

# PROJECTING CAPITALISM

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A History of the  
Internationalization of  
the Construction Industry

Marc Linder

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## PART II

# CONSTRUCTING THE WORLD MARKET: THE HISTORICAL COURSE TO WORLD WAR II

In its [the Suez Canal's] formation history has repeated itself, and the relics of the ancient canal (now hardly to be traced) attest how surely Nature heals the wounds made on her surface, and how she is ever working to efface the signs of labour and skill....

“The Suez Canal,” 8 *Engineering* 353 (1869) (editorial)



## The Rise of Large British Railway Construction Firms

It has been said with some truth that the civil engineer never makes anything but an income. Railways, harbours, docks, are almost invariably made by contractors.<sup>1</sup>

### The Separation of Construction Contracting from Engineering

It is not easy to say at what historical period the contractor came into existence.... [I]t seems to have been discovered automatically that the world got on best with a division of labour, the engineer to design and the contractor to make.<sup>2</sup>

During the early railway era, when the leading British railway engineers such as George Stephenson (1781-1848),<sup>3</sup> his son, Robert Stephenson (1803-1859),<sup>4</sup> his one-time apprentice Joseph Locke (1805-1860),<sup>5</sup> Charles Vignoles (1793-1875),<sup>6</sup> Isambard Kingdom Brunel (1806-1859),<sup>7</sup> and John Hawkshaw (1811-91),<sup>8</sup> virtually monopolized the design and execution of the undertakings in Britain, construction contracting was not yet clearly separated from the tasks of the pioneering engineers.<sup>9</sup> The rapid proliferation of rail lines, however, soon exceeded the engineers' capacity to oversee all aspects of the business on behalf of the railway owners. The increase in the size of the operations that the new contractors were able to bring under their control in the 1830s and 1840s relieved the engineers, in their capacity as employees or consultants of the railway companies, of part of their far-flung tasks.

Nor was this process of the separation of the two functions in these early stages spontaneous or unwanted. Locke, for example, whom *The Times* eulogized as "the remaining chief of the engineering world" after the deaths of Brunel and

<sup>1</sup>"English Engineers and American Bridges," 87 *Engineer* 391 (1899) (editorial).

<sup>2</sup>"Engineers and Contractors," 113 *Engineer* 98 (1912) (editorial).

<sup>3</sup>See John Rowland, *George Stephenson: Creator of Britain's Railways* (1954).

<sup>4</sup>19 *MPICE* 176-82 (1860) (obituary).

<sup>5</sup>See 20 *MPICE* 141-48 (1861) (obituary).

<sup>6</sup>20 *Engineering* 400 (1875).

<sup>7</sup>See 19 *MPICE* 169-73 (1860) (obituary); Peter Hay, *Brunel: His Achievements in the Transport Revolution* (1973); *The Works of Isambard Kingdom Brunel: An Engineering Appreciation* (Alfred Pugsley ed. 1976); Adrian Vaughan, *Isambard Kingdom Brunel: Engineering Knight-Errant* (1991).

<sup>8</sup>107 *MPICE* 321-35 (1891) (obituary).

<sup>9</sup>See James Brand, "Working Methods of Engineering Contractors," 89 *Engineer* 262 (1900).

Stephenson,<sup>10</sup>

hoped that the time would come when the contractor would see almost as quickly as himself, or at least after very simple explanation, the nature and cost of the works which he had to construct; and that the fair remuneration which had accrued from the skilful carrying out of short, would soon enable him to undertake much longer lengths. He had been very patient and painstaking with a number of small capitalists. He relied upon soon having to do with a few larger ones.<sup>11</sup>

This deepening of the division of labor presupposed that the large contractors had appropriated the technological advances embodied in the new engineering principles. This transfer process took place by means of the quasi-apprenticeships that the contractors (such as Edward Betts) served under the engineers (such as George Stephenson), who supervised the overall railway construction process.<sup>12</sup> A doubtless somewhat glorified version of the transition from an engineer-driven system to one in which the contractor was at the very least a co-equal if not the dominant element was offered by the Institution of Civil Engineers in its obituarial appreciation of the largest railway construction contractor, Brassey:

The early contractors were...men of strong natural abilities, insight into cost and method of executing work amounting to instinct, low tastes, violent habits, and grasping tenacity of purpose. A contract being once made, it seemed to be regarded as natural that the contractor should set his wits to work to make the most of it. This was done, on the one hand, by grinding his labourers under the pressure of the truck system..., and on the other hand by "scamping" his work. Under the three grades of engineers ordinarily engaged ranked an array of inspectors. These were men set to watch that the requisitions were not eluded.... Very frequently these men began by displaying extreme severity, greatly to the cost of the contractor. As a rule, vexatiously minute inspectors were open to bribes. ... This matter once arranged, the less scrupulous contractors and sub-contractors often drove a roaring trade.... Against this system of scamping and bribery Mr. Brassey was one of the first to make a stand. ... It was his plan...to "smother the engineer." This smothering, however, consisted only in extinguishing all just causes of complaint. To do his work fairly and faithfully, to render inspection superfluous, and thus to annihilate the power of the inspectors, was...one main element of Mr. Brassey's extraordinary success.<sup>13</sup>

Missing from this version is the strategy that railway company engineers devised to suppress scamping. Because small contractors gave no bond or security, the companies were frequently compelled to pay them or an equally incompetent successor to complete work. In order to avoid this problem, engineers such as Locke required contractors to deposit with the railway directors 10 per cent of the capital at stake, which they forfeited if they violated their contractual obligations.<sup>14</sup> Once the capital-less contractor was eliminated, the transition to large contracting organizations linked to solid financing intermediaries was irreversible.

To be sure, even the pioneering British engineers were autodidacts, who shared the typical merits and defects of the self-taught. This British laissez-faire model of the engineering foundations of the industrial revolution stood in sharp contrast with contemporaneous developments in France. French civil engineering,

<sup>10</sup>*Times*, Sept. 21, 1860, at 10, col. 1.

<sup>11</sup>Joseph Devey, *The Life of Joseph Locke* 145-46 (1862).

<sup>12</sup>"Edward Ladd Betts," 13 *Engineering* 187 (1872) (obituary).

<sup>13</sup>33 *MPICE* 246, 248-49 (1872).

<sup>14</sup>Devey, *Life of Joseph Locke* at 121-22.

institutionally grounded since the eighteenth century in the state Corps des Ponts et Chaussées (1716) and the Ecole des Ponts et Chaussées (1775), attained a theoretical orientation that insured it international scientific-technical preeminence until the mid-nineteenth century. In contrast, the British engineers' practical, empirical, and inductive approach was based on apprenticeship, free enterprise, and private cost and profit considerations rather than on the French model of formal engineering education and construction projects (including railways), planned, built, and financed by the central government.<sup>15</sup> The establishment of the Army Corps of Engineers and of a civil engineering curriculum at the U.S. Military Academy at West Point in the first quarter of the nineteenth century positioned engineering in the United States somewhere between the British and French models.<sup>16</sup>

The elder Stephenson best personified the British empirical tradition. The towering figure in the formative years of the railway based on his crucial contributions to the development of the locomotive steam engine, he nevertheless lacked the capacity for detail to survey, organize, and execute a great railway project. But unlike other engineers, who were still thinking in terms of local and regional networks, Stephenson pursued a national perspective, within the framework of which he was able to propose a route that accommodated the requisite engineering necessities, traffic, and local resources that the new line could exploit. Of particular relevance to the contractors' tasks, Stephenson, Locke, and other engineers surveyed possible routes with a view to calculating and prescribing the gradients and curvature of the road as a function of friction, gravitational force, and the use of the locomotive's power in order to decide whether to trade off steep gradients for short cuts or additional trackage for long levels. The engineers also recommended the kind of materials to be used for the tracks and roadbed.<sup>17</sup> These engineering considerations were shaped with reference to the costs of construction of tunnels and bridges, additional fuel, and the constant expenses in engine power and wear and tear of the rolling stock.<sup>18</sup>

The know-how that Brassey, Peto, Betts, Thomas Jackson,<sup>19</sup> George Wythes,<sup>20</sup> and other contractors acquired from engineers in this manner then enabled them to build lines even in Western Europe—albeit always in association with an engineer.<sup>21</sup> In time, both empirically oriented engineers and experienced contractors even came to nurture a contempt for the theoretically trained continental engineers whom foreign governments assigned as superintendants of the projects but who were “perfectly ignorant of all railway practice.”<sup>22</sup> In turn, professionally educated civil engineers regarded Stephenson as an impostor, who

<sup>15</sup>See Arthur Dunham, “How the First French Railways Were Built,” *IJEH* 12, 13, 18-19 (1941); Hans Straub, *A History of Civil Engineering: An Outline from Ancient to Modern Times* 171-73 (E. Rockwell tr., 1952 [1949]); Frederick Artz, *The Development of Technical Education in France 1500-1850*, at 81-84, 86, 110-11, 162-63, 244-45, 266-68 (1966); D.S.L. Cardwell, *Turning Points in Western Technology: A Study of Technology, Science and History* 122-27 (1972); John Weiss, *The Making of Technological Man: The Social Origins of French Engineering Education* 6-12, 222-25 (1982).

