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THE STATE AND THE STEAM-BOILER IN NINETEENTH-CENTURY BRITAIN

*Adjoining the bobbin factory at which the explosion occurred was a national school, and just as the children were sporting in the playground, the boiler burst, bringing down the factory to which it belonged, burying 25 of the children in the ruins, and crushing eight of them to death [. . .].*¹

*It seems, therefore, difficult to understand why boilers placed under factories, and which are often in charge of inexperienced persons (little if at all above the class of mere labourers), are left without any inspection whatever; while, in the event of explosion, the loss of life might be [. . .] great [. . .].*²

I

The search for the origins of government intervention in the nation's economic life has long interested historians of Victorian Britain. Indeed, in recent years it has given rise to an extended and enthusiastic controversy. This debate is so well known and has been so often summarised³ that it is

¹ Evidence of L. E. Fletcher to the Select Committee on Steam Boiler Explosions [Parliamentary Papers, 1870, X], q. 134. This Committee was established in 1870, but failed to complete its work before the end of the Parliamentary session. Its evidence was published without a report. In the new session the Committee was re-appointed and a further volume of evidence with a report was published in 1871 [PP, 1871, XIII].

² Half-Yearly Report of Assistant Factory Inspector Walker [PP, 1877, XXIII], p. 217.

³ A comprehensive list of contributors to this debate would require an essay in itself. Bibliographies for material published up to 1970 are available in V. Cromwell, "Interpretations of Nineteenth-Century Administration", in: *Victorian Studies*, IX (1965-66), pp. 245-55, and G. Sutherland, "Recent Trends in Administrative History", *ibid.*, XIII (1969-70), pp. 408-11. Some of the most important studies published since are A. J. Taylor, *Laissez-faire and State Intervention in Nineteenth-century Britain* (London, 1972); C. J. Holmes, "Laissez-faire in Theory and Practice: Britain, 1800-1875", in: *Journal of European Economic History*, V (1976), pp. 225-36; W. C. Lubenow, *The Politics of Government Growth: Early Victorian Attitudes Towards State Intervention* (Newton Abbot, 1971); *Studies in the Growth of Nineteenth Century Government*, ed. by G. Sutherland (London, 1972); U. R. Q. Henriques, "Jeremy Bentham and the Machinery of Social Reform", in: *British Government and Administration Studies Presented to S. B. Chrimes*, ed. by H. Hearder and H. R. Loyn (Cardiff, 1974); *id.*, *Before the Welfare State: Social Administration in Early Industrial Britain* (London, 1979); F. Bédarida, "L'Angleterre victorienne paradigme du laissez-faire?", in: *Revue Historique*, CCLXI (1979), pp. 79-98; R. Tompson, *The Charity Commission and the Age of Reform* (London, 1979).

only necessary to observe here that the core of the argument has been about whether government growth was generated more by ideology (Benthamism) or force of circumstances (Professor MacDonagh's "intolerable situation"). There is, however, consensus on several other points, namely, that the mid nineteenth century was not the "golden age" of *laissez-faire* that Dicey supposed and that government inspection was crucially important as the agency of state intervention.

Notwithstanding MacDonagh's examination of his reform "model" in the context of the regulation of emigrant traffic, and the call for the replication of such empirical work in other areas,⁴ much remains to be done in terms of case-studies of regulation, particularly beyond the first phase(s) of intervention. Thus, there is still no adequate study of factory regulation throughout the Victorian period. Indeed, as one historian has complained, the debate on the "revolution in government" has degenerated into a series of summaries of a few key studies rather than evolving into empirical examinations of the theories propounded.⁵ Moreover, as Richard Tompson has recently pointed out, historians have tended to concentrate on reform "successes" rather than the "failures" which might reveal much about the nature of society, government, administration and law.⁶

This paper examines the phenomenon of steam-boiler explosions which, in the mid nineteenth century, claimed many lives, destroyed much property, prompted government inquiries, created frequent demands for government action, and yet did not give rise to a system of bureaucratic control by means of regular inspection. It deals with stationary land boilers since these constituted a distinct problem in themselves, the Steam Navigation Act (1851) and the Merchant Shipping Acts (1854 and 1862) tackling the question in so far as it affected passenger-carrying steamships, and the Railway Regulation Act (1840) doing the same for trains. In itself, of course, it cannot be claimed that the history of steam-boiler

