

The Steam Engine as a Muslim Technology

Boilermaking and Artisan Islam

THE STEAM ENGINE AS THE “KEY TO INDUSTRY”

In 1890, Hakimuddin, the head fitter for the North-Western State Railways Locomotive Department in Sukkur, Sindh, published a manual on the steam engine. Titled *Kalīd-i ṣan‘at* (The key to industry) and published by the New Imperial Press in Lahore, the text provided notes on the use of steam engines and described how to maintain them. It explained the principles behind locomotive steam engines, focusing especially on boiler repair and use within railway workshops, and guiding Indian workers on how to move up in the locomotive workshop hierarchy.¹ The text proved popular. Following an initial print run of 350 copies, it was republished by the Khādim al-Ṭa‘īm Press three times over the subsequent thirty years.²

Hakimuddin was the son of Daswandi, a *mistrī* from a small town in Amritsar district, Punjab, and he framed his text as aimed at others from *kārīgar* and master artisan backgrounds who hoped to transition to roles in locomotive workshops. These roles focused on boilermaking, which in late nineteenth-century India primarily meant the maintenance and repair of steam engines. Educated both at home and at a colonial industrial school, Hakimuddin was part of a small cadre of upwardly mobile hereditary artisans who secured salaried or supervisory state employment through the colonial railway locomotive department, and he sought to position his text as accessible to others from artisan backgrounds. He complained that other Urdu texts on boilermaking were inaccessible to Indian *kārīgars* because they neglected the workers’ social contexts and were written in unfamiliar registers of Urdu. To counter this problem, Hakimuddin claimed to have written his text “without eloquent turns of phrase or idiomatic expressions,” relying

partially on English loanwords that were popularly used in railway workshops, since “the Urdu terms for this [boilermaking] knowledge are still not widespread.”³

In a lengthy introduction, Hakimuddin laid out his understanding of the role that the steam engine should play in Indian society and his hopes for the future of Indian artisans, though he began by acknowledging the divine “true mechanic.” “Infinite praise is due to the true mechanic, who, with only divine power, unrestrained by tools or measurements, created the perfect human engine, making it the origin of a thousand tomorrows.”⁴ For Hakimuddin, the steam engine allowed humanity to draw forward the “train of endless progress” begun through divine creation.⁵

Hakimuddin characterized divinely inspired technical progress as a boon for all mankind but also, specifically, as a route to economic and social stability for India’s skilled but impoverished artisans. “The poor man,” Hakimuddin maintained, was “terrified” to make demands or changes to his work, for he lived in “fear of a loss of wages.”⁶ But, he claimed, knowledge of the steam engine could counter such oppression. Artisans, in his view, required access to forms of training and encouragement to adapt their knowledge to the manufacture and maintenance of new tools, which would allow them to secure higher wages and improved social status.

For instance, while describing steam injectors that were used to provide cold water to the boiler from exhaust steam, Hakimuddin explained that the principles behind the injectors could be confusing but that an understanding of their use was necessary to their maintenance, repair, and use. He provided an evocative metaphor of a hookah to explain how an injector functioned:

Let us think of [the injector] as if it were a hookah, in which the base will always keep its form. Blowing into the hose of the hookah will produce a fountain of water in the base and steam out of the other hose, which will disperse, so long as there are no obstacles at the mouth of the hose. But if a stone is placed on the mouth, then the steam will only be able to come out if the force of our breath overcomes the weight of the stone. . . . In the same way, the water from the injector flows into the boiler. There are many obstacles in the way, so now we must provide the formula that overcomes the obstacle and clears the way for the water to enter the boiler.⁷

The description of the steam injector as hookah served less to fully explain its mechanical properties than to make the steam technology accessible to artisans who possessed related technical skills but limited experience with boilers. Similarly, Hakimuddin provided a sketch of the injector (figure 9), which he referenced repeatedly in his description. While the sketch was useful as an overview, Hakimuddin’s text recognized that artisans would need to physically engage with the injector to fully understand its use. Hakimuddin thus supplied familiarity with the properties of the steam engine to artisans seeking railway positions, while also recognizing that much of their physical engagement with steam technology would be learned through their job.⁸

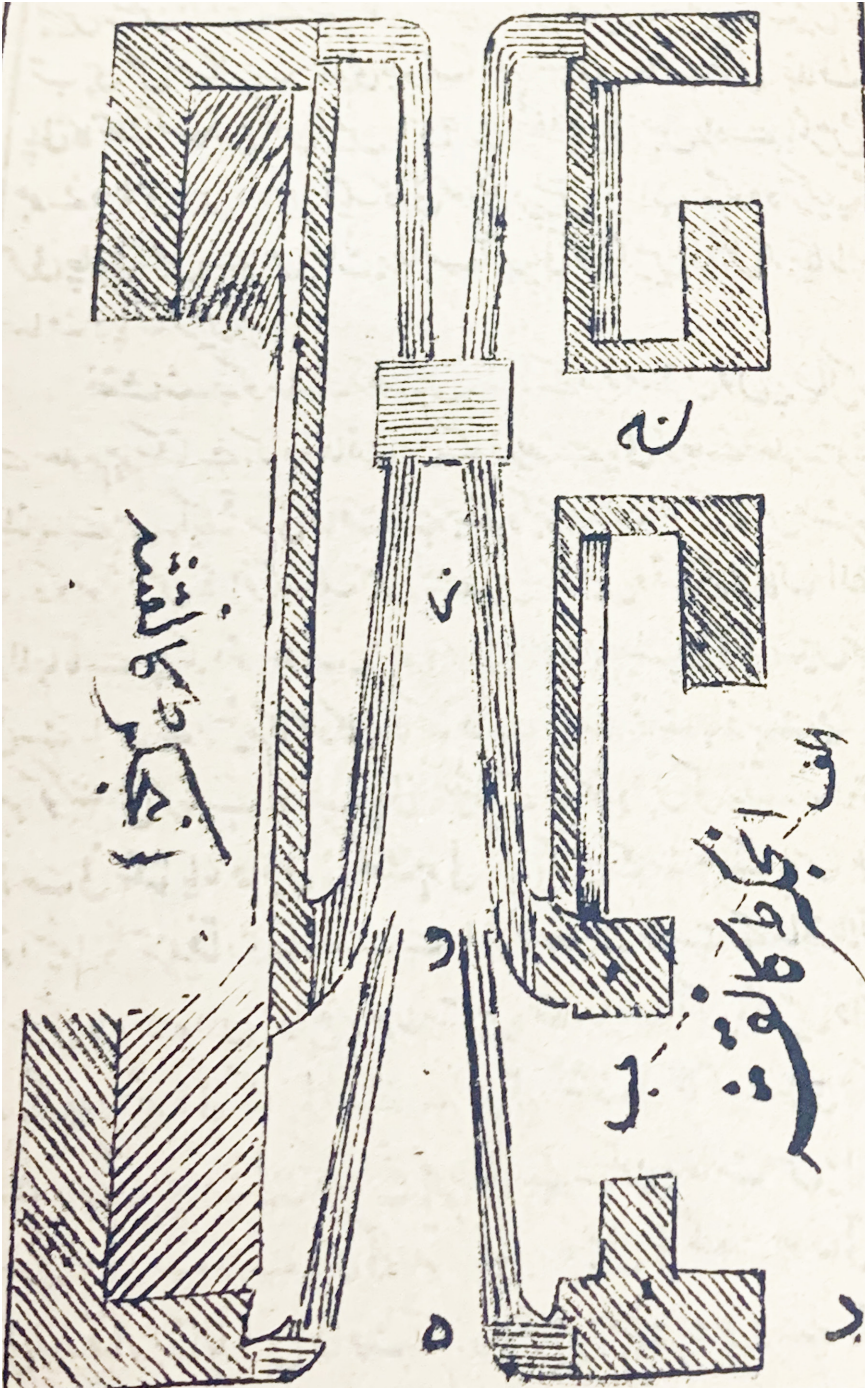


FIGURE 9. A sketch of a steam injector from the 1922 edition of Hakimuddin's *Kalid-i šan 'at* (Lahore: Khādim al-Ṭa'lim Press) (Punjab Public Library)

