to be used in the battle against waste and idleness.

The stacked bar chart shows actual production time; what Evans called "Work Accomplished", versus time taken due to miscellaneous stops, waiting, and other non production time; what Evans called "Wasted Time".

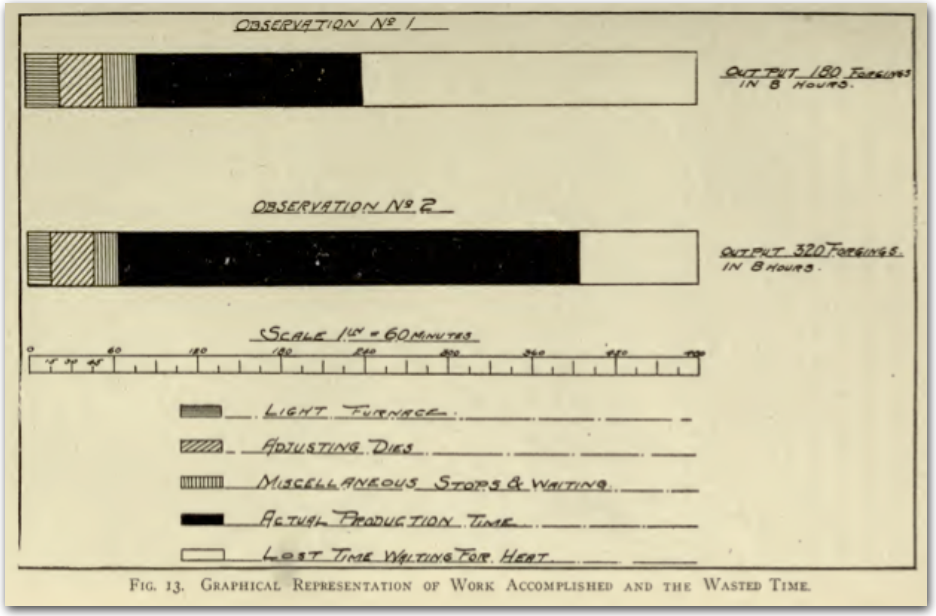


FIG. 13. GRAPHICAL REPRESENTATION OF WORK ACCOMPLISHED AND THE WASTED TIME.

It is not uncommon to see similar graphical representations of work in use today.

Image: **Work Accomplished and the Wasted Time**, Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company p. 135
archive.org/details/costkeepingandsooevangoog

TIME RECORDING CLOCKS

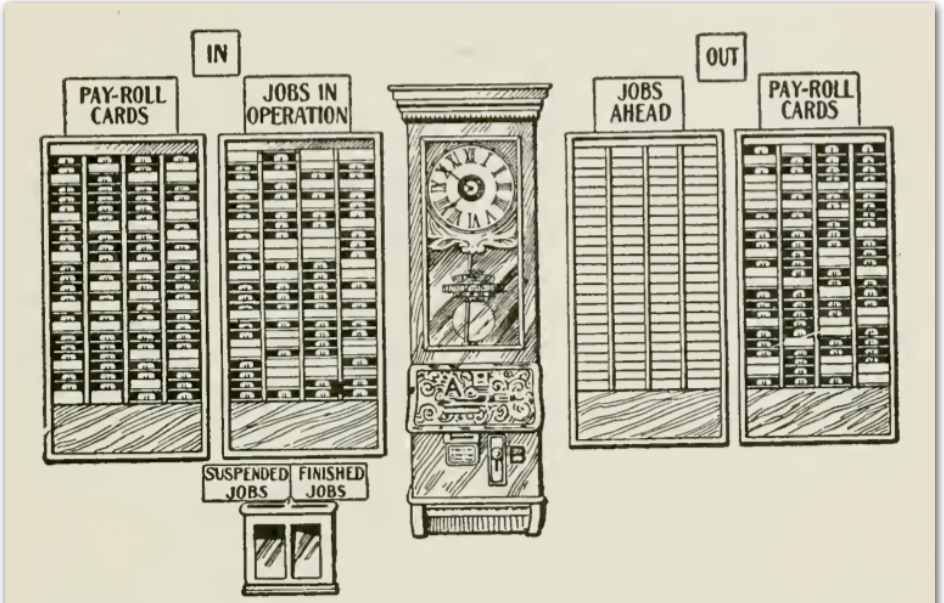
John C. Duncan in his book "The Principles of Industrial Management" (1920) detailed a further evolution in time recording; the recording clock:

> *"The greatest improvement that has been made in timekeeping devices is the introduction of the recording time-clock.*
>
> *There are a number of styles and varieties on the market, but all aim to:*
>
> 1. *Enable the employee to record his own time of entering and leaving the plant, thus preventing errors on the part of timekeepers.*
> 2. *Enable the time keeper to compute readily the number of hours each employee has to his credit, thus saving clerical work in making up the pay-rolls. ...* [520]

[520] The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), Publisher: New York, London : D. Appleton and Company pp. 242-243
archive.org/details/principlesofinduoodunc

3. *Prevent employees from entering the departments after starting time and leaving before quitting time.*

These clocks are often used in connection with a shop cost system, and have proven very satisfactory. ” [520]



By courtesy of International Time Recording Co., Endicott, N. Y.

FIG. 28.—Recording Clock with Cost Equipment. Each clock can conveniently keep record of two hundred people.

Image: **Recording Clock with Cost Equipment**, The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company p. 243
archive.org/details/principlesofinduoodunc

Here we can see an example of a Recording Clock from Duncan’s book. He stated that it could conveniently keep record of two hundred people.[520]

Timekeeping, also known as “Clocking In and Out”, via aid of a mechanical device, was now in use together with scientific management.

As an aside; The first time clock was invented on November 20, 1888, by Willard Bundy,[522] a jeweler in Auburn, New York.[521]

A year later his brother, Harlow Bundy, organized the Bundy Manufacturing Company, [523] [524] and began mass producing time clocks.

[521] en.wikipedia.org/wiki/Time_clock

[522] Willard Legrand Bundy Biography
bundymuseum.org/site3/about/the-history/willard-bundy-bio/

[523] IBM Archives: Bundy Manufacturing Co.
www-03.ibm.com/ibm/history/exhibits/vintage/vintage_4506VV2006.html

[524] Bundy Museum of History & Art bundymuseum.org/site3/about/

[520] The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie)
Publisher: New York, London : D. Appleton and Company pp. 242-243
archive.org/details/principlesofinduoodunc

In 1900, the time recording business of Bundy Manufacturing, along with two other time equipment businesses, was consolidated into the International Time Recording Company (ITR).[525 526 527 528 521]

In 1911, ITR, Bundy Mfg., and two other companies were merged, forming Computing Tabulating Recording Company (CTR), which would later change its name to IBM.[529 521]

Today time clock devices are still in use, although we have moved away from the mechanical machines to computer based, electronic time and attendance systems.[521]

[529] Bennett, Frank P.; and Company (June 17 1911). United States Investor. 22, Part 2. p. 1298 (26).

[522] Willard Legrand Bundy Biography bundymuseum.org/site3/about/the-history/willard-bundy-bio/

[523] IBM Archives: Bundy Manufacturing Co. www-03.ibm.com/ibm/history/exhibits/vintage/vintage_4506VV2006.html

[524] Bundy Museum of History & Art bundymuseum.org/site3/about/

[525] Engelbourg (1954) p.33

[526] Belden, Martin; Belden, Marva (1961). The Life of Thomas J. Watson, Little, Brown; p.92

For millions of workers, time clocks bookend their workday as they "punch in" a card to a time clock device to record they've started work and "punch out" when they're done.[530]

The basic technology is over a century old and hundreds of thousands of time clocks are sold in the U.S. every year.[530]

[521] en.wikipedia.org/wiki/Time_clock

[527] IBM Archives: International Time Recording www-03.ibm.com/ibm/history/exhibits/logo/logo_2.html

[528] IBM Archives: ITR time recorder www-03.ibm.com/ibm/history/exhibits/logo/logo_920901.html

[530] David Needle, TabTimes, Android tablet gives old punch card time clock facelift tabtimes.com/news/ittech-solutions/2011/11/18/android-tablet-gives-old-punch-card-time-clock-facelift

Image: **Electronic clocking terminal**, own picture, February 2009. Author: Original uploader was Thjurexoell at en.wikipedia, Permission (Reusing this file) Released into the public domain (by the author). en.wikipedia.org/wiki/File:Clocking_device.jpg

TWELVE PRINCIPLES OF EFFICIENCY

Harrington Emerson symbolized a new breed of "efficiency engineers" who were bringing new methods of time and cost savings to American industry.[254]

Emerson practiced his system as general manager of the Burlington Railroad, but saw the need for applications of his system in other industries.[254]

Though Emerson was in correspondence with Taylor from 1903 on, he was not an associate or a disciple of Taylor's.[345]

As discussed in chapter three, he did testify at Louis Brandeis Scientific Management Eastern Rate Case, testifying that; in this way the railroads could save a million dollars a day.[334]

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A. © 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

[345] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) p.77

To Emerson, organization was one of the greatest problems that led to inefficiency.[254]

Standards and standardization as a basis for efficiency was strongly advocated by him.[350]

The Engineering Magazine published a series of articles by Emerson in 1908 and 1909 that were later issued as a single volume.[254]

This publication became a landmark in the history of management thought.[254]

[334] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 3-8 archive.org/details/frederickwtaylor01copl

[350] Harrington Emerson - A Pioneer Industrial Engineer, Monday, February 6, 2012 nraoiekc.blogspot.com.au/2012/02/harrington-emerson-pioneer-industrial.html

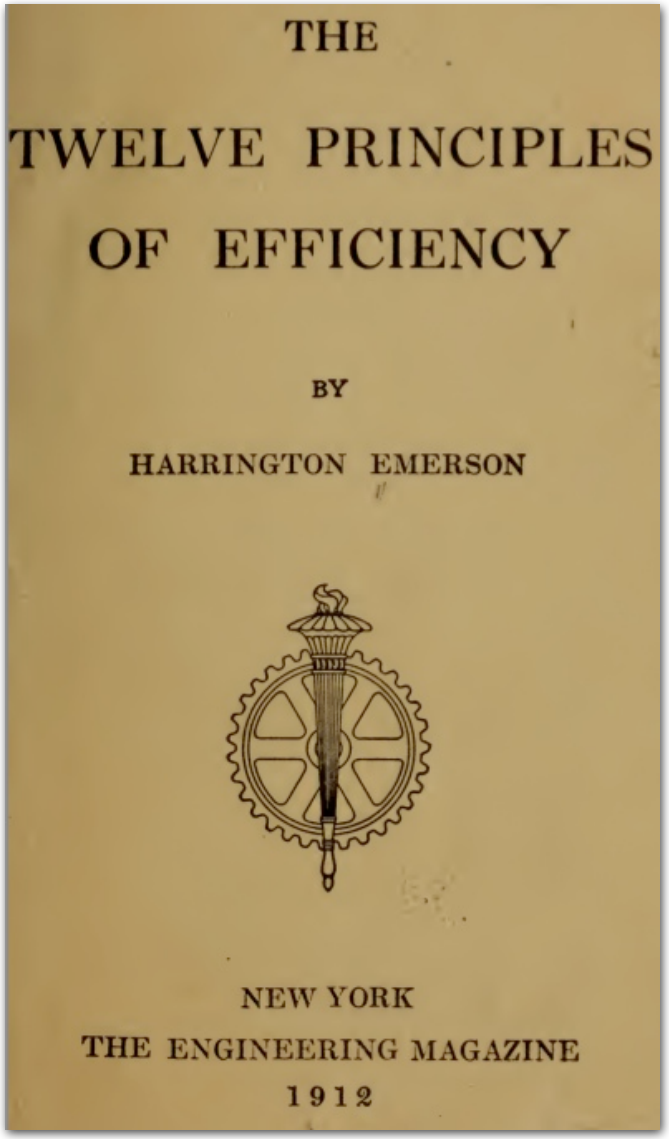


Image: **The Twelve Principles of Efficiency** (1912), Author: Emerson, Harrington, 1853-1931, Subject: Industrial efficiency, Publisher: New York, The Engineering Magazine Title page archive.org/details/twelveprinciples01emer

In each chapter of the book he described the Twelve Principles of Efficiency:

"*THE FIRST PRINCIPLE: CLEARLY DEFINED IDEALS*

The Efficiency Ideals Weak in Modern Engineering Works ... The Alternatives Offered the Modern Manager

THE SECOND PRINCIPLE: COMMON SENSE

Modifying the Type of Organization ... the First Step toward True Ideals and Sound Common Sense

THE THIRD PRINCIPLE: COMPETENT COUNSEL

The Establishment of Efficiency Counsel ... a Constructive Type of Organization

THE FOURTH PRINCIPLE: DISCIPLINE

Discipline as a Regulator of Conduct ... [346]

[346] The Twelve Principles of Efficiency (1912), Author: Emerson, Harrington, 1853-1931, Subject: Industrial efficiency, Publisher: New York, The Engineering Magazine p. xiv - p. xviii archive.org/details/twelveprinciples01emer

THE FIFTH PRINCIPLE: THE FAIR DEAL

Proof of this Found in the Future Relations of Wage Earners to National Efficiency ... Nine Provisions that Should Constitute Standard Practice

THE SIXTH PRINCIPLE: RELIABLE, IMMEDIATE AND ADEQUATE RECORDS

Records of Efficiency and Cost ... How Records Aid the Prosecution of Efficiency

THE SEVENTH PRINCIPLE: DESPATCHING

Absence of Despatching in Shop Operations ... Examples of the Resultant Inefficiency

THE EIGHTH PRINCIPLE: STANDARDS AND SCHEDULES

Time and Motion Studies as a Sub-Division of Standards ... Typical Schedules of Man-Efficiency

THE NINTH PRINCIPLE: STANDARDIZED CONDITIONS

Standards as a Progressive Evolution

THE TENTH PRINCIPLE: STANDARDIZED OPERATIONS

Standardized Operations Reached only by Observance of Preceding Principles

THE ELEVENTH PRINCIPLE: WRITTEN STANDARD-PRACTICE INSTRUCTIONS

Steps Essential to Introducing Standard Instructions ... Growth of the Body of Standard-Practice Instructions ... What Can Be Accomplished

THE TWELFTH PRINCIPLE: EFFICIENCY REWARD

Desire of Reward as a Natural Instinct, Time Payments and Bonus Rewards ”[346]

[346] The Twelve Principles of Efficiency (1912), Author: Emerson, Harrington, 1853-1931, Subject: Industrial efficiency, Publisher: New York, The Engineering Magazine p. xiv - p. xviii archive.org/details/twelveprinciples01emer

In addition to the twelve principles Emerson had two additional chapters:

> *EFFICIENCY PRINCIPLES APPLIED TO MEASUREMENT AND CURE OF WASTES*
>
> *Waste Elimination a Fundamental Ideal of Efficiency Effort ... Every Waste Elimination Brings Immediate Reward ...* [346]
>
> *The ideal that inspires the formulation of the principles of efficiency is elimination of waste, of wastes of all kinds* [349]
>
> *EXECUTIVE CONTROL OF LINE AND STAFF*
>
> *The Best Plant with the Best Philosophy of Efficiency Helpless Without Executive Direction* [346]

[346] The Twelve Principles of Efficiency (1912), Author: Emerson, Harrington, 1853-1931, Publisher: New York, The Engineering Magazine p. xiv - p. xviii archive.org/details/twelveprinciples01emer

[349] ibid., p.371

[347] ibid., pp. 267-269

Much of what Emerson described as efficiency is still prescribed today.

RANKING EMPLOYEES

Emerson was expert in 'efficiency engineering'.[345]

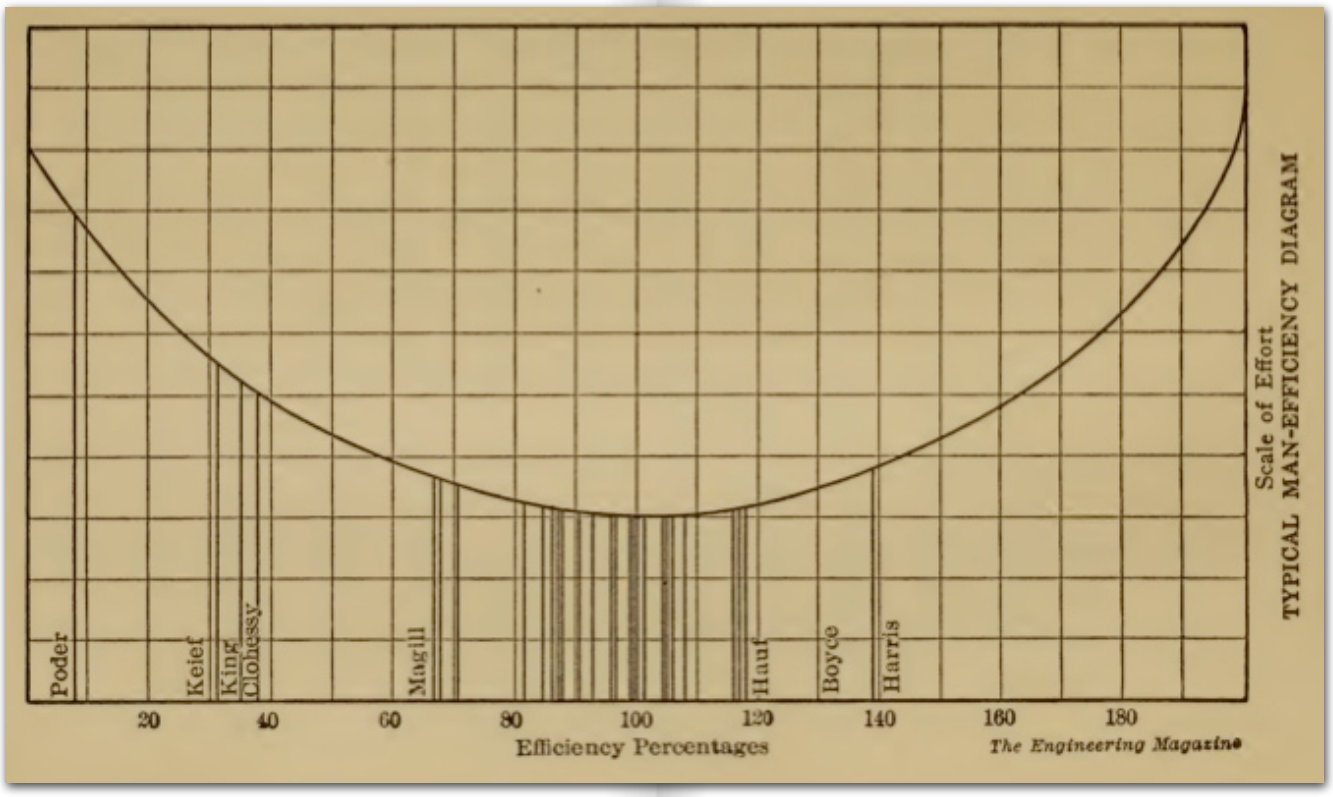
He invented efficiency percentages; how each worker can be plotted against Percentage of Efficiency vs Scale of Effort.

In his book he described:

> *Time and motion studies having been made as to all the work of a gang of men, both conditions and operations were standardized and an efficiency reward was offered.*
>
> *The results are shown in the [Efficiency Percentages] diagram* [347]

[345] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) p.77

> *Nearly all the men are grouped between 80 per cent and 120 per cent, with the greatest density around 120 per cent - the region of least effort.*
>
> *Poder, Keief, King and Clohessy could never become Hauf, Boyce, and Harris.*
>
> *Piece rates based on the performance of Harris would be as ridiculous for Poder. ... the natural Haufs, Boyces, and the Harris can can be selected for their natural work and be correspondingly rewarded. ...* [347]



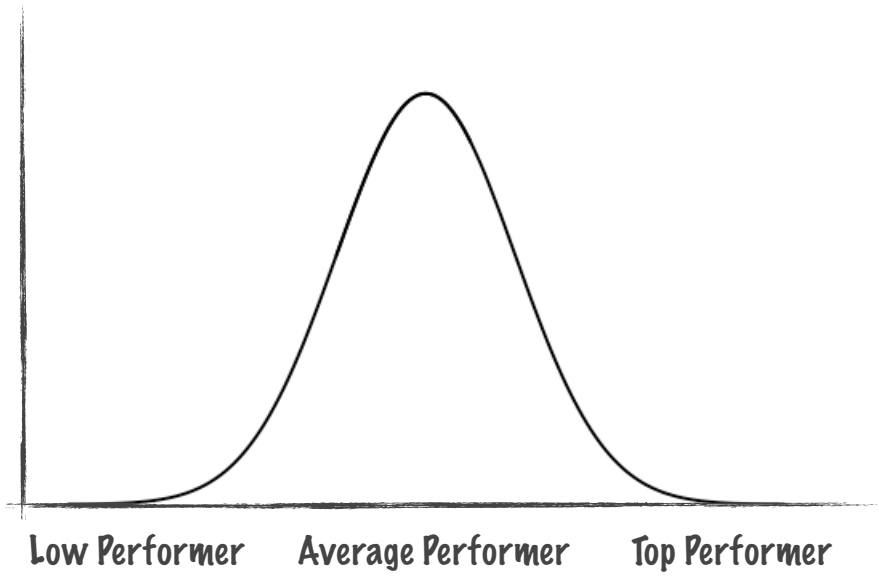
[347] The Twelve Principles of Efficiency (1912), Author: Emerson, Harrington, 1853-1931, Publisher: New York, The Engineering Magazine pp. 267-269
archive.org/details/twelveprinciples01emer

Image: **Efficiency Percentages**, The Twelve Principles of Efficiency (1912), Author: Emerson, Harrington, 1853-1931, Publisher: New York, The Engineering Magazine p.266
archive.org/details/twelveprinciples01emer

Both diagram and description show that the increase of effort between 100 per cent and 140 per cent efficiency is very slight - only 25 per cent, quite within the limit of normal variation above the rational average; and it also shows how it is possible for a good man to deliver nearly twenty times as much as the incompetent man, four times as much as the laggards, twice as much as the haphazard workers."[347]

Emerson's method for evaluating the workers and placing them on a graph is remarkably prescient.

In many of today's organisation employees are forced into a bell curve[507] with employees receiving performance rewards based upon their position in the forced ranking.