⁴ O. MacDonagh, *A Pattern of Government Growth: The Passenger Acts and their Enforcement 1800-1860* (London, 1961), cf. J. H. Goldthorpe, "The Development of Social Policy in England, 1800-1914. Notes on a Sociological Approach to a Problem in Historical Explanation", in: *Transactions of the Fifth World Congress of Sociology* (Louvain, 1962-64), IV, pp. 41-56. Three valuable case-studies not cited in note 3 are J. H. Pellew, "The Home Office and the Explosives Act of 1875", in: *Victorian Studies*, XVIII (1974-75), pp. 175-94; Roy M. MacLeod, "The Alkali Acts Administration, 1863-84: The Emergence of the Civil Scientist", *ibid.*, IX, pp. 85-112; *id.*, "Social Policy and the 'Floating Population'. The Administration of the Canal Boats Acts 1877-1899", in: *Past & Present*, No 35 (1966), pp. 101-32.

⁵ G. Himmelfarb, "The Writing of Social History: Recent Studies of 19th Century England", in: *Journal of British Studies*, XI (1971), p. 153.

⁶ Tompson, *The Charity Commission*, *op. cit.*, p. 31.

regulation represents more than a small and, perhaps, insignificant topic. It nevertheless merits investigation for the light it throws upon such important questions as the attitude of government departments towards intervention and retrenchment, the role of voluntary organisations and pressure groups in the reform process, tendencies towards local or central administration, and the *laissez-faire*/collectivist dichotomy. Overall, therefore, the purpose of this paper is to chart the process which led to steam-boiler regulation and to ascertain the forces leading to the "solution" devised. As such, it concludes that any general assessment of Victorian reform must take account of a multiplicity of factors operating at various levels, but that an influence of widespread importance, which hitherto has been largely neglected, was the failure of the common law and the legal system to come to terms with economic, social and technological change. This failure encouraged the formulation of remedial measures administered by a bureaucracy. The final part of the paper comprises an estimation of the role of law in social and administrative change in nineteenth-century England.

II

The steam-engine as a pumping device dates from a late-seventeenth-century invention of Thomas Savery. In the early eighteenth century Newcomen introduced important changes and his atmospheric pumping engine came into widespread use during the first three quarters of the century. Throughout this period there was little technological innovation and the steam-engine remained of use solely for the pumping of water. Only with Watt's revolutionary improvements did the application of steam power to industry become a generally practical proposition. From about 1780 Watt and his partner Matthew Boulton, protected from competition by patent, began to supply engines to manufacturers. The spread of steam power was slow, however, and by 1800, when the patent expired, it seems certain, though the figures are still debated, that Boulton and Watt had erected fewer than 500 engines in Great Britain. J. R. Harris estimates that a total of 1,200 steam-engines were produced in the eighteenth century. Subsequently the application of steam power to British industry quickened though there remains considerable disagreement about the pace involved.⁷

⁷ R. L. Hills, *Power in the Industrial Revolution* (Manchester, 1970); P. Mantoux, *The Industrial Revolution in the Eighteenth Century* (London, 1961); R. H. Thurston, *A History of the Growth of the Steam Engine* (London, 1889); J. Lord, *Capital and Steam Power* (London, 1923); H. W. Dickinson, *A Short History of the Steam Engine* (Cambridge, 1939); A. E. Musson and E. Robinson, "The Early Growth of Steam Power", in: *Economic History Review*, Second Series, XI (1958-59), pp. 418-39. For the

Newcomen's engine was fitted with boilers consisting of copper plates riveted together; wrought or cast iron was more generally used by the middle of the century, and rolled iron plates became readily available from about 1795. Since eighteenth-century boilers were rarely worked at pressures exceeding 10 lb. per square inch, explosions seldom occurred. From the early nineteenth century, however, Richard Trevithick and others made use of pressures exceeding 30 lb. per square inch. These high-pressure boilers, numbering thousands by the 1840's, performed economically but, at the same time, presented considerable danger. Improvements in boiler design were insufficient to withstand the strains imposed by high-pressure working. Moreover, many of the new steam users lacked technical understanding of their equipment or employed incompetent boiler-minders. It was not unusual, for example, for bricks to be placed on safety valves as a means of increasing pressures. The factory inspector Robert Baker, in drawing attention to an engine-minder killed by the boiler he had mismanaged, doubted "very much whether one engine man in ten understands the pressure per square inch at which he is working". He knew of a case in which a 12-year-old boy had had complete charge of boilers, "when not less than four storeys of workpeople were in the rooms above".⁸ Poor construction coupled with misuse and ignorance produced a growing accident toll. In the first decade of the nineteenth century only two explosions, killing three people and injuring five more, are recorded.⁹ In the 1840's, 104 recorded explosions killed 209 and injured 338. In the next decade there were more than twice this number of explosions and deaths (see Table 1).