The positions and labor described in the *Kalīd-i ṣanʿat* differed significantly from many of the others described in this book, in that they did not primarily involve making or building new items for sale or for patrons. Rather, these workers focused on the repair, maintenance, and use of boilers and other machinery associated with locomotive workshops. But for Hakimuddin—a master artisan who had secured upward mobility and economic stability through railway employment—railway workers remained *kārīgars*, skilled workers whose labor reflected divinely inspired ingenuity. This perspective hinted at the often-overlooked centrality of repair and maintenance, while also reflecting the relative fluidity with which some North Indian artisans moved between artisanal production and railway industrial labor.

Hakimuddin's treatise also differs from the other materials explored in this book in that he was not significantly concerned with Muslim religious narratives of labor and technology. Indeed, the only explicit mentions of God in the text is Hakimuddin's introductory evocation the "true mechanic" and his "divine power," a phrase he transliterated from English as "dīvāyin pāvar."⁹ Hakimuddin framed his text as intended for Indian *kārīgars*, broadly defined, emphasizing their shared social positionalities and decrying the religious conflict and "separation" that he saw as preventing economic and industrial growth.¹⁰

Despite these differences, I read *Kalīd-i ṣanʿat* as a record of Muslim artisan negotiation of the colonial industrial economy. When read alongside colonial records of railway labor and middle-class Muslim efforts to claim technological authority for members of their own class, the *Kalīd-i ṣanʿat* suggests the ways that Muslim artisans like Hakimuddin sought to raise *kārīgars'* social standing. To this end, the steam engine can be studied as a Muslim technology, not because Hakimuddin or other Muslim master artisans offered a religious past or tradition for it, but because it was a technology through which Muslim artisans asserted their visions for the economic and social futures of their communities.

Within two decades of the publication of the *Kalīd-i ṣanʿat*, Muslim railway laborers, including boilermakers, blacksmiths, and others employed in the maintenance of steam engines, founded organizations aimed at the social uplift of their communities. The evocation of *kārīgars'* authority in the *Kalīd-i ṣanʿat* suggests a potential historical lineage for Muslim artisan efforts to assert shared class and social identities, both within and across religious communities. Ultimately, a contextualized reading of the *Kalīd-i ṣanʿat* and its insistence on artisanal ingenuity may help trace the influence of Muslim artisan identities on the influential railway labor solidarities and movements of early twentieth century.

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This chapter focuses on the relationships between communities involved in the labor and oversight of boilermaking and the maintenance and use of steam

engines in the railways of Punjab and the United Provinces. Hakimuddin wrote at a moment of significant upheaval and realignment in the hierarchies of control and application of technical knowledge. Ajantha Subramanian characterizes this shift in the social hierarchies of technical knowledge and authority as one “from guild to state, shopfloor to classroom, and lower to upper caste.”¹¹ Hakimuddin occupied an ambiguous position in this shift. He was the son of a blacksmithing *mistrī* who had trained with his father but subsequently enrolled in a colonial technical school and secured state employment. He was part of a small cadre of artisans, from varied religious backgrounds, who made this transition to supervisory railway intermediary in the late nineteenth century. But by the time he published his text, this group was increasingly marginalized by an emerging middle class of technical overseers from landholding, service gentry, and other elite backgrounds.

The chapter argues that artisans—and artisan-intermediaries like Hakimuddin—did not simply acquiesce to the displacement and devaluation of artisanal skill within railway hierarchies over the course of the late nineteenth and early twentieth centuries. Instead, they developed narratives of *kārīgar* solidarity, based on both shared religious pasts and shared skill. They promoted and, in the words of Kenneth George and Kiran Narayan, “exalted” their distinctive physical skills as a form of technical authority.¹² The exaltation of *kārīgars*’ knowledge seen in the *Kalīd-i ṣan‘at* was ultimately not successful in preserving hereditary artisans’ technical authority within the railways. Nonetheless, I argue that it informed the social and religious solidarities that became increasingly prominent among railway laborers over the subsequent decades. I read the *Kalīd-i ṣan‘at* as reflective of a form of artisan Islam because it attempted to cultivate shared Muslim laboring and social spaces within locomotive workshops, not because it proposed a specific Muslim past for new technologies.

This chapter positions the late nineteenth-century *Kalīd-i ṣan‘at* at a key moment of upheaval in the forms of technical authority that commanded influence among Indian employees of the railway locomotive departments. After an overview of the rise of Indian boilermaking and locomotive workshops, it turns to the social, laboring, and religious spaces of Muslim artisan-intermediaries such as Hakimuddin and their relationships with the laborers they oversaw. Subsequently, the chapter examines the displacement of Hakimuddin’s class of artisan-intermediaries by new cadres of overseers drawn primarily from upper-caste Hindu and Sikh and *sharīf* Muslim backgrounds. I argue that middle-class Muslim technical overseers promoted their own visions of Islamic technical modernity for railway labor, which often diverged from those popular among artisan laborers. Finally, the chapter asks how artisans challenged the marginalization of their forms of technical authority and traces the ways that these challenges contributed to the laboring identities asserted by Muslim boilermakers, locomotive repairmen, and other laborers through the 1920s and 1930s.

INDIAN ARTISANS AND THE RISE OF BOILERMAKING

Starting around the late nineteenth century, colonial railway authorities began to “Indianize” railway labor and oversight, a process that Ian Kerr traces from its origins in the 1860s but that gained significant momentum around the turn of the twentieth century.¹³ While “Indianization” created new spaces of employment for educated Indians, colonial railway administrators often enforced class, caste, and social hierarchies through this process. By the early twentieth century, even as Indians were recruited for a wider range of positions within the railways, the social hierarchies of positions open to Indians became more ossified.

Though many positions remained open only to Europeans (and sometimes Anglo-Indians), from the second half of the nineteenth century, mid- and low-level supervisory positions such as “head fitter,” “subinspector,” “overseer,” and “charge-man” recruited “natives.”¹⁴ In many cases, these positions were filled by middle-class Indian men, the sons of the so-called service gentry who leveraged colonial higher education to secure state employment. But between the 1860s and the turn of the twentieth century, a small number of young men from artisan families with training in trades such as blacksmithing and carpentry also secured these positions. The number of master artisans like Hakimuddin who were able to access even supervisory positions was never large, but the possibility of upward mobility became even more remote around the turn of the century as growing numbers of middle-class Indians sought railway employment. Indian railway intermediaries—whether from artisan or middle-class backgrounds—oversaw larger cadres of Indian artisan laborers who transitioned to railway labor. This class continued to perform the lowest-paid and most physically taxing work of boiler use and repair throughout the early twentieth century.

