The Link-Belt Company occupies an important place in the history of scientific management. After 1907, as one of Frederick W. Taylor's famous showcase firms, it epitomized the "mental revolution" in cooperative and efficient production. The company's top executives, James Mapes Dodge and Charles Piez, ranked among Taylor's most ardent supporters, and Link-Belt employees often expressed their satisfaction with Taylor's system. However, there was another side to the Link-Belt experience. An examination of the firm's industrial relations from 1900 to 1940 underscores the limited impact of scientific management in an important area of industrial management: contrary to their statements, Link-Belt executives never relied on scientific management to promote industrial peace. The company's labor management strategy had combined trade association and corporate welfare activities with Taylorism from the beginning, and after World War I, scientific management became even less important in defining the relations between employer and employees.

Similarly, a reluctance to join in organized labor's attack on scientific management did not signify that Link-Belt workers were indifferent to trade union promises of higher wages and better working conditions. On three occasions labor activists threatened to organize the company's Chicago plant. With each
challenge, Link-Belt executives used every available means to oppose unionization and collective bargaining. Far from a celebration of Taylor’s methods and the “mental revolution,” the Link-Belt experience exposes the limits of scientific management in satisfying workers’ aspirations.

The Link-Belt Company grew out of a small Chicago enterprise that began manufacturing a new detachable-link chain for agricultural equipment in 1875. Link-Belt chain quickly transcended its original use in farm equipment and became an important component in elevating and conveying machinery. Over the next five decades, the company expanded its facilities and diversified its product line, initially to meet customer demand and later to maintain its position in a competitive market. By 1930, Link-Belt was a well-established engineering firm specializing in materials handling equipment, with corporate headquarters in Chicago and primary manufacturing facilities in Chicago, Philadelphia, and Indianapolis. Although some work at the three manufacturing sites overlapped, each plant specialized in particular activities, serving complementary purposes in the company’s overall manufacturing business. The Indianapolis plant made a wide variety of chain products sold to basic industries and used in Chicago and Philadelphia as components of other Link-Belt goods. The Chicago facilities did contract engineering and produced cranes, steam shovels, electric hoists, and other heavy earth moving equipment. Link-Belt’s Philadelphia shops specialized in designing and installing the customized transmission and conveying systems that fueled the growing mass-production industries.

At first, Link-Belt’s expansion and diversification had little effect on the company’s social structure or management practices. Before 1906, several levels of authority existed in the Chicago shops. Each department foreman set wages and controlled hiring, firing, and shop discipline in his own area. The foremen coordinated the efforts of a highly skilled, technically knowledgeable, and versatile work force, but the workers themselves determined production methods. Company executives and engineers, including Charles Piez, Link-Belt president and head of the Chicago operation, maintained offices right in the shops, where they did estimating, engineering, designing, drafting, and experimental work in conjunction with foremen and craftsmen. Everyone from
the greenest hand to the company president intermingled on the shop floor.²

While foremen and individual workers ironed out most labor grievances at the point of conflict, sometimes workers resorted to other means. Occasionally, they appealed to the plant superintendent or higher company officials to resolve disputes. In other cases, they looked to unions for support. Link-Belt carpenters, millwrights, machinists, and molders successfully organized the Chicago plant at the turn of the century. As part of a citywide drive to gain union recognition, the nine-hour day, and better working conditions, machinists and molders waged at least four strikes at Link-Belt between 1900 and 1906. In conjunction with other Chicago metal trades employers, Link-Belt signed agreements with the International Association of Machinists (IAM) between 1900 and 1903, and during these years the union's business agent and shop stewards had considerable voice in settling grievances, setting wage rates, and defining production norms.³

Responsibilities for meeting production schedules fell on foremen's shoulders. In fulfilling these duties, they exerted far less control than in dictating the terms of employment. In addition to a work pace determined by the craftsmen's notion of a fair day's work, foremen had to cope with periodic shortages of material, machinery breakdowns, production bottlenecks that disrupted work flow between departments, and the continual need to set aside partially completed work to produce rush orders. Often the obstacles delayed shipments until well after the delivery dates promised to customers.⁴

The nature of Link-Belt products limited the use of rigid production techniques and schedule. Except for the company's wide variety of standard chain products, business was done by special order. Marketing heavy machinery and conveying systems designed to meet the specific needs of each client called for customized chain, special devices, and new forms of conveyors. Producing an order for a production-line conveyor system used to refine Cuban sugar might be followed by another for a coal storage system capable of handling two hundred tons per hour and involving feeders, crushers, bucket carriers, storage bins, a cable car system, and a locomotive crane.⁵ The shops required a wide variety of skills and enough flexibility to accommodate such dramatic switches in production.
The foundation for scientific management at Link-Belt was laid in Philadelphia. To eliminate some bottlenecks and systematize the shops, James Mapes Dodge, who headed Philadelphia’s operation, hired Louis Wright, a former apprentice under Frederick W. Taylor, as plant superintendent in 1889. Dodge credited Wright with giving Link-Belt its “first jolt in [the] direction” of scientific management, stating that “as soon as he became our superintendent he put in all the new wrinkles he brought with him from the Midvale Steel Co.” Wright’s efforts included the introduction of a bulletin board, shop notices spelling out job instructions and rules, and new routing procedures, involving “circulating bills-of-material” that documented worker accountability for specific tasks.  