Table 1

Decade	1800-09	1810-19	1820-29	1830-39	1840-49	1850-59	1860-69
Explosions	2	12	13	42	104	248	483
Fatalities	3	52	28	77	209	486	710
Injuries	5	36	21	118	338	588	926

Source: Select Committee on Steam Boiler Explosions, 1870, Appendix 5, p. 588.

recent controversy on the growth of steam power in the eighteenth and nineteenth centuries see J. R. Harris, "The Employment of Steam Power in the Eighteenth Century", in: *History*, LII (1967) pp. 13-48; A. E. Musson, "Industrial Motive Power in the United Kingdom, 1800-70", in: *Economic History Review*, Second Series, XXIX (1976), pp. 415-39; G. N. von Tunzelmann, *Steam Power and British Industrialization to 1860* (Oxford, 1978).

⁸ Half-Yearly Report of Inspector Baker [PP, 1859/I, XII], p. 211.

⁹ Statistics for the first half of the century almost certainly represent a considerable underestimate. Select Committee on Steam Boiler Explosions, 1870, q. 132.

Accepting that the increases shown in Table 1 reflect more accurate recording and increasing use of steam power, the figures indicate a serious problem of growing proportions. Indeed the graph on p. 83 shows that between about 1840 and 1869 the number of deaths from explosions was increasing at a faster rate than the growth of horse-power derived from stationary engines. It has been suggested that Mulhall's figures for horse-power are too high for the early period, which, if true, strengthens the view that the death rate was increasing at a proportionately greater rate than the use of horse-power.¹⁰ By the 'fifties, the annual number of deaths was comparable to figures published by the factory inspectorate, and by the 'sixties they greatly exceeded the number of passenger deaths on the whole United Kingdom railway network.¹¹ Individual accidents sometimes wrought a dreadful toll. In 1851, at a Halifax mill employing 34 operatives, 10 were killed and 20 injured.¹² In 1862 one explosion killed 29 and injured 12 others.¹³ Such figures, for single accidents, were surpassed only by major mining, marine and railway disasters.

Of course, it is arguable that the figures in Table 1 demonstrate that boiler explosions did not constitute a serious problem. After all, even in the worst decade only some 70 persons *per annum* died as a result of these accidents. This was insignificant in comparison with, for example, annual mining fatalities. Given the geographical spread of accidents, the fact that most victims were of the working class, the universality of the steam-engine and the desirability of steam power, perhaps it is not to be wondered that legislation was not forthcoming. On the other hand, measures had been passed for the protection of the working class against accidents in factory and other employment, steam-boiler explosions could destroy middle-class lives and property (an MP referred to the threat posed to Parliamentarians themselves by lines of boilers in the basement of the House), and the number of deaths (it is impossible to evaluate comparative death rates) exceeded that of some regulated industries. In any case, statistical appreciation of the magnitude of a problem was by no means always a necessary prelude to social legislation. The first safety legislation for mines and textile factories, for example, was passed despite an absence of any clear idea of the number of deaths and injuries. Contemporary perceptions

¹⁰ Von Tunzelmann, *Steam Power*, op. cit., pp. 28-30.

¹¹ Between the years 1863 and 1868, 390 people were killed as a result of steam-boiler explosions, whereas 244 railway passengers perished. See Memorial from Manchester Steam Users' Association to the Home Secretary, Home Office Papers 45, Old Series 7605, Public Record Office. Except where otherwise stated, all unpublished letters quoted are in this file.

¹² Half-Yearly Report of Inspector Saunders [PP, 1851, XXIII], p. 273.