[347] The Twelve Principles of Efficiency (1912), Author: Emerson, Harrington, 1853-1931, Publisher: New York, The Engineering Magazine pp. 267-269 archive.org/details/twelveprinciples01emer

[507] Forced Distribution (Bell Curving Employee Performance Appraisals), Published on: January 10, 2012, Charles Jamieson, Jamieson Human Resource Consulting Ltd. www.jamiesonhr.com/article/2012/1/10/forced-distribution-bell-curving-employee-performance-appraisals.aspx

As with his contemporaries, waste was the enemy of efficiency. He summed his views up in his book:

> *"The twentieth century dawns with as yet unaccomplished task of conservation, of eliminating wastes - wanton and wicked wastes of all kinds, wastes that make ... our complacent industrial efficiency a peculiarly national disgrace, of all nations, we Americans ought to know better."* [348]

Nearly two hundred companies adopted various features of the Emerson Efficiency system, which included production routing procedures, standardized working conditions and tasks, time and motion studies, and a bonus plan which raised workers' wages in accordance with greater efficiency and productivity.[350]

[348] The Twelve Principles of Efficiency (1912), Author: Emerson, Harrington, 1853-1931, Publisher: New York, The Engineering Magazine p. 9
archive.org/details/twelveprinciples01emer

[350] Harrington Emerson - A Pioneer Industrial Engineer, Monday, February 6, 2012
nraoiekc.blogspot.com.au/2012/02/harrington-emerson-pioneer-industrial.html

Emerson made other contributions in the areas of cost accounting and in setting standards for judging workers and shop efficiency.[254]

Harrington Emerson achieved renown in his time and his legacy lives on today.[254]

SCHOLARSHIP OF SCIENTIFIC MANAGEMENT METHODS

C. Bertrand Thompson, Taylor's scholar-disciple [351] published several books on Scientific Management including; "Scientific Management in Practice" (1915), "Scientific Management: A Collection of the More Significant Articles Describing the Taylor System of Management" (1916), "Relation of Scientific Management to Labor" (1916), and "Theory and Practice of Scientific Management" (1917).[352]

[352] en.wikipedia.org/wiki/C._Bertrand_Thompson

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A.
© 2006 Thomson Gale, a part of The Thomson Corporation. pp. 651-653

[351] Frederick W. Taylor and the Rise of Scientific Management
By Daniel Nelson, Publisher: Univ of Wisconsin Pr (August 1980) p. xi

In his book "The Theory and Practice of Scientific Management", published in 1917, Bertrand said:

> *"Scientific management is the extension to industrial organization of the "positive" movements in current thought.*
>
> *The substitution of a basis of scientific law and principles for guesswork or tradition reminds one strongly of Auguste Comte's theory of progress from the "theological," through the "metaphysical," to the "positive" or scientific stage of thought.*
>
> *It is interesting to observe that "scientific management" is "positive management" in other senses as well, which flow from its essentially scientific aim and method. Its administration is marked by the positiveness of its control.*

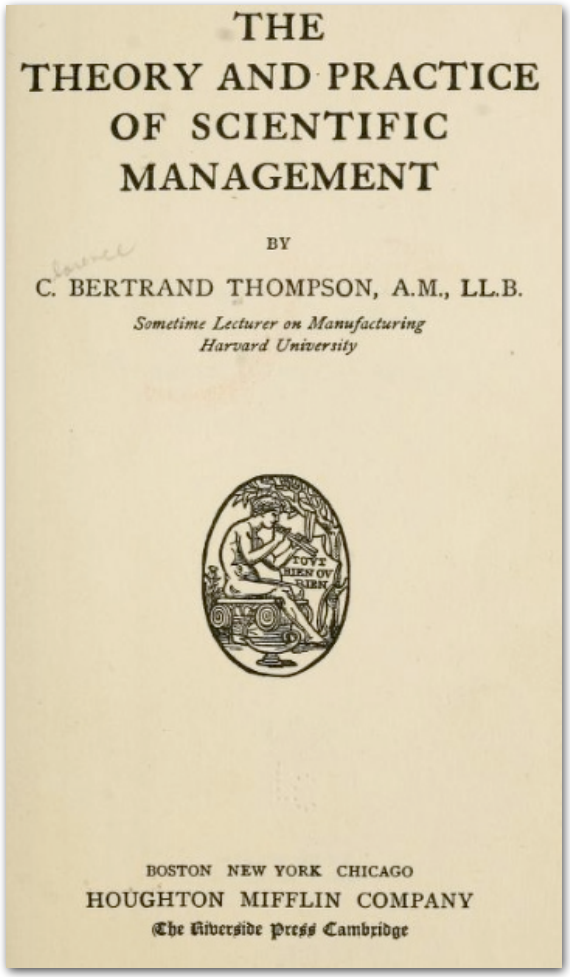
[353] The Theory and Practice of Scientific Management (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company p. 12
archive.org/details/theorypracticeof01thom

[354] ibid., pp. 37-38

> *The time, place, and sequence of all operations, as well as the details of all processes, are determined and enforced by the management.*
>
> *The result of the application ... is to develop the inherent resources and capabilities of an organization far beyond the average or normal degree of efficiency."* [353]

Bertrand had audited the number of applications of scientific management in use in industry at that time:

> *"The total number of applications of scientific management definitely known to me is 212.*
>
> *Of these 212 applications, 4 are municipal work ... 7 deal with the railroad and steamship companies ... and 201 with industrial plants: 181 factories ... 8 public service corporations, 3 building and construction companies, 1 bank, 4 publishers, and 1 professional society."* [354]


THE
THEORY AND PRACTICE
OF SCIENTIFIC
MANAGEMENT

BY

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BOSTON NEW YORK CHICAGO
HOUGHTON MIFFLIN COMPANY
The Riverside Press Cambridge

355 Public Administration: Balancing Power and Accountability
By Jerome B. MacKinney, Lawrence Cabot Howard Publisher: Praeger; 2 edition (March 10, 1998) p. 149

357 Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

Image: **The Theory and Practice of Scientific Management** (1917), Author: Thompson, Clarence Bertrand, 1882-1969, Publisher: Boston, New York [etc.] Houghton Mifflin company Title Page archive.org/details/theorypracticeof01thom

By 1925 Thompson had become world renowned for his expertise and scholarship of scientific management methods.[355]

He had introduced the Taylor Method in France, Germany, Italy and translated major management works into French.[355]

A COLLECTION OF DISCONNECTED IDEAS

Our next author who helped spread the mental revolution was Alexander Church.

Alexander Hamilton Church, a consultant and a specialist in costing systems, published his first work, 'The Proper Distribution of Expense Burden', as a series of articles in 'The Engineering Magazine' in 1901 and later as a book in 1916.[357]

These articles are regarded by many as a reference work in accounting literature both in the United States and in Great Britain.[357]

It was in his book, however, The Science and Practice of Management, that Church collected the disconnected ideas represented by the elements of scientific management and reduced them to regulative principles of management.[357]

As Church would describe in 1918:

> "*The fact is, ... that the application of disconnected ideas, however valuable in their special place these may be, does not make a science... . this bars the way to real progress.*
>
> *In the rush to apply, the necessity to construct has been forgotten, and I believe it to be true that ten years' experience of "scientific management" has produced no new developments of importance, obviously because its elements were disconnected ideas, not by any means universally applicable.*

[383] en.wikipedia.org/wiki/Alexander_Hamilton_Church

[357] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

> *It is probable, however, that the art of management has arrived at a stage of development where the study of its fundamental facts and underlying principles may be commenced.*" [385]

Together with L.P. Alford he developed a systems of management principles partly based on the ideas of Charles Babbage.[383]

He became known as one of the pioneers in reducing the commercial organization of factories to the basis of a science.[383]

Church's improvements in the machine-rate method for allocating overhead expenses along with his pointing a way to the technique of standard costs were a major contribution to the development of managerial costs concepts.[357]

[385] The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. iv-v
archive.org/details/sciencepracticeooochur

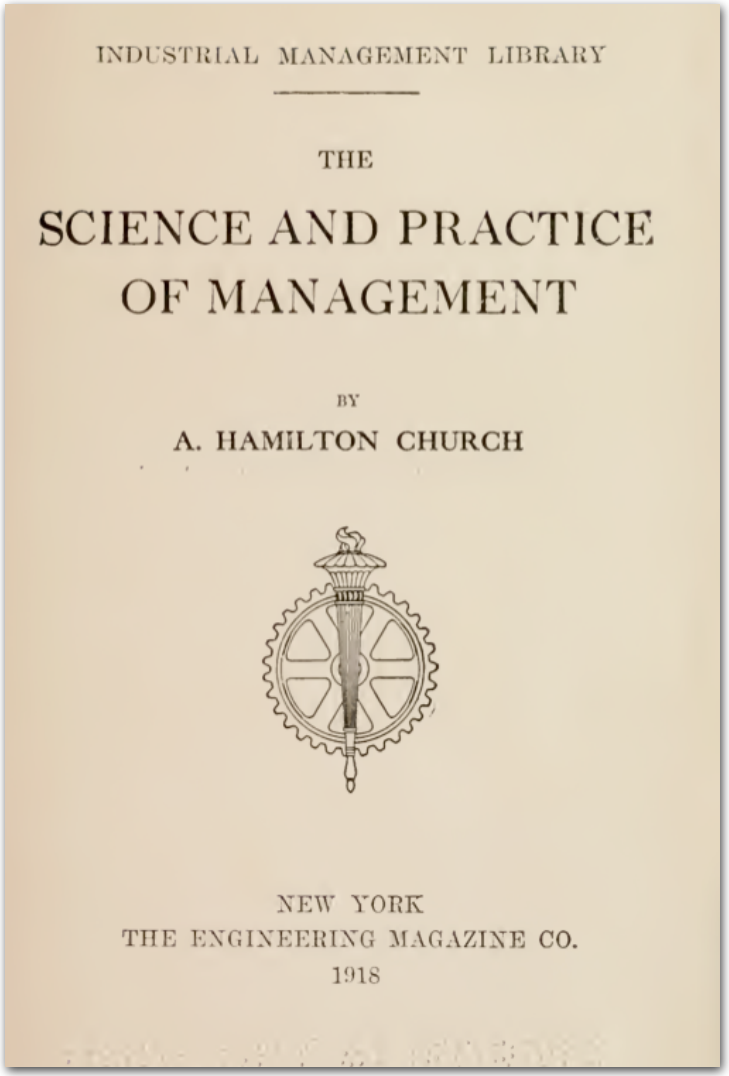
Church also worked with Hans Renold, who is credited for introducing scientific management to England.[383] [384]

PROCESS IMPROVEMENT

Church detailed methods, many of which are still in use by today's process improvement experts. Here is an example:

> *"It began to be realized that manufacturing is, in fact, made up of a long series of very small steps, and that it is desirable to ascertain the money value of these steps, so that comparisons may be made. In this way the movement towards cost accounting began, and presently reached a high state of development.*
>
> *The principle of time study is, in essence, the analysis of something into its elements, and observation of the times taken by a skilful operator to perform these elements. ...* [249]

[384] Richard Vangermeersch (1996) "Church, Alexander Hamilton (1866-1936." In History of Accounting: An International Encyclopedia, edited by Michael Chatfield and Richard Vangermeersch. New York: Garland Publishing, 1996. p. 124.



[383] en.wikipedia.org/wiki/Alexander_Hamilton_Church

[249] The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 11-12 archive.org/details/sciencepracticeoochur

Image: **The Science and Practice of Management** (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. p. Title Page archive.org/details/sciencepracticeoochur

By adding the times together, it is possible to get a very close approximation to what may reasonably be considered the standard time for the whole job.[249]

Having ascertained that unit processes are in fact made up of a series of steps, and having recorded these steps and allotted times to them, it was a natural development to apply criticism to the steps themselves. Why should this be done, and why that?[387]

Here again we have to consider whether every stage of our process as mapped out is truly significant of some thing.[508]

In each stage we must ask ourselves "Why is this done?" And the answer in all cases should be that it is done because it cannot be avoided.[508]

Just as the job is made up of small steps which it was the work of time study to analyze and tabulate with time as an element, so the aggregation of many jobs, that is the product in abstract, passes through a number of stages which

are also possible of analysis.[387]

Just as the job is made up of small steps which it was the work of time study to analyze and tabulate with time as an element, so the aggregation of many jobs, that is the product in abstract, passes through a number of stages which are also possible of analysis.[387]

The routing of product and the lay-out of machines is, then, a further development of the instrument of analysis that has very important bearing on efficiency.[387]

It is of course nothing novel. New plants have always given some attention to the matter.[387]

But exact study, its investigation by charts and diagrams, … all these are very modern applications of the instrument of analysis, which are having important economic results." [387]

[249] The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 11-12 archive.org/details/sciencepracticeooochur

[387] ibid., pp. 16-17

[508] ibid., pp. 186-187

Watch video https://vimeo.com/75215975

As an example the book contained two folding diagrams in color (shown above). It described:

> *"Diagram 1: Showing the distribution of the work of the organic functions in a complex industry, such as a machine shop* [564]
>
> *Diagram 2: Showing the distribution of the work of the organic functions in a single, continuous, chemical industry."* [564]

WORLDWIDE CONFERENCES AND A COMPREHENSIVE TREATISE

Our next proponent, Harlow Stafford Person was attracted to Taylor's work and became active in the scientific management movement.[356]

As one of the leaders in the management movement, Dr. Person was for a number of years[357] president of the Taylor Society.[358]

As an educator, he encouraged widespread discussions of the new science of management.[357]

[356] A Mental Revolution: Scientific Management Since Taylor (Historical Perspectives on Business Enterprise Series), edited by Daniel Nelson Publisher: Ohio State Univ Pr (Txt) (May 1992) p.89

[357] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

[358] Managing the Human Factor: The Early Years of Human Resource Management in American Industry, By Bruce E. Kaufman Publisher: ILR Press (July 17, 2008) p.142

[387] The Science and Practice of Management (1918), Author: Church, A. Hamilton (Alexander Hamilton), 1866-1936, Publisher: New York : The Engineering magazine co. pp. 6-17 archive.org/details/sciencepracticeooochur

[564] and Image: **Folding diagram 1.** ibid., archive.org/details/sciencepracticeooochur

Dr. Person organized the first scientific management conference in the United States.[357]

In 1929 the Taylor Society published "Scientific Management in American Industry", edited by Person.

The book's Foreword and Preface stated:

"*Taylor's books have been translated into many foreign languages and in some countries have run into very large editions.*

An entire new literature has come into being covering the conduct of industry according to standards which Taylor setup.

The International Management Institute in Geneva, a child of the International Labor Office, itself the creature of the League of Nations, has been instituted to promote these ideas through world-wide publicity.

And in June, 1929, the Fourth International Scientific Management Congress met in Paris - the earlier ones having been held at two-year intervals in Prague, Brussels and Rome.

This book has been designed to meet the increasing demand on the Taylor Society for a comprehensive treatise on scientific management. No such treatise exists.

The Taylor, Gantt and Gilbreth classics were either for special audiences or treated of special phases.

This book is a summary of a decade's study, analysis and exposition of the philosophy, principles and procedures of scientific management; and a picture of its status and influence today." [360]

[357] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

[360] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, Foreword and Preface archive.org/details/scientificmanageootayl

The book included the work of more than 20 authors:

> *"Multiple authorship makes possible illustrations out of a much wider variety of the industries which have come under the influence of scientific management as well as a wider range of functions to which scientific management has been applied.*
>
> *Authors for the various chapters ... can easily qualify as experts as to the matters about which they have written.*
>
> *The extent to which the application of scientific management has progressed among the industries of this country is evidenced in the list of contributors both by the variety in functional approach and by the number of different industries represented."*[360]

[360] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, Foreword and Preface archive.org/details/scientificmanageootayl

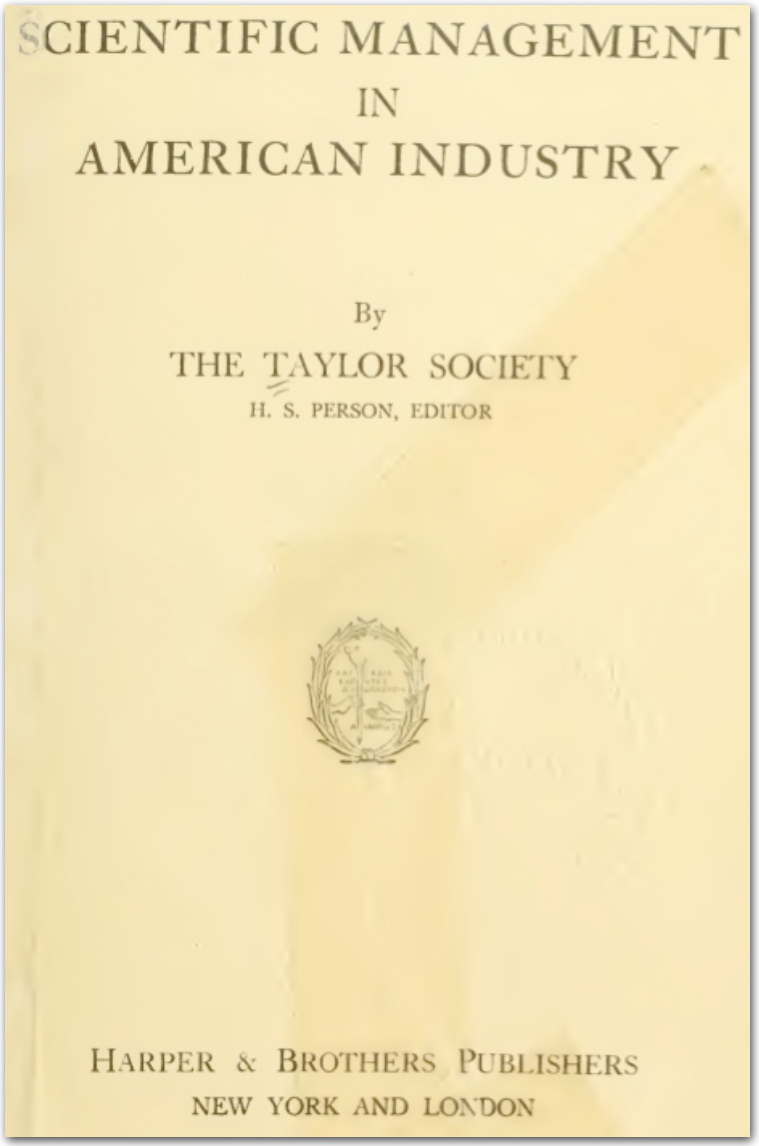


Image: **Scientific Management in American Industry**, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers, Title Page archive.org/details/scientificmanageootayl

In the book were many design and management of work innovations, that we would recognise as still in use today.

JOB APPLICANT TESTS

In one section, entitled "Methods of Analyzing Human Capacity" it was written:

> *"The process of establishing labor standards involves consideration of the man, his tools and his job.*
>
> *We are concerned here primarily with those techniques which are used to analyze the first of these - the man.*
>
> *Mental alertness tests have appeared in numerous forms since the war period.*
>
> *The majority have been devised for testing numbers of individuals in groups.*
>
> *Most of them can, however, be used to obtain data of value in individual cases."* [363]

When the signal is given, begin at top of the next page and work through the remainder of the booklet.

Work rapidly. If you are not sure about something guess at it, and go on to the next thing. There are no "catch" questions.

Do not ask questions. You are at liberty to refer to the directions at any time, but to do so oftener than necessary will waste time.

You will be allowed **fifteen minutes.** You probably will not be able to finish in the time allowed but do as much as possible.

Do not skip about. Items skipped will be counted wrong.

Do not turn over the page until the signal is given.

FIG. 39A. EXAMPLE OF MENTAL ALERTNESS TEST

Begin Here!

(1) How many are 50 tents and 8 tents? **Answer** ( )
(2) white—black **same—opposite**
(3) bird—sings :: dog—**fire barks snow flag**
(4) dogs meat eat **true—false**
(9) 2 3 4 5 6 7 ....
(11) The Merino is a kind of **horse sheep goat cow**
(178) cardinal not cultivated virtues the be should **true—false**
(179) 4 8 10 20 22 44 ....
(180) pertinacious—obstinate **same—opposite**
(181) advice—command :: persuasion—**help aid urging compulsion**
(182) A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 27 mess halls. Of this remainder each mess hall received 56 barrels. What was the total number of barrels supplied? **Answer** ( )
(183) A **five-sided figure** is called a **scholium pentagon parallelogram trapezium**

FIG. 39B. EXAMPLE OF MENTAL ALERTNESS TEST

[363] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 228-233 archive.org/details/scientificmanageootayl

Image: **Example of Mental Alertness Test** a and b
ibid., pp. 231-233 archive.org/details/scientificmanageootayl

AVERAGE TEST SCORE AND CLASSIFICATION OF JOB

Grade of Work	*Average Score*
A (Office Boys)	52
B	91
C	118
D	102
E	107
F	113
G (Supervisory)	130
Typists	90
Stenographers	106
Secretaries	120

Based on the results of the tests, standard test scores against job classification were written:

> *"In the above cases several different optimum scores would become the standard as to the amount of mental alertness required in applicants.*
>
> *Tests similar to these will usually be found useful as a preliminary in any group survey of applicants or workers.*

Image: **Average Test Score and Classification of Job**
ibid., pp. 231-233 archive.org/details/scientificmanageootayl

> *The data are easy to obtain and can in many cases be with profit made a regular part of the employment routine, provided they are administered by people thoroughly trained in their use.*
>
> *In conjunction with special ability tests ... they can gradually be formed into labor standards of great value."*[363]

These examples taken from "Scientific Management in American Industry" are not to dissimilar from those that are still in use to test job applicants today.

Many organisations still use testing as a method for recruitment. These tests are still "administered by people thoroughly trained in their use" as was recommended in the 1929 text.

[363] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 228-233 archive.org/details/scientificmanageootayl

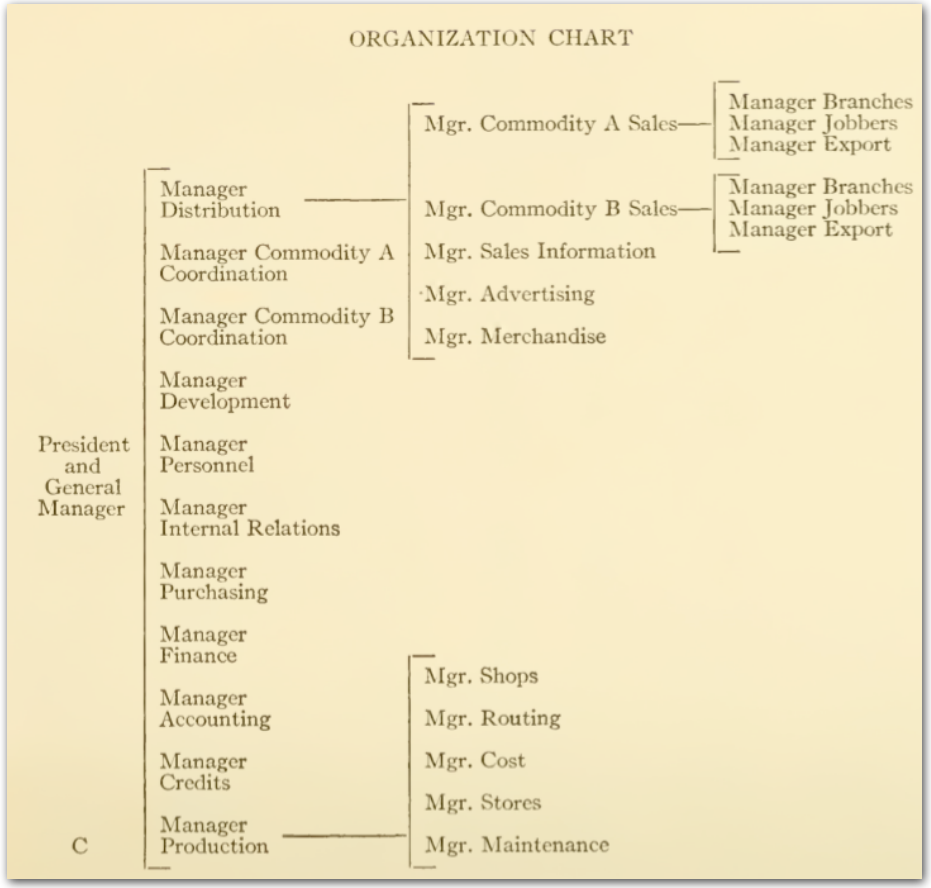
DEPARTMENT HEADS

Further innovations described in “Scientific Management in American Industry” were in organisational structure, specialization, and functional separation; once again depicted in an organization chart:

> *“No two or more men can function together effectively, and no chief executive can appraise and judge the performance of his department heads, without an agreement and understanding concerning the responsibilities and duties.*
>
> *An organization based upon natural groupings of the things to be done as determined by the technical characteristics of the particular enterprise - essentially a functional organization - is the type in which responsibilities and duties overlap least and are most precisely defined and understood.* [364]

[364] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 269-271 archive.org/details/scientificmanageootayl

Image: **Organization Chart**, ibid., p. 270 archive.org/details/scientificmanageootayl



The specialization and separate functions, that we would recognise today, have now arisen, each with their own department head.

Today the only people who don’t think functionally, are the customers of an organization and its CEO.

INSPECTION OF PERFORMANCE AND PERFORMANCE RECORDS

We discussed the beginnings of workplace inspection in chapter two, where workplace inspection was required to ensure the welfare of the workforce; that they were not being exploited.

However as we have learnt over the last two chapters, with the advent of scientific management and standardized work, a different means of inspection had arisen.