In Hakimuddin’s view, labor within the railways was a potential route not only to prosperity but also to forms of industrial authority and social status for Indian artisans. More specifically, he argued that knowledge of steam engines and boiler-making would allow artisans to adapt their extant knowledge to a trade that was in high demand. But which artisan communities transitioned into boilermaking, and what forms of social and educational access did they require to make that transition possible? In nineteenth-century India, practices such as boilermaking were often not recognized as distinct trades dependent on distinct skills. The term *boilermaker* did not reach widespread use even in Britain until the mid-nineteenth century.¹⁵ Laborers were, instead, often recorded simply as “blacksmiths” or sometimes as “machinists,” reflecting the broad nature of their skills and sometimes the trade from which they had been recruited.¹⁶ Nonetheless, it is possible to identify the centers of the growth of boilermaking as a trade and, in doing so, to consider the adaptation of specific artisan communities to its technologies and forms of labor.

Much of the earliest demand for boilermakers in the late eighteenth and early nineteenth centuries centered on the dockyards of port cities, particularly Calcutta

and Bombay. There the construction, inspection, maintenance, repair, and use of steamships necessitated a growing labor force familiar with boilers. The development of small-scale iron foundries, textile factories that relied on steam power, and a variety of saw, oil, and paper mills also spurred demand for boilermakers in mid-nineteenth-century urban India.¹⁷

The rapid mid-nineteenth-century expansion of colonial railway infrastructure represented a second stage in the growth of boilermaking as a distinct trade in India. As suggested by Hakimuddin's manual, laborers were required to maintain, repair, and use the boilers for steam-powered locomotives. The railways in India were initially constructed by private, Britain-based companies that were guaranteed a 5 percent minimum return on investment by the East India Company, contributing to financial extraction from the colony to the metropole.¹⁸ Constructed for industrial transport beginning in the 1830s, and then for the movement of passengers from the 1850s, early railways in India relied on extant boilermaking knowledge to run and repair steam locomotives. European boilermakers were recruited to these projects, but as in the case of steamships an Indian labor force quickly developed—often drawn from artisans in related trades—to address the repair and maintenance of steam locomotives. By the 1870s, railway boiler-making was a trade with considerable demand and was increasingly incorporated into colonial industrial schools.¹⁹

The 1870s also saw a reorganization of the Indian railways, contributing to the rise of large-scale, consolidated locomotive workshops. Several of the smaller Indian railway lines merged, creating a system of five major railway companies that crisscrossed British Indian territory. In the North-Western Provinces, most of the rails were controlled by the East India Railway Company, which had initially aimed to connect Delhi and Calcutta.²⁰ In Punjab, most of the lines were consolidated under the administration of the North-Western Railways from the 1880s, connecting Punjabi cities such as Lahore and Amritsar to Sindh, Baluchistan, and the Afghan frontier.²¹

Boilermakers were employed by all the railway companies in India. As was the case with carpenters, they migrated to major centers of railway construction and production, and in many cases consolidated in communities around the largest locomotive workshops. The largest locomotive workshops of the Eastern Railways were in Jamalpur, present-day Bihar, with other significant locomotive workshops near Calcutta and in Lucknow. For the North-Western Railways, the largest sites of employment for boilermakers in the locomotive workshops were Lahore (Mughalपुरa) and Rawalpindi in Punjab, and Karachi and Sukkur in Sindh. Other boilermakers migrated to or were trained in workshops that combined a smaller amount of locomotive repair and maintenance with work like carriage construction.²² Hakimuddin's own employment trajectory reflects this mobility: raised and trained in Punjab, he worked as a boilermaking fitter in a smaller workshop in Jacobabad, Sindh, before being appointed "head fitter" in Sukkur.²³

Despite the rapid expansion of the trade, boilermakers and others who labored on steam technology in the Indian railway context have received limited scholarly attention. This is in part because the “design and construction” of steam locomotives for the Indian railways were overwhelmingly carried out in Britain, so the history of Indian engagement with steam engines as a technology may seem limited.²⁴ But Indian laborers nonetheless developed their own technical practices around steam locomotives, even if they focused primarily on maintenance and repair rather than construction.

Hakimuddin portrayed boilermaking as a site of potential upward mobility, but like many technical trades in colonial India, it was rigidly and hierarchically organized along racial lines, with only specific, lower-paying positions open to Indians before the 1920s.²⁵ Throughout the nineteenth century and as late as 1935, lead railway boiler inspectors—often trained engineers—were almost always Europeans. Most district boilermakers who were responsible for the oversight of “three to five engine houses” were European or Anglo-Indian, though other Indians were also permitted to apply for these positions. Suboverseers, chargemen, and other Indian intermediary positions were responsible for coordinating between these inspectors and the *mistrīs* who carried out most of the technical work. Indian *mistrīs* were employed for the day-to-day labor of boiler repair, including “the renewing of strays, caulking of firebox corners, foundation rings, or other work coming under boiler or firebox repairs.”²⁶

Following several high-profile accidents, most Indian provinces, beginning with Bombay Presidency in 1873, required forms of certification for the people who inspected or maintained steam boilers. A divide emerged between colonial administrators who believed that such laws should certify engineers—who led the inspections—and those who believed that they should certify lower-level supervisors or even *mistrīs* themselves, who were responsible for most of the daily maintenance and repair.²⁷ In the United Provinces and Punjab, which adopted boiler inspection certification laws in 1899 and 1902 respectively, the former position eventually dominated.²⁸ This partially deprived Indian boilermaking *mistrīs*—and even some Indian supervisors—of the authority they might have held in the workshop by making their work dependent on the oversight and authority of an inspecting engineer.

Despite limitations in authority and prestige for *mistrīs* within the locomotive departments, Hakimuddin identified an important economic reality. Boilermaking provided some of the highest wages available to Indian artisans and laborers within the railways, as well as in other sites of labor recruitment such as public works departments, shipyards, and private mills and factories. By the turn of the twentieth century, locomotive shop boilermakers in Punjab and the United Provinces could earn up to forty-five rupees per month, placing them among the highest earners of the “skilled,” “native” laborers in the railway infrastructure.²⁹

In some cases, the artisans who were trained and recruited for boilermaking were part of multigenerational artisanal railway labor cadres. As chapter 4 shows,

the sons of railway workers in Lahore often trained in the Railway Technical School.³⁰ There they learned skills specifically related to railway labor, with some learning boilermaking and repair. In many other cases, however, blacksmiths and workers from other aligned trades learned boilermaking on the job, within the locomotive workshops. In the 1920s and 1930s, this ad hoc form of “training” and the organization of boiler shops was repeatedly decried by railway administrators as leading to unsafe working conditions and injuries.³¹ Nonetheless, it reflects the fact that many Indian artisans used extant skills to secure positions in the locomotive workshops that required the adaptation of technical practices but also the potential for higher wages.³²

BOILER WORK AND THE QUESTION OF ARTISANSHIP

Most of the work carried out by Indian artisans within locomotive workshops would not have been categorized as “artisanal” or “craft” work in colonial monographs on industry. It led, not to the making of distinctively “Indian” goods or items, but rather to the repair of materials that had often been brought in from abroad. But boiler repair, maintenance, and even use, built on what Joshua Grace, in the context of East African car repair, framed as the “accessible infrastructure of expertise.” Accordingly, this infrastructure reflected the “material places, things, and knowledge” often associated in India with blacksmiths and other skilled artisans.³³ When artisan-intermediaries like Hakimuddin expounded on the new technologies and materials that an artisan would encounter in a locomotive workshop, they did so secure in the knowledge that artisans had access to previous training and embodied skill in a related trade.