¹³ Sir W. Fairbairn to Sir G. Grey, 13 April 1864.

of gravity were, perhaps, more important, and here it is significant that by the 'fifties the press, particularly technical newspapers such as the *Mining Journal*, were full of discussion about the need for technological improvement and legal reform.

The 1844 Factory Act imposed certain safety standards upon factory employers. But it applied only to specified textile industries and mainly involved the fencing of machinery. No regulations covered the safety of steam-boilers; consequently, the inspectorate, like its mines counterpart, was powerless to enforce standards or prosecute the users of defective vessels. Thus, in 1851, Captain Kincaid of the Factory Department, referring to a fatal explosion at Johnstone in Scotland, pointed out that it was "one of those unfortunate occurrences to which the Inspector's authority does not reach".¹⁴ Fifteen years later a civil engineer informed the Under Secretary of State at the Home Office that "at present there is no official recognition of steam boilers. They may be placed in any position and worked under any conditions however dangerous to surrounding property and human life."¹⁵ Until the 1880's the only means of investigating explosions was the coroner's inquest and this was, of course, restricted to accidents involving death. As Sir William Fairbairn, the famous engineer, remarked, "the prevention of steam boiler explosions rests to a great extent in their [the coroners'] hands".¹⁶

III

The office of coroner is one of the oldest in the English legal system. The coroner's main duty has been to conduct an inquest or inquiry when any person has been slain or died suddenly. But such an investigation proved to be an unsatisfactory method of determining the facts of steam-boiler explosions, and one ill-suited to eliminate industrial dangers. Sir William Fairbairn pointed out its shortcomings to the 1870 Select Committee on boiler explosions.

On these occasions a jury is empanelled, not composed of men competent to understand the nature of these occurrences, but of persons such as the coroner can find; and in these cases the almost universal verdict is accidental death. Want of intelligence on the part of the jury is, however, not the only evil, as most of the witnesses examined on these occasions are even more ignorant on these questions than the jury.¹⁷

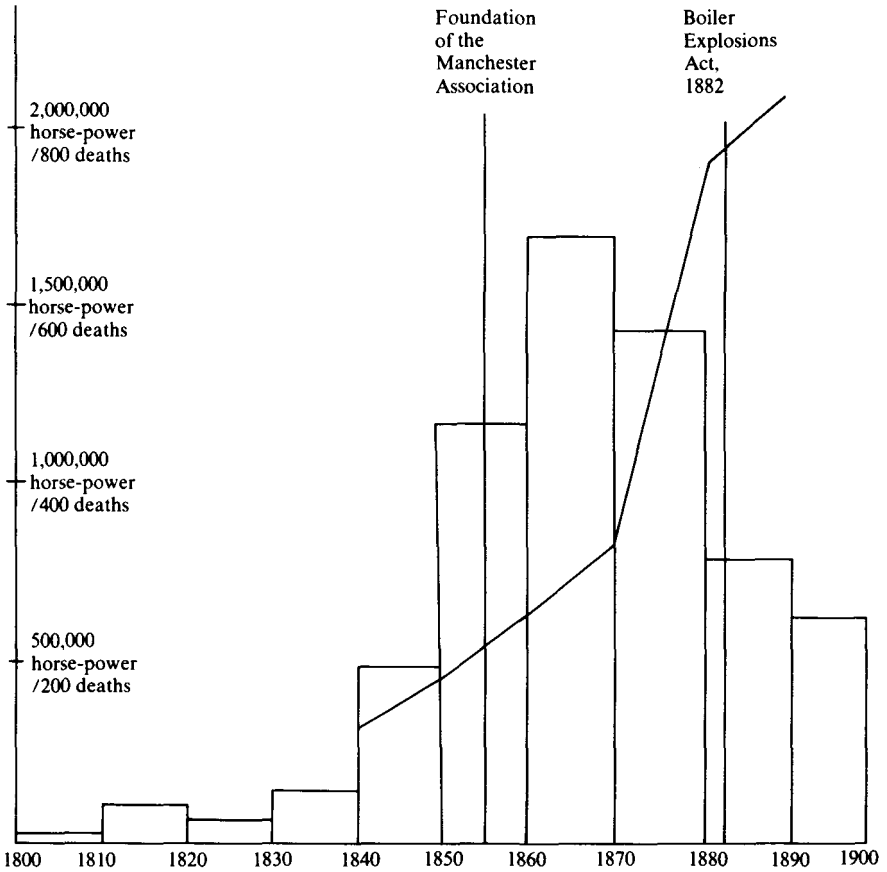
¹⁴ Half-Yearly Report of Inspector Kincaid [PP, 1851, XXIII], p. 332.