In the book "Scientific Management in American Industry" two new terms were used for this type of inspection; "Inspection of Performance" and "Performance Records":

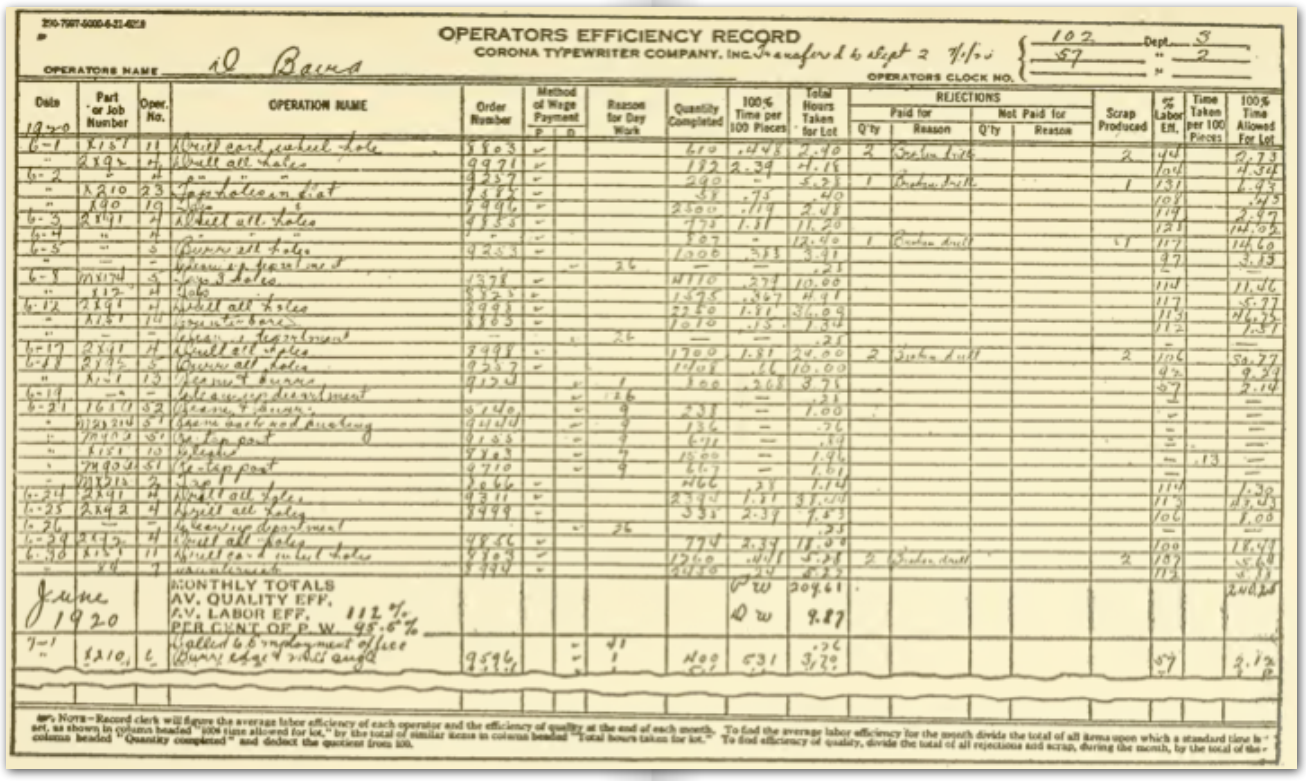
> *"Where human nature is involved there is greater danger of variations from standards.*
>
> *A systematic, continuous inspection of the performance of individual ... operatives has two major objectives: to secure data for rating individual efficiencies, and to discover variations from standard operating conditions which otherwise would not be so promptly detected.*
>
> *On the basis of such standard ... there can by time study be constructed standard times for all operations, which will hold good for purposes of planning so long as the conditions remain standard.*
>
> *The sequence and approximate duration of all operations involved in any order or job can be determined by analysis.*
>
> *The planning room can lay out the work on any job in terms of the man hours ... required for its completion, and therefore, having determined when work on the job shall begin, can predict when work on each element of the job and on the entire job should be completed. ...* [373]

[373] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 385-388 archive.org/details/scientificmanageootayl

Continuous checking against its estimated time of the time of each increment of work as it is completed, makes possible a continuous appraisal of individual efficiency.

The records of workers' efficiency on individual jobs go into their general records and permit an over-all or long-time rating of the efficiency of each." [373]

Here we can see an example of a workers' Efficiency Record taken from the book.



OPERATORS EFFICIENCY RECORD
CORONA TYPEWRITER COMPANY, INC.

Date 1920	Part or Job Number	Oper. No.	OPERATION NAME	Order Number	Method of Wage Payment P	Method of Wage Payment D	Reason for Day Work	Quantity Completed	100% Time per 100 Pieces	Total Hours Taken for Lot	Rejections Paid for Q'ty	Rejections Paid for Reason	Rejections Not Paid for Q'ty	Rejections Not Paid for Reason	Scrap Produced	% Labor Eff.	Time Taken per 100 Pieces	100% Time Allowed For Lot
6-1	X151	11	Mill card, paint, take	X803	✓			610	.448	2.90	2	Broken Link				45		2.73
"	2892	4	Mill all holes	9971	✓			182	2.39	11.16					2	104		4.34
6-2	"	"	" " "	9257	✓			290	"	5.23	1	Broken Link			1	131		1.93
"	X210	23	Tap holes on dial	9485	✓			38	.75	.40						105		.45
"	190	19	Ream	9996	✓			2500	.119	2.48						119		2.97
6-3	2891	2	Mill all holes	9983	✓			973	1.31	11.20						123		14.02
6-4	"	"	" " "	"	✓			507	"	12.40	1	Broken Link			51	117		14.60
6-5	"	5	Bevel all holes	9223	✓			1206	.583	3.91						97		3.35
"	—	—	Grease & put tools away			✓	26	—	—	.25						—		—
6-8	MX174	5	Bevel all holes	1378	✓			4110	.277	10.00						114		11.36
"	X12	11	Tap	9323	✓			1375	.367	4.91						117		5.77
6-12	2891	11	Mill all holes	1993	✓			2260	1.31	24.09						115		26.45
"	X151	10	Square bore	1983	✓			1010	.35	7.34						112		7.87
"	—	—	Grease & put tools away			✓	26	—	—	.25						—		—
6-17	2891	4	Mill all holes	7998	✓			1700	1.31	24.00	2	Broken Link			2	106		26.77
6-18	2895	5	Bevel all holes	9257	✓			1108	.66	10.00						97		9.39
"	X151	13	Ream & bore	9134		✓	1	500	.268	3.75						97		2.14
6-19	—	—	Grease up department			✓	126	—	—	.25						—		—
6-21	1611	53	Ream & bore	9140		✓	9	231	—	1.00						—		—
"	1123214	51	Ream ends and chamfer	9450		✓	9	136	—	.76						—		—
"	74902	50	Re-tap post	9155		✓	9	611	—	.59						—		—
"	X151	10	Bright	9583		✓	9	1500	—	1.96						—	.13	—
"	74902	51	Re-tap post	9710		✓	9	667	—	1.61						—		—
"	74913	2	Tap	1666	✓			466	.28	1.14						114		1.30
6-24	2891	4	Mill all holes	9911	✓			2393	1.31	31.40						113		34.43
6-25	2892	4	Mill all holes	9999	✓			338	2.39	9.03						106		1.00
6-26	—	—	Grease up department			✓	26			.25						—		—
6-29	2895	4	Mill all holes	9856	✓			774	2.39	11.00						100		18.47
6-30	X151	11	Mill card & inlet holes	9983	✓			1760	.411	5.28	2	Broken Link			2	187		15.68
"	80	7	Assemble	9999	✓			9000	.20	2.22						113		5.11
June 1920			MONTHLY TOTALS AV. QUALITY EFF. AV. LABOR EFF. 112% PER CENT OF P. W. 95.6%						P W O W	209.61 9.87								240.26
7-1	X210	L	Called G.B. replacement office Burr, edge & mill card	9596		✓	41 1	409 631	.26 3.79							97		2.12

Note—Record clerk will figure the average labor efficiency of each operator and the efficiency of quality at the end of each month. To find the average labor efficiency for the month divide the total of all items upon which a standard time is set, as shown in column headed "100% time allowed for lot," by the total of similar items in column headed "Total hours taken for lot." To find efficiency of quality, divide the total of all rejections and scrap, during the month, by the total of the column headed "Quantity completed" and deduct the quotient from 100.

[373] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 385-388 archive.org/details/scientificmanageootayl

Image: **Operators Efficiency Record**, Scientific management in American industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers p. 393 archive.org/details/scientificmanageootayl

For each worker standard times were recorded in the "100% time allowed for lot" column, actual time was recorded in the "Total hours taken for lot" column.

Similar methods are commonplace today, for example reporting against Service Level Agreements (SLAs), also known as "Should Take Times".

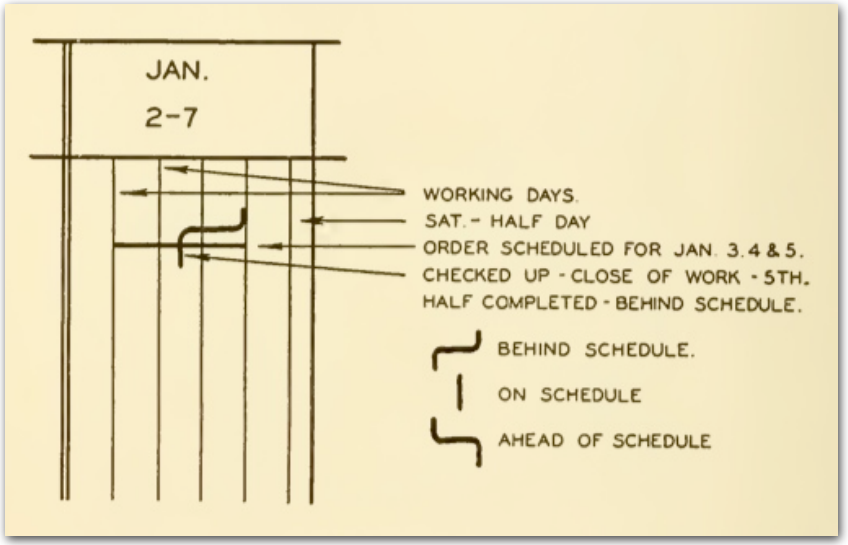
The Record clerk figured the average labor efficiency of each operator and the efficiency of quality at the end of each month.[372]

It was regarded as of the upmost importance that such records of worker performance were kept, however the detail recorded could differ:

> *"The detail in which progress and efficiency records are kept will vary among different types of operations.* [372]

Beyond Gantt's charts, and the Operators Efficiency Records, other devices of recording and depicting inspection of performance were recommended:

> *"another graphical variant of maintenance and control through inspection of performance is that of the Thompson and Lichtner Company"* [372]



[372] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 389-397 archive.org/details/scientificmanageootayl

Image: **Thompson and Lichtner Co. Inc. Chart**, Scientific Management in American industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers p. 392 archive.org/details/scientificmanageootayl

Regarding each inspection device the text went on to state:

> *"With respect to all of these devices for inspection of performance it should be observed: first, that they are identical in principle; second, that they differ mainly in graphical symbolization; third, that all are used to check progress on work and control the flow; and fourth, that they may be used to a greater or less extent for purposes of instruction and inducing voluntary improvement of conditions and methods on the part of foremen and workers.*
>
> *It should be observed that the principal purpose of such progress records is the maintenance of the flow of work through maintenance of the conditions (by discovery of lapses) on which the scheduling is based."* [372]

[372] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 389-397
archive.org/details/scientificmanageootayl

Inspection of performance wasn't limited to non executive staff:

> *"With precisely the same objectives this principle of continuous inspection has in recent years come to be applied to the field of executive performance.*
>
> *It could not come to be so applied until industry had learned how to construct standards for measurement of executive work, and it has been so applied only where and to the extent that such standards have been constructed.*
>
> *Until recently it was the custom to measure executive performance by the annual financial reports - the balance sheet, the profit-and-loss statement, and certain ratios derived from these.*
>
> *If a sound balance sheet and profits were indicated, performance was appraised as satisfactory. ...* [372]

However, the severe depression which followed the war and the appearance of a prolonged buyers' market awakened industry to the realization that such methods of appraisal are not always sufficient.

General executives, realizing that on them rested the major responsibility, jumped into action and became essentially merchandise managers, sales managers, financial managers, labor managers and production managers - in cooperation with departmental managers, of course - and among other things instituted systems of planning and of recording and appraising results of executive effort, which before had not seemed essential.

Out of these emergency activities of general managers and credit institutions there rapidly developed standards for measuring performance which have taken their place as a part of the permanent mechanism of general administrative control.

Most important are the budget, the master schedule of operations for the enterprise as a whole; the detailed operating schedules - derived from the master schedule - of the sales, production and other departments; and certain ratios which constitute standards of proportion between factors of management.

Today every function is provided with a definite target at which to aim.

The significance of these devices is that they establish for the enterprise as a whole, of which entire departments become for the purpose the unit work places, a counterpart of the planning department which scientific management many years ago established for the production department. ... [372]

[372] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 389-397 archive.org/details/scientificmanageootayl

There is this fundamental difference, however; executives are more concerned with imponderables and variables than are production operatives. ... the executive must work with a larger proportion of unknowns - industrial conditions and tendencies, the state of the market, changes in customer requirements, the influence of legislation and public opinion.

Therefore the standards to which executives must work cannot be as precise as are those to which the production group works.

There is not a comparable factual basis for plans; judgment and even guessing are involved. Therefore appraisal in terms of the standards can not be as precise.

With respect to inspection as a procedure for discovering deterioration in executive standards, or variation from estimated conditions, attention should be directed to the exception principle so strongly emphasized by Taylor.

There should be, of course, constant inspection of every unit of performance by routine comparison of results and costs with the corresponding items of the predetermined plan; but only those items should be brought to executive attention which disclose serious variation from the predetermined standard." [372]

"Inspection of Performance" and "Performance Records" for the white collar and blue collar workforce were born.

Inspection itself was viewed as an essential element of scientific management, regardless of the administrative cost:

> *"As in the case of physical inspection - or any kind of inspection - returns must be appraised in terms of the cost of the paperwork. ...* [372]

[372] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 389-397 archive.org/details/scientificmanageootayl

In the long run inspection must pay its way ... [however] inspection which does not pay its way is usually a good investment, for it helps to fix the habits required by the new methods. "[372]

BEYOND THE FACTORY

As we have seen so far in this chapter, it has been described how scientific management wasn't only applied in the factory.

It is therefore important to look at some other examples where it was applied elsewhere, each of which playing their part in spreading the mental revolution.

Our first protagonist is Morris Cooke.

Morris Llewellyn Cooke was an influential American engineer.[394]

[372] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 389-397 archive.org/details/scientificmanageootayl

In 1903 Cooke met a man with principles that would later become very influential in Cooke's work, Frederick W. Taylor.[394]

Taylor's principles influenced Cooke to believe that, "the application of scientific management principles to industry would benefit all of society". This belief later led to the creation of Cooke's own scientific consultant firm in 1905.[394]

Taylor chose four men to implement his theories of scientific management in the work force, Cooke was one of these men.[394]

He also served as president of the Taylor Society.[510]

[394] en.wikipedia.org/wiki/Morris_Llewellyn_Cooke

[510] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers p. 246 archive.org/details/scientificmanageootayl

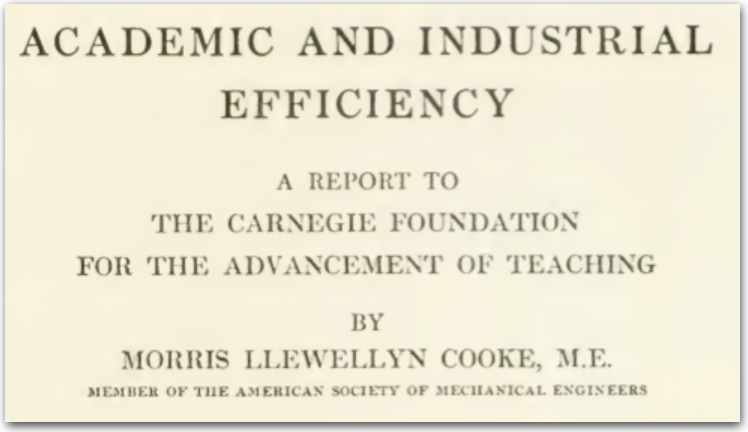
Cooke began applying the principles of Scientific Management to printing and publishing and to office practice ... [509]

So impressed was Taylor with what Cooke did ... that when, in 1906, it fell to him to reorganize the A. S. M. E. he, at his own personal expense, employed Cooke to help him.[509]

In March, 1909, Henry S. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching, wrote to Taylor saying that "nobody has ever made an economic study of education in this country so far as the administration of educational work is concerned," and asking him to recommend a man who could make such a study.[511]

[393] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

Taylor named Cooke, and the outcome was Cooke's report, Academic and Industrial Efficiency, published in 1910.[511]


ACADEMIC AND INDUSTRIAL EFFICIENCY

A REPORT TO
THE CARNEGIE FOUNDATION
FOR THE ADVANCEMENT OF TEACHING

BY
MORRIS LLEWELLYN COOKE, M.E.
MEMBER OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

In addition to printing, publishing and office practice, Cooke applied scientific management to the problems of municipal management.[393]

[509] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p. 246 archive.org/details/frederickwtaylor02copl

[511] ibid., pp. 267-268

Image: **Academic and industrial efficiency; a report to the Carnegie foundation for the advancement of teaching** ([1910]), Author: Cooke, Morris Lyewellyn; Carnegie Foundation for the Advancement of Teaching, Publisher: New York city archive.org/details/academicindustri05cookuoft

In November, 1911, Rudolph Blankenburg, Philadephia's "Old War Horse of Reform," was elected Mayor of that city, and immediately thereafter he urged Taylor to serve as Director of Public Works... . Taylor had to decline.[451]

[However] he here saw an opportunity to demonstrate something of the applicability of the principles of Scientific Management to public undertakings.[451]

So he suggested that his friend and co-worker, Morris L. Cooke, be made Director of Public Works and this suggestion being adopted, Cooke served in that office during the four years of the Blankenburg administration.[451]

Cooke found Philadelphia's Department of Public Works about the worst run plant he ever had been in, and he had only four years to work in ...[451]

[451] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 391-395 archive.org/details/frederickwtaylor02copl

Image: **Morris Llewellyn Cooke**, Date: 1911, Source: The American Magazine, march 1911, Author: The American Magazine, PD-Old en.wikipedia.org/wiki/File:Morris_Llewellyn_Cooke.jpg

It was here that Cooke began to implement Taylor's principles of Scientific Management in order to change what he considered inefficient management practices in several departments.[394]

During his four years as director of public works in Philadelphia, from 1912 to 1916, Cooke was committed to set the example of proper administration.[393]

He instituted new and efficient methods of complaint handling, financial planning, equipment replacement, personnel selection, inventory recording, subcontract letting, public relations and standardization.[393]

This change saved taxpayers thousands of dollars.[394]

[393] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

[394] en.wikipedia.org/wiki/Morris_Llewellyn_Cooke

[395] Business Week, 18 Apr. 1964, p. 132

This work was later reflected during World War II when he served on several boards.[394]

Cooke had proved Scientific Management could bring benefits beyond the factory. He wrote in 1913, [394]

> "We shall never fully realize ... the dreams of democracy until the principles of scientific management have permeated every nook and cranny of the working world." [394] [395]
>
> Morris Cooke

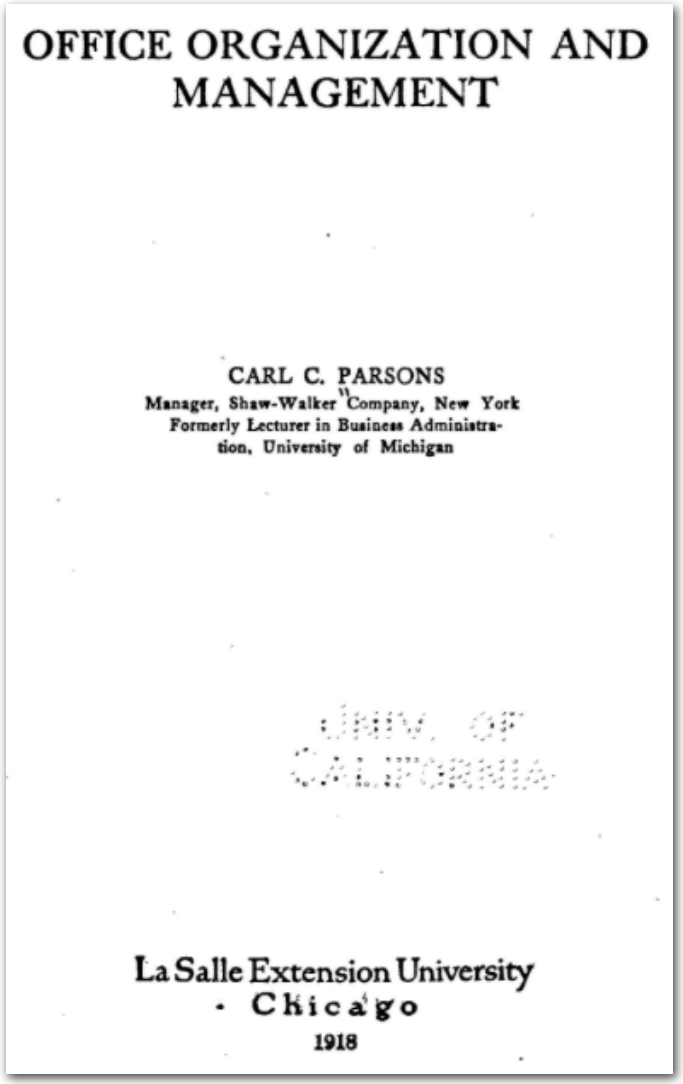
Image: **Morris Llewellyn Cooke**, Date: 1911, Source: The American Magazine, march 1911, Author: The American Magazine, PD-Old
en.wikipedia.org/wiki/File:Morris_Llewellyn_Cooke.jpg

OFFICE EFFICIENCY AND MANAGEMENT

Cooke wasn't the only person who thought that applying scientific management outside of the factory could yield benefits.

Carl. C. Parsons wrote one book, Office Organization and Management, a broad and fundamental guide published in 1918.[393]

Believing that the heart of efficiency in any business organization was its office, that the office's influence reached every department and every worker, that it was the means for securing final and complete accountability, and that its records, reports, and statistics furnished the manager with the facts necessary for intelligent decision making, Parsons wanted to see the scope of scientific management extended to the office.[393]


OFFICE ORGANIZATION AND MANAGEMENT

CARL C. PARSONS
Manager, Shaw-Walker Company, New York
Formerly Lecturer in Business Administration, University of Michigan

La Salle Extension University
Chicago
1918

Image: **Office Organization and Management** (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. p. Title Page archive.org/stream/officeorganizatooparsgoog

393 Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

In the preface he wrote:

> *This importance of the office justifies a special treatise on its management, a work board and fundamental enough to constitute a really constructive guide. The supply of that need is the purpose of this book.*
>
> *Naturally, a treatise such as this to be at once fundamental and practical develops largely through a trained observation of the principles employed in some of the most success offices today. Many sources have contributed ideas for this work.* [553]

Each organizational division was the subject of a scientific management treatise; the Sales department, the Credits and Collections department, the Orders department, the Purchasing department, Stores, the Shipping department, the Accounting department, and the Mailing department.

THE SCIENCE OF MARKETING

As an example, lets look at Parson's treatise of the Advertising department (today known as the Marketing department):

> *One of the largest advertisers in New York, who happens to be one of the most successful, recently said:*
>
> > *I will tell you that I and many other merchants are absolutely in the dark on the advertising question. ... Whilst other parts of our business are reduced to science, our advertising is a puzzle.*
>
> *That very man makes an outlay of a quarter of a million dollars a year for advertising and then admits that he cannot measure the value of the returns with any degree of exactness. ...* [554]

[553] Office Organization and Management (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. p. iii archive.org/stream/officeorganizatooparsgoog

[554] ibid., pp.207-209

He does know, however, that he has something that the people want that that he must let the people know that he has it." [554]

Parsons had the answer:

"*The advertising man is judged not along by the records that he makes, but as well but the records that he keeps.*

Because the responsibility is placed on him of securing the expected returns from the advertising investment, he should be able to show primarily that the total return has been sufficient to warrant the expenditure and, in addition, to show the relative value of each form or advertising and of each medium, in order to judge properly the most lucrative distribution for future advertising campaigns.

The systems for this have been so well worked out that all the information of the advertising department may be readily classified." [554]

554 Office Organization and Management (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. pp.207-209 archive.org/stream/officeorganizatooparsg00g

The notion of marketing campaigns, direct and indirect (Parsons terms) marketing, and records of return on investment from marketing had been born.

UNIVERSAL APPLICATION

In addition to subjecting each department to a treatise he covered other applications of scientific management for the office.

Speaking for the need for layout techniques, he emphasized the proper layout for clerical work, with work flow based on the straight-line principle.[393]

Able to visualize the universal application of scientific management to all type of work, he recognized the need for its application in organizing the office, in properly selecting and training employees, and in properly utilizing office machinery.[393]

393 Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

WORK ATTENDANCE RECORDS

Parsons described the idea of a yearly record of tardiness and absence.

> *Figure 14 shows the complete record kept for each employee during the year, giving the number of times late and the number of times absent.*
>
> *The inducement ... for the employee to maintain his good record is ... that he gains in extra days of vacation and in the certificates which he receives for a perfect record, these certificates furnishing one of the best recommendations in case the employee finds it advisable to look elsewhere for a position.*
>
> *A limit is placed on the number times that a person may be late or absent.* [551]

Such records and limits for absences are still used today, typically in a spreadsheet by a central function like HR.