Indeed, in praising *kārīgars*’ skill, Hakimuddin went beyond boiler repair and maintenance to highlight a wide range of embodied knowledge of the steam engine. He profiled, for instance, the role of the fireman, responsible for stoking the boiler fires within the steam engine. This was a physically taxing trade with a high rate of injury and low rate of pay compared to mechanical work but was nonetheless central to the safe running of locomotives.³⁴ While many firemen were Anglo-Indian, the position was open to other Indian workers and, despite its dangers, was seen as a potential path to better-paid railway positions.³⁵ Indeed, Hakimuddin noted that when a fireman had demonstrated mastery of his work and distinguished himself in his diligence, he might “climb the ladder” of his trade and take an exam to qualify him to work as a driver.³⁶ Hakimuddin offered an overview of what the fireman’s day might look like, as well as praise of his embodied knowledge and skilled diligence. After a description of how the fireman should lay out his tools, take the directions of the train driver, and check the levels of water and oil, he described the fireman’s role on the moving train:

When the train has left the station, [the fireman] opens the small damper and lights a few coals on the coal fire. This coal will burn in a dull flame. And now he must

check to see if the steam is still blowing. And this is where it is seen how useful the starting fire was, as it could get the light engine up to full speed in roughly fifty miles. Care must be taken that when the boiler is filled with steam, the needle of the steam gauge or pressure gauge is not pulled out of its place. . . . It is never possible to gain complete control over such a base substance as fire. . . . But if he keeps at his work bearing in mind moderation, then he will be up to the challenge. He will begin to see the excellent quality of his work everywhere, such as in the boiler, which is full of steam today and will be so tomorrow as well. . . . As he protects himself, so will he preserve his shovel.³⁷

By including laborers like firemen in his depiction of the skill and knowledge of Indian *kārīgars*, Hakimuddin suggests important shifts in the types of social and laboring identities and solidarities claimed by Indian artisans around the turn of the twentieth century. Their location within locomotive workshops spurred new associations and affiliations. These new *kārīgar* identities were based on the ability to make, or repair, and also on shared engagement with the material and technology of the steam engine. Hakimuddin envisioned a future in which laborers employed in the locomotive workshops would enjoy upward mobility, distinguishing themselves as in roles like firemen and sitting exams to become well-paid and respected locomotive drivers. To this end, he even provided a guide to key questions on the locomotive driver exam.³⁸ While he explained that a driver did not necessarily need to be a *kārīgar*, he maintained that any effective driver would have “appreciation for the work of industry” and competency in the “artistry” of the locomotive workshop.³⁹

But while Hakimuddin may have promoted locomotive workshops as a site of upward mobility, many workers found themselves blocked from these paths by strictures of race, caste, and education that governed railway hiring and promotion. As artisan laborers were pushed downward within technical hierarchies of railway employment from the late nineteenth century, shared identities and values among railway *kārīgars* took on contours that Hakimuddin did not predict. In many cases, they were ultimately relevant, not for securing promotions, but instead for building social and economic solidarities among workers.

MUSLIM ARTISANS AS BOILERMAKING INTERMEDIARIES

Scholars of colonial-era South Asia have emphasized the racially segregated and hierarchical nature of technical education and employment in the nineteenth and early twentieth centuries. Aparajith Ramnath, for instance, recently examined the “prevailing [colonial] view of Indians as lacking technical aptitude” and the exclusion of Indians from many forms of engineering education prior to the 1920s.⁴⁰ David Arnold describes the “clear hierarchy of authority” that gave Europeans authority over science and technology and “fixed India”—and Indians—“in a

position of dependence and subordination.”⁴¹ But colonial administrators also enforced a second hierarchy in technical education from the mid-nineteenth century. Upper-caste Hindus and Sikhs, *sharīf* Muslims, and Anglo-Indians were recruited to engineering and arts schools, creating a “native” level of technical oversight under European direction. Conversely, the state recruited children from artisan families to trade-based technical schools, often funneling them into large-scale railway workshops and public works labor.⁴²

Prior to the consolidation of middle-class Indian technical oversight, nineteenth-century artisan-intermediary communities had distinct experiences of social and economic mobility, which were rarely generalizable to broader artisan experiences. Nonetheless, some, like Hakimuddin, attempted to speak for artisan interests within state railway and public works department workshops. By tracing the careers and experiences of members of the small cadres of Muslim artisan-intermediaries we can identify ways that their backgrounds informed their engagement with both labor and Islam or the spaces of Muslim sociability.

Hakimuddin’s own career reflects moments of both distinction and engagement with broader artisan communities. He noted his hereditary artisan background, describing his father as a *mistrī* in Hoshiar Nagar, in Amritsar district.⁴³ After joining the North-Western Railways, he was posted to Jacobabad, Sindh. Jacobabad was home to a small locomotive workshop that, unlike large locomotive shops in North-Western railway centers such as Lahore and Rawalpindi, adjoined a wagon and carriage shop.⁴⁴ This meant that Hakimuddin was likely responsible for oversight not only of boilermakers and others engaged in engine repair but also for a cadre of carpenters, blacksmiths, and other artisans who built and repaired the rail carriages. Apparently distinguishing himself—and beginning his composition of the *Kalid-i šan‘at*—there, he was sent to the larger locomotive workshop in Sukkur, where he was employed as head fitter by the time the first edition of the book was released.⁴⁵

Hakimuddin’s assignments in Sindh also reflect an important social difference between artisan-intermediaries and the laboring cadres that they oversaw. While many artisan laborers migrated to secure railway positions, these migrations were frequently—though not always—within the same province or region; even when they occurred across larger distances, they were coordinated by kinship and social networks mediated by jobbers. Supervisory or salaried intermediaries, however, were assigned on the basis of the needs of the North-Western Railway administration overall. Hakimuddin, who had been born in Amritsar district, was thus sent to Sindh, where he may have encountered some Punjabis who would have migrated there for work. It is more likely, however, that he oversaw workers who had migrated from cities and towns in the surrounding regions of Sindh and Baluchistan.

Despite these social differences with the laborers that he oversaw, Hakimuddin asserted his social connectedness to the world of artisanship within the railways.

In the text, he described his social circle, with whom he shared his concerns about the future of Indian artisans and artisanship, as railway workers “in the fields of industry and crafts [*ṣan ‘at-o-ḥirfat*].” These friends, he complained, were “like parrots in a gallery,” constantly lamenting the dominance of European engineers and inspectors over Indians skilled in *dastkārī*, meaning handicrafts or artisanship.⁴⁶ Hakimuddin saw his role as building “consensus” (*itifāq*), among his fellow Indian employees, including those in both intermediary and laboring roles. He explained: “If you try to take one step forward in the field of industry without *itifāq*, you risk falling flat on your face [*munh ke bal girnā*] for the next fifty steps.”⁴⁷

Like many of the *obreros ilustrados* (enlightened workingmen) described by Jorell Meléndez-Badillo in his analysis of the knowledge produced by early twentieth-century Puerto Rican workers, Hakimuddin envisioned potential solidarities “on behalf of” a broader cadre of artisans and workers.⁴⁸ Though he possessed a higher status and a more well-renumerated position within the workshop, he positioned himself as responsible for building connections among Indian workers, including *mistrīs*, other laborers, and his fellow intermediaries. He argued that these solidarities were required both to improve the technical abilities and social status of Indian *kārīgars* and to restore Indian authority over industry.

