[1]
The Mechanization of Motive Power

L'industrie est devenue la vie des peuples.
[Industry has become the life of the nations.]
— Marc Séguin, 1839

In the economic life of the pre-industrial era, wood was the prime material, universally used in construction and as combustible matter. The shipbuilding industry of the European maritime powers, the iron works and the machines built in the manufacturing and early industrial period were all based on the use of wood. Werner Sombart, the economic historian, regarded the exhaustion of this resource (i.e., the deforestation of Western Europe in the eighteenth century) as an essential factor, or perhaps even *the* main incentive for the development of industrial capitalism. In the pre-industrial era, 'wood affected all areas of cultural existence, being the prerequisite for the prosperity of all branches of economic life: so general was its use in the production of material goods that the characteristics of culture before the eighteenth century were decidedly wooden, and thus that culture retained an "organic" quality in its material and sensual aspect'.[1]

Next to wood, water and wind power were the main energy sources of pre-industrial economic life. The Industrial

1. Werner Sombart, *Der Moderne Kapitalismus*, vol. 2, p. 1138 (1st ed., Munich, 1902).

Revolution, generally seen as having begun in the last third of the eighteenth century, was a complex process of denaturalization. The abolition of 'live' workmanship by the division of labor, a process first described by Adam Smith, corresponded in terms of materials and energies to the 'emancipation from the boundaries of nature' (Sombart) which occurs when 'live' natural materials and energies are replaced by mineral or synthetic ones. Thus wood lost its universal function. Iron became the new industrial building material, coal the new combustible.[2] In the steam engine, the prime mover of industry, these two combined to produce energy in theoretically unlimited amounts. The technological development of the steam engine in the eighteenth century exemplified the gradual process of industry's emancipation from nature. The initial economic utilization of steam power occurred in the early part of the century when Newcomen's atmospheric steam engine was deployed in the Newcastle mining region to pump water out of mine shafts. The Newcastle region can be regarded as Europe's first industrial landscape in that coal began to determine the physical aspect of the environment. Thus Daniel Defoe, who had a clear understanding of the economics of his day, traveled through the region and expressed his astonishment at the 'prodigious Heaps, I might say Mountains, of Coals, which are dug up at every Pit, and how many of those Pits there are; we are filled . . . with Wonder to consider where the People should live that can consume them'.[3] The Newcomen engine was a crude contraption, only capable of a back-and-forth motion, consuming incredible amounts of fuel, and comparatively weak in performance. However, as it was used in the coal-producing region, its excessive fuel (i.e., coal) consumption was no problem. As early as 1767, fifty-seven Newcomen engines were working in the area.[4]

The waterwheel remained the main energy source for Eng-

2. Lewis Mumford (following the Scottish sociologist Patrick Geddes) has coined the terms 'eotechnology' and 'paleotechnology' to describe this epoch-making change in materials and energy: 'The eotechnic phase is a water-and-wood complex; the paleotechnic phase is a coal-and-iron-complex.' (L. Mumford, *Technics and Civilization*, New York, 1963, p. 11.)
3. Daniel Defoe, *A Tour Thro' the Whole Island of Great Britain* (1st ed., 1724–7; repr. 2 vols., London, 1968), vol. 2, p. 659.
4. Conrad Matschoss, *Geschichte der Dampfmaschine* (Berlin, 1901), p. 55.

land's manufacturing industry in the eighteenth century. Yet, following the evolutionary pattern characteristic of the Industrial Revolution, the water-wheel was to be aided by a curious intermediate adaptation that pointed the way to mechanization: water-powered factories attempted to end their dependence on seasonally variable water levels by installing the Newcomen engine to pump back the used water (i.e., the water that had already passed through the wheel and would have been lost otherwise).[5] This recycling process was a kind of mechanization of the mill race: it regularized the previously natural and erratic stream of water and transformed it into an aqueous driving belt. Thus water-power became a merely incidental element in a uniform and regular mechanized process whose true mover was the steam engine.