[551] Office Organization and Management (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. p.95

[552] ibid., pp.131-133

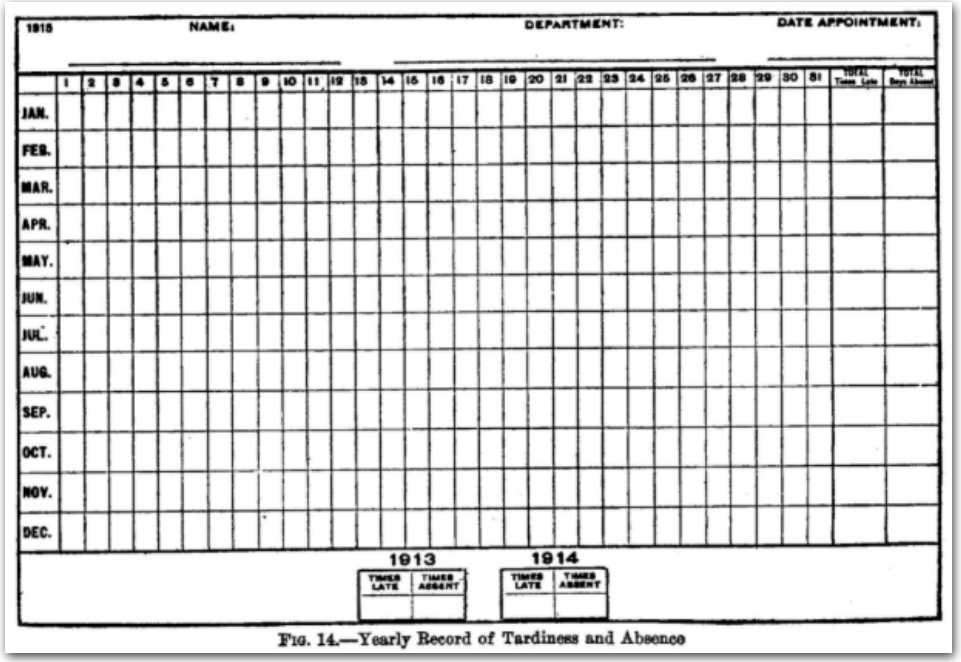


Fig. 14.—Yearly Record of Tardiness and Absence

Similarly graphical vacation schedules are kept today, also one of Parsons ideas.

On this particular subject Parsons described:

> *A vacation should not be looked upon by the employer as a favour which he is extending the employee ... but it takes its place as a part of the new scheme of efficiency. ...* [552]

Image: **Yearly Record of Tardiness and Absence** (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. p. 96
archive.org/stream/officeorganizatooparsgoog

It is because this period of rest, relaxation, and change that the employee gives better work.

Some firms allow one working day for each month's service less than one year. ... [whist at other firms] additional time is given for those whose employment is particularly characterized by length of service ...

There are, for obvious reasons, different plans as to the time when vacations should be given.

As regards the choice of time as to when vacations shall be taken, the general rule has been that those who have been longest in the employ of the company shall have first choice, but there is latterly a growing tendency to give the choice of periods ... to those whose records show the highest percentage of improvement. It is another aim to reward efficiency."[552]

Source: [552] Office Organization and Management (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. pp.131-133 archive.org/stream/officeorganizatooparsgoog

He also described the "efficiency vacation plan" for an organization;

> *" Its factory and all its offices were closed for two weeks during the summer, and the entire organization took a vacation at one time. "* [552]

Using this method of enforced vacation is still in use by many of today's organizations.

HEALTHY INTERNAL COMPETITION

Parsons advocated rivalry and making a business a game:

> *" Sales managers for a number of years have appreciated the fact that they get better results from their men by some artificial stimulus.*
>
> *The spirit of the game and the advantages of rivalry are recognized as features which arouse the enthusiasm of the selling force and eventuate in increased returns. ...* [555]

[555] Office Organization and Management (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. pp.116-118 archive.org/stream/officeorganizatooparsgoog

Recently, by inaugurating such a campaign, one of the largest office speciality houses increased its sales over 50 per cent.

During the time of the contest a weekly paper was published, showing the pictures of the salesman who made the greatest number of sales, the salesman who secured the biggest sale, and the salesman who made the highest per cent of his quota.

There was printed in the pamphlet the list of the men, showing the order in which they stood as regarded the per cent of quota required.

Without question that list was of added importance because it contained the names of all the contestants; just as any man desires to have his name at the top, no man wants his name at the bottom of the list.

Why should not this same method be adopted in offices, and why should it not be reasonable to assume that the same results will accrue?

Again, why should we accept the suggestion that salesmen need this extra stimulus to being out their best work and not see its advantages when applied to the office force?

There is nothing that increase the enthusiasm of a corps of workers more than the infusion into the work of the spirit of a contest in which the ability and energy of each one of the various members can be shown in comparison with all others.

Specific rewards and the judicious use of graphic records are the means of focusing attention and visualizing results." [555]

Extrinsic motivation methods such as league tables and "healthy competition" within an organization had arisen.

[555] Office Organization and Management (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. pp.116-118 archive.org/stream/officeorganizatooparsgoog

PERFORMANCE REVIEWS

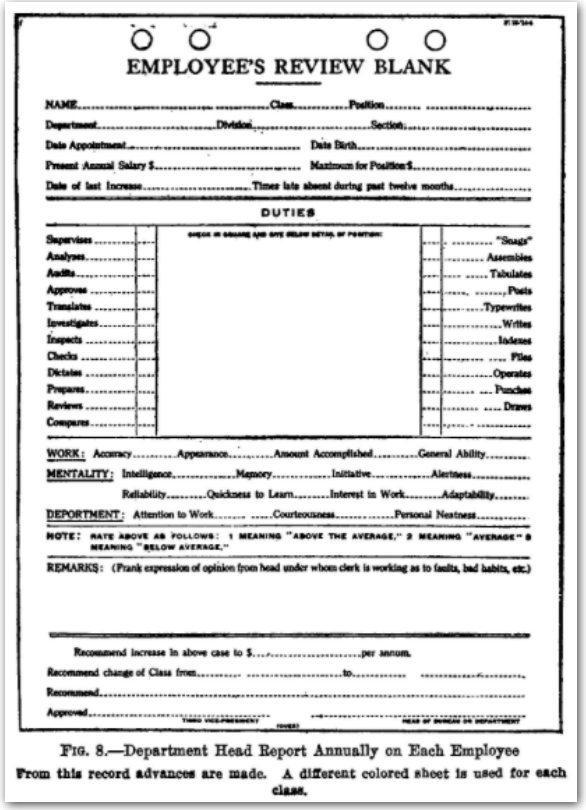
Parsons promoted the idea of keeping Individual Efficiency Records. These were similar in nature to the Operators Efficiency Records discussed previously in this chapter, except this time they were for office workers rather than factory workmen:

> *"In order that there may be an accurate record kept of employees so that advancements in salary may be based on their work, each department head turns over to the employment bureau each year a report showing the character of the work done by every employee, an estimate of the mental capacity of the employee, and showing an account of his deportment [behaviour].*
>
> *These are rested "1," meaning above the average; "2," meaning average; and "3," meaning below the average.*

[556] Office Organization and Management (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. p.43 archive.org/stream/officeorganizatooparsgoog

> *It is on these reports that advances are made in salaries or that employees are promoted from once class to another ..."* [556]

Similar methods of office worker appraisal and ratings for salary increase are used today, albeit with different criteria.



EMPLOYEE'S REVIEW BLANK

NAME..... Class..... Position.....
Department..... Division..... Section.....
Date Appointment..... Date Birth.....
Present Annual Salary $..... Maximum for Position $.....
Date of last Increase..... Times late absent during past twelve months.....

DUTIES

Supervises ..... "Snags"
Analyses ..... Assembles
Audits ..... Tabulates
Approves ..... Posts
Translates ..... Typewrites
Investigates ..... Writes
Inspects ..... Indexes
Checks ..... Files
Dictates ..... Operates
Prepares ..... Punches
Reviews ..... Draws
Compares .....

WORK: Accuracy..... Appearance..... Amount Accomplished..... General Ability.....
MENTALITY: Intelligence..... Memory..... Initiative..... Alertness.....
Reliability..... Quickness to Learn..... Interest in Work..... Adaptability.....
DEPORTMENT: Attention to Work..... Courteousness..... Personal Neatness.....
NOTE: RATE ABOVE AS FOLLOWS: 1 MEANING "ABOVE THE AVERAGE," 2 MEANING "AVERAGE" 3 MEANING "BELOW AVERAGE."
REMARKS: (Frank expression of opinion from head under whom clerk is working as to faults, bad habits, etc.)

Recommend increase in above case to $..... per annum.
Recommend change of Class from..... to.....
Recommend.....
Approved.....

FIG. 8.—Department Head Report Annually on Each Employee From this record advances are made. A different colored sheet is used for each class.

Image: **Employee Review Form** (1917) Author: Carl Copeland Parsons, Publisher: La Salle Extension University Chicago. p. 41 archive.org/stream/officeorganizatooparsgoog

SCIENTIFIC OFFICE MANAGEMENT

In addition to what we have discussed Parsons described the value of organization charts, the trial period for a new employee, methods for employee discipline, methods for employee transfers between divisions, rules and regulations, methods of payment and bonuses, promotions, and the role of the office manager.

Comparing his ideas and documented standard practices of the time (1918) there is little difference to what is commonly in use nearly 100 years later in offices today.

Whereas Parsons recognized the need for scientific office management, it was left to William H. Leffingwell to apply the principles of the Taylor system to office work.[393]

[393] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

Leffingwell was the first person to demonstrate that the principles of scientific management could be applied to the office with the same success they had enjoyed in the shop.[393]

He developed the Five Principles of Effective Work.[386]

1. Plan the work. Any administrative manager must plan what work must be done; how, when, and where it must be done; and how fast it can be done.

2. Schedule the work. By recognising a total plan of organization and product development, the manager can coordinate the efforts of all workers, machines, and information to formulate a proper work schedule that agrees with the plan. ...[386]

[386] Administrative Office Management, Complete Course By Pattie Gibson Publisher: Cengage Learning; 13 edition (April 14, 2004) p.9

3. Execute the work. Proper operating systems, procedures, record-keeping practices, and methods for executing the work must be developed. The work must be done skillfully, accurately, rapidly, and without unnecessary effort and delay.

4. Measure the work. With the effective development of measures, standards, and layouts for getting the work done, it must then be measured as to quantity, quality, the workers' potential, and past production records.

5. Reward the worker. Perhaps of most importance, the manager must select, train, motivate, compensate, and promote employees to keep their interests and those of the organization at an optimum level.[386]

[396] Technology versus Technocracy, 19-Jun-2004, BHC, slide 6, By permission of Thomas Haigh thaigh@acm.org www.tomandmaria.com/tom

[393] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

THE FATHER OF OFFICE MANAGEMENT

Leffingwell, looked upon as the father of office management, was credited with applying the principles of scientific management to office work.[386]

His book, Scientific Office Management, published in 1917, was the forerunner of all modern studies in office management.[393]

Leffingwell's system involved:

- Careful layout of office, for efficient flow of work.
- Division of tasks into simple units, scientific measurement and analysis of each part to determine "the one best way".
- Standardization of all procedures, forms, letters, equipment and personnel (test & train).[396]

[386] Administrative Office Management, Complete Course By Pattie Gibson Publisher: Cengage Learning; 13 edition (April 14, 2004) p.9

- Use of appropriate machines and equipment to maximize efficiency of each task.
- Payment of production bonus incentives to supplement salaries.[396]

STANDARD WORK

Leffingwell applied Taylor's system of time and motion studies to eliminate superfluous steps and standardize tasks.[397]

Preaching "simplification" of work, he regarded no task as too insignificant for scrutiny, not even the "correct" method for opening an envelope and removing its contents, or the proper amount of time it should take a worker to cut a piece of paper.[397]

[396] Technology versus Technocracy, 19-Jun-2004, BHC, slide 6, By permission of Thomas Haigh thaigh@acm.org www.tomandmaria.com/tom

[397] Beyond Survival: Wage Labor and Capital in the Late Twentieth Century (Labor and Human Resources), By Laurie M. Clements (Author, Editor), Cyrus Bina (Author, Editor), Chuck Davis (Editor) Publisher: M E Sharpe Inc (December 1996) p.180

Here we can see an example, asking; "Why not answer you mail this way?"

Image: **Why Not Answer Your Mail This Way?** The Automatic Letter Writer and Dictation System (1918), Edited By: Leffingwell, W. H, Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company Preface archive.org/details/automaticletterwooleff

On the subject of standardized work, and standard times, Leffingwell had the answer to the question "how long should it take?" :

> *"The remedy lies in studying scientifically the possibilities of every job in advance, and then standardizing the operations of the office.*
>
> *Figure 20 shows the results of an investigation covering 50 offices.*
>
> *These standards represent the average production for the different kinds of work in a large variety of concerns.*
>
> *If the amount of work is sufficient to warrant it, it is well to have a "book of standards" which clearly defines the method of performing every operation and the standard rate for it."* [398]

[398] The Automatic Letterwriter and Dictation System (1918), Author: Leffingwell, William Henry, 1876-1934, Publisher: Chicago, New York [etc.] : A. W. Shaw company pp. 208-211 archive.org/details/automaticletterwooleff

Image: **The Automatic Letterwriter and Dictation System** (1918), Author: Leffingwell, William Henry, 1876-1934, Publisher: Chicago, New York [etc.] : A. W. Shaw company pp. 208 archive.org/details/automaticletterwooleff

Leffingwell's Figure 20 is shown here.

Mail-handling Standards

Operation	Conditions	Hourly rate
Opening letters and sorting them for distribution	A Careful first reading	60
	B Hasty first reading	200
Registering orders	Fully interpreted	200
Writing orders	Based on orders averaging five items	20
Dictating letters	Based on letters averaging ¾ of a page in length	35
Typing letters	Based on letters averaging ¾ of a page in length	15
Folding and enclosing letters	Spurt speed is possible on this work in most offices	500
Stamping envelops	A By hand, speed possible for only an hour or so	3,000
	B Hand machines	3,000
	C Power machines	10,000
Writing invoices	A When description is brief—an average length of five lines	75
	B When description is complicated -an average length of five lines	20
Addressing envelops	A By hand	125
	B On the typewriter	225

FIGURE 20: "How long should it take?" is answered by the chart shown here. Under normal conditions you would be justified in expecting these results from employees of fair ability. The experience of 50 office managers was studied in preparing this chart which is more fully described on the opposite page. It may help you set a standard in your office.

Leffingwell continued:

> *The incentive for employees to reach the standard set for any operation is the spur of pay and promotion.*
>
> *A piece rate puts every worker doing one kind of work on the same basis.*
>
> *If the rate is fairly set, it is just both to employer and employee; moreover, it gives the employee an incentive to prove his real quality by doing more than the standard task.*
>
> *The unit of pay for stenographers varies in different offices.*
>
> *One concern pays for the number of words written, another for the number of lines, and still another for the number of square inches of typewritten matter.*

[398] The Automatic Letterwriter and Dictation System (1918), Author: Leffingwell, William Henry, 1876-1934, Publisher: Chicago, New York [etc.] : A. W. Shaw company
pp. 208-211
archive.org/details/automaticletterwooleff

> *A simple device can be attached to the typewriter which will register each time the space bar is touched, thus automatically counting the number of words written; another device counts the number of lines written by registering every time the carriage is shifted.* [398]

We see this kind of measurement system in use today; where technology is used for the purpose of measurement; from call centers where technology captures how long an agent spends on a call, to computer programmers who are paid for lines of code written, to engineers who have GPS installed to monitor their whereabouts and their travel times from job to job.

These kinds of measurement systems can lead to employees trying to distort the numbers for self preservation purposes.

Leffingwell knew that employees may try and "game the system":

> *" A few unnecessary strokes on the space bar or shifts of the carriage, however, will boost the operator's salary considerably.*
>
> *This difficulty is done away with in a Philadelphia office by having an assistant to the chief stenographer, who inspects and actually measures all letters.* [398] *"*

Again this method of inspection is in use today; checking up on the workers.

Leffingwell felt that such standards would have additional benefits to the employer:

> *" Definite standards give the manager a positive method of identifying his best workers. "* [398]

[398] The Automatic Letterwriter and Dictation System (1918), Author: Leffingwell, William Henry, 1876-1934, Publisher: Chicago, New York [etc.] : A. W. Shaw company
pp. 208-211
archive.org/details/automaticletterwooleff

[393] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

Standard work and standard times could also be used as a means for reducing cost, as Leffingwell explained:

> *" Knowing the amount of work done by each individual and each department, and the price paid for it, he can easily tell where expense is too large or where more money may profitably be used.*
>
> *Standards in the office finally come to mean lower costs and in addition better work. "* [398]

This same ideology; that standardization reduces costs, is prevalent today.

Leffingwell didn't stop at standardization as means for improving efficiency and reducing costs.

He showed which unnecessary motions could be eliminated through the proper location of desks, telephones, files, pencil sharpeners, and the like.[393]

Leffingwell drew attention through advertising of efficiency savings that could be gained through the application of his methods. As we can see in his advertisement, he guaranteed percentages of time, and payroll, that could be saved based on the number of employees applying his methods:

> *"With an office force of — Saving*
>
> *2-9 persons — 10 per cent of your time*
> *10-24 " — 15 per cent of your payroll*
> *25-99 " — 17 per cent of your payroll*
> *100-1000 " — 20 per cent of your payroll*
>
> *These figures are meant to be taken literally. They are a conservative estimate by W. H. Leffingwell ... "Too good to be true," you may say. But when you consider that he decreased payroll of an Illinois concern 40%, that he cut the force of one department of an Ohio concern from 25 to 5 employees, that he has effected wonderful*

[518] and Image: **From an advertisement used to promote Leffingwell's 1917 book Scientific Office Management**, Source: Technology versus Technocracy, By Thomas Haigh, 19-Jun-2004, BHC, slide 6, By permission of Thomas Haigh thaigh@acm.org www.tomandmaria.com/tom

economies ... isn't it worth while at least to investigate these claims, especially when it costs you nothing?" [518]

How much can Leffingwell save you?

THIS IS HIS GUARANTEE:

With an office force of	Saving
2— 9 persons	10 per cent of your time
10— 24 "	15 per cent of your payroll
25— 99 "	17 per cent of your payroll
100—1000 "	20 per cent of your payroll

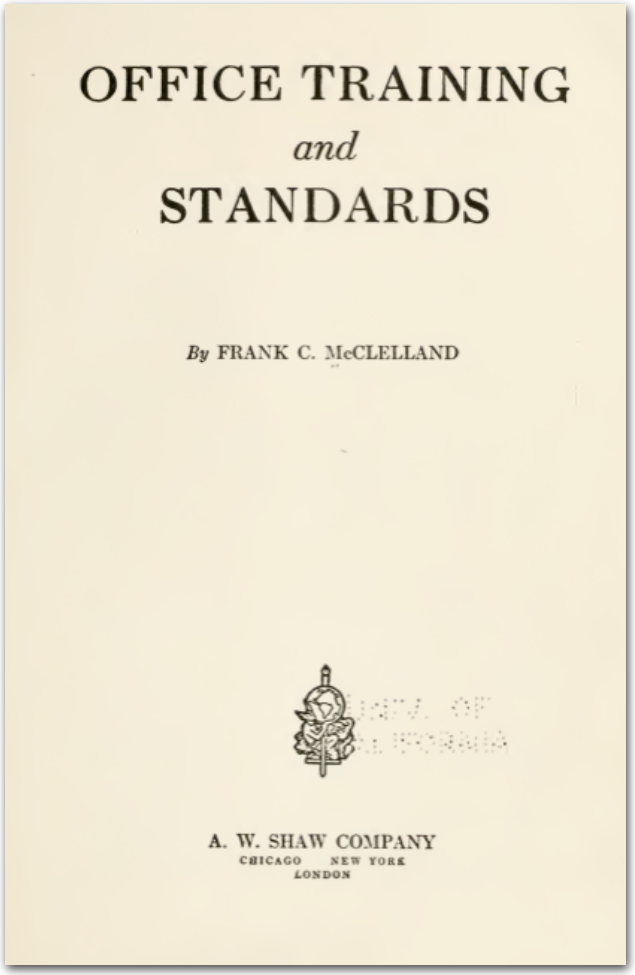
These figures are meant to be taken literally. They are a conservative estimate by Mr. W. H. Leffingwell, President, W. H. Leffingwell Company, efficiency engineers, of the savings which you can expect from the application of his methods to your office work.

"Too good to be true," you may say. But when you consider that he decreased the payroll of an Illinois concern 40%, that he cut the force of one department of an Ohio concern from 25 to 5 employees, that he has effected wonderful economies in concerns facing practically all kinds of conditions, isn't it worth while at least to investigate these claims, especially when it costs you nothing?

Leffingwell went on to found the National Office Management Association.[403]

Frank C. McClelland published "Office Training and Standards" in 1919. He drew on the work of Leffingwell. In his introduction he wrote:

> *Mr. Taylor's studies were confined largely to factories. W. H. Leffingwell has effectively applied the Taylor methods of scientific management to office work.*[400]
>
> *To Mr. W. H. Leffingwell the author is indebted for some valuable expert suggestions on scientific office management and for permission to use some material from Mr. Leffingwell's splendid report on that subject ...*[399]
>
> *Organized work under the direction of organized thinking usually means a type of scientific management that will produce results well worth while. Scientific direction often increases output 100% or more.*[400]


OFFICE TRAINING
and
STANDARDS

By FRANK C. McCLELLAND

A. W. SHAW COMPANY
CHICAGO NEW YORK
LONDON

399 Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.xi archive.org/details/officetrainingstoomcclrich

400 ibid., pp. 2-7

403 en.wikipedia.org/wiki/William_Henry_Leffingwell

Image: **Office Training and Standards** (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company Front Cover archive.org/details/officetrainingstoomcclrich

What follows are a series of examples of scientific management applied to the office as documented by McClelland.

It is easy to recognise many of these examples still used by consultants today, who ply their trade in improving efficiency in the workplace.

