Its progress, however, was always painfully slow. There were few sudden jumps in invention or discovery. Taylor's genius was the proverbial capacity for taking infinite pains.

An egotistic desire to be original, to do great and glorious things, to be revolutionary, is notoriously a weakness of youth. If Taylor himself really came to do great things, it was just because the desire to do them was early knocked out of him. Beginning in the management field with no desire other than that of adding his humble improvement to what had been found good, he followed a strictly evolutionary course throughout. [Volume I, page 196.]

Ultimately he had the satisfaction of seeing his ideas triumph and command the admiration of all who grasped them.

"It is my belief," says Mr. Charles L. Holmes, "that in a man's life he has only one great experience, and my great experience was meeting Mr. Taylor." [Volume I, page 375.]

Mr. Copley tells us that scores of men ascribe their development to some contact with Taylor. Justice Brandeis of the Supreme Court says,

"I quickly recognized that in Mr. Taylor I had met a really great man—great not only in mental capacity, but in character." [Volume II, page 371.]

Milestones of Progress

The chief periods in Taylor's unique career were: (1) the years spent as an apprentice in the Enterprise Hydraulic Works in Philadelphia [1874-1878], (2) those spent as an employee of the Midvale Steel Company [1878-1890], (3) those at the Bethlehem Steel Co. [1898-1901], (4) the remainder of his life [1901-1915] when he played the part of unpaid missionary or teacher of scientific management.

The second period, the twelve years spent at Midvale, with William Sellers, was the most active period of Taylor's life. The four years before going there were years of unconscious preparation for what followed, while after leaving Midvale his life was spent in applying and expanding what he had discovered there.

Of those twelve full years at Midvale, Copley writes:

Going to Midvale when he was twenty-two and leaving there when he was thirty-four, he packed into those twelve years of his young manhood an aggregate of achievements which, without exaggeration, can be called exceptional. While he was acquiring the expertness at tennis that enabled him to win with Clark the doubles championship of the United States in 1881, he had begun the study at night that qualified him for the degree of M. E. he obtained at Stevens in 1883. From 1878 on to about 1881 he resorted to every method he could think of to force his men to increase their production; then came his time-study, metal-cutting, and belting investigations, and the years of wearing struggle to build up a system and develop an organization that would facilitate the establishment and maintenance of his scientifically determined standards. In the meantime he met the claims of friendship, won a wife, and established a home of his own. In 1883 and 1884 he designed and superintended the construction of a new machine shop having many novel features. In 1886, two years after his marriage, he joined the A. S. M. E., became an attentive student of its papers, and prepared one of his own (on the use of gas in open-hearth furnaces). As a master mechanic and chief engineer he became responsible for all repairs and maintenance throughout the works. And all along he poured out his ingenuity in the invention, not only of management devices, but of purely mechanical; this latter form culminating in the designing, apparently in the latter part of 1889, of his great and revolutionary steam hammer. [Volume I, page 332.]

But the most remarkable part of it is this: . . . he developed, *single-handed*, a system of shop management the like of which never had been known before, and despite the opposition his radically new ways were bound to arouse, put the thing into effect with such success that he brought the entire works around to it. [Volume I, page 117.]

After these Midvale days, Taylor's most notable work was [1898-1901] with the Bethlehem Steel [formerly Iron] Company, where he, with Maunsel White, discovered "high speed steel."

After this, i.e., beginning in 1901, Taylor stopped working for money. He had accumulated a fortune, though only a trifle compared with the fortunes he had made and continued to make for his fellowmen.

In 1910 when the railways were asking for increased rates, Taylor and his ideas came into the limelight because Louis Brandeis, now Justice of the United States Supreme Court, brought forward eleven witnesses to show that by means of Taylor's "Scientific Management," the railways could so reduce their costs as to gain more than by their proposed increase in rates.

This publicity was overdone and, as Taylor feared it would, it damaged as much as helped the movement, especially by encouraging charlatans to rush into the field of "efficiency engineering." Like any other counterfeits, they have often been mistaken for the genuine article.