That bypass became obsolete with the development of a steam engine capable of rotary motion. Watt's low-pressure engine, perfected in the 1780s was such a technological advance. Thus steam power left its original 'natural' habitat, the coalfields, and became an essential part of the manufacturing industry. Watt's engine used only a fraction of the fuel required by Newcomen's. Its performance was also far better and it produced the rotary motion required by industry. (The immediate incentive for Watt's development of the low-pressure engine was the saturation of the coal mine market with Newcomen pump engines. Its manufacturer, the firm of Watt & Boulton, urged Watt to develop an engine for the new market of the manufacturing industries. The success of this speculation demonstrates that industry had in the meantime indeed developed a need for mechanical power.)[6]

At the turn of the eighteenth and nineteenth centuries, the evolution of the steam engine reached its culmination in Oliver Evans' high-pressure engine. Once again, the improvement was tremendous: the engine's performance was no longer based solely on condensation, but on the immediate effect of steam pressure. This made it possible to further reduce the size of the engines, which had been quite unwieldy, while increasing performance and reducing fuel consumption. On the other hand, it

5. Thomas Ashton, *Iron and Steel in the Industrial Revolution* (1st ed., 1924; repr. ed., Manchester, 1951), pp. 99–100.
6. Matschoss., op. cit., p. 77.

became necessary, in order to meet the requirements of increased temperature and pressure, to improve the quality of machine technology and its materials.

The intensification achieved by the high-pressure engine — maximal work performance with minimal machinery — permitted the *mobile* use of the steam engine, that is, its use as locomotive. This first occurred at the beginning of the nineteenth century in the coalfields around Newcastle, where the Newcomen engine had found its first application a century before. In the wake of the now full-blown Industrial Revolution and its increased demand for coal, the region, already transformed by coal production in Defoe's time, underwent further changes. The land between the mines and the river Tyne became covered by a dense network of railways up to ten miles long — descendants of the rails used in mountain mine shafts since the late Middle Ages. These railways were appendages of the mines and were used only to move coal. The wagons were first pulled by horses, but after the end of the Napoleonic Wars these were progressively replaced by steam-powered locomotives. The changeover to mechanized motive power was possible because in the mining region, fuel (coal) was cheaper than food — which latter had to be shipped from other regions. From 1815 on, coal became cheaper to use than food throughout England and in that year, Parliament, dominated by agricultural interests, passed a Corn Law which, by imposing steep taxes on imported grain, forced grain prices to rise.[7] Obviously, the artificially high level of grain prices helped to replace horsepower by mechanical power in much the same way as the shortage of wood in eighteenth-century Europe had accelerated the development of coal production. Confirmation for this is provided by a contemporary, Thomas Grahame, who, in 1834 when steam locomotion was an accomplished fact, described the

7. Concise information on the history of the English Corn Laws can be found in: Eric Hobsbawm, *Industry and Empire: From 1750 to the Present Day*, Pelican Economic History of England, vol. 3 (Harmondsworth/New York, 1968); Asa Briggs, *The Age of Improvement, 1783–1867* (New York, 1959), pp. 202, 312; R. K. Webb, *Modern England* (New York and Toronto, 1970), pp. 153, 185–6. The corn legislation after 1815 can be seen as a temporarily effective skirmish conducted by the land-owning class against the rising industrial bourgeoisie. No later than 1828 the pressure of free-enterprise interests caused the law of 1815 to be modified, and by the mid-1840s it had been abolished entirely, after the industrial bourgeoisie and the working class (i.e., the Chartists) had joined, in 1838, to form the Anti-Corn Law League.

choice the English industrial capitalists had to make: 'The landed capitalists of Britain . . . have by the taxes on corn and provisions more than doubled the price of animal labour, whether of man or horses. To avoid the effects of these taxes the monied capitalists of Britain have been for years devoting their capital to the promotion of those inventions by which taxed animal power may be dispensed with; and their endeavours have been crowned with eminent success'.[8]

From the beginning of the nineteenth century, there were plans to develop the railroads into a general and national mode of transportation. The 1820s saw the origins of a fully-fledged 'railroad movement', whose main promoters were agreed that the railroad, which in the meantime carried not only coal but other goods and passengers, must be powered by steam. The high cost of grain was a recurrent and standard argument. According to Adam Smith, the upkeep of a horse was equal to the feeding of eight laborers. Thus, it was argued, when the one million horses kept for purposes of transportation in England were made redundant by mechanization, they would release additional foodstuffs for eight million laborers.