<sup>16</sup>See Leonard White, *The Jeffersonians: A Study in Administrative History 1801-1829*, at 251-65 (1965 [1951]); Daniel Calhoun, *The American Civil Engineer: Origins and Conflict* 37-50 (1960).

<sup>17</sup>See Devey, *Life of Joseph Locke* at 137-43; Calhoun, *American Civil Engineer* at 58-60.

<sup>18</sup>G. Drysdale Dempsey, *Practical Railway Engineer* 2-55 (1855). At the time, Locke prevailed against Stephenson in his view that the cost of additional fuel and motive power required by steeper gradients was less than the sum needed to pay the interest on the additional capital required by longer and more easily graded routes. L. Rolt, *Great Engineers* 125 (1962).

<sup>19</sup>On Jackson (1808-1885), see *Times*, Jan. 13, 1885, at 6, col. 5.

<sup>20</sup>Wythes (1811-1883) built railways in Europe, the Orient, and North America. See the obituaries in *Times*, Mar. 7, 1883, at 7, col. 5; 74 *MPICE* 294-97 (1883).

<sup>21</sup>John Hawkshaw was one of the key railway engineers operating overseas during this period for private contractors and British colonial governments.

<sup>22</sup>John Valentine, “Description of the Line and Works of the Railway from Lisbon to Santarem,” in 21 *MPICE* 1, 23 (1859) (discussion contribution of George Bidder).

had never acquired the technical qualifications of the profession.<sup>23</sup> The large staffs of scientific and commercial personnel that, for example, Brassey's and Peto's organizations maintained, the origins of which can also be traced back to the eighteenth-century canal building organizations,<sup>24</sup> eventually promoted a re-consolidation of engineering and construction functions in twentieth-century multinational construction-engineering firms.<sup>25</sup> Even in the late nineteenth century, many British contractors were also engineers while some of the most able construction-engineers were contractors.<sup>26</sup>

### Subcontracting as Profit-Maximizing Labor Force Management

We must get more money out of business...than we put in...and the only way to do this is to turn labor into capital by means of existing capital.<sup>27</sup>

In order to capture what was both novel and indispensable about the great railway contractors, it is necessary to focus on their capacity to organize unprecedentedly large projects—especially the recruitment and supervision of huge labor forces. Of Brassey, after all, it has been said that “in the management and control of large labour forces he was a genius without rival.”<sup>28</sup> The large contractors who emerged in the 1830s have been seen as successors to those who undertook civil engineering projects in the later eighteenth and early nineteenth centuries under the supervision of such engineers as James Brindley (1716-1772) and Thomas Telford (1757-1834).<sup>29</sup>

Indeed the term “contractor,” in the sense of one who undertakes work by contract in the building trades, arose in the eighteenth century.<sup>30</sup> In its generic sense the term has become misleading in its unique application to construction since “[e]very manufacturer is a contractor—nothing more, nothing less. The primary difference is that the manufacturer has a fixed plant, whereas the contractor moves his plant from place to place.”<sup>31</sup> It remains to explore whether this connotation of a contractually stipulated price-cost structure rather than of a capital investment requiring valorization captures a significant aspect of the economics of the construction industry or merely garnishes an ideological pose. In any event, the Victorian railway contractors' adoption of subcontracting as a management method as it had previously evolved in road and above all in canal building—the workers on which, *navigators* or *navvies*, formed a personal and

<sup>23</sup>See e.g. Samuel Smiles, *The Life of George Stephenson and of His Son Robert Stephenson* 281-95, 353-61, 368-74 (1868); L. Rolt, *The Railway Revolution: George and Robert Stephenson* 227, 250-56, 280, 296 (1962 [1960]); Michael Robbins, *George and Robert Stephenson* 27-28 (1966); S. Checkland, *The Rise of Industrial Society in England 1815-1885*, at 85 (1971 [1964]); Arthur Helps, *Life and Labours of Mr. Brassey: 1805-1870*, at 225-28 (1872); Leland Jenks, *The Migration of British Capital to 1875*, at 134-35 (1963 [1927]); Robert Middlemas, *The Master Builders* 34, 121, 166, 262, 310 (1963).

<sup>24</sup>See W.H.G. Armytage, *A Social History of Engineering* 129 (4th ed. 1976 [1961]).

