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[The Baldwin Locomotive Workers]

toll in deaths and injuries at Baldwin, often caused by the pressure to work quickly, is notable nonetheless. The most reliable statistics on workplace deaths and injuries are from the company itself and date from 1903 to 1913. Over this eleven-year period seventy-four men died in industrial accidents. Men were crushed by boiler shells falling from cranes, struck by falling shafting, or killed by benzene explosions in the paint shop.[75] Injury rates were far higher. For example, in 1911—a relatively safe year when the Baldwin workforce reached upward of 15,500 men—over 1,800 men were injured, roughly 12 percent of the total force.[76]

The dangers arose largely from workers and managers skirting safe practices in their rush to produce engines.[77] In 1900 boilermaker Dominick O'Dowd lost three toes after a chain broke while he was lifting a boiler throat sheet with a crane. He had complained to his foreman about the defective chain but was told, "No; let her go until [it can be fixed on] Monday, go on with your work." And in 1913 machinist John Campbell lost an eye to a steel chip from a defective cutter bar on his boring machine. Campbell showed the defective tool to his foreman, but he was told to "make the best use he could of the old cutter" until new ones were made.[78] Since at least the 1860s men injured on the job at Baldwin had received treatment from a doctor selected and paid for by the company.[79] But this provided scant consolation for men with serious injuries. Disability could threaten their incomes for life, and even if they had recuperated, how would their families eat while they were laid low?

Baldwin's skilled men addressed this threat early on by establishing the Baldwin Mutual Relief Fund Association in 1866. Its charter stated the association's mission: to provide "mutual assistance to the members and their families in case of accident, sickness or death, out of a fund to be paid by general contributions of the members in season of health and prosperity."[80] Evidently Baldwin managers had no role in the association, whose leaders were skilled workers with long seniority.[81] Management probably viewed the fund with wary approval, though mutual aid by employees was certainly laudatory; such collective efforts could easily evolve into an organized union. The association maintained its original purpose, however, until dissolving sometime after 1888. In exchange for an admittance fee and monthly dues of 50 cents, members who could not work because of sickness or accident received $5 a week for the first six months of incapacity, with lesser payments thereafter. After a member's death his spouse or heir received $60.[82] Such benefits offered only a meager safety net, but aid from fellow workers offered more assured protection than the kindness of strangers.

The bylaws of the association had one provision that underscored the special status of skilled workers at Baldwin: membership was limited to 250 men. When leading skilled hands began the fund in 1866, Baldwin's force totaled over eight hundred workers. The membership limit suggests that skilled men

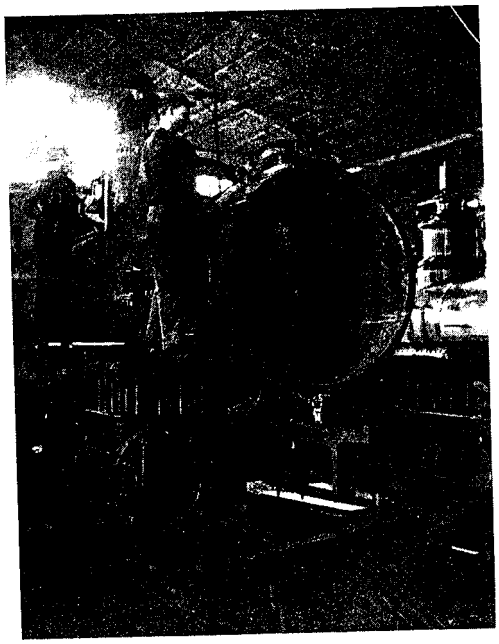


The inside-contract system suited tasks like riveting up a boiler, since such work required the management of large groups of men working on unwieldy subassemblies. In this view from the 1880s the boy *(left)* removed glowing-hot rivets from a furnace and passed them to the "holder-on" inside the boiler. He placed the rivet in a hole and backed it up while the large fellow *(right)* hammered or peened over the rivet head. SMITHSONIAN INSTITUTION

would associate with each other for their own benefit but felt an unbridgeable gulf of interests between themselves and the semiskilled and laboring men also working in the plant.[83] For years the company had sought to create bonds of mutual interest with its skilled craftsmen; here they acted to reinforce their own group ties and distinct status.