¹⁵ R. Rawlinson to H. Waddington, 23 April 1866.

¹⁶ W. Fairbairn to H. A. Bruce, 4 December 1869.

¹⁷ Select Committee on Steam Boiler Explosions, 1870, q. 31.

Graph showing fatalities from steam-boiler explosions, 1800-1900, and horse-power generated by fixed steam-engines, 1840-88



The ascending line indicates horse-power generated by fixed steam-engines, that is, excluding railway trains, steamships and traction engines. Decennial fatalities from steam-boiler explosions are indicated by rectangles.

Source: M. G. Mulhall, *The Dictionary of Statistics* (London, 1892), p. 545; Select Committee on Steam Boiler Explosions, 1870, p. 588; Chaloner, *Vulcan* (cf. note 53), pp. 25, 34-35. Overlapping figures from the Committee and Chaloner do not always coincide, but discrepancies do not affect overall trends.

On another occasion, Fairbairn argued that though a verdict of “accidental death might often be valid in a legal sense”, it was usually inappropriate in the engineering context. It prevented further inquiry and was frequently interpreted “as a licence for a repetition of neglect”.¹⁸

One solution to the problem of ignorance was to employ expert witnesses. An Act of 1836 allowed for the attendance and remuneration of medical witnesses,¹⁹ and from about the mid 1840’s engineering testimony was sometimes called for. Fairbairn himself “was much in demand” as an expert witness.²⁰ But the decision to use engineers was entirely at the coroner’s discretion and heavily dependent on financial considerations. It was not clear whether local or national government was responsible for the remuneration of such witnesses, and, if national, which department. Indeed, in the 1860’s the Board of Trade and the Home Office disputed responsibility for boiler explosions, each department pressing the claims of the other. At this time the former already undertook investigations into marine and locomotive accidents, including explosions. But the Board argued that railway accidents, for example, “were merely incidents in the whole railway system of the United Kingdom, which involves many important commercial and economical considerations.” The steam-boiler issue, on the other hand, “is rather one of police than of trade regulation.”²¹ This, the Board felt, made it a Home Office responsibility.

In 1869, at an inquest in Oxford into a fatal accident caused by a boiler explosion at Sutton Courtenay, Berkshire, the jurors decided to recommend scientific investigation. However, the coroner explained that he had no authority to pay the fees for such an investigation.²² In 1870 the Portsmouth coroner requested the Home Office to provide a skilled engineer to assist at an inquest. Following consultations with the Board of Trade, the Board’s Southampton-based surveyor was directed to attend.²³ Later in the same year the Barnstaple coroner asked for an expert witness to be brought in at Treasury expense on a boiler-explosion inquest. Despite the fact that the Home Office and Board of Trade had liaised on this subject only a few months before, the coroner was notified that

as the Secretary of State has no authority to deal with boiler explosions, as he has in the case of accidents in mines and factories, Mr. Bruce must

¹⁸ W. Fairbairn to H. A. Bruce, 4 December 1869.

¹⁹ 6 and 7 Will. IV, c. 89.

²⁰ *The Life of Sir William Fairbairn*, ed. by W. Pole (London, 1877), p. 261.

²¹ Board of Trade to Under Secretary of State at the Home Office, 11 May 1864.

²² Coroner of Oxford to Home Secretary, 29 May 1869.

²³ Coroner of Portsmouth to Home Secretary, 1 April 1870, and Board of Trade to Under Secretary of State at the Home Office, 5 April.

decline to recommend the payment by the Treasury of expenses incurred in the examination of the boiler in the case in question.²⁴

One month after this the Durham coroner informed the Home Office that his county magistrates would allow payment of expert witnesses provided the request for their employment was endorsed by Whitehall. The coroner wanted to know how many witnesses he could call and how much they should be paid. In reply the department stated that it had no power to direct the employment of experts and that the coroner himself was the best judge of whether any were required. However, it suggested that two experts be called.