DESK EFFICIENCY

Our first example is one of desk efficiency; what was called "Suiting the Desk to the Work".[512]

> *If the insides of all the desks are arranged according to a standard plan, it is easier for a substitute to take up the work where it was left off.* [512]

For the image on the left it was described:

> *You won't waste time fumbling for clips and pins if your desk drawer is well arranged with partitions.* [512]

and for the image on the right:

> *The middle drawer of this desk is divided into small compartments for pins, clips, and rubber bands.* [512]

[512] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp. 199-204 archive.org/details/officetrainingstoomcclrich

Image: **Suiting the Desk to the Work**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.200 archive.org/details/officetrainingstoomcclrich

Another example of desk efficiency, this time in handling incoming mail:

> *"The special mail-opening table ... was devised after several careful tests were made to ascertain the most effective way of opening mail. The sunken baskets and pincushions eliminate a great deal of useless motion."* [515]

For the image on the left it was described that:

> *"This girl can open, pin, and sort 310 letters an hour by using this special table with sunken trays."* [515]

and for the image on the right:

> *"This girl is sorting miscellaneous letters on this peculiar looking rack for distribution to departments."* [515]

[515] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.15 archive.org/details/officetrainingstoomcclrich

Image: **Mail Opening Tables**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp.10-15 archive.org/details/officetrainingstoomcclrich

In the next example an executives desk was tackled. It was explained that:

> *" The executive who uses this desk has arranged it so that his "working tools" can be easily reached.*
>
> *The kind of work you do will, of course, determine the arrangement of your desk somewhat.*
>
> *But no matter what the work, the object always is to have an efficient arrangement and stick to it. "* [512]

Once again this bears a remarkable resemblance to what some consultants today call 5S, which is a work organization method.[503]

[512] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp. 199-204
archive.org/details/officetrainingstoomcclrich

[503] en.wikipedia.org/wiki/5S_(methodology)

Image: **The Executive Desk**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.204
archive.org/details/officetrainingstoomcclrich

What today we would recognise as office ergonomics was also described:

> *" If you want to feel tired out before you are half through the day sit humped up like this girl, but - If you prefer to keep fresh and alert all day long, you will find that this posture is very much better. "* [513]

[513] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.27 archive.org/details/officetrainingstoomcclrich

Image: **Office Ergonomics**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.27 archive.org/details/officetrainingstoomcclrich

All areas of the office were examined:

> *" Just imagine how much mail this concern receives! Here are seven men and boys sorting mail for the various departments. In order to work fast each worker must, of course, know just where each letter goes.* [515] *"*

[515] ibid., p.15

Image: **Sorting Mail**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.15 archive.org/details/officetrainingstoomcclrich

In the Stock department, to increase efficiency it was described:

> *"In this office the stock clerks do their work on roller skates."* [516]

[393] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 87-89

In 2007, Martin Fowler described the same approach that had been seen in a brokerage firm:

> *"They hired some more temps to get the orders from the fax machine to the people that keyed the information into the back end system.*
>
> *Since the fax machines were a bit of a distance away, this is where the roller-skates came in."* [517]

THE EFFECTIVE OFFICE LAYOUT

Earlier we discussed that Carl C. Parsons spoke for the need for layout techniques, he emphasized the proper layout for clerical work, with work flow based on the straight-line principle.[393]

[516] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.109 archive.org/details/officetrainingstoomcclrich

[517] RollerSkateImplementation, Martin Fowler, 9 September 2007 martinfowler.com/bliki/RollerSkateImplementation.html

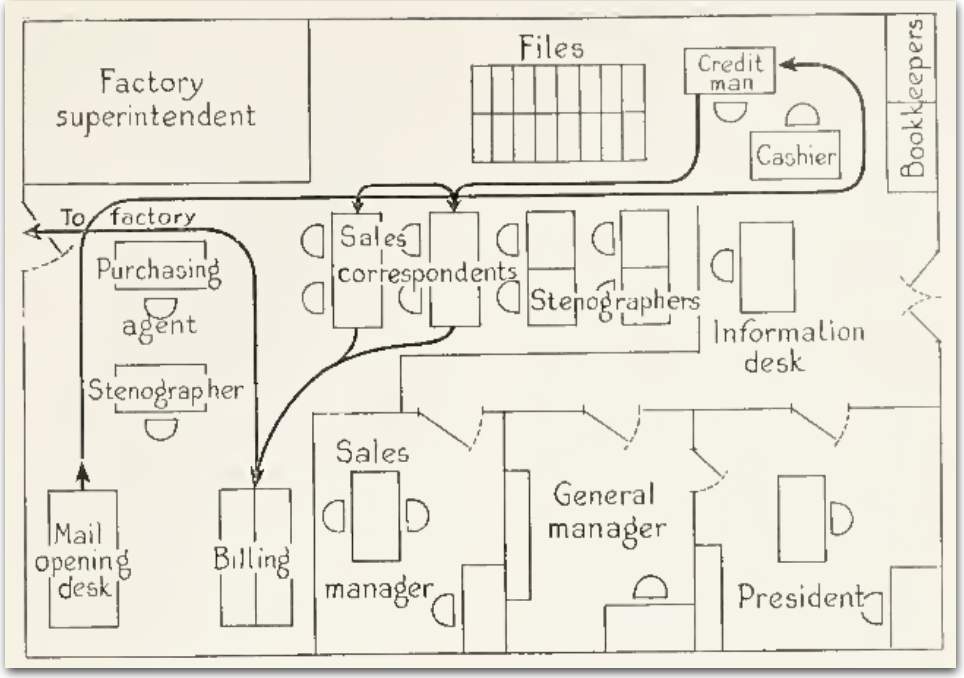
Image: **Stock Office Clerks Do Their Work on Roller Skates**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.109 archive.org/details/officetrainingstoomcclrich

Leffingwell and McClelland agreed:

> *An office, like a factory, should be laid out on the "straight line" principle.*
>
> *The straight line principle means the arrangement of desks and equipment so that there will be no "doubling back" of an order from the time it enters the office until it is filled and shipped.*
>
> *Water will run through a straight pipe faster than through a crooked one.*
>
> *If the insides of all the desks are arranged according to a standard plan, it is easier for a substitute to take up the work where it was left off."* [512]

McClelland gave an example concerning the flow of work through an office and the arrangement of each specialised function:

> *When a certain office manager came into a new concern, he found the office arranged like this.*
>
> *An order came in to the mail-opening desk and from there it skipped all over the office. ...* [512]



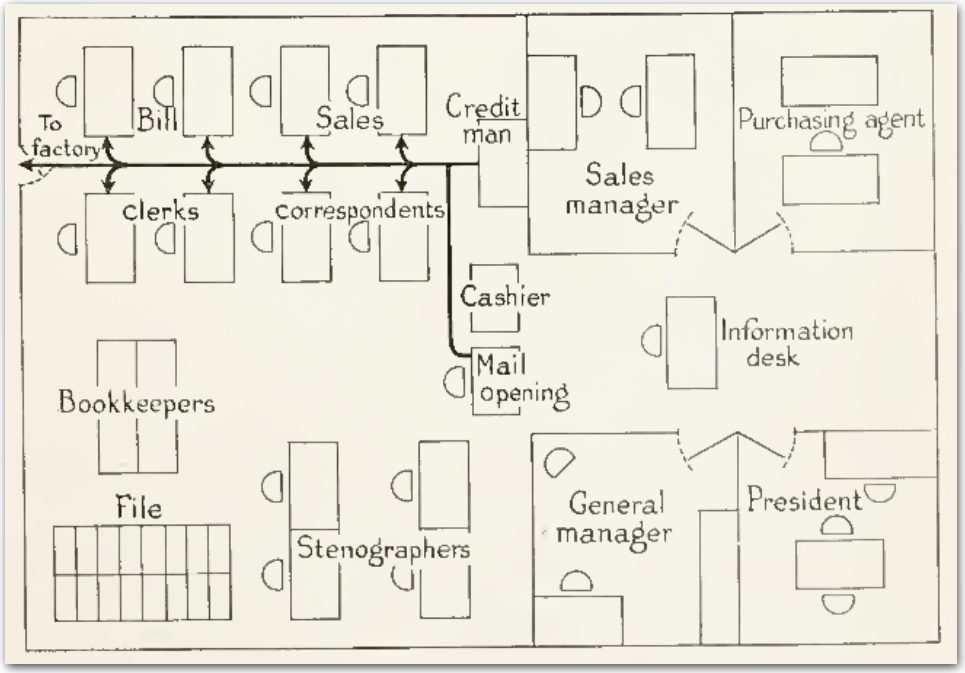
[512] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp. 199-204 archive.org/details/officetrainingstoomcclrich

Image: **Office Layout**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.199 archive.org/details/officetrainingstoomcclrich

He decided time could be save by rearrangement.

This is how the office looked after he made the change.

The order now goes in one straight line from the mail opening desk to the credit man, the bill clerks and the factory. [512] ”



[512] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp. 199-204 archive.org/details/officetrainingstoomcclrich

Image: **Office Layout**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.199 archive.org/details/officetrainingstoomcclrich

MANAGERS DECIDE - WORKERS DO

As was the case in the factory, for example Taylor’s description of Schmidt, the scientific management approach to an office was equally unforgiving on its view of the manager versus the worker; where managers decide, and workers do:

“ *Although the manager may sometimes appear to have an easy job, he is usually hard at work - with his brain.*

Large corporations pay large salaries to men and women who work with their brains. ... The eye of the master does more work than both his hands. ...

Unnecessary talking causes a great deal of noise. Everyone can do his part to lessen it. Think before you speak. ...

In “breaking in” a new employee, many concerns use standard practice instructions in preference to having an older employee do the teaching. ” [512]

McCelland had a section entitled; "Where the thinking is done". In it he described:

> *"The office of any successful business must be the thinking and directing force for the entire concern.*
>
> *As the thinking department, the office must provide plans, standards, and instructions for those in the operating departments, and keep records of the results."* [400]

Today this "thinking department" would be known as the Head Office, Headquarters (HQ), or as John Seddon has termed it; "The Management Factory", a place where strategies, plans, procedures and policies are devised and cascaded down the organisation.

STANDARD TIMES AND BEST PRACTICE

McClelland went onto further expand on standardized work and standard times for office work:

> *"Under Mr. Taylor's plan each worker has as few operations to perform as possible, and he is drilled in each operation until he becomes proficient. There is usually one person in each department who supervises this training.* [400]
>
> *A standard method can be found for every operation in the office ... Whatever you are doing, there is one way of doing it that is best - best because the results are of the highest quality and because it takes less time and effort.*
>
> *How the standard is set ... Whatever you are doing in the office - if it is only addressing envelopes - there is one method that will yield the best results, a standard method.*
>
> *The question now is - how to find the standard. The first step is to analyze the job,whatever it may be. ...* [401]

[400] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp. 2-7 archive.org/details/officetrainingstoomcclrich

[401] ibid., pp. 240-242

The expert who set the standard may have spent a long time [where the work is being done]. He noticed that even the fastest worker went through unnecessary motions.

Finally he worked out a method which combined the best points of all the workers and omitted useless motions. This method then became the standard.

As soon as the standard method has been determined, instructions for performing the operation in the standard way are written down. These are called standard practice instructions.[401]

Standard practice instructions for any job are usually prepared only after that job has been thoroughly analyzed and carefully studied.[512]

A great many concerns today have standard practice books or office manuals.

These books contain the standard practice instructions for carrying on all the work of the office.

There are very good reasons for having all standard practice instructions written out.[401]

Standard practice instructions show the very best way to perform each operation in the office.[512]

Written instructions are one of the best possible methods of teaching new employees their work

Now they are all working according to the same plan.

Many concerns, in addition to adopting standard methods, set a standard amount of work to be accomplished every day ... [401]

[401] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp. 240-242 archive.org/details/officetrainingstoomcclrich

[512] ibid., pp. 199-204

Those who reach or excel the standard rate of accomplishment receive more money.

Now we can see how standards may be used to increase the efficiency of the office.

When a standard method is determined upon - when all the workers are instructed in the use of the standard method - then there is no injustice in expecting a uniform amount and quality of work from all.

You see then that a standard is something to measure by, something that can be used as a model.

Certain tests have been devised by which you can determine how nearly you measure up to the standard of accomplishment.[401]

The usual methods of checking work are counting and measuring, comparing and inspecting, supervision and reports." [512]

McCelland had described what he called "Standard Practice Books", today we would call this "Documented Best Practice".

MEASURING ACTIVITY

Managers of the office became preoccupied with measuring and managing activity:

> "*The work of an office is usually more difficult to measure than that of a shop, but it can be done in nearly all cases.*
>
> *Office departments usually have a few things around which their other work revolves; in an advertising department, for instance, they have several individuals whose duty it is to get out circular letters. It is easy to decide on a daily task of a certain number of letters. ...* [402]

[401] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company pp. 240-242 archive.org/details/officetrainingstoomcclrich

[402] ibid., pp. 95-98

[512] ibid., pp. 199-204

Another group in this same department may be answering inquiries, and since no one knows in advance how many inquiries will be received each day, no one can say how many should be answered.

However, it is most important to have those inquiries handled promptly, so the real task of this group of people is to answer each day all the inquiries received. Their daily task is then expressed in numbers of inquiries received.

The daily task in most office departments can be expressed in one of these two ways, i.e., by a definite quantity per day or by the amount of work received each day.

It is the aim of an office manager to get work done, and in order to accomplish this he wants to know at frequent intervals, usually daily, what progress is being made.

Accordingly, he gets reports from each of his department heads showing the amount of work they receive each day, the amount done, and the amount left over over at the end of the day."[402]

This paradigm is commonplace today; with managers thinking of their jobs as continually juggling the following equation: how much work is coming in, how many people do I have, and how long do people take to do things?[519]

We discussed Gantt's Progress Chart earlier in this chapter. In addition to the factory, these charts were now also being used in the office.

[402] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 95-98
archive.org/details/ganttchartworkinooclaruoft

[519] TRANSFORMATION 2010, How lean became mean, Professor John Seddon March 2010

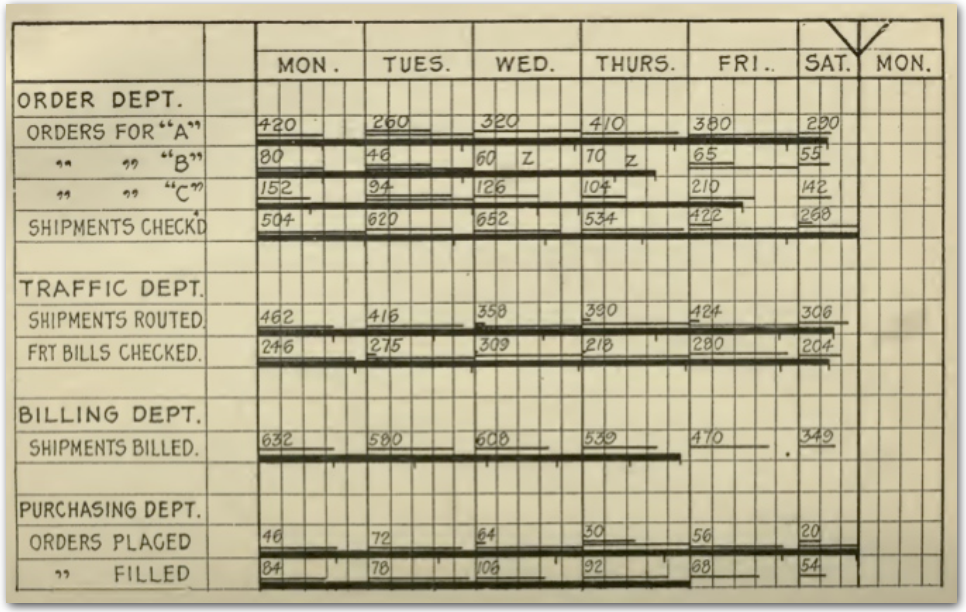
“ In order to get things done on time in an office, a department head or office manager must be kept advised continually and promptly as to whether or not those under his control are doing their work on time.

It is also his duty to maintain a definite standard of quality in the work turned out, but that is not quite so difficult as to keep the work up to date.

A Progress Chart ... keeps an office manager accurately and promptly advised as to the status of the work under his charge and enables him to give whatever assistance may be necessary to those behind schedule.

This chart is so simple that anyone in the office can understand it; it emphasizes above everything else the time when work should be finished; and show at a glance what work is up to date and what work is behind.” [402]

Here we can seen an example entitled “Progress Chart of Office Work” tracking orders, shipments, billing and purchasing.



[402] The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, pp. 95-98
archive.org/details/ganttchartworkinooclaruoft

Image: Progress Chart of Office Work, The Gantt Chart, A Working Tool Of Management; (1923), Author: Clark, Wallace, 1880-1948; Gantt, Henry Laurence, 1861-1919, Publisher: New York, Ronald Press, p.96
archive.org/details/ganttchartworkinooclaruoft

CODIFICATION OF METHOD

Even the simplest operation was studied and a more efficient method described:

> *"Hold the receiver firmly to the ear with the left hand. Leave the right hand free to take notes."* [514]

[514] Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.63 archive.org/details/officetrainingstoomcclrich

We may scoff at instruction for such a simple task, yet today, instructions for many tasks are documented, that the recipient, due to their training and experience, would deem as simple, yet they have to follow them, and are inspected to ensure that they have done so.

SCIENTIFIC MANAGEMENT EDUCATION

As we have discussed, the scientific management mental revolution had taken hold outside of the factory, into municipal management, into the office, and into the administration of educational work.

Beyond educational administration, the popularity of scientific management in industry also led to its inclusion in university education, further spreading the mental revolution.

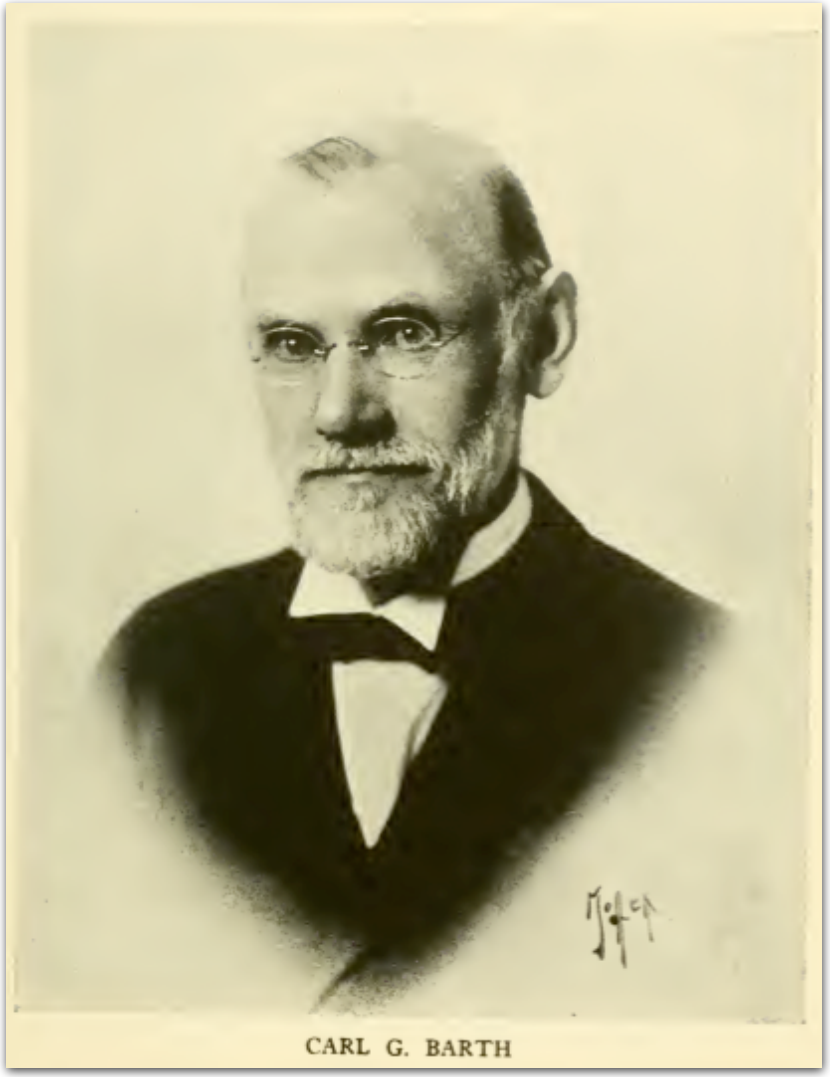
Image: **Efficient Telephone Use**, Office Training and Standards (1919), Author: McClelland, Frank Clark, 1866-; Shaw, A. W., company, Publisher: Chicago, New York [etc] A. W. Shaw company p.62 archive.org/details/officetrainingstoomcclrich

In his last book [Henry] Towne contrasted the status of scientific management in 1886 and in 1921, noting the establishment of industrial management courses, and crediting Frederick Taylor as the apostle of the scientific movement.[254]

Harvard University, one of the first American universities to offer a graduate degree in business management in 1908, based its first-year curriculum on Taylor's scientific management.[281]

Carl G. Barth [who] helped Taylor to develop speed-and-feed-calculating slide rules to a previously unknown level of usefulness. (similar aids are still used in machine shops today) [281] became an early consultant on scientific management and later taught at Harvard.[281]

[254] Encyclopedia of Management, 5th Edition, Edited by Marilyn M. Helms, D.B.A.
 pp. 651-653



CARL G. BARTH

[281] en.wikipedia.org/wiki/Frederick_Winslow_Taylor

Image: **Carl G. Barth**, Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers p.31
archive.org/details/frederickwtaylor02copl

Hugo Diemer rose to an important position in the American management movement mainly through his publications. As a professor and as an active engineer in industry, he was the author of dozens of articles and books dealing primarily with management principles and foremanship.[357]

In 1909 he established the first course in industrial engineering at Penn State University, [389] where he was recommended by Frederick Winslow Taylor.[388]

His pioneering textbook, Factory Organization and Administration, first published in 1910 [was] an immediate success, the book showed the interrelation and universal application of management principles.[357]

[388] en.wikipedia.org/wiki/Hugo_Diemer

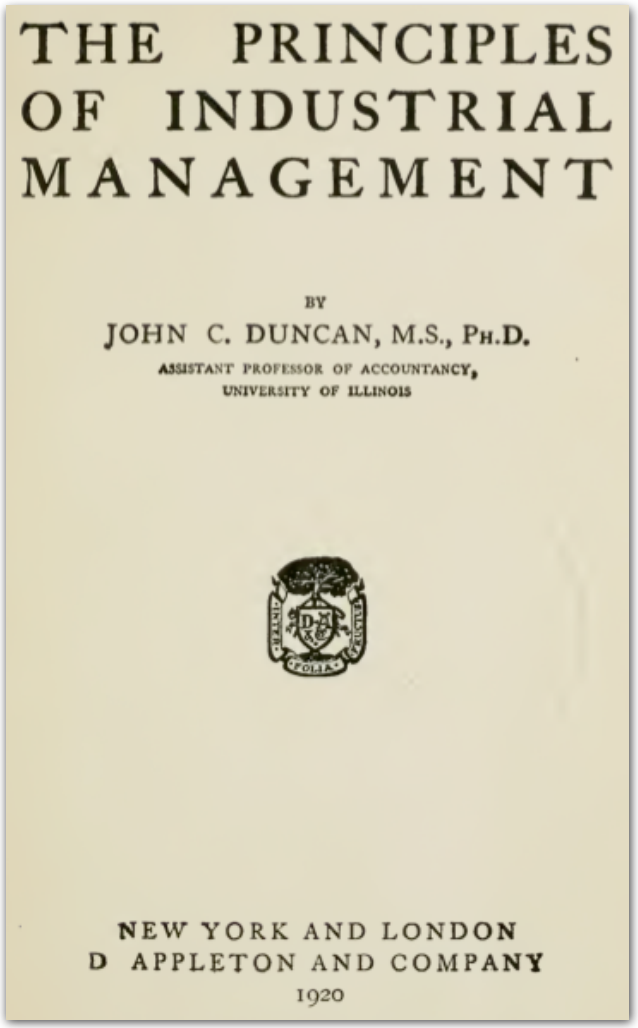
[389] David F Noble (1979) America by Design: Science, Technology, and the Rise of Corporate Capitalism. p. 276

In addition to his writings, Hugo Diemer aided the recognition and growth of the science of management through his lectures, his public speeches, and his consultation with leading public and private institutions.[357]

John C. Duncan, a professor of accounting at the University of Illinois, published his Principles of Industrial Management in 1911.[357]

Although the ideas in his book were not new, the book itself was original. Along with Diemer's, this was one of the first textbooks on industrial management. Duncan's Principles of Industrial Management showed that he recognized the existence of a body of knowledge that could and should be included in a college-level curriculum.[357]

[357] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82


THE PRINCIPLES OF INDUSTRIAL MANAGEMENT

BY

JOHN C. DUNCAN, M.S., PH.D.

ASSISTANT PROFESSOR OF ACCOUNTANCY,
UNIVERSITY OF ILLINOIS

NEW YORK AND LONDON
D APPLETON AND COMPANY
1920

Image: The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company Title Page archive.org/details/principlesofinduoodunc

He saw the need for enlightened management in industry; but more than this, he saw the need for the mass education of students in this developing field of management: [357]

> *"The writer has long felt the need of a scientific treatment of industrial management. Hundreds of young men are now in our schools and colleges intending to engage in the world of affairs, and it is exceedingly important that they gain a clear conception of the principles underlying the successful conduct of industrial enterprises.*
>
> *The book is written to give both the accountant and the general student of business a brief presentation of the underlying principles of the science of management."* [392]

[392] The Principles of Industrial Management (1920), Author: Duncan, John C. (John Christie), b. 1881, Publisher: New York, London : D. Appleton and Company pp.vii-viii archive.org/details/principlesofinduoodunc

[357] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

He assembled and organized the prevalent current practices in a concise, well-written manner so that an understanding of them could be gained in an academic rather than in a practical environment.[357]

This meant that a young man interested in business learned about it in theory instead of serving an apprenticeship.[357]

Our last protagonist in the education section is Joseph Wharton.

Wharton, co-founded the Bethlehem Steel company.[390]

Wharton was the man who induced the Bethlehem Steel Company to employ Taylor to systemize its works.[307]

It was Wharton who held him responsible for results.[391]

[357] Management Thought, By Jayanta K Nanda, Publisher Sarup & Sons, New Delhi (1 Jan 2005) pp. 79-82

[390] en.wikipedia.org/wiki/Joseph_Wharton

[307] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers pp. 111-112 archive.org/details/frederickwtaylor01copl:

[391] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 9-10 archive.org/details/frederickwtaylor02copl

Image: **Joseph Wharton**, PD-old-100 en.wikipedia.org/wiki/File:Joseph_wharton.jpg

Frank Copley wrote in "Fredrick W. Taylor: Father of Scientific Management" (1923):

> *"Wharton always will have the distinction of being one of the first financiers in this country to recognize the value in industry of the scientific expert.*
>
> *It was due to his belief in experts that he was attracted to Taylor."*[391]

Wharton's effect on scientific management was therefore profound, being the man that hired Taylor into Bethlehem Steel, however he also had another part to play.

Wharton wrote extensively on economic matters, including protective tariffs and business cycles.[390]

In the last half of the 19th century, business education typically consisted mainly of training on the job or an apprenticeship.[390]

Wharton conceived of a school that would teach how to develop and run a business. The Wharton School was the first to include such a practical focus on business, finance, and management.[390]

During its first century through the present day, it was and is widely known as one of the most prominent schools of business in the world.[390]

Through the work of these men, scientific management had entered education, further spreading the mental revolution; to those in those in management roles at the time, and to those who would enter the role of management after graduation.