<sup>25</sup>For the claim that at least in some fields engineers assumed contractors' functions, see Per Jensen, “Work and Qualifications of Civil Engineers in Relation to the Development of the Labour Process in the Construction Industry,” in [4] *PBE, 1982: Labour in Building and Construction* 1-23, 1-24 (1983).

<sup>26</sup>See e.g., “Contractors and Engineers,” 50 *Engineer* 425 (1880) (editorial); “The Liege Contractors' Congress,” 52 *Engineer* 117 (1881) (editorial).

<sup>27</sup>Maurice Parsons, “The Philosophy of Engineering,” 77 *TASCE* 38, 48 (1914).

<sup>28</sup>Rolt, *Railway Revolution* at 214.

<sup>29</sup>See L. Rolt, *Thomas Telford* (1962 [1958]). Telford acted as engineer for the king of Sweden on the Gotha Canal beginning in 1808, an enterprise that required the shipment from England in 1819 of 48-ton iron lock gates. *Id.* at 93-109. See generally, Samuel Smiles, 1-2 *Lives of the Engineers* (1861).

<sup>30</sup>2 *Oxford English Dictionary* 915 (1961 [1933]).

<sup>31</sup>“What the Great English Engineer, Telford, Said About Day Labor as Compared with Contract Work,” 31 *EC* 345, 346 (1909) (editorial).

linguistic link with railway construction—has crystallized out as the key defining characteristic of the new railway contractors.<sup>32</sup>

The connection between mobilization and control of large bodies of workers on the one hand and subcontracting on the other was in fact crucial. Perhaps the most valuable material on this subject emerged from the evidence presented to two parliamentary inquiries held in 1846 on railways and the abusive conditions of railway laborers near the peak of the second railway mania in Britain when more than a quarter-million workers were constructing new rail networks.<sup>33</sup> Not only did the largest contractors and most influential engineers testify, but Brassey's railway construction operations in France were discussed in detail.

The contractor Peto, whom the engineer Brunel called "probably the largest in the world at present, or that has ever carried on work of this description,"<sup>34</sup> testified to the Select Committee on Railway Labourers that he had 9,000 men in his employment, 3,700 of whom he employed directly. By 1854, when Peto himself had become a member of Parliament and his field of operations had reached across the oceans, his worldwide employment figures reached 30,000, making him "one of the largest employers of labour in the kingdom."<sup>35</sup> As to unions among his men, he had "never heard anything of the kind at all."<sup>36</sup> Perhaps in mitigation of such deprivation, Peto felt it his "duty to provide them with scriptural instruction." Whether his scriptural readers in their reports to Peto focused on his men's spiritual or other concerns, Peto did not testify. Instead, he stressed that he furnished bibles gratis to all his literate workers in complete derogation of the aforementioned distinction between those in his direct and indirect employ.<sup>37</sup>

In response to a question as to whether he exercised any control over those whom he did not employ directly, Peto stated that:

The parties to whom I let the work are entirely under my own control; many of them have been gangers under me on previous works, who have saved enough money to buy horses and railway wagons and plant. I let them the earth-work, principally by the lump, instead of employing men directly under myself.<sup>38</sup>

This testimony seemed to suggest that his gangers were petty capitalists who had worked their way up and out of the proletariat.

Yet his and others' testimony was not easily reconcilable on this point. The parliamentary committee also heard that the ganger, who was himself a laborer and the lowest form of subcontractor with twelve to fourteen men below him, was selected for "his power to keep his men in order." Part of their income the gangers took out of their supervisees' pockets by various wage payment and truck stratagems.<sup>39</sup> In many instances gangers merely received wages and some

<sup>32</sup>See Sidney Pollard, *The Genesis of Modern Management: A Study of the Industrial Revolution in Great Britain* 60-62, 106-10 (1968 [1965]); W. Cunningham, *The Growth of English Industry and Commerce in Modern Times: The Mercantile System* 532-35 (1925); Paul Mantoux, *The Industrial Revolution in the Eighteenth Century* 112-32 (1961 [1928]); Terry Coleman, *The Railway Navvies: A History of the Men Who Made the Railways* 56-65 (1970 [1965]); Charles Hadfield, *British Canals: An Illustrated History* 33-47 (1974 [1950]); *idem*, *The Canal Age* 50-60 (1981).

<sup>33</sup>See R. Lewis, "Edwin Chadwick and the Railway Labourers," 3 *EHR* (2d ser.) 107 (1950); Phyllis Deane and W.A. Cole, *British Economic Growth 1688-1959: Trends and Structure* 231-32 (1969 [1962]).