Louis Wright left Link-Belt after two years, but systematization continued throughout the decade. Company executives departmentalized production and implemented new accounting methods, work rules, and bureaucratic labor control mechanisms, including a “Time Recorder.” Between 1890 and 1903, the supervisory staff doubled and the nonproduction managerial staff nearly tripled. Higher management chipped away at the foremen’s empire by delegating some supervisory tasks to “assistant foremen,” and by restricting the foremen’s ability to hire, fire, and set wages at will. By the turn of the century, Link-Belt management had paved the way for a smooth transition to scientific management.

Link-Belt was among the first companies to install Taylor’s system. Taylor’s most orthodox student, Carl Barth, oversaw the installations. Barth’s work coincided with retooling the plants to utilize high-speed steel cutting tools, converting from partial to full electrification, and installing individual motor drives on all machinery. In 1904, Barth began his preliminary work in Philadelphia by standardizing and upgrading machinery, tools, and other equipment, redesigning the shop floor layout, and experimenting to determine the proper speeds and feeds for machining different types of metal with high-speed steel. Gradually, skilled workers were promoted and trained as functional foremen. Some former foremen and skilled workers joined draftsmen and engineers in setting up the planning room and designing instruction cards and other recordkeeping forms.

More than a year passed before Dwight Merrick, a former Link-Belt draftsman promoted to assist Barth, began time stud-
ies. Merrick proceeded cautiously after Philadelphia's machine shop workers objected to the stopwatch. Barth and Link-Belt Superintendent Willis Adams took two of the younger machinists aside to explain how they could earn 35 percent over their day rate by "working under instructions and direct supervision." The young machinists agreed to try it and their wages immediately averaged 40 percent more than those of veteran coworkers. The two machinists worked under functional foremen, but their work involved no time study, no slide rule calculations, no detailed instruction cards, or any discernable new work methods. Other Link-Belt machinists stood on the sidelines for some time, comparing their relatively thinner pay envelopes to those of the two young men. Eventually, a worker with fifteen years' seniority succumbed, deciding he wanted a chance to earn the higher wage. Thereafter, others approached Adams asking "to be put on that kind of work." As resistance eroded, Barth and Adams introduced new elements of the system "little by little," including "time study and task work with bonus, for which, later on, Mr. Taylor's differential rate was substituted."

To maintain the employees' confidence throughout this process, Link-Belt managers assured workers that once time studies were taken and fair piece rates established, there would be no tampering with the rates. It was management's duty to eliminate disruptions and provide workers with the best equipment and materials. No matter how much money a worker might make, rate changes were not allowed unless new machinery or technology rendered old production methods obsolete. In Dodge's words: "We would not dare to cut the rate. Scientific management would evaporate like snow in sunshine if we did not keep our word with our men."

With reorganization and time study work well under way in Philadelphia, Barth departed for Chicago to introduce the system in June 1906. Conditions there differed substantially from those in Philadelphia. First, there is no evidence that Louis Wright's work was duplicated in Chicago. Second, while Philadelphia's labor relations were generally friendly, in Chicago they were strained. Barth entered the Chicago shops in the aftermath of a six-year unionization drive involving citywide labor unrest and considerable violence at the Link-Belt plant. For example, during the IAM strike of 1900, fights between strikers and nonunion employees led
to some serious injuries. "[M]en were knocked out in the shop, windows . . . and machinery were broken, . . . and mobs [went] through the Chicago shops three times" during subsequent machinists and molders strikes. Furthermore, the molders' shop steward ordered what Charles Piez considered "a steady and insidious reduction in output," cutting production on some operations by 30 percent. A management study estimated that Link-Belt's Chicago machine shop workers had reduced their output by 35 percent. Such challenges led to stormy labor relations at the firm. Consequently, following a citywide strike beginning in May 1904 and lasting into 1905, Link-Belt refused to renew its contract with the IAM. The company also rejected the molders' contract demands after a general strike in 1906. Thereafter, Link-Belt management vowed to operate as an open shop in Chicago.\textsuperscript{11}

Chicago's branch of the National Metal Trades Association (NMTA), an organization spawned and nurtured by the strikes, aided Link-Belt in this endeavor. Initially, when member firms realized they could not keep unions out of their plants, the NMTA served as bargaining agent for all its members, bringing metal manufacturers and unions together under citywide contracts between 1900 and 1903. When contract negotiations broke down in 1904, the NMTA developed new tactics aimed at breaking the unions. Two weeks after the IAM called its members out on strike, NMTA recruiters began scouring midwestern and northeastern cities for replacement workers. In the midst of a depression, recruiters found "an unusual number of unemployed mechanics" who willingly travelled to Chicago.\textsuperscript{12} The NMTA's national secretary opened a temporary office in Chicago to coordinate recruitment, interview incoming workers, match up their qualifications with the needs of member firms, and dispatch them under guard to their new employers.\textsuperscript{13}

Link-Belt and other NMTA members intended to teach the strikers "that they cannot leave their positions and still have them." Recruiters had instructions to engage only permanent replacements, not temporary strikebreakers, and member firms pledged to protect the nonunion machinists throughout the strike and offer them preferential employment afterwards. Travel advances, deducted from the strikebreakers' wages in the first two weeks of employment, were refunded to those who "rendered faithful service" for sixty to ninety days. Apparently, many
received their refunds. Five months after the strike broke out, the NMTA declared a “crushing defeat” of the IAM, reporting that 75 percent of the NMTA “certified mechanics” remained on the job along with about 20 percent of the strikers who defected from the union and returned to work. In a move to further cripple the IAM, the NMTA worked with the Chicago Employers’ Association to prosecute sixty machinists on criminal charges.14