THE INSIDE-CONTRACTING SYSTEM

The Baldwin men who sought protection from accident or sickness in the Mutual Relief Association utilized similar cooperative effort throughout their work. While piecework aimed to foster individual productivity, most tasks in locomotive building required teamwork. Almost all skilled workmen depended on laborers or crane operators for help in setting up their work and moving materials. Tradesmen in boilermaking, smithing, forging, molding, and erecting all worked in groups or gangs throughout the day. In cases of standard tasks, many such gangs were no doubt receiving piece rates by the early 1870s, but group pressures probably blunted the individual incentive for high output Baldwin sought to foster. Other group work such as assembling boilers or



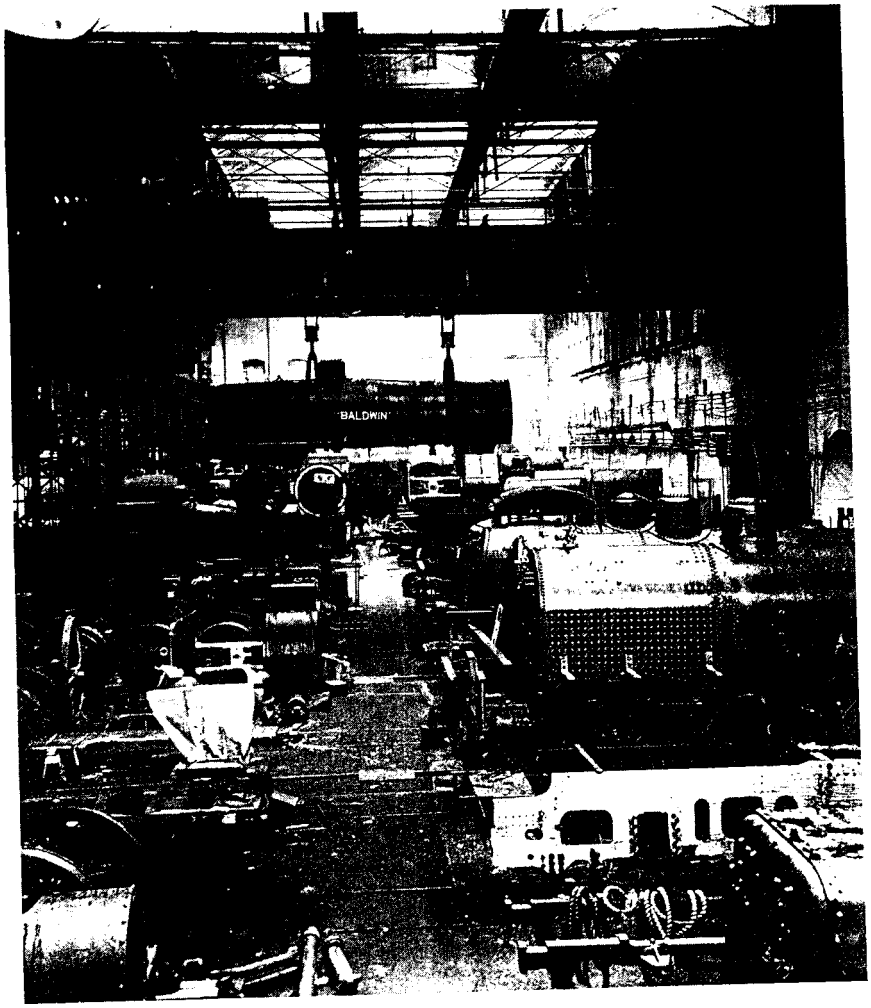
Inside contracting quickly came to dominate in erecting work. In this view from the 1880s workers from a range of trades erect an engine in Baldwin's 1869 erecting shop on Broad Street.
SMITHSONIAN INSTITUTION

erecting engines proved difficult to organize on a piecework basis, yet the firm also needed productivity improvements in these areas to avoid production bottlenecks.