Thomas Gray, the most important railroad promoter of the time, whose *Observations on a General Iron Rail-Way* appeared in five editions between 1820 and 1825, considerably expanded each time, argued for his proposed steam-driven railroad as follows: 'The exorbitant demands now made on the public, for conveyance of goods and persons by waggons and coaches, are caused principally, if not altogether, by the enormous expense of a stock of horses, the continual renewal of the stock, and the intolerable expense of their keep'.[9]

It is possible to see how advanced mechanization was in Britain at this time, in both theory and practice, when one consults a roughly contemporary French statement on the question of animal versus mechanical power. Pierre-Simon Girard, an engineer and member of the Académie des Sciences, who in 1819 had been given the task of planning and realizing a

8. Thomas Grahame, *A Treatise on Internal Intercourse and Communication in Civilised States* (London, 1834) p. vi.
9. Thomas Gray, *Observations* . . ., 3rd ed. (London, 1822), p. x.

street-lighting system for the city of Paris, ostensibly summarized the state of the English debate on horse-power versus steam power in an article published in 1827; in fact, his account, tinged with eighteenth-century physiocratic theory, projects French conditions onto England:

> The use of steam engines as locomotives on the railways is still a great open question in today's England. While one is willing to agree with the partisans of this solution that locomotives would be more economical than the use of horses, it is necessary to point out that the fuel on whose consumption these engines depend for the production of their motive power has to be extracted daily from natural deposits whose vast expanses nevertheless are not inexhaustible . . . The use of horses is not subject to similar hazards; the motive power horses are able to produce is fed by products of the soil that nature renews every year and will continue to reproduce in ever greater abundance as agriculture grows more advanced.[10]

The apprehension that coal resources would be exhausted one day, combined with the notion that organic horsepower is able to reproduce itself *ad infinitum,* reflected not only the physiocratic tradition that guided Girard's thinking, but also the economic realities of France during this period: specifically, the state of French coal production. During the first third of the nineteenth century, coal, in France, was *un produit révolutionnaire.*[11] While in England, coal production was sixteen million tons in 1816, thirty million tons in 1836, forty-four million tons in 1846, and fifty-seven million tons in 1851, French production figures were much lower: one million tons in 1820, two million tons in 1837, and five million tons in 1846.[12]

In addition, French production was not centered in one region, but was scattered throughout the country. Unlike the English, whose coal industry was centralized in a way that altered both landscape and consciousness, the French were unable to perceive coal as *the* endlessly available fuel. It was precisely because of the physical reality of the concentration of English

10. P. S. Girard, Foreword to the French edition of Friedrich von Gerstner's *Mémoire sur les grandes routes, les chemins de fer, et les canaux de navigation* (Paris, 1827), pp. cxxv–cxxvi.
11. C. Fohlen, in *Charbon et sciences humaines: Colloque international de l'Université de Lille en mai 1963* (Lille, 1963), p. 148.
12. Op. cit., pp. 141–2.

coal production, and their awareness of it, that the English were able to mechanize motive power with such ease.

The mechanization of overland traffic subjected it to the same degree of regularization that had already been firmly established in bourgeois self-discipline and in industrial production. Unlike traffic on the waterways,[13] land traffic had until then been the weakest link in the chain of capitalist emancipation from the limits of organic nature, because animal power — on which land traffic was based — cannot be intensified above a certain fairly low level. Yet one should not underestimate the efforts made in the decades before the advent of the railroads to increase the efficiency of land traffic within the framework of these narrow natural limits. These efforts did, in fact, introduce a trend that eventually made mechanization appear as the final logical step. According to Bagwell — who, interpreting the material available to him, saw the English 'transport revolution' as beginning as early as 1770 — traveling time between the most important cities was reduced by four-fifths between 1750 and 1830, and cut in half between 1770 and 1830.[14] The trip from London to Edinburgh, which in the 1750s still required ten days in the summer, took only forty-five and a half hours in 1836.[15] With the increase in traveling speed came increases in the number of traveled routes, in traffic intensity and in the number of transportation enterprises. In the ten most important English cities, there were eight times as many regular departures in 1830 as there had been in 1790; Bagwell thinks that the number of passengers was multiplied by a factor of fifteen, as some of them were carried 'outside' (i.e., on top of the coach) on regular runs.[16] Due to these improvements, the stagecoach surpassed the riding horse as the fastest mode of land transportation.[17] Karl Philipp Moritz gives us a vivid impression of that highly developed mode of passenger traffic in his *Reisen eines Deutschen in England* (*Travels of a German in England*). At this time, in the 1780s, the German