<sup>34</sup>*Report from the Select Committee on Railway Labourers* Q. 2060 at 134 (13 PP 1846 [530]).

<sup>35</sup>*Id.*, QQ. 1228, 1230 at 72; 130 *PD* (3d ser.) 761 (1854); William Galt, *Railway Reform: Its Importance and Practicability* 352 (1865) (quotation).

<sup>36</sup>*Report from the Select Committee on Railway Labourers*, Q. 1302 at 77.

<sup>37</sup>*Id.*, QQ. 1302, 1348-73 at 77, 80-81.

<sup>38</sup>*Id.*, Q. 1232 at 72.

<sup>39</sup>*Id.*, QQ. 596 (quotation), 225, 229, 603-35, 768-69 at 38, 14, 38-39, 46.

compensation for finding horses, or, as chiefs of butty-gangs, received the money from the contractor and shared it among the workers.<sup>40</sup> Three-quarters of a century later, a U.S. engineer was at least frank enough to admit that the use of the term “contractor” to describe the “penniless” Nicaraguan miners employed “to drive the bore at so much a foot” in building a hydroelectric plant owned by a U.S. company was “misleading.” Since the company provided all the materials and equipment and the “contractor” was too impoverished to provide a bond, the contract could not be enforced by the company let alone the workers.<sup>41</sup>

Curiously, whatever efficiencies Peto’s organization purportedly derived from this system of delegation were dissipated and perhaps even outweighed by the elaborate hierarchy of supervision which Peto devised and which had no other purpose than to curb his straw bosses’ irrepressible kleptomania. Peto’s chief agent, who supervised the work in its entirety, had under him subagents, who were in charge of eight or nine miles of track; under these in turn were timekeepers, whose job it was to account for the time of every worker on two miles of track. “The work is then let to gangers, who employ the men.” Based on the timekeepers’ report of the amounts payable to each worker, Peto testified, the accounts were made up and

in convenient change, and in a sealed bag, is handed over to the ganger the amount necessary to pay all his men; and it is then the duty of the time-keeper to see that these men are paid the money paid in bulk by me, and that these men have the money in accordance with the amount of time so returned by him to the sub-agent.<sup>42</sup>

Baffled by these arrangements, the committee members asked Peto why he needed the gangers or, alternatively, why he exercised such supervision since he had, after all, let the work to others. Peto’s not entirely enlightening responses were that “we cannot have a control without” gangers and that he otherwise would not have the satisfaction of knowing that the workers had been paid properly by his frankenstein, the ganger, who was however “quite safe in my hands”—despite the fact that “[v]ery often” he had had to dismiss gangers for violating his regulations.<sup>43</sup> When Peto let two or three miles in bulk, he engaged in no bargaining with his gangers or ex-gangers: he merely gave them take-it-or-leave-it prices. “If he is a good man, I do not pay the money perhaps every week, but every month, if I know he has plenty of capital; but if not a strong-backed man, as we call it, he has it every fortnight or every week.”<sup>44</sup>

In this regard Peto’s methods resembled Brassey’s, whose “organization of supervisors, inspectors, and sub-inspectors, by which this industrial kingdom was regulated, made the labour of this vast community proceed as methodically as the machinery of a clock.”<sup>45</sup> Brassey’s subcontractors “did not exactly contract with him, but he appointed them their work, telling them what price he should give for it.” Moreover, Brassey furnished “all the materials, and all the plant.”<sup>46</sup> As labor-only subcontractors, who supplied 100 to 300 workers, it is unclear how gangers could curtail Brassey’s losses when work was delayed or reduce the amount of variable capital that Peto had to advance since he appeared to finance

<sup>40</sup>*Id.*, QQ. 2793-99 at 183.

<sup>41</sup>H. Thackwell, “Tunnel Building in Nicaraguan Jungles,” 86 *ENR* 821, 822 (1921).

<sup>42</sup>*Report from the Select Committee on Railway Labourers*, Q. 1245 at 73.

<sup>43</sup>*Id.*, QQ. 1248-50, 1276 at 73, 75.

<sup>44</sup>*Id.*, QQ. 1264, 1266 at 74.

<sup>45</sup>Devey, *Life of Joseph Locke* at 150-51.