[390] en.wikipedia.org/wiki/Joseph_Wharton

[391] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 9-10 archive.org/details/frederickwtaylor02copl

THE "QUICK FIX" CONSULTANTS

Taylor's single most important disciple was … an extraordinary man called Charles Eugene Bedaux … he did more than anyone else to advance the cause of Taylorism in the United States and elsewhere in the first half of the twentieth century.[266]

Discovering the importance of work study, he set up a management consultancy in Cleveland, Ohio in 1918, publishing tables of efficiency that would pass into general use throughout the world.[266]

Bedaux introduced the concept of rating assessment [in] timing work which led to great improvements in employee productivity, and which became known as the "Bedaux System."[325]

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

[532] Condensed Capitalism: Campbell Soup and the Pursuit of Cheap Production in the Twentieth Century, By Daniel Sidorick Publisher: ILR Press; 1 edition (February 26, 2009) p.29

Unlike Taylor's system the Bedaux system was designed to be confusing as this worked to the advantage of employers and to the disadvantage of workers and trade unions.[534]

He conferred his own name on his version of Taylor's work units … 'Bedaux units'.[266]

The Bedaux system was unique among the many scientific management systems that sprouted from the initial work of Frederick W. Taylor.[532]

It wrapped its instructions, calculations and methods in pseudo-scientific jargon to bolster its claims of authority and accuracy, yet its relatively quick implementation made it more attractive than Taylor's original schemes, which required long and difficult study of every work process and mandated that each workman be assigned a particular job for which he was suited.[532]

[325] en.wikipedia.org/wiki/Charles_Bedaux

[534] Knowledge, Space, Economy, edited by J. R. Bryson, Publisher: Routledge; 1 edition (January 31, 2001) p.172

It was first laid out formally in his book, The Bedaux Efficiency Course for Industrial Application (1917).[533]

However, Bedaux was less interested in academically published studies.

Thus, of the 20 articles published about Bedaux in the New York Times between 1930 and 1944 (when he committed suicide), only two dealt specifically with his consulting activities.[536]

The system was installed not by the employers but by Bedaux's own staff of time-study "engineers".[531]

These men entered individual firms in the guise of neutral third parties, bringing the benefits of Bedaux's "labour science" to worker and employer alike.[531]

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

Mauro F. Guillén wrote:

> "*many employers and managers used the Bedaux System to introduce scientific management through the back door.*" [533]

Bedaux's "quick fix" proved popular.

About two hundred American companies would adopt his system by the 1930s, including General Electric, Campbell Soup and Goodrich Rubber.[266]

In 1927, Bedaux moved to London, establishing a company called British Bedaux which would also enjoy success in attracting leading manufacturing companies as clients; eventually, it changed its name to Associated Industrial Consultants.[266]

[531] Manufacturing Inequality: Gender Division in the French and British Metalworking Industries, 1914-39 (Wilder House Series in Politics, History & Culture)
By Laura Lee Down Publisher: Cornell University Press; 1 edition (July 1, 1995) p.289

[533] Models of Management: Work, Authority and Organization in a Comparative Perspective,
By Mauro F. Guillén Publisher: University Of Chicago Press; 1 edition (October 15, 1994) p.57

[536] The Oxford Handbook of Management Consulting, edited by Matthias Kipping, Timothy Clark, Publisher: Oxford University Press (December 12, 2012) p.11

It was only in the late 1920s and especially the 1930s that scientific management really began to affect the practice of British industry. Bedaux and his consulting firm … was an important channel.[535]

Bedaux amassed a fortune expanding on the Taylorism style of scientific management.[325]

At the time, despite his success, he had many detractors. Lyndall Urwick, the influential business management consultant and thinker in the United Kingdom,[538] was one of them.

Urwick … made an important point in his autobiography about the way Bedaux had distorted scientific management: [537]

[535] Markets, Firms and the Management of Labour in Modern Britain By Howard Gospel, Publisher: Cambridge University Press (May 29, 1992) p.55

[537] Lyndall Urwick, Management Pioneer: A Biography, By Edward Brech, Andrew Thomson, John F. Wilson, Publisher: Oxford University Press p.95

[538] en.wikipedia.org/wiki/Lyndall_Urwick

[325] en.wikipedia.org/wiki/Charles_Bedaux

> *"In the first place I myself through that the so-called 'Bedaux system' was merely a sales gimmick.*
>
> *It was taking the ideas of Frederick Winslow Taylor and other founders or scientific management and dressing them up in an apparently 'patent' jargon as though its Directors had some secret formula to sell.*
>
> *To me it seems as remote from true scientific management as I understand the term, as the quack selling cure-alls at a country far is remove from a trained practitioner."* [537]

Despite Urwick's criticisms the Bedaux system proved popular in Britain.

The history of Scientific Management in Britain up to 1940 is largely a history of the Bedaux company.[534]

[534] Knowledge, Space, Economy, edited by J. R. Bryson, Publisher: Routledge; 1 edition (January 31, 2001) p.172

As we have discussed, Taylorism evolved after Taylor's death, never becoming a fixed body of principles and practices.[266]

However, scientific management and Taylorism continued to flourish and spread.

By the 1930s, many shop-floor disciplines sheltered under its umbrella in addition to time-and-motion study … in the form of cost accounting, the preparation of job descriptions, the systematization of salary scales and the like, its influence extended far beyond the factory, the office and indeed beyond business.[266]

[412] en.wikipedia.org/wiki/Henry_Ford

[539] Ford R. Bryan, "The Birth of Ford Motor Company", Henry Ford Heritage Association, retrieved August 20, 2012.

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

HENRY FORD

Popularity in a scientific approach was further propelled by Henry Ford and his Ford Motor Company. Therefore, I will dedicate the last part of this chapter to it's influence.

Henry Ford was an American industrialist, and the founder of the Ford Motor Company.[412]

After a few false starts Ford, together with other investors formed: the Ford Motor Company on June 16, 1903 [539] with $28,000 capital.[412]

Ford then demonstrated a newly-designed car on the ice of Lake St. Clair, driving 1 mile (1.6 km) in 39.4 seconds and setting a new land speed record at 91.3 miles per hour (147.0 km/h).[412]

You can see Henry Ford stood next to the car on the next page.

Convinced by this success, the race driver Barney Oldfield, who named this new Ford model "999" in honor of the fastest locomotive of the day, took the car around the country, making the Ford brand known throughout the United States.[412]

[412] en.wikipedia.org/wiki/Henry_Ford

Image: **Henry Ford, standing, and Barney Oldfield in 1902, with the "999" racing automobile**.
Source: www.automotivehistoryonline.com/Fordbeginning.htm Permission=PD-US
en.wikipedia.org/wiki/File:BarneyOldfieldHenryFord.jpg

The Ford Motor Company was one of several hundred small automobile manufacturers that emerged between 1890 and 1910.[420]

During its early years, the company produced a range of vehicles designated, chronologically, from the Ford Model A (1903) to the Model K and Model S (Ford's last right-hand steering model).[541]

During this time, Ford had modest success producing a small number of vehicles; the Model A (1903-1904) 1700 produced,[557] the Model C (1904-1905) 800 produced,[558] the Model F (1905-1906) 1000 produced,[559] and the Model N (1906-1908) 13,250 produced.[560]

[420] en.wikipedia.org/wiki/Fordism

[557] en.wikipedia.org/wiki/Ford_Model_A_(1903–1904)

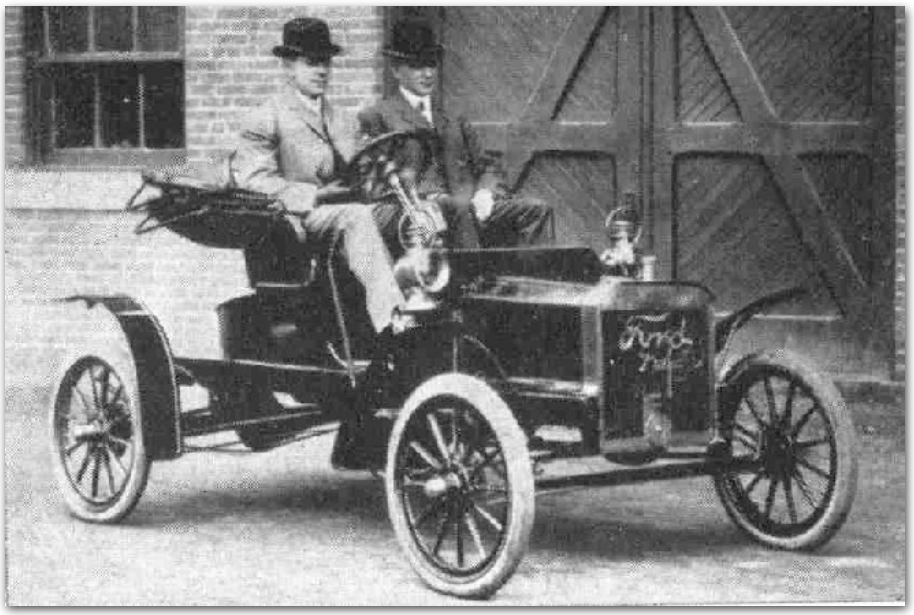
[558] en.wikipedia.org/wiki/ Ford_Model_C

[559] en.wikipedia.org/wiki/Ford_Model_F

[560] en.wikipedia.org/wiki/Ford_Model_N

[541] Clymer, Floyd. Treasury of Early American Automobiles, 1877–1925 (New York: Bonanza Books, 1950), p.120.

A 1906 Model N automobile (also known as Model R and Model S) is shown below.



These modest production numbers were all about to change.

[412] en.wikipedia.org/wiki/Henry_Ford

[540] en.wikipedia.org/wiki/History_of_Ford_Motor_Company

[407] en.wikipedia.org/wiki/Ford_Model_T

[439] "Chronicle of 1908". Library.thinkquest.org. 1908. Retrieved 2012-10-21.

[295] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management, 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 66-68

Image: **Ford Model N** um 1906 in den USA entstanden, Date: circa 1906, Source: Transferred from de.wikipedia; transferred to Commons using CommonsHelper.
Author: Originuploader was Harz4 at de.wikipedia. Permission PD-US
en.wikipedia.org/wiki/File:Ford_N.jpg

THE MODEL T IS BORN

In 1908, Ford's Model T was born.[295]

His introduction of the Model T automobile revolutionized transportation and American industry.[412]

Earlier models were produced at a rate of only a few a day at a rented factory on Mack Avenue in Detroit, Michigan, with groups of two or three men working on each car from components made to order by other companies (what would come to be called an "assembled car").[540]

The first Model Ts were built at the Piquette Road Manufacturing Plant, the first company-owned factory.[540]

The first production model T was produced on August 12, 1908 [439] and left the factory on September 27, 1908.[407]

Ford's Piquette plant could not keep up with demand for the Model T, and only 11 cars were built there during the first full month of production.[407]

This was only the beginning for Ford. He would embark on journey that led to a series of remarkable innovations, based upon the design and management foundations laid thus far in this book.

GLOBAL CONSUMERISM

Ford had a global vision, with consumerism as the key to peace.[412] In this autobiography he recounted his now famous statement:

> *I will build a motor car for the great multitude.*
>
> *It will be large enough for the family but small enough for the individual to run and care for.*
>
> *It will be constructed of the best materials, by the best men to be hired, after the simplest designs that modern engineering can devise.*
>
> *But it will be so low in price that no man making a good salary will be unable to own one - and enjoy with his family the blessing of hours of pleasure in God's great open spaces. ...* [409]

[407] en.wikipedia.org/wiki/Ford_Model_T

[412] en.wikipedia.org/wiki/Henry_Ford

[409] My Life and Work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company pp. 72-73 archive.org/details/mylifeworko1ford

Image: **1910 Model T Ford**, Salt Lake City, Utah, Date: 11 April 1910, Source: Commercial photo for advertisement, published 1910. Photographer Shipler Commercial Photographers; Shipler, Harry, URL: content.lib.utah.edu/cdm4/item_viewer.php?CISOROOT=/USHS_Shipler&CISOPTR=2629&CISOBOX=1&REC=2, Author: Harry Shipler, Permission (Reusing this file) PD-US. en.wikipedia.org/wiki/File:1910Ford-T.jpg

Therefore in 1909 I announced one morning, without any previous warning, that in the future we were going to build only one model, that the model was going to be "Model T," and that the chassis would be exactly the same for all cars, and I remarked: "Any customer can have a car painted any colour that he wants so long as it is black". " [409]

Ford began building a small number of vehicles in 1909 [279] which grew tremendously as his innovations took hold.

The paradox of Ford was that by thinking of the consumer first and production second his was a triumph of marketing as much as of production methods. Though the two were inextricably linked, he is usually associated with the latter rather than the former.[295]

[295] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 66-68

[540] en.wikipedia.org/wiki/History_of_Ford_Motor_Company

Ford created a huge publicity machine in Detroit to ensure every newspaper carried stories and ads about the new product.[412]

He invented the system of franchised dealers who were loyal to his brand name. [540]

Ford's network of local dealers made the car ubiquitous in almost every city in North America.[412]

As independent dealers, the franchises grew rich and publicized not just the Ford but the concept of automobiling; local motor clubs sprang up to help new drivers and to encourage exploring the countryside. [412]

[412] en.wikipedia.org/wiki/Henry_Ford

[409] My Life and Work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company pp. 72-73
archive.org/details/mylifeworko1ford

[279] www.systemsthinking.co.uk

THE HIGHLAND PARK EXPANSION

Ford needed to expand, as he explained in his book "My Life and Work":

> *"The 1908-1909 sales of more than ten thousand cars had convinced me that we needed a new factory.*
>
> *We already had a big modern factory the Piquette Street plant. It was as good as, perhaps a little better than, any automobile factory in the country. But I did not see how it was going to care for the sales and production that were inevitable.*
>
> *So I bought sixty acres at Highland Park, which was then considered away out in the country from Detroit. The amount of ground bought and the plans for a bigger factory than the world has ever seen were opposed."*
>
> *The question was already being asked: "How soon will Ford blow up?"* [409]

Ford's factory at Highland Park, Michigan opened in 1910.[426]

[426] en.wikipedia.org/wiki/Highland_Park_Ford_Plant

[409] My Life and Work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company pp. 72-73
archive.org/details/mylifeworko1ford

Image: **Highland Park Ford Plant** c. 1922, Source: The city of Detroit, Michigan, 1701-1922 By Clarence Monroe Burton, William Stocking, Gordon K. Miller, Author: Clarence Monroe Burton, William Stocking, Gordon K. Miller
en.wikipedia.org/wiki/File:Highland_park_plant_1.jpg

THE MOVING ASSEMBLY LINE

One of Ford's most notable innovations was the creation of the moving automotive assembly line.

At Ford, Charles Sorensen (with others, notably Walter Flanders, Clarence Avery, and Ed Martin) is credited with developing the first automotive assembly line, having formulated the idea of moving a product (for cars, this would be in the form of the chassis) through multiple workstations.[425]

On a Sunday in 1910, in the Piquette Plant, Sorensen and another Ford executive, Charles Lewis, tested his idea.[425]

Apparently, by the end of the day he had determined that moving a car in a straight line from one end of the factory to the other, with parts added along the way by specialized

[425] en.wikipedia.org/wiki/Charles_E._Sorensen

workers performing repetitive tasks (with the stockrooms also placed strategically along the line) was the most efficient and therefore cheapest way to build an automobile.[425]

To prove his theory, he then towed an automobile chassis on a rope over his shoulders through the Ford plant while others added the parts.[425]

It wasn't until 1913 however that a moving assembly line in Ford's plants was applied.

As Ford described:

> *"The first step forward in assembly came when we began taking the work to the men instead of the men to the work.*
>
> *We now have two general principles in all operations - that a man shall never have to take more than one step, if possibly it can be avoided, and that no man need ever stoop over. ...* [429]

[429] My Life and Work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company pp. 80-83 archive.org/details/mylifeworko1ford

The principles of assembly are these:

(1) Place the tools and the men in the sequence of the operation so that each component part shall travel the least possible distance while in the process of finishing.

(2) Use work slides or some other form of carrier so that when a workman completes his operation, he drops the part always in the same place - which place must always be the most convenient place to his hand - and if possible have gravity carry the part to the next work-man for his operation.

(3) Use sliding assembling lines by which the parts to be assembled are delivered at convenient distances.

The net result of the application of these principles is the reduction of the necessity for thought on the part of the worker and the reduction of his movements to a minimum.

He does as nearly as possible only one thing with only one movement.

Along about April 1, 1913, we first tried the experiment of an assembly line. We tried it on assembling the flywheel magneto. I believe that this was the first moving line ever installed.

With one workman doing a complete job he could turn out from thirty-five to forty pieces in a nine-hour day, or about twenty minutes to an assembly. What he did alone was then spread into twenty-nine operations; that cut down the assembly time to thirteen minutes, ten seconds.

Further experimenting with the speed that the work should move at cut the time down to five minutes. In short, the result is this: by the aid of scientific study one man is now able to do somewhat more than four did only a comparatively few years ago. ”[429]

[429] My Life and Work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company pp. 80-83
archive.org/details/mylifeworko1ford

Here you can see Ford workers on the new Flywheel-Magneto Assembling Line.

Middle of Flywheel-Magneto Assembling Line

The successful results obtained through these early experiments led to widespread usage of the moving assembly line throughout the Ford plant.

In 1913, the Highland Park Ford Plant became the first automobile production facility in the world to implement the assembly line.[426]

As Ford stated:

> *"That line established the efficiency of the method and we now use it everywhere.*
>
> *The assembling of the motor, formerly done by one man, is now divided into eighty-four operations - those men do the work that three times their number formerly did.*
>
> *Every piece of work in the shops moves; it may move on hooks on overhead chains going to assembly in the exact order in which the parts are required; it may travel on a moving platform, or it may go by gravity ...* [429]
>
> *Everything moves and there is no skilled work."* [430]

[430] My Life and Work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company p. 202
archive.org/details/mylifeworko1ford

[426] en.wikipedia.org/wiki/Highland_Park_Ford_Plant

Image: **Ford Methods and the Ford Shops** (1915), Author: Horace Lucien Arnold , Fay Leone Faurote, Publisher: The Engineering magazine company, Year: 1915 p.110
archive.org/details/fordmethodsandfoofaurgoog

SPECIALIZED DEPARTMENTS

Ford took the division of labour to new levels. He explained:

> *" We started assembling a motor car in a single factory.*
>
> *Then as we began to make parts, we began to departmentalize so that each department would do only one thing.*
>
> *As the factory is now organized each department makes only a single part or assembles a part. A department is a little factory in itself. "* [429]

Here we can see different departments, or little factories as Ford put it, working on different vehicle components as part of the moving assembly line, all the within the single factory. This model of specialized departments is still used in organizations today.

Watch video http://vimeo.com/75217295

[429] My Life and Work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company pp. 80-83
archive.org/details/mylifeworko1ford

Video: **Ford Model T - World's Most Famous Car**, Car Data Videos
This movie is part of the collection: blip.tv
www.archive.org/details/Cardatavideo-FordModelTWorldsMostFamousCar152

FLOW PRODUCTION

In 1913 he married consistently interchangeable parts with standard work and moving conveyance to create what he called flow production.[406]

Ford's cars came off the line in three-minute intervals, much faster than previous methods, reducing production time by a factor of eight (requiring 12.5 hours before, 93 minutes afterwards), while using less manpower. [407] [428]

By 1914, the assembly process for the Model T had been so streamlined it took only 93 minutes to assemble a car. That year Ford produced more cars than all other automakers combined.[407]

Here you can see the Model Ts rolling out of the factory.

Watch video http://vimeo.com/75215983

[406] A BRIEF HISTORY OF LEAN www.lean.org/whatslean/History.cfm

[407] en.wikipedia.org/wiki/Ford_Model_T

[428] Georgano, G. N. (1985). Cars: Early and Vintage, 1886–1930. London, UK: Grange-Universal

Video: **Ford Model T - World's Most Famous Car**, Car Data Videos
This movie is part of the collection: blip.tv
www.archive.org/details/Cardatavideo-FordModelTWorldsMostFamousCar152

All Model T chassis were essentially identical up through the end of production in 1926.[406]

Ford implemented consistently interchangeable parts (made possible by the Ford gauging system with go/no-go gauges for every part, which were shared with every supplier).[547]

Image: **Ford assembly line**, 1913.
Source: www.gpschools.org/ci/depts/eng/k5/third/fordpic.htm PD-US
en.wikipedia.org/wiki/File:Ford_assembly_line_-_1913.jpg

The leap from the previous world of stationary assembly with fitting (filing) of parts to the correct dimensions, treasure hunting for materials and tools, and extensive rework at the end of the process was remarkable.[547]

[406] A BRIEF HISTORY OF LEAN www.lean.org/whatslean/History.cfm

[547] Book Value: Jim Womack on Ford Methods and Ford Shops, by Jim Womack, July 9, 2013
www.lean.org/leanpost/Posting.cfm?LeanPostId=34

Image: **Ford Assembly Line in 1913**, Date: 1913, Source: www.archives.gov/exhibits/
picturing_the_century/newcent/newcent_img5.html
en.wikipedia.org/wiki/File:AssemblyLine.jpg

The Model T was a great commercial success, and by the time Henry made his 10 millionth car, 50 percent of all cars in the world were Fords.[407]

MASS CODIFICATION OF METHOD

In 1915 Horace Lucien Arnold and Fay Leone Faurote published "Ford Methods and the Ford Shops" which contained extremely detailed description of Fords shops and methods. In the preface was written:

> *"Ford's success has startled the country, almost the world, financially, industrially, mechanically.*
>
> *What is the personality behind these startling results? What are the ideals worked out in them? What are the conditions and methods in the shops where they have been secured in regular every-day operation?*
>
> *The story is told completely, practically, and graphically in the pages of this book.*

> *Both authors worked with the direct co-operation of Henry Ford himself and of the Ford engineers.*
>
> *They had full access to the most intimate data of every department, and unstinted assistance in the preparation of illustrations and the compilation of figures.*
>
> *To the manufacturer, manager, or engineer confronted by the problems of mechanical production this exposition will excel in interest and value anything of the kind heretofore attempted, not only by the intrinsic quality of the text and illustrations, but by their exposition of what is up to now the final word in efficient, standardized, repetitive production. ...* [546]

[407] en.wikipedia.org/wiki/Ford_Model_T

[546] Ford Methods and the Ford Shops (1915), Author: Horace Lucien Arnold , Fay Leone Faurote, Publisher: The Engineering magazine company, Year: 1915 p. Preface archive.org/details/fordmethodsandfoofaurgoog

... while it thus deals with the production of interchangeable components, embodied, so far as manufacture is concerned, in semi-automatic machinery, and turned out by progressive processing and gang assembling with specialized transportation, it has very wide application in other lines where similar practice can be adopted in whole or in part, with similar advantages to purchaser, worker, and consumer. "[546]

It was the first example of mass codification of methods that could be copied by the management of other businesses, regardless whether they were manufacturing motor vehicles.

This method of codification and then copying of "best practices", regardless of their source, with the aim of achieving similar results, is prevalent today.