13. Traditionally, traffic on waterways has always been greater than overland traffic. From the early fifteenth century to the end of the nineteenth century, sailing-ship technology was sufficient for the transportation needs of capitalism in all its phases of expansion. Fifty years after the mechanization of land traffic by means of the railroad, sailing-ship technology (i.e., the clipper) still dominated ocean traffic.
14. Philip S. Bagwell, *The Transport Revolution from 1770* (London, 1974), p. 41.
15. Ibid., pp. 42, 43.
16. Ibid., p. 43.
17. Ibid., p. 49.

traveler mostly proceeded on foot. Moritz, who attempted to wander about England in this manner, found himself regarded as a curiosity. He noted with surprise that in England even the lower orders traveled by stagecoach.

Finally, the high degree of development that the coach system achieved can be seen in its economic concentration: of the 342 scheduled daily departures from London listed in John Bates' *Directory of Stage Coach Services* for 1836, 275 were run by three enterprises, the largest of which, owned by William James Chaplin, also had considerable interests in the catering business and employed a total of more than two thousand people and eighteen hundred horses. (Bagwell, p. 50).

One of the main arguments for replacing the horse teams with steam locomotives was presented by Nicholas Wood, author of the most authoritative technical work of his time on railroads: 'The greatest exertions have been used to accelerate the speed of the mails (which have hitherto been the quickest species of conveyance), without being able to exceed ten miles an hour; and that only with the exercise of such *destruction of animal power*, as no one can contemplate with feelings except of the most painful nature; while, upon the Liverpool Rail-way, an average rate of fifteen miles is kept up with the greatest ease'.[18] (Italics added.)

How long overdue the mechanically produced means of locomotion must have seemed to the progressive contemporary consciousness — and how hopelessly anachronistic the animal power still in use — can be seen in a text from 1825 that juxtaposes both forms of locomotion:

> The animal advances not with a continued progressive motion, but with a sort of irregular hobbling, which raises and sinks its body at every alternate motion of the limbs. This is distinctly felt on horse-

18. Nicholas Wood, *A Practical Treatise on Rail-Roads, and Interior Communication in General*, 2nd ed. (London, 1832), p. xii. Within the mail system, there were attempts to increase physical capacity from the sixteenth century on: letters were no longer carried long distances by means of only one courier, but from one station to the next, 'with either changes of horses, or of couriers, *relays*, in any case, consisting of runners or riders or drivers'. (Sombart, op. cit., vol. 2, p. 382.) This subdivision of the formerly unified effort caused the process to become intensified, but the system remained subject to the limits of physical capacity, even though this was now the sum of the physical capacities of all the individual relays. This intensification also intensified costs, and thus only the mails employed this mode of transportation.

> back, and it is the same when an animal draws a load. Even in walking and running one does not move regularly forward. The body is raised and depressed at every step of our progress; it is this incessant lifting of the mass which constitutes that drag on our motions which checks their speed, and confines it within such moderate limits. . . . With machinery this inconvenience is not felt; the locomotive engine rolls regularly and progressively along the smooth tracks of the way, wholly unimpeded by the speed of its own motions; and this, independent of its economy, is one of the great advantages it possesses over animal power.[19]

The mechanical motion generated by steam power is characterized by regularity, uniformity, unlimited duration and acceleration. 'No animal strength', says Gray, 'will be able to give that uniform and regular acceleration to our commercial intercourse which may be accomplished by railway'.[20]