<sup>46</sup>Helps, *Life and Labours of Mr. Brassey* at 45, 47.

the entire payroll.<sup>47</sup> Yet Peto insisted that without subletting parts of the construction “a very much larger capital” would be required, indeed, that “it would be almost impracticable, and that in any event it offered advantages that he did “not desire to forego”—or to elucidate.<sup>48</sup> Nor was Peto’s account made any more comprehensible by Brunel’s testimony that Peto had such “an immense capital” that he could afford the most advanced systems of accounting and superintendence.<sup>49</sup>

These lump-of-labor English gangers, who were also widely used by British contractors overseas,<sup>50</sup> had to be supervised as if they were employees<sup>51</sup> Peto’s confused testimony notwithstanding: “I do not exercise any superintendance over him beyond the time-keeper; but then, over him is an agent whose duty it is to watch the progress of the work, to make a weekly report to the principal agent, and to make a report to me also.”<sup>52</sup> Peto’s attachment to his middlemen is the more puzzling not only for his clear understanding that under labor-protective legislation “the petty contractors, and others under them...would be the difficult people to keep in check thoroughly,” but also by virtue of his suggestion that both the railway company and the principal contractor be made responsible for the gangers’ failure to pay in cash.<sup>53</sup>

When gangers absconded with his payroll, Peto asserted that he held the navvies harmless—provided that they could convince him that they had not colluded with the ganger.<sup>54</sup> Peto evinced a decided preference to act as his own magistrate in such nonpayment matters, a course of action in which his navvies, like all poor workers in England, were constrained to acquiesce.<sup>55</sup> Like their contemporary native counterparts in India whose wages were pilfered by middlemen, they may have had a cause of action, but the fact that the expenses of litigation would have exceeded the recovery effectively precluded suits in both countries.<sup>56</sup> The middleman system operated in a particularly rapacious manner in the 1850s in India, where it left native construction workers on British railways with only enough “to keep body and soul together.”<sup>57</sup>

The only coherent *raison d’être* for the subcontracting system was offered by Brunel, who testified that all grades of subcontractors,

<sup>47</sup> *Report from the Select Committee on Railway Enactments*, Q. 857 at 54 (14 PP 1846 [590]); John Francis, *A History of the English Railway: Its Social Relations and Revelations 1820-1845*, I, 271; II, 75-84 (1968 [1851]); Helps, *Life and Labours of Mr. Brassey* at 45-51, 78, 160; Middlemas, *The Master Builders* at 22, 35, 42, 44, 73.

<sup>48</sup> *Report from the Select Committee on Railway Labourers*, Q. 1338 at 79.

<sup>49</sup> *Id.*, Q. 2083 at 137.

<sup>50</sup> See e.g., Valentine, “Description of the Line and Works” at 21. A half-century later the same system was described for the construction of railways supervised by English engineers in China. “These gangers are really contractors for labour of the class to which they themselves belong....” The major difference was that they were paid monthly and “do not require an advance every week, affording...an example to British navvies.” Edward Rigby & William Leitch, “Railway Construction in North China,” 160 *MPICE* 271, 308 (1905). At the turn of the century, Pauling “sub-contracted to Chinese navvies” railway work he was performing in Borneo. For Pauling’s otherwise incredible account, see *Chronicles of a Contractor: Being the Autobiography of the Late George Pauling 181-85* (David Buchan ed., 1926).

<sup>51</sup> The contractor Thomas Jackson agreed with his questioner that his subcontracts were worded so as to “leave the control of the manner in which the work is conducted in his [Jackson’s] hands....” *Report from the Select Committee on Railway Labourers*, Q. 1912 at 124. On the issue of firms’ decisions regarding control over employees and non-employees, see Marc Linder & Larry Zacharias, “Opening Coase’s Other Black Box: Why Workers Submit to Vertical Integration into Firms,” 18 *JCL* 371 (1993).

<sup>52</sup> *Report from the Select Committee on Railway Labourers*, Q. 1266 at 74-75.

<sup>53</sup> *Id.*, QQ. 1338-43 at 79.

<sup>54</sup> *Id.*, QQ. 1333-35 at 79.

<sup>55</sup> *Id.*, QQ. 1277-78 at 75.

<sup>56</sup> *Report from the Select Committee on East India (Railways)*, Q. 1140 at 74 (14 PP 1857-58 [161]).