To Stop "Soldiering"

We may trace the beginnings of Taylor's study in trying to stop the universal "soldiering," or shirking of workmen.

Taylor was convinced through his life that practically all workmen in industry, except the few under scientific management, soldiered.

He confesses that as a workman, he himself "soldiered" with the rest. In fact, he sympathized with them, under the circumstances. Nor did he ever lose their point of view or regard them as solely to blame.

It was because of his loathing of soldiering, or the system causing it, and of his persistent efforts to find some way to stop it that he was led, step by step, to what is now called the Taylor System.

As soon as he became gang boss, he sought to stop soldiering. At that time the only way he could think of was by instilling fear. That was the traditional way and Taylor simply sought to make this fear-method more frightful.

But Taylor did not find it easy to make workmen work against their wills. They tried every possible way to circumvent him, even sabotage, and often nearly persuaded the management that Taylor was responsible for these "accidents" because he drove both man and machine too fast.

Almost anyone but Taylor would have failed utterly, but he knew, from his own experience as a workman, that the soldiering was genuine and the "accidents" a sham, while the management knew, from Taylor's antecedents and character, that he was to be depended upon. He was indefatigable and undaunted even by frequent threats against his life.

He threatened in his turn. He also tried fines. Sometimes in justice, he had to fine himself for misplacing tools or otherwise breaking his own rules.

This spectacle of his fining himself provided amusement for the entire establishment; but it was an early example of his principle of one law for all, high and low, and the lesson of it was not lost. [Volume I, page 172.]

But neither threats, cursing, fines, firing men, hiring others nor teaching them the trade succeeded, at first, in overcoming the sullen resistance of his men. Ultimately, however, after three years, they got sick of being fined, their opposition broke down, and they promised to do a fair day's work and did.

He had succeeded "in doubling the output of the men on the whole."[3] But he was far from satisfied.

"It is a horrid life for any man to live, not to be able to look any workman in the face all day long without seeing hostility there, and feeling that every man around you is your virtual enemy." [Volume I, page 5.]

Yet he did not relinquish his faith in fear as a driving force, though he came to feel the urgent need of supplementing this force by other forces. He explored further, and it was this exploration which led to scientific management.

We may perhaps register as the second step in Taylor's progress, a reconsideration of the reasons for soldiering, a clearer diagnosis. Why, he asked, do workmen so generally *want* to shirk? If only workmen could be led to put more will into promoting instead of retarding the work of the shop!

Taylor became conscious of several reasons for soldiering. One was the almost universal ignorance, on the part of the employers, of what constitutes a day's work. Another was the fact that when men work in large groups, individual incentive is lost. A third reason was that the clumsy efforts of employers to remedy this by substituting piece rates for day rates proved self-defeating, for the instant the piece rates operated to increase daily earnings, the rates were cut. Then the workmen "become imbued with a grim determination to have no more cuts if soldiering can prevent it."[4]

A Fair Day's Work

With this threefold diagnosis of the soldiering disease—ignorance of what constitutes a day's work, herding of workmen together, and rate cutting, not to mention other complications—Taylor set out first of all to discover, by scientific experiment, what constitutes a fair day's work in any concrete case.

His main idea was that, once the employer knows that a workman can do twice, three times, or four times what he actually does do, the higher standard can be insisted upon, and piece rates can be established which will not have to be cut.

Here entered the stop-watch idea which later became a chief target of criticism. Evidently the way to ascertain what labor can do is to measure the time it takes.

Taylor tells us that the stop-watch idea was first suggested in his school days at Exeter, when his mathematics professor, Wentworth, used this method for ascertaining what was the proper length of lesson to assign to his classes. He had each student raise his hand as soon as a certain problem was solved until just half had done so, and recorded this last or median time with a stop watch.

Little did "Bull" Wentworth, famous as the author of mathematical text books, realize that this idea, implanted in the fertile mind of one of his students,

[3] Volume I, page 214.

[4] "Principles of Scientific Management," page 23.