BOILERMAKING ARTISAN-INTERMEDIARIES BEYOND THE RAILWAYS

Prior to the release of the second edition of his book in 1899, Hakimuddin left the railways to work as an “in-charge” in a European-owned ginning and pressing factory in Okara, Punjab, where he supervised the maintenance of the boilers and other machinery.⁴⁹ This transition out of railway employment reflected the fact that there was high demand for boilermakers in a variety of different industrial contexts, not just privately owned factories but also government military and public works projects.

Hakimuddin’s career is not traceable beyond his move to Okara, as later editions of the text continued to list his role as “in-charge” at the ginning and pressing factory.⁵⁰ However, the experiences of other artisan-intermediaries engaged in boilermaking and in positions of oversight likewise suggest the ways that members of this class engaged with labor beyond the railways. Like Hakimuddin, a father and son named Muhammad Bakhsh (d. ca. 1890) and Muhammad Hanif (d. 1915) were members of an artisan family who secured salaried employment, working for the public works department of the princely state of Rampur.⁵¹ The father, Muhammad Bakhsh, trained in the family trades of metalwork and weaponsmithing, learning to make cannons and artillery for the state armory and other patrons. But British military paramountcy and new restrictions on weaponsmithing drove Muhammad Bakhsh to pursue alternative employment. He was employed in the state’s icehouse (*barf khānah*), an innovation that was adopted in

princely states in the 1850s following earlier trends in the import, production, and storage of ice in major British-administered Indian cities.⁵²

Muhammad Bakhsh became known in the state for his skill in repairing the icehouse's boiler, a skill he used to secure an official role as a state public works department subinspector.⁵³ He trained his son, Muhammad Hanif, in both metal-smithing and the technical skills that he had developed through his work on the icehouse boiler. Muhammad Hanif used these skills to gain a position overseeing the repair of engines and boilers for several state workshops.⁵⁴ He was selected to accompany the state's British chief engineer to the 1883 Calcutta International Exhibition, where he studied displayed steam-powered lathes. Upon his return to Rampur, he manufactured his own power lathes for state use.⁵⁵ Both Muhammad Hanif and Muhammad Bakhsh thus successfully negotiated an emerging system of state technical oversight to secure formal positions, despite training within familial artisan apprenticeships rather than state institutions.

In the first decade of the twentieth century, many princely states like Rampur had slightly more flexible requirements for supervisory public works employment than the railways or the public works departments of directly administered British Indian regions. The fact that neither Muhammad Hanif nor Muhammad Bakhsh had studied in colonial engineering or industrial schools was therefore less of an impediment to their employment than it may have been in British India. Nonetheless, Muhammad Hanif, like Hakimuddin, was likely representative of a final generation of state-employed artisan-intermediaries.

By 1915, the time of Muhammad Hanif's death, employment in Rampuri public works oversight was increasingly limited to the graduates of colonial engineering and arts schools.⁵⁶ Although colonial administrators often expressed a desire to recruit the sons of artisans to these schools, they overwhelmingly became sites primarily for the training of middle-class boys from nonartisan backgrounds by the early twentieth century. This consolidating class of state-educated, middle-class intermediaries—composed primarily of upper-caste Hindus and Sikhs, *sharif* Muslims, and some Anglo-Indians—pushed artisan-intermediaries downward in the hierarchies of technical oversight. This process took place not only within the railway locomotive workshops but also across a wide range of spaces where artisan-intermediaries had overseen and engaged with boiler repair and maintenance.

THE MUSLIM SOCIAL SPACES OF ARTISAN-INTERMEDIARIES

As new cadres of middle-class Muslims displaced artisan-intermediaries in positions of oversight in the railways and other contexts of boilermaking, they brought with them narratives about the relationship between technology and Islam. These new understandings about the relationship between technology and Islam did not supplant artisan engagement with Islam in the workshop but

did contribute to the marginalization of Muslim artisans' understanding of their work and religious practice. I examine whether, and how, artisan-intermediaries such as Hakimuddin participated in or made space for artisan Islam in contexts of boilermaking and railway workshops before I turn to the new Muslim middle-class *ashrāf* of technical intermediaries and their efforts to discipline the religious practices of Muslim laborers.

Hakimuddin's treatise did not conform to many of the conventions of writing about the pious labor of Muslim artisans. At nearly 150 pages, it was far longer than most technical manuals and community histories, and Hakimuddin showed limited interest in integrating the Muslim past into his explanation of new technologies and trades. Many of the narratives of artisan Islam that I have explored so far—such as references to a prophetic past or emphasis on the pious nature of physical labor—seem notably absent from the *Kalid-i ṣan'at*. Nonetheless, in his claimed inspiration for the text, as well as his theory of translation, Hakimuddin reflected a Muslim sociability of railway work, in which skilled workmanship and Muslim social identities intersected to contribute to new laboring solidarities among *kāriḡars*. His work suggests an artisan Islam that included not just narratives of religious piety or practice but also the cultivation of shared social and intellectual worlds among Muslim workers.

Hakimuddin's initial impetus for writing the text, he claimed, was conversations with his colleague Nur Muhammad Khan, a railway water inspector. The two lamented to each other, "Why is it that the industry and craft of our country declines day by day, even in this modern era of development and growth?"⁵⁷ Hakimuddin castigated both "Europeans" and the "Indian gentlemen who follow in the footsteps of the English in most matters" and held them responsible for this "decline" in Indian artisanal and industrial skill. He concluded that the solution was for Indian workers to collaboratively cultivate these skills for themselves.⁵⁸ Hakimuddin's account of his conversation with Nur Muhammad Khan painted an image of two Muslim railway intermediaries who identified with the challenges of the artisanal laborers employed in their workshops and saw themselves as distinct from the "European" and "Indian gentlemen" supervisors with whom they likely interacted. It suggests that a community of Muslim intermediaries used their social connections with each other to imagine new forms of technical authority for *kāriḡars*.

Hakimuddin's theory of translation likewise reflected a Muslim laboring sociability, in which shifting technologies were articulated through localized forms of knowledge, including religious and cultural knowledge. In his introduction, he criticized British Indian industrial and technical institutions for relying primarily on direct translations of European works. "Most translators," Hakimuddin lamented, "do not consider that they must bring a book new life. . . . They reject the idea of taking parts out and putting new parts into the book."⁵⁹ Conversely, he wrote, his technical manual was one through which "everyone might find

satisfaction in its *faiz*.” *Faiz* is often translated as “grace” or “bounty,” and Paul Losensky characterizes it as the “infinite inspiration” that writers and thinkers take from the divine.⁶⁰ Hakimuddin contrasted his own manual—suffused with *faiz*—with technical manuals that had been translated from English, which, he claimed, “follow[ed] the rules” of language but failed to communicate knowledge. By communicating with and through *faiz*, Hakimuddin wrote, “we have compiled the book for this community, in which there is no need for ostentation and pretentiousness [*ṣūrat parastī aur ‘ibārat-ārā’ī*].”⁶¹

Hakimuddin’s reference to the *faiz* of boilermaking knowledge did not necessarily suggest a specific form of divine inspiration. But it did reflect a mode of writing common among Muslim artisans in which the “divine power” of new technical knowledge was made accessible through reference to artisan experiences, be they material, religious, or social. Even the use of the hookah as a metaphor for the steam injector might, in Hakimuddin’s terms, contribute to a reader finding “satisfaction in [the] *faiz*” of mechanical knowledge. Hakimuddin was, of course, just one representative of the small but diverse cadre of Muslim artisan-intermediaries who attained positions of oversight in the late nineteenth century. But his emphasis on the *faiz* inherent in knowledge of steam engines suggests that he expected artisans to engage creatively with both processes of physical production and knowledge of the “divine power” that inspired this production in the workshop.