Heralding its new focus, the NMTA changed the name of its monthly publication from the Bulletin to The Open Shop. To further its objectives after defeating the machinists, the Association converted its emergency organization into a permanent labor bureau to screen prospective employees for member firms. Association members refused to hire workers without cards on file with the NMTA. Besides recording the employment histories, qualifications, and union activities of workers who consented to the process, clerks kept similar records on many unsuspecting Chicago metal workers through a network of secret informants in the plants. The NMTA’s extensive card index served as a powerful blacklist in the following years, and Link-Belt’s Charles Piez felt it was “perfectly proper” to use it for that purpose.15

James Dodge offered ambiguously worded denials when asked if Link-Belt had “discharge[d] the entire force in Chicago” before introducing scientific management. He denied that any “whole-sale exodus of men” had taken place, and he refused to connect individual dismissals with the success of scientific management. Undoubtedly, few, if any, IAM activists were reinstated. Link-Belt officials demanded undivided loyalty from their workers after the strike. Anyone expressing discontent or having union connections was fired on some other pretext. Describing the situation at Link-Belt a decade after the strike, Chicago’s IAM business agent complained: “I do not believe you can find a union man with a fine-tooth comb.”16

Reshaping Link-Belt’s labor force did not completely satisfy the company’s needs. Like other firms, it soon detected “wide-spread disloyalty” among foremen and superintendents. The NMTA’s “special agents” reported that supervisors had shown “a strange antipathy toward the newcomers,” by using everything from subtle discouragement to discharge without cause to rid their departments of strikebreakers. Most of the wayward supervisors held withdrawal cards from the union. Early in the 1904 strike, the
NMTA convinced its members that such attitudes compromised their efforts, and the employers began hosting dinner meetings with their production supervisors and NMTA officials to discuss "the question of a superintendent or foreman's true position" in the firm. In December, the Chicago Metal Trades Association Superintendents' and Foremen's Club was officially organized. Among those elected to office at this meeting were Link-Belt Assistant Superintendent L. I. Yeomans and Foreman J. D. Wiggins. No doubt others participated as well.

Consequently, Barth arrived in Chicago to deal with a restructured Link-Belt production force consisting of longtime employees who sided with management during the strikes, newcomers who replaced striking machinists, and a supervisory staff purged of incorrigible union sympathizers and instilled with a new sense of responsibility toward the company. The economic downturn beginning in October 1907 further reinforced the new order. In November, Link-Belt laid off its entire night shift and many workers on the day shift; the remaining employees worked short hours. The depressed market extended well into 1909. Under such circumstances, Barth met little resistance. While he had required over four years to develop and install scientific management in Philadelphia, he took only eighteen months to transplant it to Chicago. By relying on prior experience and data from Philadelphia, Barth and his assistants dispensed with much time-consuming experimentation and preliminary work. Barth quickly installed what he considered to be an operational system, and then he left it to the superintendent and newly trained functional foremen to keep things running.

After the installations, Link-Belt became a prominent stop on the tours Frederick W. Taylor arranged for potential clients who wished to see a working model of scientific management. Dodge and Piez welcomed both admirers and critics to tour the Link-Belt plants. Even skeptical visitors were impressed by the orderly, efficient plants they saw and the promotional pitch they heard. With the introduction of scientific management, Link-Belt officials explained, worker productivity had more than doubled and wages ran 25 to 35 percent above the straight day rate, prices of Link-Belt products had decreased by 10 to 20 percent, and yet the corporation's profit margin had increased 15 to 20 percent. After stressing that all this was accomplished without a hint of labor
trouble—sometimes even crediting the system with solving Chicago's labor problems—they invited members of the audience to get the workers' firsthand reactions. Most visitors left the premises convinced of scientific management's unqualified success in the Link-Belt shops.\textsuperscript{19}

The promotional rhetoric fell short of fully disclosing the complex series of changes influencing the statistics. State-of-the-art machinery, high-speed steel cutting tools, and more extensive and effective use of electricity in the shops also help to explain increased output. Link-Belt officials who described the plants frequently used wage data from 1904 to emphasize the workers' higher earnings in the 1910s. However, they failed to acknowledge that 1904 was a depression year, disregarded inflation, and overlooked the portion of workers' higher earnings attributable to their increased skill or length of service. Nor can scientific management alone explain growing corporate profits. For example, the Indianapolis plant was profitable although it operated under traditional management methods until 1916.\textsuperscript{20} Many interrelated factors account for increased profits between 1904 and 1915, including product development and more sophisticated marketing techniques. Finally, Link-Belt officials told half-truths in describing the labor situation, obfuscating the strikebreaking and blacklisting that suppressed labor activity in Chicago, and disregarding factors other than scientific management that encouraged worker cooperation.