<sup>57</sup> *Id.*, QQ. 1135 and 1140 at 74.

including the lower ones also, are necessary for the protection of such contractors as Mr. Peto and others; but for the competition of the small contractors, I do not think the public would have the advantage of these large contractors, and large capitalists disposed to execute works at low prices. We have contractors very much below Mr. Peto in point of capital...and the way that class of contractors get their work cheap is by subletting the different portions of the work to gangs of excavators and small bricklayers, who have their working bricklayers under them; and the consequence is, therefore, that on these works a very small class of contractors is employed, because the ganger or sub-contractor under the principal contractor is in fact the very contractor for the work, running his risk of the price at which he has taken it being sufficient or not. That leads frequently, certainly, to defaulters, and to distress among the men...; but I do not see, in the first place, that it is possible to prevent it; I do not believe it is at all desirable to prevent it, because but for the fact that we can get works executed at moderate prices, we certainly should not get large capitalists, who would very soon have a monopoly of all these works, to execute works at low prices. The price at which railways are constructed, compared with those at which large government works were constructed 30 years ago, is a strong instance of that; in those days there was a monopoly by the large contractors.<sup>58</sup>

Once Brunel had committed to the system of subcontracting with penny capitalists, it was consistent for him to maintain that if the state prevented the ganger from cheating workers, “the instant the ganger found that the work did not pay him, he could go away and leave the company to pay.”<sup>59</sup> But:

If a contractor has taken work at a lower price than he can execute it at, and the contractor fails, the money is not forthcoming; and unless you go back upon the [railway] company...it would be impossible to pay the men. If you did that you would destroy the whole system of contract throughout England; on these large works...you would not have any means of executing those.... [B]ut if you made the company liable for everything, and if they require sufficient security to meet such liabilities, the contractors would directly raise the prices at which they took the work. There are no doubt great difficulties in all this; but the system of free competition for contracts is that which enables us to execute works in England so extensively over the country at a moderate price, and I should fear to destroy this.<sup>60</sup>

Brunel, as an engineer allied with railway owners and viewing construction from the perspective of maximizing the profitability of their (and his own) investments—like the Stephensons, he “died rich”—did nothing less than sketch a system in which such profitability hinged on making workers share fully in all risks.<sup>61</sup> Thus the worker was to suffer not only the wage laborer’s normal risk of unemployment and the capitalist’s normal risk of not realizing the value of the commodity he has already produced, but even the risk of not realizing the value of a commodity (labor power) that he had already sold and thus of remaining uncompensated for work already performed. This transparently biased individualistic conceptualization of labor was and remained common in the profession. As George Stephenson’s nephew explained to the Institution of Civil Engineers in his presidential address three decades after Brunel’s parliamentary testimony: “The effect of recent combinations of workmen has been to deny the

<sup>58</sup> *Report from the Select Committee on Railway Labourers*, Q. 2063 at 134-35.

<sup>59</sup> *Id.*, Q. 2075 at 136.

<sup>60</sup> *Id.*, QQ. 2087-88 at 137-38.

<sup>61</sup> “Robert Stephenson,” 8 *Engineer* 379, 380 (1859) (obituary by the French engineer, Flachet). Engineers sometimes invested in the railways the construction of which they supervised. Vignoles, for example, was the largest shareholder in a Brazilian railway—a circumstance, however, that did not prevent the other shareholders from losing their confidence in him when they suspected that he was ordering the performance of unnecessary construction. “Mr Vignolles [sic] and the Bahia and San Francisco Railway,” 22 *Engineer* 340 (1866).

just right of employers to regard either wages or labour as a commodity.’<sup>62</sup>

Brunel in effect pleaded for maintenance of an elaborate pyramid of nonresponsibility, which rested quite fittingly on the image of a “man who is working piece-rate at the bottom of a mine [and] is thrown entirely upon his own resources.” Any change that made the master liable for accidents that befell those occupying the lower rungs would “inevitably alter the present position of things, by which every department, from highest to lowest, is sublet to men, who are free agents, and seek to execute the work in the cheapest way. Some risks, I admit, are run in consequence; but I do not think that the results of those risks are at all to be compared with the advantage attained in our manufactures generally by that system....”<sup>63</sup>

This brutally frank language of one of the leading mid-nineteenth-century constructional engineers exposes striking structural-functional parallels between hierarchical construction subcontracting on the one hand and its direct late-twentieth-century descendant in the building industry in Britain and elsewhere—labor-only subcontracting or the Lump.<sup>64</sup> Such subcontracting systems are also homologous with the mid-Victorian agricultural gang system and its descendant—the migrant farm labor contracting system in the United States.<sup>65</sup> None of these systems was in any sense physically required by the process of production in construction or agriculture; neither system was in any sense physically more efficient or productive than centrally organized production. Indeed, the Brassey-Peto regime represented precisely such centralization. The only advantage offered to agricultural employers by, and the sole *raison d’être* of, farm labor contractors is “reducing labor costs by violating labor laws.”<sup>66</sup> Common to all of these systems is that the employer, by dealing with a labor contractor, became “an accessory before the fact to his robbing somebody else.”<sup>67</sup>