To deal with these and other problems, the Baldwin company instituted the inside-contracting system in 1872. One of this era's few instances of labor unrest in the plant impelled its adoption. During the summer of 1872 the Eight-Hour Movement swept through eastern manufacturing centers, particularly New York City. Workers at Singer Sewing Machine, an American System manufacturer, struck when that firm refused to shorten its hours of work.[84] In June the workforces of the three Paterson (N.J.) locomotive builders—Cooke, Grant, and Rogers—also walked off the job. In Philadelphia two thousand cabinetmakers held a mass meeting on June 11 to lobby for the shorter workday, and shortly thereafter they went on strike.[85]

Baldwin's workforce also became caught up in the movement, but before the men went so far as to strike for the eight-hour day, the company's superintending partner, Charles Parry, wrote them an open letter. It was addressed to "that higher grade of our workmen who unite judgment with intelligence," specifically the skilled men essential to production.[86] Parry argued against the notion that the eight-hour system would result in higher wages by decreasing the quantity of labor in the economy at large. He also noted that such an enforced change would cut the company's return on fixed capital by 20 percent. But he said, "Your right to work eight hours is not disputed by us," noting, "If you want it you can have it, but if you take it, you must bear the loss incident to its adoption equally with your employers." Parry enjoyed great respect among workmen, having first entered Baldwin as a fifteen-year-old apprentice in 1836, and his letter cooled the ardor of the eight-hour advocates. Baldwin's employees stayed on the job.

Parry knew that such a letter might fail to prevent a strike in the future, and so he instituted the inside-contract system.[87] Contracting offered a number of advantages to the company. If the rank and file were broken into productive subunits, general labor movements such as the eight-hour drive would be less



The great variety of work in progress inside Baldwin's 1890 erecting shop suggests why contractors' oversight and adaptability were so important in building heavy capital equipment. In this room dozens of designs stood circa 1900 in varying stages of completion; finishing each required a complex series of sequential operations. In such a shop, foremen found it difficult enough merely to see workers, let alone guide their work, but contractors had the experience and the incentive to get the product out the door. PENNSYLVANIA MUSEUM AND HISTORICAL COMMISSION

likely to enlist the entire force. Contracting also put day-labor tasks under what amounted to group piecework, since the contractor would bid by the piece or job. This would improve productivity, particularly in assembly work. Finally, contracting allowed increased managerial oversight, at a time when the workforce numbered over twenty-five hundred men, without adding to the ranks of central management or increasing overhead costs.

It has been said that companies adopted contracting in "an attempt to

control the craft system from the inside" by enlisting skilled men in a managerial role.[88] The Baldwin case suggests another motive, however. By 1872 labor specialization under piecework had already mortally wounded the craft orientation of most work. Evidently Baldwin instituted contracting mainly to extend the productivity and cost-cutting benefits derived from piecework to tasks not easily organized on an individual piece-rate basis. Such assembly work as tanks, cabs, tender frames, brakes, and trucks were difficult to put under piecework, since designs varied so greatly from one order to the next. Assembly and erecting workers could also face delays awaiting parts held up in other shops, delays that again blocked piece rates. By putting these assembly jobs under contracting, Baldwin secured close supervision, a faster pace of production, and a piece-rate price for the work, leaving the contractor to manage any problems, variations, or uncertainties.

As a company executive noted in 1903, "The contractor is a piece-worker on a larger scale. As he is paid by the job, he has the incentive to turn out his work as quickly as possible and to get as much as possible out of the men under him."[89] Contractors were generally older men with long seniority who had worked their way up to the position. On small-scale contracts with only a few employees, contractors worked alongside their men, but in other cases these quasi managers oversaw hundreds of workers and acted solely as supervisors. In either case contractors were leaders in the workforce, princelings in the aristocracy of labor.

Their high income provided one measure of contractors' special status. Circa 1910—a year of strong locomotive sales and much work in the plant— their average annual wages ranged from $1,600 to $3,000.[90] Such totals matched or exceeded foremen's incomes, while the average annual wage of all workers, skilled and unskilled combined, stood at $723 in 1910.[91] Since the company knew its contractors' profits precisely, it evidently paid such high wages to ensure close supervision and high productivity.