As the motion of transportation was freed from its organic fetters by steam power, its relationship to the space it covered changed quite radically. Pre-industrial traffic is mimetic of natural phenomena. Ships drifted with water and wind currents, overland motion followed the natural irregularities of the landscape and was determined by the physical powers of the draught animals. Charles Babbage observed, concerning the eotechnical utilization of wind and water power: 'We merely make use of bodies in a state of motion; we change the directions of their movement, in order to render them subservient to our purposes, but we neither add to nor diminish the quantity of motion in existence'.[21]

The earliest perceptions of how steam power dissolved that mimetic relationship can be found in descriptions of the first steam-powered ships. An eyewitness to John Fitch's steamboat experiment in 1790 found it particularly remarkable that the boat proceeded in a straight line, instead of tacking, as one would expect, in the traditional eotechnically 'natural' manner of marine vessels.[22] Putting it differently, another account said of

19. James Adamson, *Sketches of Our Information as to Rail-Roads* (Newcastle, 1826), pp. 51–2.
20. Thomas Gray, *Observations . . .* (London, 1822), p. 39.
21. Charles Babbage, *On the Economy of Machinery and Manufacture* (Philadelphia, 1832), p. 27. An application to the motion of sailing ships, the text goes on to say, would mean that 'the quantity of motion given by them [the sails] is precisely the same as that which is destroyed in the atmosphere'.
22. Report in *New York Magazine* (1790), quoted in Seymour Dunbar, *A History of Travel in America*, 4 vols. (Indianapolis, 1915), vol. 1, pp. 256–7.

steam power that 'it *forces* the ships to traverse the ocean against wind and waves'.[23] (Italics added.)

Thus steam power appeared to be independent of outward nature and capable of prevailing against it — as artificial energy in opposition to natural forces. While this was first perceived in steamship traffic, it became even clearer only a little later, when animal power was abandoned in favor of mechanical power. As long as the conquest of space was tied to animal power, it had to proceed within the limits of the animals' physical capabilities. One way of gaining an immediate perception of the distance traveled was to observe the exhaustion of the draught animals. When they were over-taxed, it was seen as 'destruction of animal power'. Steam power, inexhaustible and capable of infinite acceleration, reversed the relationship between recalcitrant nature (i.e., spatial distance) and locomotive engine. Nature (i.e., spatial distance), which had caused the animal 'locomotive engines' to strain themselves to exhaustion, now succumbed to the new mechanical locomotive engine of the railroad that, in a frequently used metaphor, 'shoots right through like a bullet'. 'Annihilation of time and space' was the *topos* which the early nineteenth century used to describe the new situation into which the railroad placed natural space after depriving it of its hitherto absolute powers. Motion was no longer dependent on the conditions of natural space, but on a mechanical power that created its own new spatiality.

> We have seen the power of steam suddenly dry up the great Atlantic ocean to less than half its breadth. . . . Our communication with India has received the same blessing. The Indian Ocean is not only infinitely smaller than it used to be, but the Indian mail, under the guidance of steam, has been granted almost a miraculous passage through the waters of the Red Sea. The Mediterranean, which is now only a week from us, has before our eyes shrunk into a lake; our British and Irish channels are scarcely broader than the old Firth of Forth; the Rhine, the Danube, the Thames, the Medway, the Ganges etc., have contracted their streams to infinitely less than half their lengths and breadths, and the great lakes of the world are rapidly drying into ponds![24]

23. W. Heimann, *Über Dampfmaschinen, Dampfwagen und Eisenbahnen* (Frankfurt, 1836), p. 2.
24. *Quarterly Review*, vol. 63 (1839), p. 23.