Despite outward appearances, the uneven application and administration of the "system" at these showcase plants cannot be emphasized too strongly. Some work was readily adapted to the system, other applications took years to implement, and in other cases, scientific management proved entirely impractical. Link-Belt continued using several payment methods, including straight day work, piece work, and bonus rates in the shops, long after it installed scientific management. Fully 50 percent of the work done in Chicago was paid on a straight day work basis. Regardless of the payment methods, workers' rates were not uniform and earnings did not depend solely on output, since management made individual adjustments based on seniority and the foreman's assessment of ability.\textsuperscript{21}

Since the planning department routed work to minimize material handling and to avoid foreseeable delays, the system affected
all production workers to some degree. However, Link-Belt’s most highly skilled workers, such as the pattern makers, tool makers, electricians, maintenance workers, and structural steel workers, maintained their autonomy under scientific management. For less skilled workers, the system’s effect varied from day to day, depending on the feasibility of conducting time studies of work moving through the shops at any given time. Scientific management’s impact also changed from one shift to the next. During the day, labor crews moved raw materials and work in progress from one machinist to the next while tool boys ran errands, gathered tools, stood on line to collect and return time cards, and even fetched water for the machinists. Machinist Michael Donnelly, who eventually refused to work under the system at Link-Belt, complained of losing his bonus “quite frequently” because this advantageous support network did not exist for him on the night shift, and time studies made no compensating allowances.22

Although management methods and the physical arrangement within the plants changed, Link-Belt’s special-order, custom-designed products remained the same, requiring small batch production, flexibility, and highly skilled labor. Dodge described Link-Belt workers as “ambidextrous,” capable of moving easily from one machine and operation to another. He insisted that “specialists” would be detrimental in shops like his, where most production jobs involved a complicated series of operations rather than a few repetitive tasks. Although workers might repeat the same work process several times, the typical machine shop job required one and a quarter hours to complete. On average, workers changed jobs seven times a day. This work pace was faster under scientific management, but it did not involve deskilling. In most cases, well-paid versatile machinists concentrated their efforts where skill was essential, while low-paid common laborers took over menial tasks and routing of material. Link-Belt machinists apparently paid more attention to their wages than to “any particular system of management in the shop.” Of the few Link-Belt workers’ voices appearing in the scientific management sources, Michael Donnelly alone complained, while the others reported satisfaction with the system based on their high earnings.23

Upon Barth’s departure, local managers began simplifying, adapting, and improving the system to meet each plant’s specific
needs. In December 1907, Link-Belt eliminated the speed-bosses; in early 1908 it altered some forms to reduce some paper work; and by 1913 it had abandoned functional foremen in favor of conventional general foremen and subforemen.24

After being lured into working under the differential piece rate, machinists turned it to their advantage. In many cases, the workers knew more than Dwight Merrick and the other time study experts and protested to the rate setter, the foreman, and even higher management if they considered a rate too low. By establishing informal limits on production among themselves, workers influenced the process of determining methods, defining operation times, and setting rates. Moreover, Chicago's management encouraged employee initiative in improving methods by awarding three monthly prizes for the best suggestions. To their credit, Link-Belt managers took the workers' complaints and suggestions seriously and kept their promise to uphold established piece rates.25

From their first experience with Taylor's methods, Link-Belt managers recognized the system's deficiencies in maintaining the worker's cooperation. At a conference on scientific management, Dodge argued:

Certainly, where human elements are introduced into a problem, scientific methods alone will hardly achieve a complete solution. It must be a combination of scientific analysis and methods plus consideration for the interest and well-being of the workers, and tact in meeting their inherent resistance to change. . . . Truly Scientific Management takes account of both sides of the problem, and the method of approach should lie along both these lines [emphasis Dodge's].26

As early as the 1890s, Link-Belt introduced an impressive and growing array of employee benefits, incentives, and welfare measures, designed to personalize the relationship between management and labor. These activities lacked the elaboration and sophistication of programs developed by companies such as Joseph & Feiss. Link-Belt had no welfare department or special staff. Some Link-Belt welfare efforts developed piecemeal to address specific needs, while others grew out of close contact and genuinely friendly relations between management and workers during the
late nineteenth century. Dodge and Piez believed in maintaining personal contacts and in giving workers a "square deal," but they disapproved of "soup-house philanthropy." Consequently, most Link-Belt initiatives required matching employee contributions in effort, talent, or funding. From the Beneficial Society's support for ill or disabled workers to company events providing family entertainment, managers and workers collaborated in organizing and operating the company's welfare programs. One observer aptly termed such Link-Belt activities the "philanthropy of self-help." 27

In January 1915, James Dodge wrote to his friend Frederick W. Taylor: "I believe that it would be perfectly possible to harmonize Scientific Management with Trade Unionism if an earnest effort were made by both parties." In a subsequent letter, Dodge informed Taylor that at Link-Belt's annual meeting the executives discussed introducing worker-elected shop committees to permit employee participation in "the determination of base rates and piece rates so as to . . . disarm organized labor in their claim that we are all arbitrary and heartless in our determination of these figures. . . ." Taylor minced no words in his reply: "I think you are making a great mistake in doing this. I do not believe there is the slightest [sic] dissatisfaction among your men and having these Shop Committees would only have the effect of stimulating you[r] men in the direction of trades unionism." 28

Dodge's views in this exchange expose his ambivalence toward labor unions. While "gradually coming to the opinion that . . . intelligent labor leaders might overcome their opposition . . . [to] scientifically-managed shops," Dodge stopped short of sanctioning unions at Link-Belt. His practical alternative was to enlist workers into a Link-Belt association. However, other Link-Belt executives were less enthusiastic. Taylor's firm opposition to the shop committees gained a sympathetic response from Charles Piez, who feared that any form of organization might revive the IAM in Chicago. He wrote to Dodge: "I want to move very cautiously before taking a step that may haunt us later on. . . . There is . . . no great haste about the appointment of these committees, so that we will have ample time for further reflection." Link-Belt never established shop committees, and management dropped the debate after Dodge's death in December 1915. 29

Link-Belt managers clung to familiar methods to discourage union inroads. They expanded their traditional social and welfare
measures and continued to play active roles in the NMTA.\textsuperscript{30} These additional methods complemented scientific management at Link-Belt in a three-pronged strategy designed to enhance management authority: scientific management controlled the labor process and individualized bargaining between labor and management; corporate welfare encouraged workers to identify with management; and trade association activities shaped the labor market. In trying to block later unionization efforts all three elements of the company’s management strategy came into play.