It is clear that whatever the merits of specialised testimony in principle, the practice was unsatisfactory because it was so sporadic. Proposals to obviate the disorganisation were made in 1869 by the Manchester Steam Users' Association and by Henry Hiller of the National Boiler Insurance Company. Both favoured the compulsory use of experts at inquests into deaths caused by boiler explosions. They anticipated not only that such a reform would produce truer verdicts, but that it would accumulate valuable evidence which would lead to a decline in the number of explosions, thereby discouraging government intervention.²⁵ By this time, however, a bill to provide for periodic inspection by government was already before Parliament.

IV

The idea of a system of steam-boiler inspection may be traced back to the early years of the nineteenth century when one, Joel Lean, inaugurated the inspection of steam-engines in Cornish copper mines. His principal objective was to improve efficiency, but in 1817 a Select Committee of the House of Commons recommended, on safety grounds, the inspection of boilers on passenger-carrying steamships.²⁶ However, in the absence of official engineers to undertake the work, the suggestion came to nothing. Not until the middle of the century did Sir William Fairbairn conceive and establish a general system of inspection for land boilers. In 1851, in his evidence to a Stockport inquest, Fairbairn said: "It seems to me that there should be some association, either under the local authorities or under Government, by which registers should be kept, not only with reference to the safety of the public, but also to show what duty engines and boilers perform."²⁷

²⁴ Coroner of Barnstable to Home Secretary, 11 October 1870 (draft reply on rear).

²⁵ H. Hiller to Board of Trade (copy) and Manchester Steam Users' Association Memorial, April 1869.

²⁶ Select Committee on Explosions on Board Steamboats [PP, 1817, VI], p. 226.

²⁷ The Life of Sir William Fairbairn, op. cit., p. 265.

Henceforward, Fairbairn's evidence always contained suggestions for inspection, though by 1853 he had ruled out government intervention.²⁸ He envisaged a combination of manufacturers retaining an inspector who would periodically examine and report upon the condition of boilers and engines. Throughout 1854 he sought to secure manufacturers' interest in such a plan in his home town of Manchester. On 23 January 1855, with 271 steam users enrolled, the Association for the Prevention of Steam Boiler Explosions (later renamed the Manchester Steam Users' Association) was formally established. As Fairbairn stated: "Its primary object is to secure the greatest practical safety in the raising and use of steam, by means of an intelligent supervision, to be carried on by competent and well instructed inspectors, employed by the Association".²⁹ But, as he also observed, another reason for establishing the association was to remove "any pretence for Government inspection".³⁰

Firms within a thirty-five-mile radius of Manchester were eligible to join the association on payment of a £2 membership fee and an annual subscription of thirty shillings per boiler.³¹ The rules stipulated regular inspection, though for an extra charge the chief inspector would attend on special summons. After each inspection a report was to be written, one copy going on file, the other being sent to the member concerned. The association emphasised that its role was to be no more than advisory:

it is not intended that the inspectors, either in testing boilers or other apparatus, or in communicating information, or advising in respect to any matter or thing in the discharge of their duties, shall take upon themselves any responsibility to supersede in any degree that of the members or their servants.³²

Fairbairn's organisation was praised by Charles Dickens who, in other contexts, was critical of safety standards in Lancashire factories.³³ But even within its restricted area, success was limited. The original membership

²⁸ *Ibid.*, and *A Sketch of the Foundation and of the Past Fifty Years' Activity of the Manchester Steam Users' Association for the Prevention of Steam Boiler Explosions and for the Attainment of Economy in the Application of Steam* (Manchester, 1905) (hereafter *MSUA Jubilee Book*), p. 5.

²⁹ W. Fairbairn, *Useful Information for Engineers; Being a Series of Lectures delivered to the Working Engineers of Lancashire and Yorkshire* (London, 1856), p. 46.

³⁰ *Ibid.*

³¹ *Ibid.*, Appendix IV, p. lxxiii.

³² *Ibid.*, p. lxxiv.