The shrinking of the natural world by means of mechanical transportation was perceived and evaluated in different ways, dependent on the evaluator's economic and ideological position: there was shrinkage as economic gain versus shrinkage as loss of experience. The representatives of industry and free enterprise saw transportation's release from nature's fetters as a gain: nature, in the form of distances that were hard to bridge, and exhaustible and unpredictable energy sources, had been an obstacle to the development of world trade. Mechanical energy rendered all transportation calculable. The promoters of the railroad regarded steam power's ability to do away with animal unreliability and unpredictability as its main asset. Here is Thomas Gray:

> The dangers to which the present coach system is obnoxious (such as the untractableness of horses, the imprudence of drivers, cruelty to animals, the ruggedness of roads, etc.), would not be encountered on the rail-way, whose solid basis and construction render it impossible for any vehicle to be upset or driven out of its course; and as the rail-way must also be perfectly level and smooth, no danger could be apprehended from the increased speed, for mechanic power is uniform and regular, whilst horse-power, as we all very well know, is quite the reverse.[25]

This rational and progressive evaluation was opposed by a contrary position, in which the loss of organic natural power was not seen as an elimination of interfering factors that have hitherto hindered the smooth conduct of business and transportation, but as the loss of a communicative relationship between man and nature. Thus for instance, Thomas De Quincey described the lost experience of coach travel:

> Seated in the old mail-coach, we needed no evidence out of ourselves to indicate the velocity. . . . The vital experience of the glad animal sensibilities made doubts impossible on the question of our speed; we heard our speed, we saw it, we felt it as a thrilling; and this speed was not the product of blind insensate agencies, that had no sympathy to give, but was incarnated in the fiery eyeballs of the noblest among brutes, in his dilated nostril, spasmodic muscles, and

25. Gray, op. cit., p. 55.

thunder-beating hoofs.[26]

We should not read that account of a past mode of travel merely as a reactionary-romantic tirade against the new technology. De Quincey described the disorientation experienced by the traveler when the traditional, 'natural' mode of travel, the one based on traditional technology, was superseded by a new travel technology. Contemporaries perceived the transition from coach to railroad technology as a decisively reduced expenditure of work or power: in the form of animal exhaustion, that expenditure had been immediately perceptible to the senses, and spatial distance had been experienced by means of sensory recognition of that physical exhaustion. As the sensory perception of exhaustion was lost, so was the perception of spatial distance. De Quincey's description of this process was echoed in numerous variations in contemporary literature and journalism, as in this anonymous polemic from the year 1839:

> When we are travelling by stage-coach at the rate of eight or ten miles an hour, we can understand the nature of the force which sets the vehicle in motion: we understand in a general way the nature of animal power: we see how soon it is exhausted; every successive hour do we watch the panting and reeking animals in their stalls, and, in the course of a day's journey, we can appreciate the enormous succession of efforts required to transport a loaded vehicle from London to a distant town.
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> But, when proceeding on a journey by the rail-road, we are seldom allowed to get a sight of the wondrous power which draws us so rapidly along. The scene is altogether changed, there are no animals yoked to the car, to excite our pity by their apparently short, but really severe labour; we hear the steam gushing from the safety valve, while the machine is for a short time stationary; then we hear a number of rapid beatings: we feel that we are moving; the motion soon increases rapidly, and the journey which by the stage-coach is so tedious, is here, long before we are aware of it, at an end. The traveller then wonders not only at the rapidity of his journey, but often wishes to inspect and comprehend the means by which it was effected.[27]

26. Thomas de Quincey, *The Collected Writings*, ed. David Masson (London, 1897), vol. 13, pp. 283–4. (First published in 1849 in *Blackwood's Magazine*.)
27. *The Roads and Rail-Roads, Vehicles, and Modes of Travelling, of Ancient and Modern Countries* . . . (London, 1839), p. 279.

As the new technology terminated the original relationship between the pre-industrial traveler and his vehicle and its journey, the old technology was seen, nostalgically, as having more 'soul'. In addition to this sentimental line of thought there appeared another criticism of steam power that also had a high regard for the old technology but, while using the same arguments to be found in de Quincey and others, invested them with a modern content. This was accomplished by transferring the economically obsolete old technologies to a new realm, that of leisure and sports. What de Quincey deplored as a loss of sensory perception, others now attempted to reinstitutionalize. Thus, for instance, W. B. Adams' *Pleasure Carriages*, published in 1837, was the precursor of a literature of leisure and sports whose ever-increasing growth the century was to witness.[28] In this book, the use of horse-power was no longer treated nostalgically, but from a point of view that regarded the use of steam as merely unsportsmanlike:

> Steam is a mere labourer — a drudge who performs his work without speech or sign, with dogged perseverance but without emotion. . . . He may be personified when speaking *of* him; but no one pats his neck or speaks *to* him in a voice of encouragement. It is not so with a horse or horses. They are beautiful and intelligent animals, powerful yet docile; creatures that respond to kindness, and shrink from cruelty and injustice. The driver and owner can love them or feel proud of them; they step with grace, and can vary their form and movements in a thousand ways. They are creatures of individual impulses. . . . The man who rides a horse, feels a pleasure when the creature responds willingly to his purposes; and when he responds unwillingly, he feels a pride in the exercise of his power to compel him to obedience. Even when a horse is vicious, there is a pleasurable excitement in riding him. The rider's nerves are strung, his senses are quickened; eye, hand, and ear are alike on the alert; the

28. 'In the manual on the art of driving published by the president of the Four-in-Hand Driving and Coaching Club, which was revived in 1870 by the Duke of Beaufort, there is a chapter titled "The coaching revival" that deals exclusively with the club members' new practice of driving coaches on busy routes (e.g., to Brighton, Dover, Tunbridge Wells) and racing the railway trains to those destinations; this activity made the long-abandoned inns of the coaching era come alive again with the neighing of horses and the cracking of whips.' (P. D. Fischer, *Betrachtungen eines in Deutschland reisenden Deutschen* [Berlin, 1895], pp. 43–4. Fischer also mentions the following coaching titles published in the 1880s: Stanley Harris, *Old Coaching Days*; W. Outram Tristram, *Coaching Days and Coaching Ways*.)

> blood rushes through the veins, and every faculty is aroused.[29]

The final fate of carriage-riding, the traditional mode of travel, was to become the amateur sport of the privileged classes. In everyday existence, the new technology took over. Only during a transitional period did the travelers who transferred from the stagecoach to the railway carriage experience a sense of loss due to the mechanization of travel; it did not take long for the industrialization of the means of transport to alter the consciousness of the passengers: they developed a new set of perceptions. The uniform speed of the motion generated by the steam engine no longer seemed unnatural when compared to the motion generated by animal power; rather, the reverse became the case. Mechanical uniformity became the 'natural' state of affairs, compared to which the 'nature' of draught animals appeared as dangerous and chaotic. An anonymous text from the year 1825 gives us an idea of the adaptation to this industrialization of travel. It discusses the 'sensitive or nervous man' who will find the new mechanical mode of transport more agreeable than the horse-drawn vehicle:

> It is reasonable to conclude, that the nervous man will ere long, take his place in a carriage, drawn or impelled by a Locomotive Engine, with more unconcern and with far better assurance of safety, than he now disposes of himself in one drawn by four horses of unequal powers and speed, endued with passions, that acknowledge no control but superior force, and each separately momentarily liable to all the calamities that flesh is heir to. Surely an inanimate power, that can be started, stopped, and guided at pleasure by the finger or foot of man, must promise greater personal security to the traveller than a power derivable from animal life, whose infirmities and passions require the constant exercise of other passions, united with muscular exertion to remedy and control them.[30]

The 'sensitive and nervous man', in whom those horses in front of the coach, tended to cause unhealthy excitement, was enabled to relax in the railway carriage, and to sit in it without moving a muscle, without 'exertion' or any 'other passions'.

29. W. B. Adams, *English Pleasure Carriages* (London, 1837), pp. 198–9.
30. *The Fingerpost; or, Direct Road from John O'Groat's to the Land's End*, 3rd ed. (London, 1825), pp. 24–5.

Despite the apparent smoothness of transition to industrialized travel, certain residues of anxiety remained. We get an inkling of this from the report written by Thomas Creevy, the Liberal politician, about a trip on Stephenson's locomotive in 1829: 'It is really flying, and it is impossible to divest yourself of the notion of instant death to all upon the least accident happening'.[31]

31. Jonn Gore, ed., *The Creevy Papers* (New York, 1963), p. 256.