Industrial mobilization during WWI posed the first challenge to Link-Belt’s smooth operation under scientific management. The trouble rose from a booming market as American industries began to supply the European combatants. In 1916, Link-Belt filled the largest number of orders in its forty-one year history. The boom revealed “every weak spot and laid bare every defect in organization, in facilities, in method” at Link-Belt, and “carried with it ugly portents,” according to Charles Piez. In particular, the company faced increasing difficulty in recruiting and retaining employees. Workers of all skill levels demanded and received more money. In May 1916, Link-Belt offered its entire manufacturing workforce a 10 percent bonus, regardless of output or the type of work performed. Thereafter, the company advanced “certain wage rates . . . almost weekly.” During January 1917, “in order to secure labor at all,” the Chicago plant had to raise the hourly rate of common laborers from 23 to 27.5 cents in addition to the 10 percent bonus. This amounted to average earnings of 30 cents per hour, nearly 50 percent above the prevailing rate of January 1916. In April 1917, union demands for the eight-hour day at neighboring establishments forced the company to reduce its work week from 54 to 50 hours and cut back to a 45-hour week a year later. Since production demands necessitated long working hours, the shorter work week translated into extra overtime pay for Link-Belt workers.\textsuperscript{31}

In this tight labor market, the company could ill afford to depend on “scientific” methods to set wages or determine production methods. As Link-Belt and all other metal manufacturers strained to keep pace with rising wages in the defense industries, its incentive wage came to closely resemble the community wage norm for a given occupation. Wartime wage inflation effectively negated the economic incentives of working under scientific management at Link-Belt.
Despite wage and hour concessions, a shortage of skilled workers and labor turnover plagued Link-Belt. Superintendents and foremen gladly hired anyone who walked through the door, even applicants lacking NMTA labor bureau credentials. Labor turnover reduced efficiency and managerial control over production in three important ways. First, the firm's skilled workforce was "continually besieged by other employers with flattering offers."

Second, new recruits were seldom trained well enough to begin producing Link-Belt's special-order products immediately. Furthermore, they became "a source of expense rather than profit," by simply quitting their jobs if management proved too demanding. Third, the process of on-the-job training enhanced the power of skilled workers in defining and controlling work methods.

These problems notwithstanding, Link-Belt managed to double production and earn substantial profits by expanding facilities, running night shifts, and hiring large numbers of inexperienced workers. The aspects of scientific management directly affecting labor played a surprisingly minor role in this accomplishment. Although central planning and accounting, efficient routing, and the use of time study data remained in force, supervisory controls and systematic efforts to reduce costs by increasing worker efficiency fell into disuse. In the wartime market, inefficiency had no effect on company profits. The pressing demand for Link-Belt products allowed the company to pass rising costs along to customers by qualifying all contract proposals with the warning: "prices are subject to change with market conditions."

Once conditions returned to normal, management renewed the quest "for economy, method and efficiency." However, scientific management came to represent a set of guiding principles, rather than a system of specific methods. New initiatives often reflected Taylor's philosophy, but not his methods. For example, in coming years, Link-Belt's efficiency experts would characterize time studies taken with a "slow and clumsy" stopwatch as "half-baked." New rate-setting methods involved motion-time analysis and "synthetically constructed" elementary times based on "practically universal" body movements. Moreover, new work methods and economic incentives often focused on white-collar workers. After the war, superintendents and foremen also implemented new efficiency measures on the shop floor, but they considered their efforts as outgrowths, rather than components, of Taylorism.
Although company officials again argued that wages must be tied to production, Link-Belt's wartime experience had dramatically transformed Taylor's most controversial practices. Both managers and workers knew that the bonuses and pay increases every few months from 1916 to 1920 bore no relationship to individual productivity. With time study thus exposed as just one of many factors in establishing piece rates, Link-Belt employees of the postwar period joined in the universal demand for wage adjustments based on the cost of living. No opposition developed over time study or piece rates per se, but growing pressure for across-the-board raises kept Link-Belt wages in line with the pay scales at neighboring plants.\textsuperscript{35}

As scientific management's overt significance receded at Link-Belt, trade association activities and corporate paternalism took on greater importance. Charles Piez was particularly concerned about the postwar upsurge in labor conflict. On leave from Link-Belt as Director of the U.S. Shipping Board's Emergency Fleet Corporation, he and Seattle, Washington's mayor had broken the five-day Seattle general strike of January 1919. Piez believed that Seattle's workers had relinquished control to radical, foreign leaders who aimed to "wrest control of industry from its owners. . . ." During the steel strike several months later, he appealed to steel users "to keep 'hands off the strike situation and to accept inevitable business losses . . . rather than embarrass the steel companies by bringing pressure on them to surrender to the strike leaders." He called for "a fight to the finish," since he believed the ultimate control of industry was at stake.\textsuperscript{36}