[546] Ford Methods and the Ford Shops (1915), Author: Horace Lucien Arnold , Fay Leone Faurote, Publisher: The Engineering magazine company, Year: 1915 p. Preface archive.org/details/fordmethodsandfoofaurgoog

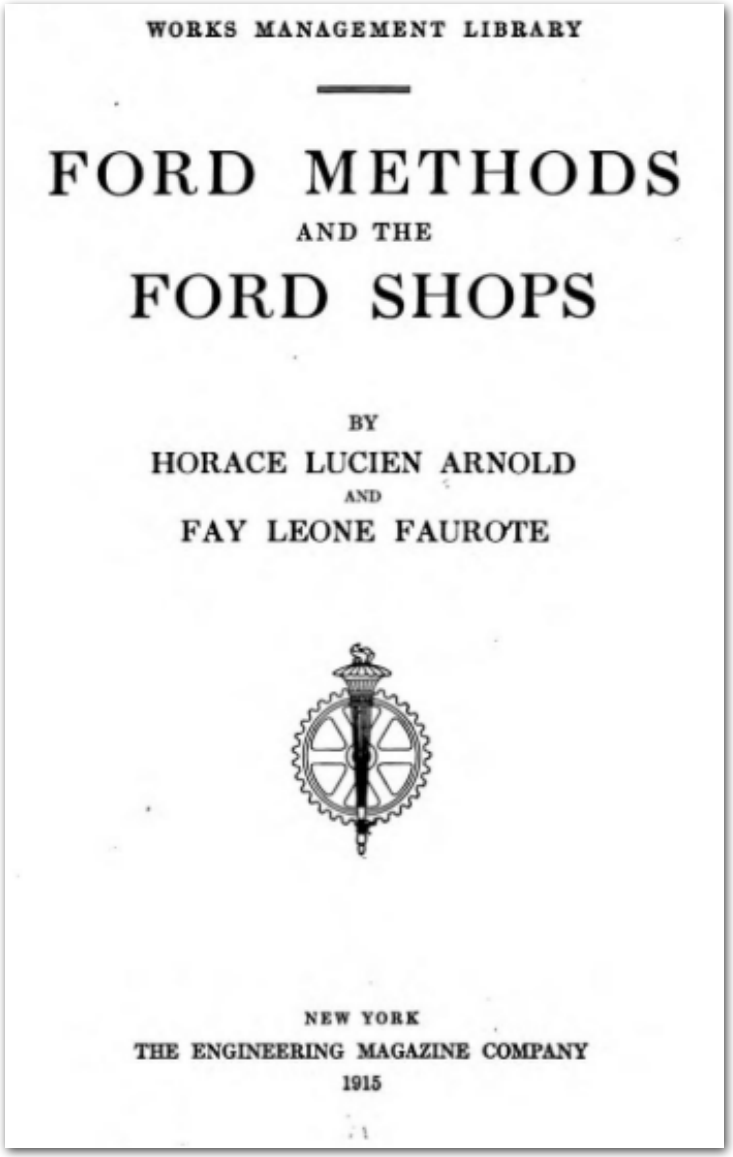


Image: **Ford Methods and the Ford Shops** (1915), Author: Horace Lucien Arnold , Fay Leone Faurote, Publisher: The Engineering magazine company, Year: 1915 p. Title Page archive.org/details/fordmethodsandfoofaurgoog

FORECASTS, BATCHES AND SALES

Although the Ford Motor Company brought mass production to new heights,[4] as we have discovered in the book so far, it was a synthesizer and extrapolator of ideas.[4]

Ford produced his vehicles in batch. His was a make and sell view of the world; economies of scale thinking.[279]

Ford's problem was the more people that wanted cars, the more they wanted variety. People didn't all want black cars![279]

Ford solved this variety problem by mass producing in batches.[279]

People in the head office were writing the specifications, doing the auditing, doing the planning, the warehousing, and all of the scheduling that was needed to mass produce in batches.[279]

We follow that same theory today.[279]

As Ford had to mass produce in batches, he needed to know how many different models and colours they were going to sell. So they started forecasting.[279]

Predictions about sales volumes were compared with abstracted production data to establish batch sizes.[413]

This is still how all but one of the major car manufactures operates today. It is the reason why there are fields of unsold cars, waiting for customers, in disused airfields around the globe.[413]

4 en.wikipedia.org/wiki/Mass_production

279 www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

413 Designing a customer-driven system: Change management thinking, Barry Wrighton © Henry Stewart Publications 1754–1662 (2008) Vol. 1, 3 000–000 Journal of Telecommunications Management

It is a 'Make and Sell', or 'push', attitude to production based on marketing predictions of sales volumes.[413]

One only has to visit one of these sites to understand how unreliable these marketing predictions can be.[413]

FORDISM

Henry Ford helped build the U.S. automobile industry by becoming a master of production methods, and using the subsequent economies of scale to progressively offer the public a better Model T at an increasingly lower price.[405]

[413] Designing a customer-driven system: Change management thinking, Barry Wrighton © Henry Stewart Publications 1754–1662 (2008) Vol. 1, 3 000–000 Journal of Telecommunications Management

[405] Alfred Sloan and Organizational Management www.melodiesinmarketing.com/2008/01/28/alfred-sloan-and-organizational-management/

Image: Portrait of **Henry Ford** (ca. 1919), Date: 1919, Source: Library of Congress, Author: Hartsook, photographer. en.wikipedia.org/wiki/File:Henry_ford_1919.jpg

He halved the cost of making cars and doubled the wages for the workers.[279]

Between 1908 and 1916 Ford also reduced prices by 58 percent.[295]

The reduction in the price of a car allowed people who previously could not afford the expensive bespoke option to become car owners. Unsurprisingly, demand increased dramatically.[413]

He was quick to establish international operations – Ford's first overseas sales branch was opened in France in 1908 and, in 1911, Ford began making cars in the UK.[295]

[412] en.wikipedia.org/wiki/Henry_Ford

[279] www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

[295] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 66-68 Copyright © 2002, John Wiley and Sons

[413] Designing a customer-driven system: Change management thinking, Barry Wrighton © Henry Stewart Publications 1754–1662 (2008) Vol. 1, 3 000–000 Journal of Telecommunications Management

A new term for Fords methods was coined called Fordism; "a model of economic expansion and technological progress based on mass production: the manufacture of standardized products in huge volumes using special purpose machinery and unskilled labor" [420] [421] coupled with high wages for workers.[412]

Henry Ford downplayed the role of Taylorism in the development of mass production at his company.[4]

However, Ford management performed time studies and experiments to mechanize their factory processes, focusing on minimizing worker movements.[4]

Management "Science" was at work.

[4] en.wikipedia.org/wiki/Mass_production

[420] en.wikipedia.org/wiki/Fordism

[421] Tolliday, Steven & Zeitlin, Jonathan. The Automobile Industry and its Workers: Between Fordism and Flexibility, St.Martin's Press (New York: 1987) pp. 1-2.

The essential core of scientific management, regarded as a philosophy, was the idea that human activity could be measured, analyzed, and controlled by techniques analogous to those that proved successful when applied to physical objects.[432]

The difference is that while Taylor focused mostly on efficiency of the worker, Ford also substituted for labor by using machines, thoughtfully arranged, wherever possible.[4]

His model ... Ts flowed out of a factory that worked like a grand machine, men and materials in harmonious flow.[1]

WORKERS AS MACHINES

While customers and shareholders of these mass production systems were happy, the workers were not.[1]

[432] Taylorism at Watertown Arsenal: Scientific Management in Action, 1908-1915, Hugh G. J. Aitken, Harvard University Press, 1960 p.16

Ford needed to hire more people to make and assemble the standardised parts. The only source of available labour was the pool of immigrants arriving on ships from Europe. These people were largely unskilled and could not speak English.[413]

He solved this problem by creating specialist functions where everyone spoke the same language and had a supervisor who spoke both English and the language of the workers.[413]

Workers were controlled ... by the repetitive tact of the assembly line, where the worker had to perform very few routine tasks within a short given timespan dictated by the assembly line.[282]

[1] 540-A brief history of Western management thought, Copyright © Vanguard Consulting Limited

[4] en.wikipedia.org/wiki/Mass_production

[413] Designing a customer-driven system: Change management thinking, Barry Wrighton © Henry Stewart Publications 1754–1662 (2008) Vol. 1, 3 000–000 Journal of Telecommunications Management

[282] "QUALITY: QUO VADIS?", The Swiss Deming Institute (December 2006): Ernst C. Glauser,
p. 10 www.deming.ch/downloads/E_quo_vadis.pdf Used with kind permission.

It meant that workers could be trained speedily and cheaply. People learned more about their specialism and less about how the whole system works.[279]

The methods used by Ford were grim and unforgiving. "How come when I want a pair of hands I get a human being as well," he complained.[295]

In his book, My Life and Work, Ford gave a chilling insight into the unforgiving logic of Scientific Management. He calculated that the production of a Model T required 7882 different operations:[288]

> *"Of these, 949 were classified as heavy work requiring strong, able-bodied, and practically physically perfect men; 3,338 required men of ordinary physical development and strength.*

[279] www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

[295] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 66-68 Copyright © 2002, John Wiley and Sons

> *The remaining 3,595 jobs were disclosed as requiring no physical exertion and could be performed by the slightest, weakest sort of men. In fact, most of them could be satisfactorily filled by women or older children.*
>
> *The lightest jobs were again classified to discover how many of them required the use of full faculties, and we found that 670 could be filled by legless men, 2,637 by one-legged men, 2 by armless men, 715 by one-armed men, and 10 by blind men."*[410]

Debased though it was, this was the logical conclusion of Scientific Management.[288]

[288] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 228-230 Copyright © 2002, John Wiley and Sons

[410] My life and work (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company p. 108 archive.org/details/mylifeworko1ford

THE $5 PER DAY PROGRAM

Ford astonished the world in 1914 by offering a $5 per day wage ($110 today), which more than doubled the rate of most of his workers.[412] [414]

Ford announced his $5-per-day program on January 5, 1914, raising the minimum daily pay from $2.34 to $5 for qualifying workers.[412]

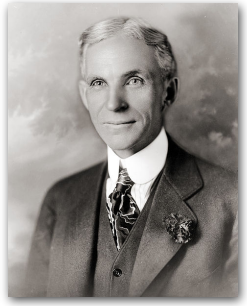
Ford's policy proved, however, that paying people more would enable Ford workers to afford the cars they were producing and be good for the economy. [412]

THE 5-DAY WORKWEEK

Ford's next act came in September 1926, when the company announced the five-day workweek. As he noted in his company's Ford News in October, [415]

[415] worldhistoryproject.org/1926/9/25/henry-ford-announces-5-day-work-week

> "Just as the eight-hour day opened our way to prosperity in America, so the five-day workweek will open our way to still greater prosperity ...
>
> It is high time to rid ourselves of the notion that leisure for workmen is either lost time or a class privilege. [415]"
>
> Henry Ford



[412] en.wikipedia.org/wiki/Henry_Ford

[414] Using the consumer price index, this was equivalent to $111.10 per day in 2008 dollars.

Image: Portrait of **Henry Ford** (ca. 1919), Date: 1919, Source: Library of Congress, Author: Hartsook, photographer. en.wikipedia.org/wiki/File:Henry_ford_1919.jpg

Both acts increased the number of applicants who wanted to work at Ford.

Here we can see applicants for work crowded into Manchester Avenue, at the Highlands Park Ford Plant.

Applicants for Work crowded into Manchester Avenue on Rumors of the Ford Bonus

Image: **Applicants for Work**, Ford Methods and the Ford Shops (1915), Author: Horace Lucien Arnold , Fay Leone Faurote, Publisher: The Engineering magazine company, Year: 1915 p.29 archive.org/details/fordmethodsandfoofaurg00g

HIGH TURNOVER OF WORKERS

Despite the high pay and reduced work hours, Ford's turnover rate was very high, some men simply walked away from the line to quit and look for a job elsewhere.[416]

Newly hired workers stayed an average of only 3 months. Many walked off the job without any formal notification and were presumed to have quit after missing five days of work: the notion of the 'five day man' was born and accounted for 71 per cent of the workers leaving Ford.[1] [411]

In 1913, Ford had to hire 50,448 men during the course of the year in order to maintain the average labour force at 13,623, an astounding 370% turnover of workers.[1]

[416] The Story of Henry Ford's $5 a Day Wages: It's Not What You Think, Tim Worstall, Contributor, 3/04/2012 www.forbes.com/sites/timworstall/2012/03/04/the-story-of-henry-fords-5-a-day-wages-its-not-what-you-think/

[1] 540-A brief history of Western management thought, Copyright © Vanguard Consulting Limited

[411] Raff and Summers 1987

THE RIVER ROUGE EXPANSION

Despite the high turnover, Ford's customers remained happy and he needed to expand.

In the late 1920s Ford moved automobile assembly to the River Rouge Plant complex in nearby Dearborn.[426]

In 1928 it had become the largest integrated factory in the world.[427]

Over 100,000 workers were employed there in the 1930s.[427]

However, workers were still unhappy; at Dearborn, in one single year, the staff turnover actually reached 900 per cent.[266]

Here we can see the sheer scale of the River Rouge Plant.

[426] en.wikipedia.org/wiki/Highland_Park_Ford_Plant

[427] en.wikipedia.org/wiki/River_Rouge_Plant

Watch video http://vimeo.com/75215471

[266] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) pp. 74-79. By permission of Ken Hopper and Will Hopper

Video: **Harvest Of The Years**, Production Company: Ford Motor Company
This movie is part of the collection: Prelinger Archives
archive.org/details/HarvestOfThe

INDUSTRIAL TOURISM

Thousands came to see Ford's flow production at the River Rouge Plant.

As it was described:

> *"From all over the world, and from all of America, come visitors by the thousand daily, some are daily citizens ... some are industrialists, scientists, students, business leaders, some are eminent engineers ...*
>
> *[to see] the city of transportation ... a complete city, a city founded on a complete idea, a different idea, a city whose every source and resource brings here the means, find here the methods, join here the opportunities to work ... to form and transform that from within this city of transportation, great values in transportation are made available to the world."* [561]

"Industrial tourism" on a grand scale had begun.

Here we can see a film made at the time describing the global interest in Ford's methods.

Watch video http://vimeo.com/75215467

[561] and Video: **Harvest Of The Years**, Production Company: Ford Motor Company
This movie is part of the collection: Prelinger Archives
archive.org/details/HarvestOfThe

BREAKING WORK INTO COMPONENTS

It is true that his assembly line was revolutionary, but [as we have discussed] it was in no way original.[422] [420]

[Fords] most original contribution to the modern world was his breaking down of complex tasks into simpler ones with the help of specialised tools.[422] [420]

This allowed for a very adaptable flexibility allowing the assembly line to change its components whenever the product being assembled, changed enough to warrant a change in tools.[422] [420]

His real accomplishment was recognizing the potential, breaking it all down into its components only to build it back up again in a more effective and productive combination, therefore to produce an optimum method for the real world.[422] [420]

The major advantages of such a change was that it cut down on the man power necessary for the factory to operate, not to mention that it deskilled the labour itself, cutting down on costs of production.[422] [420]

MASS PRODUCTION BECOMES THE NORM

The mass production of the Model T lowered its unit price, making it affordable for the average consumer.[420]

It caught the world's attention; the mass-production factory brings efficiency, efficiency means you can compete.[1]

Mass production [make and sell] became the norm.[1]

[1] 540-A brief history of Western management thought, Copyright © Vanguard Consulting Limited

[420] en.wikipedia.org/wiki/Fordism

[422] Edited by; Burrows, Rober; Gilbert, Nigel; Pollert, Anna. Fordism and Flexibility: Divisions and Change St. Martin's Press (New York: 1992)pp.13-17.

Watch video http://vimeo.com/75215469

Ford also helped out the First World War effort. He received a Navy contract to build Eagle boats … using the technique of the automobile assembly line, the hulls of eagle boats were riveted together at Ford's new River Rouge Plant.[562]

At Highland Park, Ford experimented with a small tank powered by 2 Model T engines.[562]

Italian Marxist thinker Antonio Gramsci called Fordism:

> "an ultra-modern form of production and of working methods such as is offered by the most advanced American variety, the industry of Henry Ford. [419]"
>
> Antonio Gramsci

[562] and Video: **Henry Ford's Mirror of America**, Producer: U.S. National Archives and Records Service Production Company: U.S. National Audiovisual Center
This movie is part of the collection: Prelinger Archives
archive.org/details/0528_Henry_Fords_Mirror_of_America_03_01_00_29

[419] Gramsci, Antonio. "Taylorism and Fordism." Taylorism and Fordism. www.vanderbilt.edu/AnS/Anthro/Anth101/taylorism_and_fordism.htm

Image: **Portrait of Antonio Gramsci** around 30 in the early 20s, Date: 26 April 2007, Source: eserver.org/
en.wikipedia.org/wiki/File:Gramsci.png

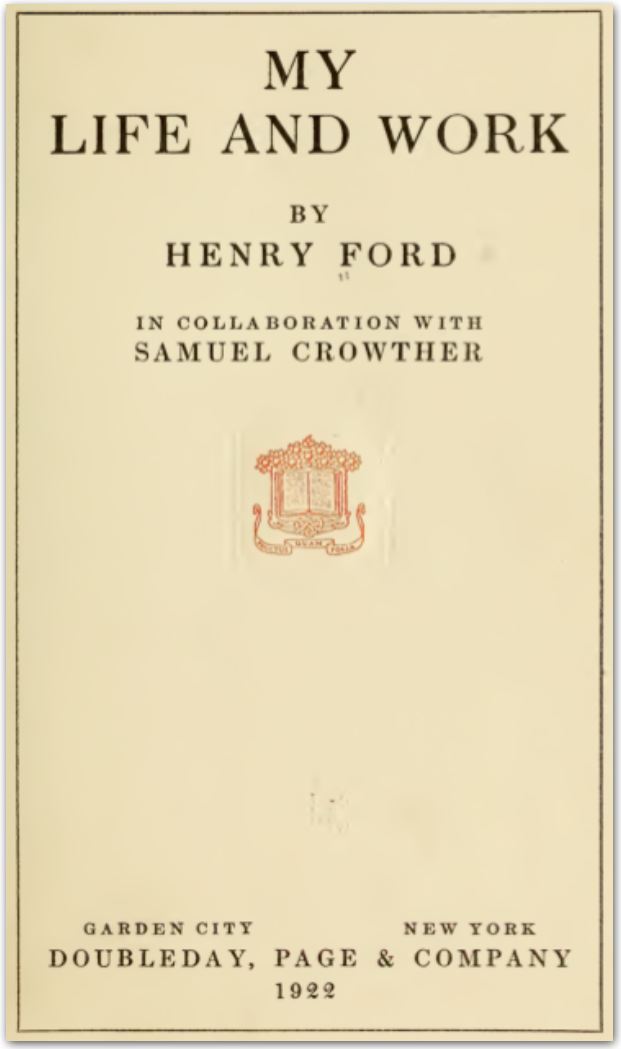
"Fordism" for Gramsci meant routinized and intensified labor to promote production.[420]

FORD - MY LIFE AND WORK

In addition to the book "Fords Methods and Ford Shops" which we discussed earlier, another seminal text was published, this time by Ford himself. It was entitled "My Life and Work".

Ford would go into great detail about the business of the Ford Motor Company and it's many innovations. Indeed, some of our discussion points thus far have come from his book.

In addition to the industrial tourists that visited Ford's plants, the books "Fords Methods and Ford Shops" and "My Life and Work", gave to the world a means by which others could could copy Ford's methods, and thereby attempt to replicate his success.



[420] en.wikipedia.org/wiki/Fordism

Image: **My Life and Work** (1922), Author: Ford, Henry, Crowther, Samuel, Publisher: Garden City, N.Y., Doubleday, Page & company Title Page archive.org/details/mylifeworko1ford

EUROPE EMBRACES FORDISM

William Morris pioneered the introduction to the United Kingdom of Henry Ford's techniques of mass production.[418]

In 1912 he designed a car, the "Bullnose" Morris and began manufacturing at a disused military training college in Cowley, Oxford.[418]

The outbreak of World War I saw the nascent car factory given over to the production of munitions but in 1919 car production recommenced rising from 400 cars in that year to 56,000 in 1925.[418]

Such was his success, during the period 1919 -1925 Morris built or purchased factories at Abingdon, Birmingham, and Swindon to add to that in Oxford.[418]

[418] en.wikipedia.org/wiki/William_Morris,_1st_Viscount_Nuffield

[420] en.wikipedia.org/wiki/Fordism

[422] Edited by; Burrows, Rober; Gilbert, Nigel; Pollert, Anna. Fordism and Flexibility: Divisions and Change St. Martin's Press (New York: 1992)pp.13-17.

After 1918, … labor efficiency thought in Europe moved to "Fordism", that is, reorganization of the entire productive process by means of the moving assembly line, standardization, and the mass market.[422] [420]

Image: **William Morris** with a prototype Minor in the summer of 1928, www.vintageminor.co.uk/history/history.htm

The grand appeal of Fordism in Europe was that it promised to sweep away all the archaic residues of pre-capitalist society by subordinating the economy, society and even human personality to the strict criteria of technical rationality.[422] [420]

Historian Thomas Hughes has detailed the way in which the Soviet Union in the 1920s and 1930s enthusiastically embraced Fordism and Taylorism, importing American experts in both fields as well as American engineering firms to build parts of its new industrial infrastructure.[420]

[420] en.wikipedia.org/wiki/Fordism

[422] Edited by; Burrows, Rober; Gilbert, Nigel; Pollert, Anna. Fordism and Flexibility: Divisions and Change St. Martin's Press (New York: 1992)pp.13-17.

[295] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 66-68 Copyright © 2002, John Wiley and Sons

[404] The Assembly Line (1908), History Day Project Made By: Matthew Wood and Maurice Braga henryfordassemblylinehistoryday.weebly.com/assembly-line.html

[562] and Video: **Henry Ford's Mirror of America**, Producer: U.S. National Archives and Records Service Production Company: U.S. National Audiovisual Center
This movie is part of the collection: Prelinger Archives
archive.org/details/0528_Henry_Fords_Mirror_of_America_03_01_00_29

THE PINNACLE OF SUCCESS

In 1919 Ford resigned as the company's President. By then the Ford company was making a car a minute. In 1923 annual sales peaked at 2,120,898.[295]

On June 4, 1924, the 10-millionth Model T rolled off the Henry Ford assembly line.[404]

Dealers sold Ford vehicles in just about every town in the land.[562]

Watch video http://vimeo.com/75215466

Watch video http://vimeo.com/75217375

Through innovative use of new mass production techniques, between 1908 and 1927 Ford produced 15 million Model Ts.[295]

On May 26, 1927, Henry Ford watched the 15 millionth Model T Ford roll off the assembly line at his factory in Highland Park, Michigan.[407]

[407] en.wikipedia.org/wiki/Ford_Model_T

[408] and Video: **Ford Model T - World's Most Famous Car**.
This movie is part of the collection: blip.tv
www.archive.org/details/Cardatavideo-FordModelTWorldsMostFamousCar152

Here you can see the 15 millionth car being completed on the production line, which is a four door convertible, and is another colour other than black. Henry Ford is in the passenger seat as it drives off the assembly line.[408]

The Ford Model T was the first automobile built by various countries simultaneously … being produced in Walkerville, Canada and in Trafford Park, Greater Manchester, England starting in 1911 and were later assembled in Germany, Argentina,[431] France, Spain, Denmark, Norway, Belgium, Brazil, Mexico, and Japan, as well as several locations throughout the US.[543] [407]

[295] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 66-68

[408] Ford Model T - World's Most Famous Car. This movie is part of the collection: blip.tv
www.archive.org/details/Cardatavideo-FordModelTWorldsMostFamousCar152

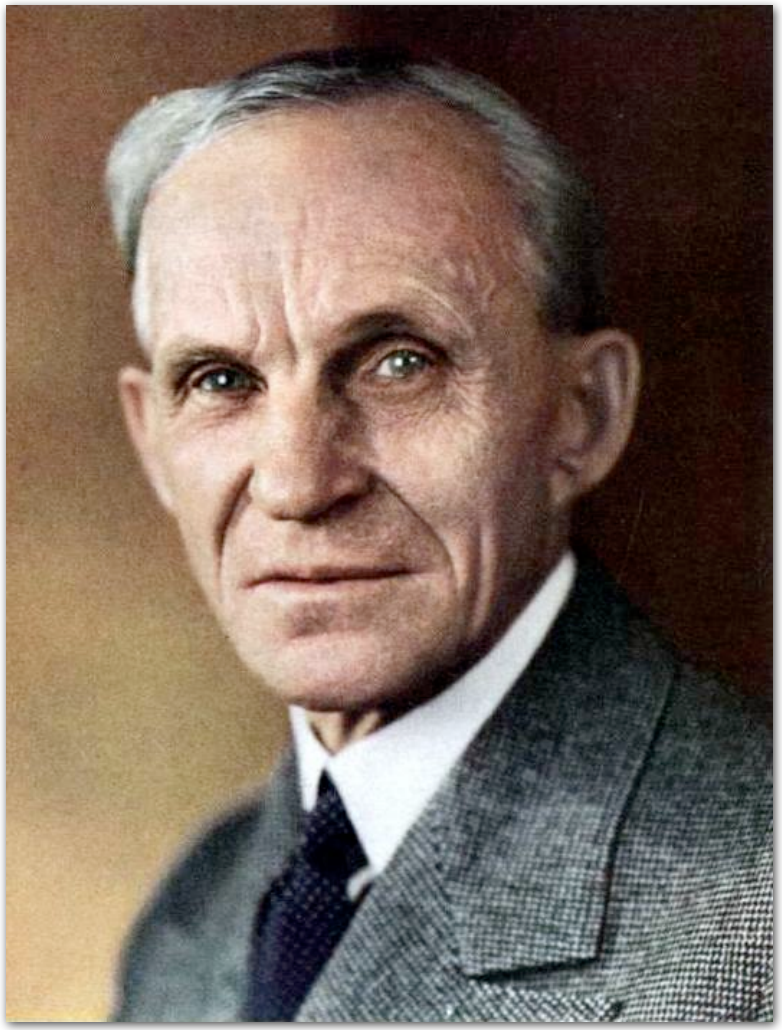
[431] Historia de Ford en Argentina" [History of Ford in Argentina] (in Spanish). Auto Historia. Retrieved 2012-12-24.

[543] "Celebrating the Ford Model T, only 100 years young!". Auto Atlantic. 2008-09. Retrieved 2012-12-24.

Watch video http://vimeo.com/75215465

Ford's production facilities expanded across America. Here we can see just some of the locations.

As owner of the Ford Motor Company, he became one of the richest and best-known people in the world.[412] It also meant his methods for designing, and managing, work spread world-wide too. His importance to the mental revolution can not be underestimated.