Before bidding on a job, contractors selected their workers and negotiated pay rates with them—with their foreman's approval.[92] Contractors could not seek advantage by depressing wage rates very far, since the company prohibited clear exploitation, and skilled men in the force avoided such contractors. As a visitor at American Locomotive noted, the contractor "has to be sharp and use the best methods for getting a good output, or the men will not work for him."[93] This resulted in another set of mutualist ties in the plant, based on the producer culture, as productive contractors developed long-term relationships with hardworking men in the skilled force. Contractors had to entice these men with prospects of good earnings and mutual benefit, rather than chisel them for personal gain. Contractors paid a mix of hourly and piece-rate wages, depending on the task at hand and their workers' receptivity to either form of

payment.[94] The contracting system itself encouraged use of piece rates, since a contractor constantly sought per-unit efficiencies while knowing that the size of the contract would automatically limit his pieceworkers' total earnings.[95]

Contractors' anomalous position as both managers and workers and their ties to their men became apparent following the 1893 cut in piece rates. This 10 percent reduction was first applied to the workforce of two joint contractors, Thomas Roberts and Samuel Mettler, making boiler staybolts.[96] When their 250 workers struck in protest, Roberts and Mettler pleaded with superintendent Vauclain to roll back the cut to 5 percent. The cut threatened the incomes of both contractors and their workers, since all had to share the loss. And with their men on strike, Roberts and Mettler earned nothing at all for the duration. As it happened, the strike collapsed within a day after Baldwin announced the first of two thousand layoffs.[97] This brief incident well illustrates how contractors could represent the interests of their men, particularly in less dire situations.

Contractors' bonds with employees represented another set of ties that cemented various groupings among workers. Beneath the individualized producer culture fostered by piecework, ties of trades, skills, family, ethnicity, religion, and neighborhood stretched across the workforce. These mutual relations regularly played their part in labor recruitment, job assignments, pay rates, and layoffs. Piecework set the overall pace of work, but these mutual ties ameliorated the driven individualism the partners sought to foster. Such relationships often served the company's interests as well. Men who had foremen to thank for hiring their sons, contractors who showed loyalty to their workforces and received it in return, and blacksmiths who trained their helpers in the trade were creating bonds that aided the company's long-term strength and stability.

ADVANCEMENT AND PROMOTIONS

Opportunities for promotion were another aspect of working life at Baldwin during the Gilded Age that heightened cooperation between managers and workers and relieved potential discontents among skilled workers. Piecework, the specialization of tasks, and the incessant drive for productivity were pressing realities for workers at any given moment. Over the passage of time, however, Baldwin's great expansion affected men's working lives the most. In every decade from 1870 to 1900 the company's workforce essentially doubled in size, growing from an average of 1,455 men in 1870 to 8,208 in 1900. The firm came to rely upon internal promotions of experienced workers to cope with this helter-skelter growth.

Growth enabled managers to narrow work tasks further, the division of labor expanding as output increased, but it also created new opportunities for

advancement. This occurred in a variety of ways. When men with true craft training were drawn to Baldwin by the high pay, they worked in tasks requiring only a narrow portion of their training and skill. That expertise remained, however. As the force expanded, these men moved into higher-paying work that utilized more of their skills. Thus a craft-trained molder could move up from simple castings to pouring locomotive cylinders—still specialized work, but requiring great skill nonetheless. The group orientation of many tasks opened another avenue for promotions through on-the-job training. As the company grew, blacksmiths' helpers became smiths themselves, and rivet holders became riveters.[98] As a visitor noted in 1895, "Every mechanic who shows powers beyond the sphere of his employment is advanced until his limit of usefulness is reached."[99] Throughout the Gilded Age the firm narrowed the tasks and skills required in production, but growth also allowed a minority to move up in skills and pay.