Piez's fears and impressions filtered down to Link-Belt even before he returned to the company in May 1919. Link-Belt officials carefully monitored national labor unrest and looked for signs of contagion in their own shops. In assessing prospects for the New Year of 1919, Link-Belt's acting president, Staunton Peck, sensed undercurrents of "anarchy, Bolshevism, socialism, populism, and other isms." He had evidence to suggest that an unnamed union (probably the IAM) had planted organizers in the Chicago shops. Carefully avoiding the attention of foremen, the organizers approached fellow workers, "pouring into them radical ideas about the wage scale and shop conditions."\textsuperscript{37}

Company documents do not explain how the union infiltration was discovered. Quite possibly, Link-Belt lathe operator James
Cousland provided the information. Cousland, who started working at Link-Belt in 1916, commenced spying on his coworkers shortly thereafter. From 1918 to 1936, Cousland sent weekly or monthly reports to the NMTA. An Association secretary copied the information and sent it to the Chicago plant superintendent. Cousland insisted that he only reported on "piece work trouble," workers' complaints about safety hazards, and production problems, not on "labor activities." However, his denials are unconvincing in view of Link-Belt management's own account, which identified agitation and dissatisfaction over "the wage scale and shop conditions" as the inspiration for "labor activities." There is no record of how the shops were purged of radical elements, although it is likely that workers who publicly expressed grievances were fired.

Dispelling distrust took more concerted effort. Upon resuming control at Link-Belt, Piez realized that the plants had grown to the point where he and other top executives could no longer personally sway worker opinion. He favored regaining loyalty in the shops by preparing the superintendents, foremen, and subforemen "to meet this insidious doctrine that is being spread to the detriment of industry." He believed the first-line managers could "create sound public opinion" in the shops. But, before assuming this role, the supervisors had to cease supporting the "aggressive, vociferous, minority" of workers who advocated unionization. Piez persuaded Link-Belt's directors to expand a stock option plan to give production managers a personal stake in the company's growth, and to supplement the efforts of the NMTA Supervisors' and Foremen's Club to eradicate union sympathy among production supervisors. To "build and maintain a high esprit de corps," foremen gathered in the plant superintendent's office for special weekly meetings to address "pure labor questions."

Link-Belt officials knew that labor espionage and supervisory training programs provided only partial solutions to their problem. Piez opposed some popular programs of the 1920s, such as profit sharing and company unions, which he characterized as "a great deal of bosh." Consequently, Link-Belt expanded its welfare programs, self-help initiatives, and company-sponsored social affairs to reinvigorate employee loyalty. During the early 1920s, each plant organized an Employment Office and appointed a manager with a threefold agenda: to administer nonwork related
activities, to raise management’s consciousness of the “human aspect of production problems,” and to preserve employee morale. The Employment Office recruited labor, selected potential candidates for job vacancies, settled grievances, and processed dismissals and resignations. The employment managers compiled detailed histories of each active and former employee to identify workers suitable for promotion, pay raises, disciplinary action, or reinstatement. The records were also used for statistical analyses of labor turnover and accident rates. The office investigated worker complaints and offered solutions, recommended amenities such as men’s locker rooms and women’s rest rooms, and managed the operation of dispensaries and cafeterias. Finally, the employment managers oversaw the company’s Beneficial Societies, Building and Loan Associations, Credit Unions, charitable activities, athletic teams, and worker education and training programs, and administered a growing number of other benefits, such as newly inaugurated paid vacations for shop workers. To enhance employee morale, individual plants hosted outings and elaborate social events featuring the talents of Link-Belt employees. In 1925, the entire corporation celebrated “half a century of successful operation” and Charles Piez’s retirement as president.40

Other than the recession of 1921-1922, when workers suffered wage cuts and layoffs, Link-Belt enjoyed a decade of growth, prosperity, steady employment, and minimal worker dissatisfaction. The surviving records reveal no hints of strikes, union organizing efforts, or overt labor problems, and little management paranoia.41

If these factors did not entirely subvert union sympathy during the 1920s, the failing economy and insecure labor market of 1930-1933 certainly had a chilling effect. Management employed a step-by-step strategy developed during earlier economic slumps to minimize disruption of the workforce. Initially, as special orders dropped off, nonessential overtime was eliminated and workers produced stock items or did repairs and odd jobs around the shops. As stopgap jobs ran out, foremen closed early on weekdays and suspended Saturday schedules and night shifts. When work fell off further, management instituted work sharing by limiting some workers to a three- or four-day work week. It later reduced benefits and periodically cut hourly wages, piece rates, and salaries, but the company laid off employees only as a last resort.
Many Link-Belt employees worked without layoffs throughout the Depression, and those forced out of work or placed on part-time schedules for extended periods often returned to their full-time jobs when work picked up again. Consequently, Link-Belt employees considered themselves fortunate and felt satisfied with their work, or at least refrained from complaining about wages or working conditions. During this difficult period the company enhanced its reputation as a good employer.42

As Link-Belt’s business began a fitful recovery, management faced new challenges from the federal government. Link-Belt officials generally disapproved of government interference in industry. In public statements, advertising literature, and internal communications, they vigorously opposed New Deal legislation. However, as Assistant General Manager E. L. Berry phrased it, “in order to sort of cooperate with the spirit of the N. I. R. A.,” the Chicago plant management organized the Link-Belt Employees Board. Existing records do not reveal whether fear of local labor activity or pressure from corporate headquarters prompted the decision.43