In an era of pervasive state intervention into the employment relationship, such schemes as labor-only subcontracting or farm labor contracting are restorationist devices designed to eject workers from the realm of labor-protective legislation by creating the fiction of self-employment. What is intriguing about the nineteenth-century variant is that even prior to the emergence, and thus in the absence, of state intervention such as minimum wage laws, railway construction subcontractors could fulfill a homologous role by enabling those above them—railway owners and/or large contractors—to get the work done more cheaply and/or to expand their profits by shifting the risk of underpayment or nonpayment to the laborers. And like farm labor contractors today, gangers were financial straw men, whose own impecuniosity rendered legal recourse senseless: “[T]here is often a defeat of justice, where wages are found due because the employers of the men are only lodgers, having no goods, and the magistrates can only proceed against their goods, by distress and sale....”<sup>68</sup>

Even when construction workers were able to secure legal representation, the results were typically disappointing. The construction of the Crystal Palace at mid-

<sup>62</sup>George Robert Stephenson, “Address of the President,” 44 *MPICE* 2, 11 (1876).

<sup>63</sup>*Report from the Select Committee on Railway Labourers*, Q. 2124 at 141.

<sup>64</sup>See e.g., Michael Ball, “The Housing Production Process and the Crisis of Production,” in [4] *PBE 1982. Labour in Building and Construction* 2-18 (1983); Ellen Leopold, “The Costs of Accidents in the British Construction Industry,” in *id.*, 1-28, 1-34-1-35.

<sup>65</sup>See Marc Linder, *Migrant Workers and Minimum Wages: Regulating the Exploitation of Agricultural Labor in the United States* (1992).

<sup>66</sup>Philip Martin, *Seasonal Workers in American Agriculture: Background and Issues* 38 (National Commission for Employment Policy, Research Rep. RR-85-04, 1985).

<sup>67</sup>Gradus, “A Treatise on Building by Contract,” 14 *Builder* 296, 297 (1856).

<sup>68</sup>*Report from the Select Committee on Railway Labourers* at viii.

century presented one such opportunity, as workers filed 200 wage payment actions against the contractors. When painters sued the large firm of Fox & Henderson, for example, the firm denied liability on the ground that the subcontractor was the employer. The plaintiffs admitted that the alleged subcontractor had hired them, but stated that they had every reason to believe that he was merely the firm's foreman especially since they were paid by the firm. When the judge, who considered subcontractors "a positive evil," asked why the firm paid the wages of those not in its employ, its representative could point merely to custom. The judge, conceding that he could not imagine that Fox even knew of the dispute, then asked the firm's representative why the dispute should not be referred to Fox; the representative rejected this approach as "a bad precedent." The judge then urged the plaintiffs to sue the subcontractor, in whose favor he eventually ruled.<sup>69</sup>

The wage-theft associated with so-called subcontracting flourished among, but did not expire with, the Victorian railway constructors.<sup>70</sup> International construction firms have repeatedly shown a penchant for contractual designation of their work forces as subcontractors. An internationally prominent U.S. firm building highways in Colombia in the 1930s, for example, simply converted its day laborers into sub-contractors, lending them tools and charging for other items.<sup>71</sup> Then again a Danish consortium that built extensive railway systems in Turkey in the 1920s and 1930s was required by the Turkish government to entrust the actual building to local contractors. Because these local contractors lacked experience in railway construction and were "almost without resources...technically, commercially and financially...in effect...all the local contractors had to do was to supply the labour...." The local contractors, in turn, divided the excavation or construction sections into piecework subcontracts. The Danish firms "tolerate[d] the system in spite of its drawbacks, on condition that the contractors take responsibility for the wages of the sub-contractors' men. This was absolutely necessary on account of dishonesty among the sub-contractors." Although it was never explained how contractors with "slender resources at their disposal" could be relied on to compensate for dishonest subcontractors, the salient point was the "cheap labour" of the "well behaved" Turkish peasants with which "machines cannot compete...."<sup>72</sup>

<sup>69</sup>Collins & Baker v. Fox & Henderson (Brompton County Ct.), as reported in 9 *Builder* 422, 470 (1851).

<sup>70</sup>Coleman, *Railway Navvies* at 64-65.

<sup>71</sup>Albert Mittag, "Constructing Highways in Colombia," 5 *CE* 361, 362 (1935) (R.W. Hebard & Co.)

<sup>72</sup>"Railway Construction in Asia Minor," 133 *Engineering* 120, 122, 123 (1932).