Some blue-collar workers also rose into Baldwin's managerial ranks. The firm's policy was "to make promotions from within, foremen, bosses or superintendents are not imported."[100] Seven of Baldwin's craft apprentices became departmental foremen during the Gilded Age. Others moved into quasi-managerial positions as draftsmen, contractors, and delivery engineers. Draftsmen in turn took up sales positions and jobs in production management. Similar patterns held true for the highest ranks of the company. Five of the firm's Gilded Age partners had entered the company as teenagers, working their way up from the ranks of clerks, draftsmen, and apprentices.

While only a select group of workers moved into top management, substantial numbers rose up limited ladders of promotion. Hard work and loyalty to the firm were required for advancement; these men had decided to cast their lot with that of the company. But even workers who did not identify with the firm knew that most of their managers could partly identify with them, having once been workers themselves. Managers and most skilled men shared a common ethnic background, further binding these two groups, while ethnicity also separated skilled from unskilled workers.[101] These factors helped to heighten the cooperative relations prevailing between management and labor at Baldwin.

It is difficult to summarize the character of life on the job at Baldwin between 1860 and 1900 because so much was in transition, and different employees and trades had very different experiences and opportunities within this context of change. In general terms, however, the workforce passed through three broad stages between 1860 and 1900. In 1860 skilled work retained a crafting character, although artisan traditions had never been firmly rooted in many of the new trades required in machinery building. From the 1860s to the 1890s Baldwin's employees were transformed from craft to industrial workers.

Thereafter narrowly skilled industrial operatives accounted for the majority of the force. Throughout the entire period, management clearly exerted control over the broad character of work, using its power vigorously to recast operations along industrial lines. Its chief instrument was piecework, which subdivided skilled crafts into job specialties, curtailed soldiering, and boosted productivity.

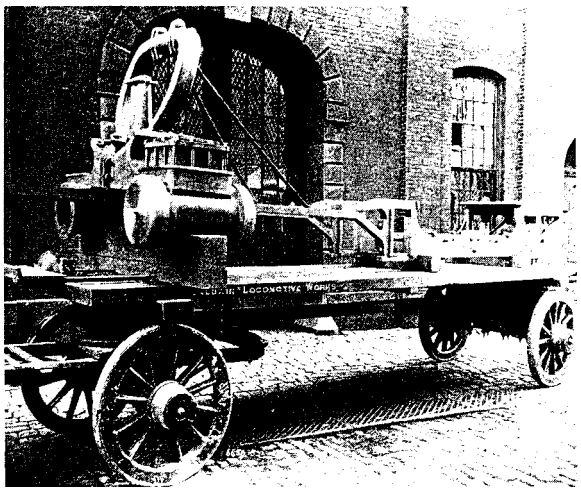
But workers had power too, thanks to their skills and the influence they exerted over the pace of production. Baldwin's severe limits on the number of management personnel also promoted workers' autonomy. The key success of Baldwin's producer culture was its ability to foster the strengths and powers encompassed in management and in labor, so that for a half century both contributed to production without clashing. Each side offered enough value to the other, and each respected the other sufficiently, that both could focus on their common goal: building locomotives. Baldwin's workers derived considerable pride from their work. Rather than calling themselves machinists or boilermakers, many preferred the title "locomotive builder."[102]

BATTLEGROUND OR MEETING GROUND?

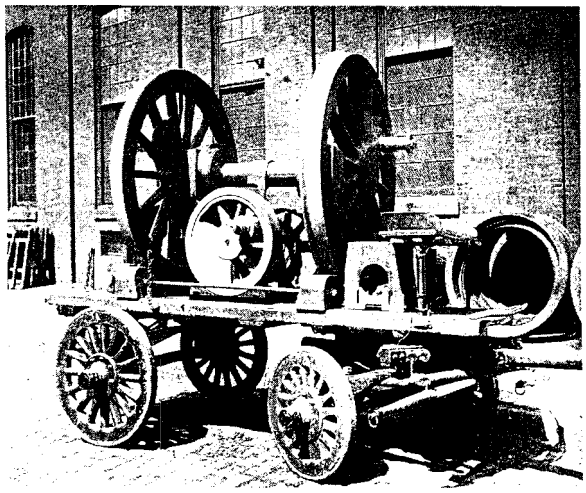
Many late-nineteenth-century workplaces, particularly in metalworking, are commonly seen as battlegrounds between capital and labor. According to this portrait, managers sought an increasingly directive and assertive role over the content and pace of work—an effort that skilled craft workers fought bitterly from their power base as the practitioners and guardians of the craft knowledge essential to production.[103] By the 1920s craft labor had succumbed to management's Taylorist assaults. Although a tidy drama, it scarcely applies to Baldwin, the largest metalworking employer in America during this period. Why?