The degree to which Hakimuddin or other artisan-intermediaries led their workshops in ways that encouraged the adaptation of artisan religious practices in the context of industrialized labor remains opaque. Nonetheless, Hakimuddin’s writing hints at a Muslim parallel to the world of Hindu “technophany” described by George and Narayan, in which skilled mechanic-technicians often claimed “special discerning authority and understanding” of the relationships between technology and divinity.⁶² Hakimuddin’s aims for Indian *kārīgars* extended beyond the boundaries of religious identity, but they were articulated within a Muslim social world and through Muslim imaginaries of divine knowledge.

EDUCATIONAL HIERARCHIES AND THE MARGINALIZATION OF MASTER ARTISANS

The marginalization of artisan-intermediaries—and their social and religious spaces and imaginaries—within the railways took place gradually. It was a result of the slow rise of a new middle class and accompanying practices of technical oversight, which were, in turn, shaped by emerging systems of colonial technical education and employment preferences. Although individuals like Hakimuddin and Muhammad Hanif secured positions of technical oversight in the waning years of the nineteenth century, they were members of a diminishing cohort of artisan-intermediaries. Artisans of diverse religious backgrounds continued to find employment in railway workshops and through public works contracts. But

while master artisans occasionally rose to positions of oversight in the nineteenth century, by the 1910s these positions went almost exclusively to members of a new middle class. *Sharīf* Muslims and upper-caste Hindus and Sikhs dominated the positions of oversight permitted to Indians, alongside the Anglo-Indian workers who were often most closely associated with the railways and who were sometimes preferred for higher-paid positions.⁶³

While Hakimuddin was optimistic about the ability of Indian artisans to assert authority over knowledge of steam engines, he also recognized the strengthening of social hierarchies that marginalized artisanal authority. He was especially suspicious of evolving systems of employment and patronage that gave “gentlemen” technical authority over artisan skill. Describing Indian social hierarchies that were strengthened through the colonial organization of railway workshops, he wrote: “Assuming I am well versed in industry and craftsmanship, and even know how to make sketches, and I have endured hard work to make complete and useful items, I still cannot trust that a nobleman [*raīs*] or other wealthy Indian will treat me well and will respect my work in a way that will encourage me to make something even better in the future and to expand my knowledge.”⁶⁴ Hakimuddin thus highlighted the social hierarchization that had dominated boilermaking and engine repair and their oversight from the rise of these trades in the 1850s. He expressed hope that artisans might disrupt these hierarchies through their technical mastery—or through the *faiz* of boilermaking knowledge. Nonetheless, he also seemed to recognize that, around the turn of the twentieth century, these hierarchies were strengthening, not diminishing.

One reason for the ossification of social hierarchies of technical oversight was that middle-class boys—from across religious backgrounds—were increasingly likely to engage with colonial technical education. The most prestigious site for technical training in North India was Thomason Civil Engineering College in Roorkee (founded as the College of Civil Engineering circa 1847).⁶⁵ Education at Roorkee was segregated along racial lines. Small numbers of Indians were admitted into “engineering” and “upper subordinate” courses, but they were educated separately from their European counterparts. Prior to the twentieth century, most Indian graduates from the college studied in the “lower subordinate” courses.⁶⁶ Nonetheless, Roorkee and other engineering colleges provided a springboard from which Indians—primarily with upper-caste and Muslim *ashrāf* backgrounds—secured provincial public works and railway jobs.

Reflecting some of the earliest associations between *ashrāf* identities and technical training at institutions like Thomason College, a list of graduates in 1852 showed that of the ten Indians who completed lower subordinate training, five—all Muslims—had previously studied at the Anglo-Arabic Delhi College.⁶⁷ Delhi College had its origins as a center for the education of regional Mughal nobility, but in the 1820s, under British East India Company direction, it became a prominent site for the education of regional elites in “Western” knowledge. Moreover, while the

college's mid-nineteenth-century students were religiously diverse, Delhi College became an embodiment of the new middle-class *ashrāf* mode of education and comportment for many Muslim students.⁶⁸

The associations between the emerging middle class and government positions of low-level technical supervision grew over the course of the late nineteenth century. The expansion of engineering and technical education to regional universities and schools made it a viable option for members of Muslim middle-class *ashrāf* families across the United Provinces and Punjab. Members of this class, along with their upper-caste Hindu and Sikhs counterparts, often framed technical work as both the most secure form of salaried, government employment and an appropriate use of middle-class skill and education. An 1895 article in the Urdu-language journal *Indian Architect* (transliterated in Urdu as *Indiyan arkitikt*), published from Lahore, reflected this perspective. Writing about the local engineering school, the author praised "those parents who enroll their sons" in the school as "invested" in both the "progress of the province" and the children's "future employment."⁶⁹ Emphasizing that the school "combined book learning with practical knowledge," the author framed technical education as a suitable path to salaried state employment for middle-class families who hoped to encourage both the economic and intellectual development of their sons.⁷⁰

British administrators of colonial engineering and technical schools sometimes expressed a desire to reorient their educational institutions away from the education of the sons of wealthy and middle-class families to attract students from artisan families instead. Records on Thomason College and other engineering, technical, and arts colleges are replete with British lamentations about artisan "lack of interest" in the "special courses" that they had opened in fields like woodworking.⁷¹ Some administrators blamed artisans themselves for these "failures," citing a supposed lack of technical and social adaptability among Indian artisans. The more circum-spect noted the loss of wages and the lengthy nature of programs.⁷²

But the predominantly wealthy and middle-class makeup of technical training also reflected an enforced colonial hierarchy of technical education. The massive demand for physical labor in urban public works departments and railway workshops meant that artisans who did engage with state-led training were usually recruited for industrial schools associated with these workshops, such as the Lahore Railway Technical School.⁷³ Efforts to train a large-scale wage labor force belied colonial administrators' stated desire to educate artisans in ways that would enable them to secure salaried state employment. Colonial hierarchies of technical education—including the recruitment of urban artisans primarily into workshop-based technical schools—created conditions in which members of the Indian middle classes dominated salaried technical positions and claimed authority over technical knowledge.

In this context, master artisans were increasingly restricted to wage labor positions under these new middle-class overseers on the railway and in public works

department service. Though artisans were often still employed as *mistrīs* under these new intermediaries, they lacked opportunities for promotion into the ranks of technical oversight. Reflecting this hierarchy, an Urdu-language treatise, published in 1913 in Shahjahanpur, in the United Provinces, listed wage rates that the railways would provide to salaried, middle-class overseers and contractors for the various artisans they hired. The text, titled simply *Engineering Book* (*Injiniring buk*) and authored by a middle-class Muslim railway contractor, Sayyid Tasdiq Husain, was aimed at overseers in locomotive workshops in addition to others. It provided information on new materials, methods of measuring and drawing, and styles of construction for middle-class technical overseers, including those who may have overseen boilermakers.⁷⁴ The treatise assumed that members of this middle class were responsible for “*mistrīs*, blacksmiths, carpenters, masons, and menial servants.”⁷⁵

“MECHANICS AND MUSLIMS”: MIDDLE-CLASS INTERMEDIARIES AND GOLDEN AGE NARRATIVES

The skills of master artisans were still in demand on the railways and in public works departments, but these artisans were pushed downward in a colonial hierarchy of “native” employment that demanded new forms of middle-class oversight, such as that outlined in the *Engineering Book*. Muslim members of the new middle-class overseer cadres brought with them new narratives about the ways that Muslims should engage with technological change. Many members of this class also read and debated the works of Indian Muslim scholars who sought to integrate the study of “Western” science and technology into “Islamic” models of education.