[412] en.wikipedia.org/wiki/Henry_Ford

Video: **An Introduction To The Ford Rouge Plant** , Producer: Ford Motor Company
This movie is part of the collection: Community Video
archive.org/details/AnIntroductionToTheFordRougePlantCa1936

Image: **Henry Ford** on the cover of Time Magazine, January 14, 1935. Copyrights on this issue were not renewed. See wikisource:Time (magazine). Date: January 14, 1935), Source: (Original text : Time Magazine), Author: Time Magazine. Original uploader was Gamaliel at en.wikipedia, Permission (Reusing this file) PD-US-NOT RENEWED. Cropped. commons.wikimedia.org/wiki/File:Timehenryford-crop.jpg

— Summary —

Scientific Management!

A Mental Revolution

In this chapter we have met the people who either continued, disseminated, implemented, published, enriched, or modified, Taylor's scientific management principles and methods. Together they all contributed to the Mental Revolution.

Frank Barkley wrote in "Frederick W. Taylor, Father of Scientific Management" (1923):

> *... [the] men to follow after him [Taylor] had to undergo a mental revolution singularly like that of a religious conversion.*
>
> *... this precise mental attitude had been taken into industry to be applied to its management in a way destined to have an ever-widening influence.*" [697]

Their mission was clear. As Harlow Stafford Person wrote in Scientific Management in American Industry (1929):

[698] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.2, Publisher: New York, London, Harper and Brothers pp. 124-125 archive.org/details/frederickwtaylor02copl

> *The mental revolution must be carried beyond the individual plant, beyond the total industrial organization, until it embraces the mind of the entire community.*" [696]

Through their work, the Mental Revolution spread way beyond the factory floor. As Person later wrote:

> *Taylor's mental revolution is proceeding through industry out into the world.* " [696]

Barkley would reflect on it's global influence:

> *Few of us have known it in all these succeeding years; but looking back now, we can see that it was a dramatic moment—the herald, indeed, of what Taylor, in view of the novelty of this attitude and gesture in industry, was fully justified in calling a " great mental revolution." ...* " [697]

[696] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 455-457 archive.org/details/scientificmanageootayl

[697] Frederick W. Taylor, Father of Scientific Management (1923), Author: Copley, Frank Barkley, Volume: v.1, Publisher: New York, London, Harper and Brothers p.94 archive.org/details/frederickwtaylor01copl

That influence continues today. David Boyle stated in BBC History Magazine:

> "The robots have taken over the factories - the masses don't work there any more - and we can have any colour we like, despite Ford's insistence that it had to be black.
>
> But we are not necessarily in a 'post-Taylor' one. [275] "
>
> David Boyle

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

2011 marked the one-hundredth anniversary of the publication of Taylor's "Principles of Scientific Management".

Even though Taylor wrote his seminal text over 100 years ago, the lasting effects of Taylors principles are seen on all sides in industry, commerce and government.[279]

2013 marks the one-hundredth anniversary of Ford's moving assembly line.

Ford's theories of work of; mass production, mass consumerism, economies of scale, standardization, departmental "factories", make and sell; push production, and forecasting, can still all be seen today.

His 5 day week, 8 hour day is commonplace.

[279] www.systemsthinking.co.uk Copyright © Vanguard Consulting Limited

Image: **David Boyle** www.david-boyle.co.uk/IMAGES/clip_image002_000.gif

But is this not just interesting history? Despite what Boyle says, have we not moved on?

In 2000, the International Labor Organisation published an article called "A comeback for Taylorism?" [257]

In the article it was described that:

> "*... today it is widely felt that the trend toward humanizing work has ended, and that Taylorized, heteronomous work is on the upsurge again. ... complex work processes in banking, insurance and other data processing sectors are being broken down into tiny units, standardized and thus made suitable for low-skilled, monotonous work.* [545] "

As I did in chapter three, I would argue that many of methods discussed in this chapter bear a remarkable similarity to methods employed in our organisations today.

Managers of these organisations think of their job as continually juggling the following equation: how much work is coming in, how many people do I have, and how long do people take to do things? [519]

Central to this production-driven view is that activity equals cost; hence, the argument goes, the more we reduce activity times the more we cut costs.[519]

Just as each of the scientific management proponents we have met in this chapter looked to do, today's managers are constantly looking for new ways to do three things: standardise work, reduce activity times and drive out waste. [519]

[257] FREDERICK WINSLOW TAYLOR, Author: Bill Barry, Community College of Baltimore County, and The St. James Encyclopedia of Labor History Worldwide (2004), used with kind permission.

[545] World of Work, No. 38, January/February 2001 - "A Comeback for Taylorism? A Report from Germany"

[519] TRANSFORMATION 2010, How lean became mean, Professor John Seddon March 2010

Just like Taylor and Ford, the view of managers today is that they have a resource management problem. How do we get workers to go faster? [544]

To improve operations they give workers job aids to help people speed up, and to reduce average activity times they increase specialisation of the workers; as that reduces the training costs, they standardise work processes in the belief that standardised operations will make work more efficient, they break work into sub tasks then put similar kinds of work into particular "factories"; each sub task having its own standard times (sometimes known as should take times [279]), which are then inspected in the belief that this achieves quality control.[544]

Managers today believe that this will all increase efficiency and cut costs, just as each

[279] www.systemsthinking.co.uk

and every of our promulgators and proponents we have met in this chapter did.

This is music to today's efficiency experts ears. They go about repeating the same methods we have discussed in this chapter, all in the name of improving efficiency, all the time reenforcing the status quo.

It is claimed that these methods are "new", that they have originated from exemplary companies. For example, many believe the notions of removing waste, reducing delays and queues, ensuring tidy workspaces; with everything in their place, performing time and motion studies; with the aim of reducing worker over motion, all originate from the Toyota Production System; and are encapsulated in Lean, yet, as we have seen, they were in common use in the late 1800s and early 1900s.

[544] Rethinking Lean Service, John Seddon
www.thesystemsthinkingreview.co.uk/index.php?pg=18&backto=1&utwkstoryid=186

As we have also discussed, one of the architects of the Toyota Production System, Dr. Shingo, clearly states in his books that he was influenced by many before him such as Taylor.[300]

Charles Bedaux's quick fix is often repeated today, where the fastest route to change is sought by an organization's management; consultants are hired, who bring with them "best practices", sometimes under their own brand names, to propagandize.

Unfortunately, as discussed in the introduction to this book; all the research and experience show that the latest panacea does no better than its predecessors.[6]

However, our organizations keep repeating this method, hiring another set of consultants who peddle another "quick fix".

Just as Bedaux's success exemplified, the only winners in this game are the consultants.

We are still fixated on industrial based approaches today, and are inventing evermore ingenious devices to solve the same problems managers of organisations thought that had over 100 years ago.

For example, in this chapter we discussed time clocks as an example of this phenomenon.

More recently, time clocks have started to adopt technology commonly seen in phones and tablets - called 'Smartclocks'. Some of the smartclocks use front facing cameras to capture employee clock-ins.[521]

6 The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) p.42. By permission of Ken Hopper and Will Hopper

300 The legacy of Dr. Shingo and his influence on TPS, By Art Smalley, President, Art of Lean, Inc. www.artoflean.com

521 en.wikipedia.org/wiki/Time_clock

With the increasing popularity of cloud based software, some of the newer time clocks are built to work seamlessly with the cloud.[530] [521] New technology, same thinking.

We have seen technology added to typewriters; the birth of using technology to evaluate worker efficiency, that has been taken to new levels today; from call centers where technology captures how long an agent spends on a call, to computer programmers who are paid for lines of code written, to engineers who have GPS installed to monitor their whereabouts and their travel times from job to job.

We are impressed with our own ingenuity, our mastery of technology, yet all we are really doing is reinventing the wheel, and preventing real change in how we design and manage work.

[530] David Needle, TabTimes, Android tablet gives old punch card time clock facelift
tabtimes.com/news/ittech-solutions/2011/11/18/android-tablet-gives-old-punch-card-time-clock-facelift

text

The method of Time Tickets is still in use today. I have seen recent presentations at IT conferences where the practice of recording times for tickets of work are advocated, with the aim to improve efficiency by reducing delays, reducing wait times, and removing waste.

We have discussed the use of Job Cards:

> *Each pigeon hole shows at a glance what labor has been done on the job it represents, when, and by whom. Every empty pigeon hole testifies to a job so far untouched, and so on.*[343]
>
> *Upon the completion of the job represented by the card, the workman will remove the card [and] ... note the time of its completion on its face. ...* [319]

[319] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 202-207
archive.org/details/costkeepingscienooevan

[343] The Cost of Manufacturers and the Administration of Workshops by Henry Metcalfe Publisher: John Wiley & Sons New York (1890) pp. 152-155
archive.org/details/costofmanufacturoometc

[521] en.wikipedia.org/wiki/Time_clock

After the work has been moved, the move man will initial the card and return it to the planning department, this serving as a notice to this department that the work is at the next machine.

While each man has a definite duty to perform the result of his work must be passed along to the next man, and the next, until the job is complete.

This method will be continued from machine to machine until the work is inspected and ready for delivery. [319]"

Reading the above text that will be nothing new to today's knowledge workers using Agile methods, except today's pigeon hole is called an Agile "Card Wall" or "Kanban System", initials are called an avatar, inspection is termed testing, and the planning department is called a Project Manager.

We have discussed the birth what was called the "thinking department"; a place where strategies, plans, procedures and policies are devised and cascaded down the organisation, that today it is known as the Head Office, Headquarters (HQ), or as John Seddon has termed it; "The Management Factory".

We have seen the further specialization of separate functions that we would recognise today, each with their own department head, and have seen how every function is provided with a definite target at which to aim.[372]

Today the only people who don't think functionally, are the customers of an organization and its CEO.

[319] Cost Keeping and Scientific Management (1911), Author: Evans, Holden A, Publisher: New York [etc.] McGraw-Hill book company pp. 202-207 archive.org/details/costkeepingscienooevan

[372] Scientific Management in American Industry, by the Taylor Society, H. S. Person, editor (1929), Author: Taylor Society; Person, Harlow S. (Harlow Stafford), 1875-1955, Publisher: New York and London, Harper & Brothers pp. 389-397 archive.org/details/scientificmanageootayl

We have seen that Gantt's end of year Permanent Record Cards are similar in nature to what we would recognise today as the annual appraisal records.

His ideas of monthly inspection reports are still in use today, as are tickets recording defects that are passed back to workers having failed quality inspection. The given today is that something needs testing, we inspect quality out.

Gantt's charts allowed for management to remain in their offices and rely on these charts, prepared by a separate office, as an indicator of progress. This separation from work occurs and a reliance on reports is the norm today.

Despite being invented over 100 years ago, Gantt charts are used by millions of people

[263] Taylor Timeline. Author: Bill Barry, Community College of Baltimore County, used with kind permission.

in the world of work today, albeit in a shiny computerized version.

We have seen the "task-plus-bonus" established as a traditional measure.[263]

Today fewer organisation set a reward in the form of a bonus for a day's work (although it is still used), however extrinsic motivation in the form of achieving a bonus against a target or an end of year bonus is still commonplace.

We have Gantt to thank for this.

As I identified in chapter three with Taylor, today, Gantt too, would look upon the use of so many of his theories of work with pride.

Many of the proponents we have discussed, like many people today, were fixated on increasing utilisation of the workforce and removing "idleness".

I was told a story the other day that sums up the 21st century workplace and the relentless focus on 'being busy'.

The person in question had worked for the same company for over 20 years, and told me "When I used to ask a work colleague how they were, we would engage in a conversation, now when I ask how they are they always say "Busy!".

The use of written documentation for each part of a worker's job, inherent in scientific management, is strikingly prescient of the procedural documentation in use in the ISO 9000 series of quality standards.[265]

Today, instructions for many tasks are documented that the recipient must follow, and are inspected to ensure that they have done so. A call center script would be one such example.

John Seddon argues:

> "The obsession with industrial design principles such as maximizing resource loading must be seen for what it is: a plausible but wrongheaded ideology. [344]"
>
> John Seddon - Occupational Psychologist

[344] Dissolving a Dangerous Enthusiasm: Taking a Systems Approach to IT Systems, by John Seddon, Cutter IT Journal Vol. 26, No.4, April 2013, Cutter Consortium

[265] Frederick Winslow Taylor - Chartered Management Institute - www.mbsportal.bl.uk/taster/subjareas/busmanhist/mgmtthinkers/taylor.aspx

We have discussed how McCelland described what he called "Standard Practice Books", today we would call this "Documented Best Practice".

The Ford Motor Company was so successful it led to full scale industrial tourism. It also led to the codification of his methods, which in turn led to the copying of "best practices", with the aim of achieving similar results, even if the organization in question was not an automobile manufacturer. This is still prevalent today.

In many of today's organisation employees are forced into a bell curve[507] with employees receiving performance rewards based upon their position in the forced ranking.

[507] Forced Distribution (Bell Curving Employee Performance Appraisals), Published on: January 10, 2012, Charles Jamieson, Jamieson Human Resource Consulting Ltd. www.jamiesonhr.com/article/2012/1/10/forced-distribution-bell-curving-employee-performance-appraisals.aspx

Employees are categorised, using terms such as "below average", "average" or "above average". Other terms may be used such as 'A' players or the "Top 20%".

As we have discussed, Emerson's method for evaluating the workers and placing them on a graph was remarkably prescient of this approach.

We have discussed how similar methods of office worker appraisal and ratings for salary increase described by Parsons in 1917 are used today.

We saw Parson's methods for keeping records and limits for absences that are also still used today, typically in a spreadsheet by a central function like HR. We also saw his graphical vacation schedules and enforced vacation method, again both of which are still used by many of today's organizations.

We have seen job applicant tests taken from "Scientific Management in American Industry" that are not to dissimilar from those that are still in use to test applicants today. Many organisations still use testing as a method for recruitment. These tests are still "administered by people thoroughly trained in their use" as was recommended in the 1929 text.

Although the mental revolution has occurred the name Scientific Management is, in reality, misleading. There was nothing really scientific about Scientific Management.[290]

Apart from statistical quality control, which was a much later development[290] (and one we will explore in a future chapter), the nearest that Taylorism's practitioners ever came to scientific method was the use of elementary arithmetic.[290]

[289] Stewart, Thomas, Intellectual Capital, Nicholas Brealey, London, 1997.

[288] The Ultimate Business Guru Guide: The Greatest Thinkers Who Made Management , 2nd Edition, Stuart Crainer, Des Dearlove, John Wiley and Sons, Oct 1, 2002, pp. 228-230 Copyright © 2002, John Wiley and Sons

We heard from the management guru Peter Drucker at the end of the previous chapter.

Drucker argued that 'to take apart and to put together are different things. To confuse the two is grossly unscientific.' [288]

The other blemish, said Drucker, was to fail to recognize that 'planning and doing are separate parts of the same job; they are not separate jobs' [288] [289]

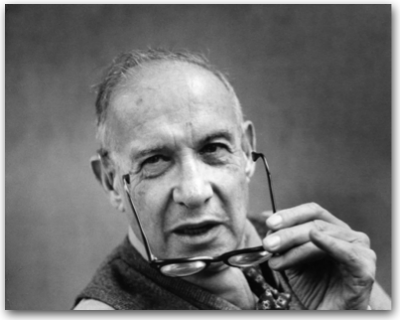
That didn't hinder its spread however, nor that it became ingrained as the method for designing and managing work.

Peter Drucker sent a warning to managers in the 1950s, to the effect that they should not treat their staff as machines. The advice went unheeded.[292]

[290] The Puritan Gift: triumph, collapse and revival of an American dream, Kenneth Hopper and William Hopper, I. B. Tauris (April 3, 2007) p. 80. By permission of Ken Hopper and Will Hopper

[292] The Vanguard Guide to Understanding your Organisation as a System, Copyright © 2001, Vanguard Consulting Limited

> "Most organizations are being run very much the way they were when I first started to study them.
>
> We have a lot of new tools, but not very many new ideas," [287 291]
>
> Peter Drucker



... lamented Drucker in 1995.[287 291]

As we have discussed in the previous chapters it is likely he would still feel the same way in 2013.

Most people in work today would not be able to articulate that they are working in a Scientific Management system, it is no longer common business language, however they are; as David Boyle succinctly put it; "Taylor the man who made us all work like this".[275]

A further mental revolution is required for today's organisations' to really change. The irony is, that Scientific Management was the last mental revolution to take place in industry.

It's remarkable that Taylors mental revolution did indeed take hold, and even more remarkable that it has never let go.

[275] BBC History Magazine www.historyextra.com and Frederick Winslow Taylor The man who made us all work like this..., David Boyle, BBC History Magazine, June 2003 david-boyle.co.uk/history/frederickwinslowtaylor.html

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291 'Managing in a time of great change', Business Week On-line conference, 14 December 1995.

Image: **Peter Drucker**, Photograph Courtesy of The Drucker Institute at Claremont Graduate University

Design and Management
— Concepts —

- Command and Control; A Global Management Mental Revolution.
- The Efficiency Expert.
- The Bonus System.
- Gantt Charts; Planning Work, Presenting Facts about Progress, and Scorecards.
- Getting Work Done on Time, Standard Times, and Service Levels
- Time and Motion Studies.
- Removing Idleness and Waste.
- Moving the Work to the Workers (the Moving Assembly Line).
- Task Cards and Time Clocks.
- Worker Report Cards, Inspection of Performance Performance Reviews, and Removing “Dead Wood” and Laggards.
- Forced Employee Ranking; the “Bell Curve”.
- Inspection of Workers, Supervisors and Executives.
- Vacation Schedules and Records of Absence.
- Quick Fix Change Programs.
- Functions with Department Heads and Targets.

Design and Management
— Concepts —

- Quality Inspection
- Activity Based Accounting
- Mass Management Education, Courses and Literature.
- Documented Best Practices, Codification of Method, Written Documentation and Instructions.
- Assessing Job Applications Through Tests.
- Breaking Work Down into Components, and Specialized Departmental “Factories”.
- Scientific Management Applied to the Office.
- The Head Office
- Technology to Aid Efficiency
- Fordism.
- Flow Production, Routinized and Intensified Labor, Analysis and Documentation of Processes.
- Consumerism; Build, Market, Sell, Service.
- International Operations and Franchising Systems.
- The 8 Hour Day and 5 Day Week.
- Company Discount Schemes.

In our next chapter we will look at the rise of administration, bureaucracy and management by numbers.

— Footnote —

Management Science

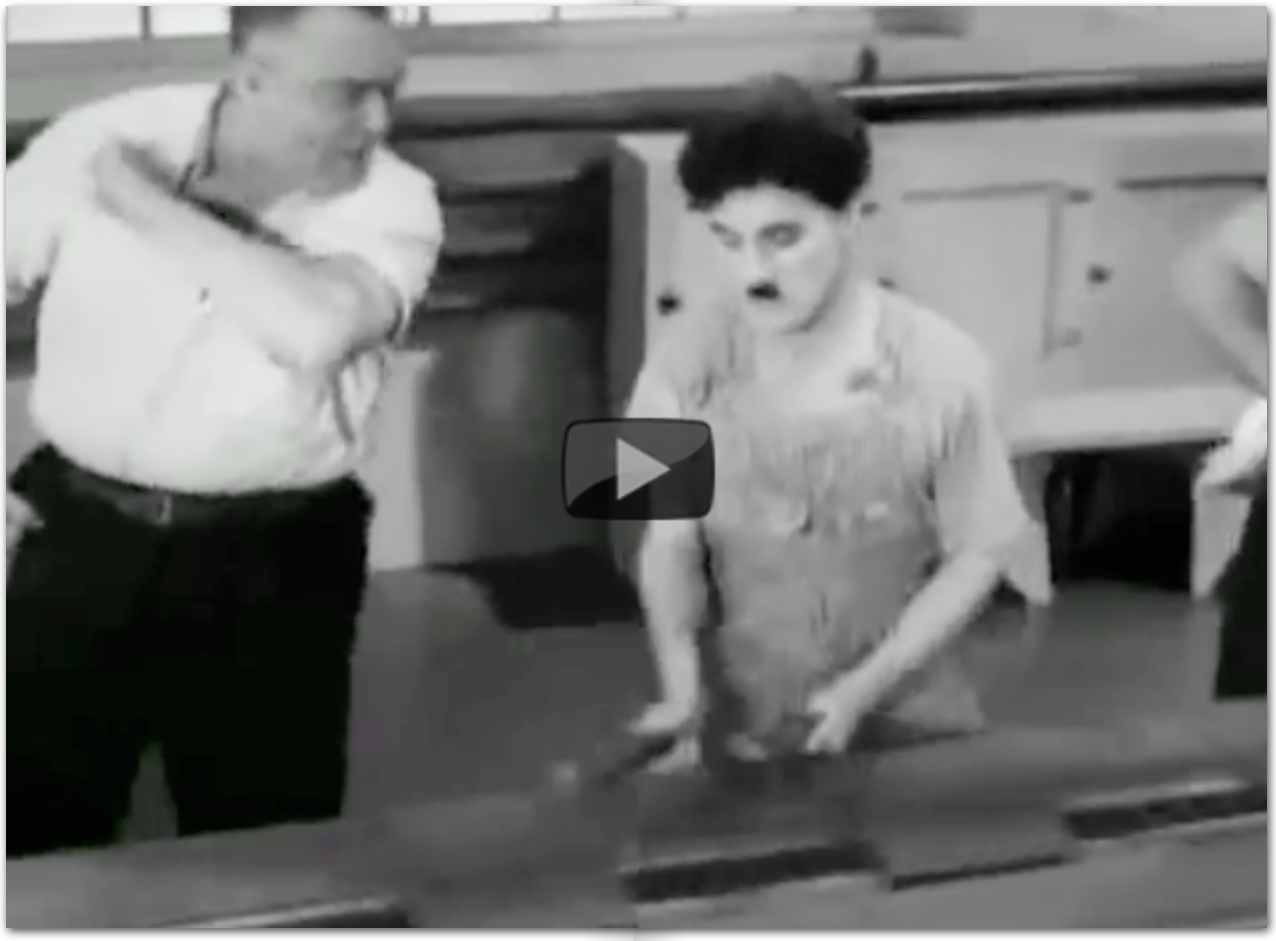
One of Charlie Chaplin's most famous movies, Modern Times, parodied Scientific Management.[327]

The film opens with an image of a clock and shows workers toiling on assembly lines. Chaplin's character is even fed food by a machine, and later gets sucked into and becomes a part of another machine.[327]

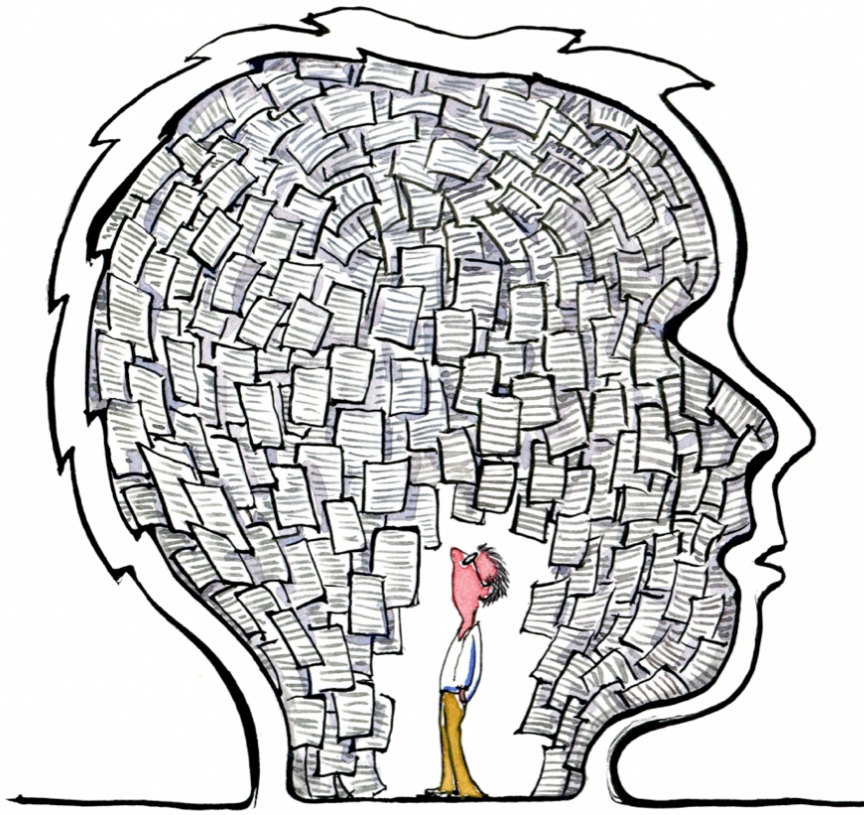
You can see an excerpt from the movie overleaf.

[327] An Analytical Study On Scientific Management HRM 601, Akeem Adebiyi Adeyemi Ersal Aslam Alan Cohen Sangram Singh Jolanta Soltis

Watch video http://www.youtube.com/watch?v=DfGs2Y5WJ14&



Chapter Four:
Scientific Management!
A Mental Revolution



By David Joyce

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