The answer is in three parts. First there is the matter of management and its policies. The Baldwin case suggests that Frederick Taylor came in the middle of a long lineage of managerial systematizers, not at the beginning. Between 1850 and 1872 Baldwin installed piecework, standardized parts, regularized production processes in achieving interchangeability, and created design and production controls over work. In sum, the company took a highly directive role over production twenty to thirty years before the supposed origins of the systematic management movement. Baldwin's Gilded Age growth saw it extend piecework and adopt contracting. By the 1870s the company's workers were becoming industrial operatives, possessing only vestiges of a crafting past. They remained skilled, but theirs was a narrow expertise, defined by the company's needs rather than by craft training.

This raises the second factor: workers lacked sufficient power to resist these managerial encroachments. Piecework and contracting splintered the workforce, hindering group consciousness and action. Boilermakers, for example, could not readily take on management when they were themselves divided

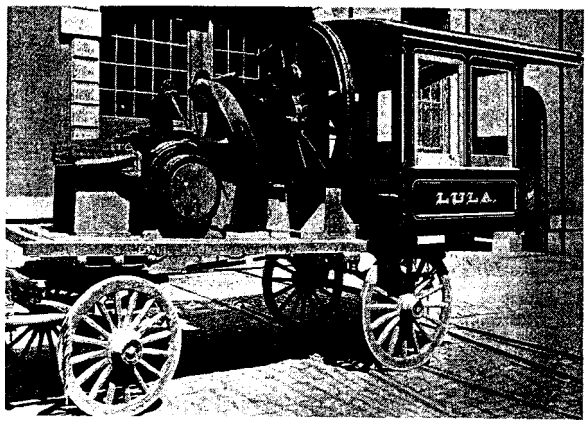


Finished cast-iron cylinders and steam pipes bolted to forged and machined engine frames. Making this relatively small number of parts required the work of patternmakers, coremakers, molders, blacksmiths, machinists, and laborers. HAGLEY MUSEUM AND LIBRARY

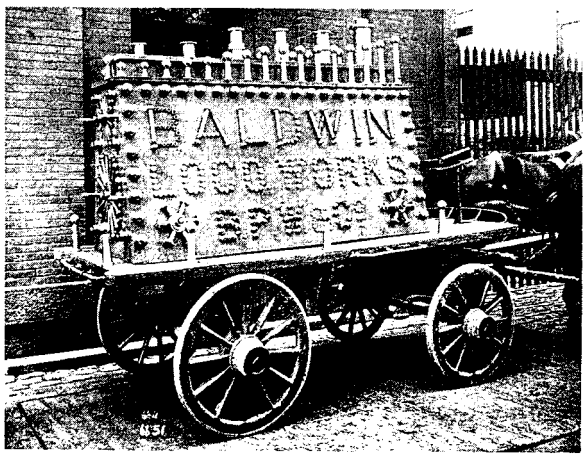


Two finished wheel sets stood on this wagon, the larger diameter for fast passenger service and the smaller for a slow freight engine. Notwithstanding their size, such wheel sets called for precise machining. Steel tires were turned and then heat-shrunk onto the cast-iron wheel centers. The crankpins and axles were pressed into holes, measured to the thousandth of an inch, bored in the wheel. Then the whole wheel set, weighing upwards of 5,000 pounds, was turned on a wheel lathe to ensure that all drivers had the same diameter. HAGLEY MUSEUM AND LIBRARY