This trend, represented most famously by Sayyid Ahmad Khan and his educational institutions in Aligarh, made explicit efforts to address members of the technically educated Muslim middle class.⁷⁶ Sayyid Ahmad’s *Aligarh Institute Gazette*, a bilingual paper published in Urdu and English through the Aligarh Scientific Society, occasionally noted developments in steam technology and boilermaking, most notably improvements in safety mechanisms.⁷⁷ At the same time, while Sayyid Ahmad Khan was adamant that the Aligarh Scientific Society’s most important work was in “practical technology,” including “mechanics,” many of their publications focused on debates about the causes of perceived Muslim “decline” or “backwardness” vis-à-vis European technology.⁷⁸

The writings of Muslim scholars often diverged from artisan-intermediary representations of technology because scholars sought to establish Indian Muslim rootedness in a supposed Islamic “golden age.” A short article by Allamah Shibli Nu‘mani (1857–1914), a prominent North Indian Muslim scholar and educator, is representative of this “golden age” discourse and its impact on elite Muslim technical

writing.⁷⁹ Published in 1898 in Amritsar, just eight years after the first edition of the *Kalid-i šan‘at*, the article, titled “Mechanics and Muslims,” traced the history of Muslim ingenuity in the “art of mechanics.”⁸⁰ “Among Muslims,” Shibli wrote, “this art began with the translation of Greek treatises under the Abbasid Caliphate” (AD 750–1258).⁸¹ He emphasized that Muslim mechanics had improved on Greek ideas and that Europeans had appropriated “Muslim” knowledge, creating circulatory exchanges. By way of example, Shibli profiled the work of Abbasid-era clockmakers. He told his readers of the “wonderous art” of Abbasid clockmaking under the Caliph Harun al-Rashid (786–809), recounting a story of the caliph’s exchange of gifts with Charlemagne (800–814). The caliph sent Charlemagne a brass water-powered clock with hourly chimes, and according to Shibli this “miraculous” technology sparked renewed European interest in mechanics.⁸²

“Golden age” discourse—and its accompanying narratives of decline—asked how Indian Muslims might create a new era in which European Christians coveted “Muslim technologies,” rather than the reverse. It sought to reclaim for Muslims an intellectual heritage associated with the Abbasids that Europeans had often erased through their own projects of translation.⁸³ In reclaiming the Arab-Islamic pasts of “European” technologies, Indian Muslim scholars imagined a future in which “Islamic” technical ingenuity was recognized and coveted in the “West.” At the same time, it often sidelined the position of artisans and laborers within material production and diminished their technological authority by assuming that the rejuvenation of Islamic science and technology was the responsibility of patrons and scholars. Any role for Muslims who made and repaired mechanical objects was subsumed under an imagined revival of elite Muslim authority over technical knowledge.

Ideals of the restoration of an Islamic golden age through elite engagement with technology were cultivated through Muslim reformist institutions such as the Aligarh Muhammadan Anglo-Oriental College. But they did not remain confined to these spaces, and over time they became relevant to locomotive department workshops and other sites of railway labor. Middle-class Muslim supervisors in these spaces likely read and circulated periodicals such as *Taraqqī* (Development)—published in Lahore in the first decade of the twentieth century—which echoed “golden age” narratives about the need to cultivate elite Muslim authority over technology. Indeed, *Taraqqī* reflected the interests of the Muslim middle class in both developments in locomotive construction and debates among religious scholars about how to engage with technological change. Some articles profiled the scientific principles behind technologies, including steam engines.⁸⁴ Others, however, focused on the efforts of Indian Muslim scholars to explain what they saw as a “decline” in Islamic civilization, and through this narrative of decline to explain why Muslims seemed to lag Europeans in technical capabilities.⁸⁵

MUSLIM ARTISANS UNDER MIDDLE-CLASS TECHNICAL OVERSIGHT

The popularization of this discourse of “decline” among new middle-class Muslim cadres of overseers engaged in railway oversight had several important implications for Muslim artisans, including those who participated in boilermaking. The discourse of decline suggested that a reason for Muslim “backwardness” in technological development was the dominance of “custom” over both technological creativity and theology. Muslim artisans were often assumed to be the culprits of both sources of decline. Muslim scholars—borrowing, in some cases, from colonial writing—characterized Indian artisans as lacking in technological adaptivity and creativity. At the same time, as I noted in chapter 3, Muslim reformist scholars often characterized laboring-class Muslims as participants in what Francis Robinson termed “indigenous customs that had come to be incorporated into Islamic practice.”⁸⁶ These scholars critiqued popular practices that reformists saw as insufficiently supported by Quran and hadith, often directing their attention and criticism to practices that were most widespread among Muslim artisans and laboring communities.⁸⁷

Middle-class narratives left little room for an exaltation of boilermaking. As Muslim middle-class overseers who were conversant in discourses of decline, revival, and purification took up intermediary positions in the railways, they sought to distinguish themselves, socially and religiously, from the workers they oversaw. As a result, forms of Muslim artisan sociability—and the understanding of the divine that may have accompanied them—were pushed downward in the hierarchies of knowledge and status within locomotive and other railway workshops.

Nonetheless, artisan-intermediary insistence on the creativity and divine inspiration of technical labor such as steam engine repair and boilermaking did not disappear from railway workshops. Instead, it seems to have contributed to the consolidation of class solidarities and identities within the workshops, occasionally even inspiring forms of labor agitation similar to those analyzed in chapter 1.

MUSLIM BOILERMAKERS AND THE POLITICS OF CLASS AND LABOR

The strengthening of social hierarchies and limitations on opportunity for advancement for artisans in the locomotive workshops around the turn of the twentieth century contributed to rising participation in labor agitation and organizing. By the late 1910s, the transition that Hakimuddin made—from artisan family to supervisory technical intermediary—was rare. Even as his text remained popular and was repeatedly reprinted, the potential for artisans to attain his level of supervisory authority had largely waned. This alienation of artisans from technical oversight spurred Muslim master artisans to articulate new community identities in the early twentieth century, and these identities sometimes—though not always—emphasized laboring-class solidarities within the workshop.

Hakimuddin's writing itself, with its assertions of *karīgars*' solidarities and its frustrations with both British and Indian "gentlemen" who controlled the capital of boilermaking, reflected an awareness of and a desire to align with laboring-class identities.⁸⁸ At the same time, although Hakimuddin worked for colonial state projects, his aims for Indian artisans in some ways also echoed the emerging swadeshi movement, which would gain significant traction and popular support following the first partition of Bengal in 1905. His writing is evocative of what Aashish Velkar terms the "swadeshi spirit of combining indigenous enterprise, local traditions, and Western technologies."⁸⁹ Hakimuddin dreamed that "we might keep our needs confined to Indian products" and argued that "it is not possible for our industry and crafts to progress until the existence of the nation is fully implemented."⁹⁰ Unlike the leaders of the swadeshi movement, however, he did not primarily frame this potential turn toward Indian products as a political tool for pressuring the colonial state. Instead, he argued that it would push Indian artisans to "develop," claiming that "as a result, Indian artisans will become more attracted to [making] modern products." In the long run, he opined, this would both free Indian artisans from the authority of colonial capital and improve the social status of artisan labor.⁹¹