On arriving at work one Monday morning in 1933, Chicago workers found a notice posted on the bulletin board suggesting that they establish an Employees Board and calling for nominations and an election of representatives. Although Link-Belt workers recognized this as a company initiative, they willingly gave it a try. As established, the Board provided a monthly forum for E. L. Berry and seven employee representatives to discuss health and safety; education, recreation, and benefit programs; wages, hours, and working conditions; “continuity of employment,” industrial conditions, and “economy and waste prevention.” Dividing the plant into seven electoral areas ostensibly insured “fair representation to each department,” but in fact, it diluted the potential power of the blue collar employees. Three divisions contained predominantly white-collar and professional personnel, one division combined white-collar, professional, and highly skilled craft workers, and three divisions represented the majority of Link-Belt’s blue-collar employees. The seven elected “voting members” served advisory roles, while authority rested with management’s “non-voting representative.”44

Louis Salmons, a maintenance electrician and former AFL member with nine years’ service at Link-Belt, was elected as a
worker representative. At the board’s first session, Salmons proposed holding an open meeting of “the whole rank and file . . . to let everybody have a voice instead of leaving it up to the representatives to use their own judgment on all matters.” The other representatives—an engineer, a clerk, two foremen, and two oldtimers—unanimously voted Salmons down. For three years Salmons served on the board, persistently trying to represent his constituents by bringing up wage and hour grievances, poor working conditions, and work-related health problems. Assistant General Manager Berry acted promptly on suggestions for repairing or improving facilities, but dismissed wage demands, declaring that the company was losing money.

Dissatisfaction with the Employees Board and knowledge that workers had other options led Salmons to the Steel Workers Organizing Committee [SWOC] in September 1936. He described the Employees Board and working conditions at Link-Belt and asked for the SWOC’s assistance in organizing the plant. Assured that the organization would back him “100 per cent,” he requested fifty application cards to start organizing Local 1604 of the Amalgamated Association of Iron, Steel and Tin Workers.

Sensing that there would be retribution, Salmons proceeded cautiously. The application cards required an organizer’s signature, so Salmons signed each one, guarding against someone else bearing the consequences of his actions. He asked seven coworkers to assist him in organizing, and they began passing out cards to fellow workers whom they considered trustworthy. Salmons’ position allowed him to move freely through the plant doing routine inspection, maintenance, and troubleshooting when machinery broke down. Salmons started discussing the Amalgamated Association as he worked and, when the opportunity rose, he slipped Local 1604 application cards among literature he distributed for the Employees Board. “I was elected to represent the men . . . not to represent the company,” Salmons recalled. “I took the stand that I would represent them. And when I couldn’t represent them properly through the employees board, I took other steps to represent them.”

After a week of discreet recruiting netted eleven members, the organizers met to discuss strategy. Salmons told his friends that management would soon learn of the organizing and fire him. He warned the other organizers: “I will have to work on the outside.
Then it will be up to you fellows to keep this thing going on the inside.” Salmons was right. A batch of application cards disappeared from one organizer’s toolbox, and some employees turned the cards over to E. L. Berry. The morning following the strategy session, Berry discharged Salmons. Salmons shrugged it off, bluffing: “It is all right, we have 370 men signed up.” The rumor spread through the plant, generating interest in the “big drive” and making the inside organizers’ efforts a bit easier.  

Within six months, Local 1604’s membership caught up with the rumor. Salmons went on the SWOC payroll and began rallying forces on the outside—at the plant gates, at the streetcar stop, and at the neighborhood tavern where Link-Belt workers frequently stopped after work. The tavern owner rented a back room to the union for meetings, posted the local’s recruiting sign, and kept a stack of application cards handy. The insiders’ ranks gradually grew to include organizers in every department, and evidence suggests that the Amalgamated won broad support, fairly evenly distributed among the skilled, semiskilled, and unskilled blue-collar ranks. While some workers with ten or more years’ seniority played important roles in organizing the union, employees hired during the depression years—who identified least with management and whose jobs were most vulnerable—seemingly joined in larger numbers. Meanwhile, the Regional National Labor Relations Board [NLRB] Director negotiated Salmons’s reinstatement. Berry’s conditions for putting Salmons back to work in December 1936 were “no more running around the plant” and “no more organizing.” Berry isolated Salmons by placing him at bench work where he repaired only small items brought directly to him, but the feisty electrician challenged Berry’s second condition, responding: “there will be no more organizing in the plant, but there will be lots on the outside.” After attracting about 400 members, the union elected Salmons as President in April 1937.  

The company kept tabs on the union’s activities for months as James Cousland attended organizing meetings and spied on workers throughout the plant. Cousland briefly served as a union member, but his usefulness to the company diminished after the LaFollette Committee exposed him as an NMTA operative. Since the unionists could not directly link Cousland’s spying to any damage, they reported his activities to the membership but took no further action against him.
Link-Belt management and a substantial number of loyal employees found another way to fight back. After the *Jones & Laughlin* decision held employer-dominated organizations illegal, the Employees Board disbanded and several former representatives formed a new organization, the Independent Union of Craftsmen [IUC]. During the three-day IUC recruitment drive, foremen conveniently disappeared or turned their heads while employees worked their way through the shops requesting, cajoling, bribing, or coercing fellow workers to obtain signatures on IUC petitions. Many workers willingly signed, particularly white-collar employees, skilled blue-collar workers with long terms of service, and those in line for promotion, while others felt they had no choice. In one flagrant move, a foremen “signed up” several illiterate workers without seeking their consent. Such tactics obtained signatures from 760 of approximately 1,000 Link-Belt employees in three days. A committee of self-appointed delegates presented the petitions to Berry on April 20, 1937, and the following day he signed an agreement officially recognizing the IUC as the employees’ bargaining agent.51