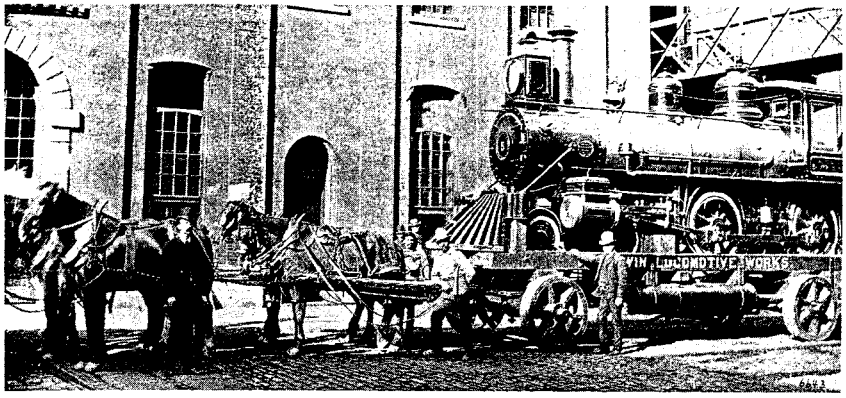
Above and opposite: In 1887 Philadelphians held a great parade to honor the centennial of the U.S. Constitution. Baldwin mounted an impressive spectacle for the procession. On a dozen horse-drawn wagons the firm displayed examples of all the finished components that entered into a locomotive. They underscored the range of trades and skills found at Baldwin—even after three decades of piecework and labor specialization. The parade also demonstrated how by the 1880s the work of locomotive building had become oriented along industrial, rather than craft, lines. In the machine makers' procession of 1844 described in chapter 1 Baldwin's men walked with other Philadelphia craftsmen in a parade organized by trades. In 1887 the workers marched in groups organized by the shops they worked in, rather than by their varied trades. Although they remained skilled, here was physical evidence of their transformation from craft to industrial workers.



The work of the patternmakers and carpenters. Patternmakers made wooden mockups for the molds used to cast parts in iron or brass, including the cylinder, steam pipe and driving-wheel patterns shown here. Steam pipe molds in turn needed cores made by other skilled workers to create hollow castings. Carpenters built the engine cab in their own shop, sending the complete cab to the erecting shop. HAGLEY MUSEUM AND LIBRARY



Locomotives required hundreds of machined detail parts like crankpins, finials, nuts, and bolts. Making these parts to precise and interchangeable standards was an idea of self-evident value, although it required new production controls and changed the character of machinists' work. HAGLEY MUSEUM AND LIBRARY



Pulled by a team of thirty-two horses, this locomotive must have been a show-stopper in the parade, with steam up and the drivers slowly revolving on rollers. Built to the meter gauge for the Dom Pedro Segundo Railway of Brazil, this 4-4-0 bore Baldwin construction number 8,780. Part of batch order of two, it sold for $8,200 and came with a guaranteed performance rating to haul 95 long tons on a 2 percent grade. HAGLEY MUSEUM AND LIBRARY

into leading men, helpers, flangers, flanging helpers, chippers and caulkers, riveters, and rivet holders. Employment fluctuations further divided the men into temporary, semipermanent, and long-term workers. These tenure rankings roughly matched skill levels, a further point of division. Management possessed unity, but labor found itself divided, making protest difficult.

Workers did not even try to resist management's mounting influence over the character of work, raising the third point. Baldwin secured their consent through cooperative labor-management relations, high pay, and its producer culture. The partners created these policies to serve their conception of the company's long-term interest. Workers, particularly the skilled men, generally believed that those interests sufficiently accorded with their own needs to be worth supporting. Baldwin's workplace culture required individual initiative and high productivity as its first criteria. In exchange for the piecework and specialization needed to achieve that productivity, workers received high pay, and over time they garnered substantial increases in real wages.

In dealing with workers Baldwin's partners truly believed that "we are as much your *employees* as you are ours," a view echoed in 1903 by another executive who wrote that "the policy of the firm is to make the interests of the men identical with its own."[104] It would be easy to dismiss such words as pandering patter, but they truly summarized the firm's cooperative policies. These policies offered sufficient value to enough workers to defuse conflict and promote accommodation at Baldwin for fifty years. When discord erupted in 1860 and in 1910–11, it followed a breakdown in Baldwin's cooperative relations with workers. In both cases competitive pressures in the locomotive industry caused the firm to curtail its high-wage policy. As a consequence, workers walked off the job.