By the end of the first decade of the twentieth century, the limitations placed on the mobility and authority of master artisans in the railway workshops, including those engaged in boilermaking, spurred many to explicitly assert class identities and even organize as laborers. Among the most notable organizations founded in this period was the Anjuman-i muṣṭaḥ-i qaum-i āhangarān (AMQA), or Organization for the Uplift of the Community of Blacksmiths.⁹² Although the AMQA used the term *āhangar*—"blacksmith," drawn from Persian—in its title, it sought to represent the social, economic, and technological interests of members of a variety of aligned trades in the railways, including boilermakers.⁹³

The AMQA was founded in Lahore around 1909 by two blacksmiths, Firozuddin and Ziauddin, who seem to have been employed at the Mughalpura workshops. According to colonial reports, the organization published a monthly periodical, the *Risālah-yi roidād-i jalsah-yi 'ām anjuman-i muṣṭaḥ-i qaum-i āhangarān* (Report of the events of the general meeting of the AMQA). The periodical grew to a circulation of approximately eight hundred by the end of 1911 from an initial circulation of about two hundred copies. It circulated primarily but not exclusively within Lahore and its surrounding regions in Punjab.⁹⁴ The ability of the AMQA to command eight hundred monthly readers suggests that its projects attracted significant interest in the growing artisan and laboring communities around Mughalpura and other regional locomotive workshops. Moreover, whether the periodical was read aloud or simply passed among literate workers, it likely circulated beyond those who subscribed or purchased it.

Reflecting the high level of demand for organizations and publications that addressed Muslim artisans and laborers, the AMQA was one of two

organizations that were founded in Lahore between 1909 and 1911 and that aimed to speak for this community. The second, the Anjuman-i mu'ayyid al-*ṣan'at* (AMS), or Organization for the Strengthening of Industry, was likewise founded by a railway blacksmith, Muhammad Din, who worked under the office of the district traffic superintendent in Lahore. Beginning in 1911, AMS published a monthly periodical, *Ṣan'at* (Industry), although the periodical seems to have been focused more on explaining technical knowledge and processes than on cultivating laboring-class identities among workers. Within a year of its foundation, *Ṣan'at* had a circulation of approximately five hundred, and it provided special reduced rates to students, suggesting that its authors may have hoped that subscribers would be pupils of institutions such as the Lahore Railway Technical School.⁹⁵

Neither of the periodicals published by these two organizations seems to have survived, a fact that reflects the piecemeal and endangered nature of the archive of materials written for and by Muslim artisan communities. Nonetheless, colonial reports suggest that the AMS focused on artisan education for railway and public works department positions, likely asserting some of the same goals as Hakimuddin.⁹⁶ The AMQA, by contrast, sought to “uplift” Muslim blacksmiths and grouped railway laborers as a social and class community. Even the choice of the term *āhangar* over the more commonly used Urdu *lohār* highlights the commitment of the organization to improving the social status of Muslim blacksmiths. By avoiding *lohār*, a term laden with caste connotations, and adopting *āhangar*, the group may have sought to avoid assumed placement in the low levels of a caste-like social hierarchy. Likewise, while *āhangar* was sometimes used as a synonym to *lohār* in Urdu, it was more common in Persian, and in choosing a Persian term for the organization’s title the AMQA may have sought to evoke a transregional Muslim past.

These attempts at internal social “uplift” among Muslim blacksmiths and boilermakers were sometimes accompanied by projects of labor organization and agitation that sought to improve the wages and working conditions within the railways. By 1905, colonial records note that North Indian locomotive workshops were periodically shut down by strikes focused on improved pay and conditions.⁹⁷ Labor organization and agitation gained further traction in locomotive workshops and other sites of boilermaking in the wake of the First World War. Indian artisans, especially from Punjab and the North-West Frontier Province, were recruited as ironsmiths, carpenters, and other industrial workers as part of the war effort, with many assigned to ordnance factories in Britain.⁹⁸ In the postwar period, as Radhika Singha has shown, many of these workers transitioned to urban industrial projects in their home regions, particularly on railways and in public works departments. They faced, however, colonial reluctance to legislate improved wages and limited attempts to improve labor conditions. Colonial industrial reports accused Indian laborers of a lack of “commit[ment] to industrial and urban life” based on their supposed “inefficiency” vis-à-vis Western laborers but maintained that the

solution was to teach Indian laborers to aspire to better standards of living, rather than raising wages.⁹⁹

In addition to the large-scale railway strike of 1920 in Lahore, noted in the previous chapter, the immediate postwar period saw a series of smaller strikes across the locomotive workshops of both Punjab and the United Provinces.¹⁰⁰ As was the case with the press strikes and other instances of labor agitation discussed in chapters 1 and 4, strike organizers likely drew on narratives of Muslim labor and community that had been reimagined and reasserted by groups such as the AMQA. The AMQA—and to an extent, artisan-intermediaries like Hakimuddin before it—provided a language for social solidarities among Muslim blacksmiths, boilermakers, and other aligned workers. As Nitin Sinha argues, railway workers' politics were both contested and shared across racial, religious, and caste boundaries, with workers sometimes using these identities to build solidarities but rejecting solidarities in other cases.¹⁰¹

While strike and union organizers sought to assert class solidarities that cut across religious identities, they also recognized that workers in locomotive workshops and other sites of boilermaking engaged with a religious imagination of their trades and technologies. During prominent strikes and efforts at union agitation, these leaders called on Muslims to build a more egalitarian and equal society through rhetoric of both religion and class. At the same time, as Ali Raza has noted, many of the Muslim leftist organizers of the 1920s drew inspiration from the newly founded Soviet Union, with several engaging with Soviet publications and emissaries in Afghanistan.¹⁰² The converging language of class and religion in railway strikes and other labor agitations of the 1920s thus likely had multiple antecedents and influences. But for Muslim laborers in locomotive workshops and other sites of boilermaking, these movements likely evoked social and religious solidarities that had been built on the “exaltation” of artisan technical knowledge.

. . .

Hakimuddin wrote his guide to the steam engine and boilermaking as a member of a small cadre of artisan-intermediaries who sought to promote what they saw as the interests of master artisans within colonial railway workshops. He imagined spaces where artisan technical skill and adaptability provided opportunities for upward social and economic mobility. At the same time, he seemed to recognize that he was a representative of a shrinking, small community of upwardly mobile artisan-intermediaries within the railways and that the hierarchies of oversight were increasingly closing these pathways to other master artisans. While expressing a degree of optimism, Hakimuddin's text recognized that many hereditary artisans within railway locomotive workshops experienced the marginalization of their technological authority. These shifts took place in a context in which, as Subramanian argues, “technical knowledge went from the purview of Indian

lower-caste artisans to becoming integral to state power, economic development, and upper-caste status.”¹⁰³

To counter the ways in which they were pushed downward in colonial railway hierarchies, Muslim boilermakers and other skilled artisans employed in the railway locomotive workshops increasingly asserted class-based solidarities. But Muslim artisans negotiated these shifts not just by asserting class-based identities that drew on their sense of shared religious history as members of a trade. They also sometimes incorporated aspects of the religious expectations of their middle-class Muslim supervisors into their narratives of the Muslim past of their trades. In the next and final chapter, I examine these varied responses to changes in technical oversight and authority in the context of stonemasonry, particularly the construction of Muslim religious architecture. In doing so, I analyze the relationships between Muslim artisans and their supervisors or intermediaries and their negotiations with Muslim patrons as well as the patrons’ understanding of the relationships between labor, technology, and Islam.