Imposing the IUC on the workforce and intimidating workers through discriminatory dismissals and layoffs stalled the Amalgamated’s efforts for nearly five years. As in 1904 and 1919, when unionization threatened Link-Belt, management purged the labor activists. Nine workers lost jobs at Link-Belt because of their actual or suspected union activity during the organizing drive, and other workers believed that they were targeted for layoffs during the economic slump of 1937 because of their union affiliation.52

Unlike past experiences, the fired unionists had means of fighting back after 1937. With Louis Salmons’s determination and the SWOC’s support and guidance, the aggrieved workers took their cases to the NLRB. The NLRB disestablished the IUC, and ordered the company to end its spying activities and reinstate the labor activists with back pay. Although Link-Belt won a favorable ruling in Federal Appeals Court, the union activists triumphed in January 1941, when the United States Supreme Court reversed the lower court’s decision.53

Thus for Link-Belt executives, scientific management provided a vital mechanism for organizing and managing production, but it offered no answer to another pressing problem, the
turbmoil associated with union organizing campaigns and collective bargaining. Incentive wage plans and good working conditions, coupled with the company's traditional benefit programs and later efforts in systematic personnel management, helped attract and retain a capable labor force, but they could not satisfy additional demands inspired by members of the metal trades unions. Although the company refused to deal with unions after 1906, replaced strikers, resorted to labor espionage, and discharged men identified as union partisans, the problem did not go away. Consequently, Taylor's promise of industrial harmony under scientific management proved elusive. It took four decades of considerable conflict before Link-Belt executives reluctantly returned to the bargaining table.

NOTES
7. Link-Belt Notice Book, notices from April 1890 through December 1903; Eastern Freight Hearings, pp. 2733, 2742.


11. Alford, “Scientific Management in Use,” p. 548; U.S. CIR, vol. 4, p. 3177; Chicago Tribune, March 1, 1900, p. 12; March 9, 1900, p. 1; March 10, 1900, p. 9; March 14, 1900, p. 9; U.S. CIR, vol. 1, p. 868; Montgomery, Fall of the House of Labor, p. 270. Montgomery provides general background on this strike wave, see pp. 259–75.


13. Ibid.


16. Eastern Freight Hearings, pp. 2743–44; U.S. CIR, vol. 4, pp. 3177–79, 3414. Link-Belt refused to reinstate labor leaders after the 1900 strike; see Montgomery, Fall of the House of Labor, p. 205. Montgomery suggests that by introducing high-speed steel and scientific management, Link-Belt weaned formerly aggressive workers from both their skills and their unions; see pp. 231–32. Taylor, Dodge, and Piez also claimed that scientific management eliminated the workers’ desire to unionize. However, I find no evidence of strong union sympathy in Philadelphia before or after 1904. Although the success of scientific management in Chicago possibly hinged on eliminating the union, that occurred prior to Barth’s installation. Link-Belt’s reshaped labor force of 1906 was not the same as the union-prone group of 1900–1904. Moreover, while Link-Belt’s priority in replacing the strikers and in introducing scientific management was to gain greater control, it was not an assault on skill per se. Link-Belt’s production required craft skills. Striking machinists were not replaced by deskilled machine tenders, but by nonunion skilled workers or by less skilled workers whom the company trained to assume skilled positions.


28. James Mapes Dodge to Frederick W. Taylor, January 18, 1915 and February 18, 1915; Taylor to Dodge, February 25, 1915, all in Taylor Collection 58B.
29. James Mapes Dodge to Frederick W. Taylor, December 14, 1914 and March 9, 1915; Charles Piez to James Mapes Dodge, March 1, 1915, all in Taylor Collection 58B. Other researchers have claimed that Link-Belt formed a company union, based on the letters that circulated among Taylor, Dodge, and Piez in 1915. See Frank Barkley Copley, Frederick W. Taylor: Father of Scientific Management, vol. 2 (New York, 1923), pp. 428–29; Nelson, Frederick W. Taylor, p. 145. I find nothing in these letters or in other company records to indicate that Link-Belt executives moved beyond discussing the merits and drawbacks of shop committees. In response to an NMTA questionnaire in 1919, Piez wrote: “The Link-Belt Company has never organized any shop committees. . . .” See Weekly Letter 521 (September 1, 1919), p. 701.
32. Weekly Letter 461 (December 8, 1916), p. 313; 466 (January 22, 1917), pp. 342–43. Montgomery notes the high cost of labor turnover at other firms during this period; see Fall of the House of Labor, pp. 239–40.


43. Link-Belt v. N.L.R.B., pp. 1127, 1296; Link-Belt Bulletin, July 10, 1933-
Guidelines for establishing similar representation plans spread throughout the corporation, although local management had final say over implementing such a program. In 1933, the Indianapolis plant established an Employees Board with bylaws nearly identical to those written in Chicago. Philadelphia management rejected the idea of installing an Employees Board.

49. *Link-Belt v. N.L.R.B.*, pp. 153-54, 161, 163, 171, 190-91, 196, 211-13, 1229-31, 1234. Information on occupations and length of service of Amalgamated members is found throughout the testimony of NLRB witnesses.
51. *Link-Belt v. N.L.R.B.* Accounts of this organizing drive and information on occupations, length of service, and subsequent promotion of IUC members are found throughout the testimony of NLRB, Respondent, and Intervener witnesses.