During the intervening half century of labor peace, Baldwin derived substantial competitive advantages from its cooperative relations with workers and its producer culture. Over that period the company's share of the growing market for locomotives rose from 24 percent to 39 percent, while workers' productivity increased fourfold between 1850 and 1900. Here Baldwin reaped the benefit of its workplace policies.[105] Labor received high wages, and in return Baldwin took firm control over production. How it used that power in building locomotives is our next subject.

Comparative data on accident rates in the steel industry vs. the "machine building industry" (i.e., capital equipment firms) are found in Cheney and Hanna, "Accidents," p. 9. The rate of severe injuries in locomotive building was half that in the steel industry, but the injury rate among workers in locomotive plants was double that of machine builders generally.

75. These are the actual causes of death of three Baldwin men as listed in *Pennsylvania Industrial Statistics Report*, vol. 20 (1892), p. 110F. Eleven-year death statistics from CIR *Report*, 3:2867.

76. CIR *Report*, 3:2924.

77. Newly hired employees accounted for most of the dead and injured (ibid., p. 2866). Baldwin was not unconcerned about the combined influences of inexperience and haste on the accident rate. Ca. 1900 the following notice was posted in the plant: "Owing to the . . . number of men who are continually being taken on . . . every precaution should be taken to prevent accidents . . . [in] your effort to get out the most work in the least possible time" (cited in Tolman, *Social Engineering*, pp. 114–15). But posting a notice was different from ensuring that its instructions were followed.

78. *O'Dowd v. Burnham* and *Campbell v. Baldwin Locomotive Works*. O'Dowd and Campbell sued Baldwin for damages after their injuries. In such cases the firm invariably mounted vigorous defenses and appeals, suggesting a general strategy to discourage all claims by maintaining a reputation for legal intransigence—a common stance among industrial employers. Baldwin generally won these cases, often under the fellow-servant rule (applied in *O'Dowd*), although it lost in *Campbell*. Injured men who did not sue often received low-paying sinecures such as watchman's jobs.

79. OUT 10/61: M. W. Baldwin & Co. to C. G. Steer, M.D., Nov. 23, 1861, BLW-HSP.

80. *Pennsylvania Industrial Statistics Report*, vol. 15 (1887), p. 32B.

81. The association incorporated in 1870 (*Laws of the General Assembly of the State of Pennsylvania* [1870], pp. 1295–96); among its nine incorporators were the fathers of two Baldwin apprentices, suggesting the seniority and special status of the incorporators.

82. *Pennsylvania Industrial Statistics Report*, vol. 15 (1887), pp. 38B–39B.

83. A search for the incorporators in the manuscript schedules of the 1870 U.S. Population Census uncovered three out of the nine: an erector, a blacksmith, and an iron molder. This suggests that skilled men had stronger ties across trades than they had with the semiskilled and laboring men of their own departments. The limit probably rose as Baldwin's force grew, but in its first year only 30 percent of the force could have joined the association.

84. A good primary source on developments in New York is "Appeal to the Machinists and Blacksmiths of America," *Machinists' and Blacksmiths' International Journal*, p. 693. See also Montgomery, *Fall of the House of Labor*, pp. 193–94. The strike was no problem to Singer, since it had fifty thousand finished machines laid up in inventory, and it could sit the workers out (*New York Times*, June 6, 1872, p. 4). The builders of custom capital equipment lacked this latitude when labor unrest threatened production.

85. Philadelphia *Public Ledger*, July 27, 1872, p. 1 (Paterson), and June 12 and 15, 1872, both p. 1 (cabinetmakers).

86. Charles T. Parry to "Messrs. J. Brown and others," June 20, 1872, uncataloged, DEG.

87. Vauclain and May, *Steaming Up*, p. 181, and Richards, "Cooperative Contract System," p. 3.

88. Clawson, *Bureaucracy and the Labor Process*, p. 94.

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