³³ Charles Dickens to W. H. Wills, 29 September 1854, *The Letters of Charles Dickens*, ed. by W. Dexter (Bloomsbury, 1938), II, pp. 592-93. See P. W. J. Bartrip, "Household Words and the Factory Accident Controversy", in: *The Dickensian*, LXXV (1979), pp. 17-29; *id.*, *Safety at Work: The Factory Inspectorate in the Fencing Controversy, 1833-1857* [Centre for Socio-Legal Studies Working Paper, No 4] (Oxford, 1979).

came from 635 invitations.³⁴ As Fairbairn later admitted, “only a fraction” of Manchester boiler users enrolled.³⁵ Some were deterred from joining by the lack of insurance cover offered; indeed, if an inspected boiler burst, the association suffered no financial loss. Dissatisfaction with inspection without financial responsibility led to the establishment of several engineering insurance companies, such as the Steam Boiler Assurance Company, founded in Manchester in 1859.³⁶ The Manchester Steam Users’ Association, however, stood firm against the insurance principle.

The Committee are of the opinion that there is neither expediency or utility in boiler assurance, on the contrary, they are of the opinion that such a course would tend to increase rather than diminish accidents, as it would induce a carelessness which the committee think should be punished rather than rewarded.³⁷

In fact, steam users frequently took out an insurance policy for a nominal sum (perhaps £100) in order to secure cheap inspection. But if the financial risk to the insurance company was small, it sometimes did not think it worthwhile to inspect.³⁸ The *Bradford Observer* suggested that in cases of explosion where inspection had been neglected, insurance companies should be liable “for the real damage and compensation”.³⁹ Yet, as the historian of accident insurance states, public liability insurance was deemed contrary to public policy for much of the nineteenth century.⁴⁰

In 1864, the Manchester Steam Users’ Association, damaged by insurance competition, was forced to adopt a guarantee scheme whereby financial liability in the event of the explosion of an inspected boiler was accepted. In all but name this was insurance. However, the wider issue of responsibility for damage sustained by the general public, or for death and injury to the workforce or public, remained unresolved. In 1870 Fairbairn was adamant that neither the inspecting body nor the steam user could be blamed for an explosion provided the one had submitted to inspection and the other had carried it out.⁴¹ This whole question of responsibility was of central importance in nineteenth-century safety questions. As the *Bradford Observer* observed, “We have not much faith in compulsory government

³⁴ Manchester Courier, 27 January 1856.

³⁵ Select Committee on Steam Boiler Explosions, 1870, q. 73.

³⁶ These offered insurance in conjunction with inspection.

³⁷ MSUA Jubilee Book, p. 27.

³⁸ Bradford Observer, 22 October 1879.

³⁹ Ibid.

⁴⁰ W. A. Dinsdale, *History of Accident Insurance in Great Britain* (London, 1954), p. 177.

⁴¹ Select Committee on Steam Boiler Explosions, 1870, qq. 47-121.

inspection [of steam boilers] which would take the responsibility off everybody.”⁴² In fact, almost every suggestion for extension of the powers of government safety inspection of mines, factories or railways was countered by claims that the employer would cease to exercise care under the assumption that an official body had taken responsibility.

Although the Manchester Association was established partly to deter interventionist legislation, it is not clear how close such intervention was in the early 1850's. It is probable that Lancashire textile manufacturers, alarmed by what they took to be an aggressive line on industrial safety taken by the factory inspectorate, exaggerated the threat. Certainly, throughout the 'fifties there was little progress towards intervention despite the fact that boiler explosions and fatalities continued to increase. By the early 1860's, however, the problem had attained proportions which re-awakened the fears of insurance and inspection bodies that government action was imminent.⁴³ Fairbairn wrote to Sir George Grey: “To protect the public from these sad catastrophies, it has been suggested by some that an engineer should be appointed by the Government to investigate, and report to Parliament [. . .] upon every boiler explosion that occurs.”⁴⁴ This, of course, was anathema to the Manchester Association, and Fairbairn countered the imagined threat with his own proposals for a new “authorised” system of inspection.

In a letter to the Home Secretary, Fairbairn suggested that the government should investigate and report on all explosions. He argued that this would render legislation unnecessary, since the publicity given to accidents would make steam users “accountable”.⁴⁵ Superficially, the proposal seems to represent a renunciation of the association's *laissez-faire* principles. But Fairbairn went on to offer its services in carrying out inspections in return for an annual grant and a payment for each visit made. The offer, partly an attempt to boost business, which had declined with the success of insurance,⁴⁶ was also a recognition of the supposed inevitability of government intervention and an effort to forestall the creation of entirely bureaucratic machinery.⁴⁷ Although the Home Office showed initial interest, the offer lapsed owing to official indifference. Meanwhile, an abortive private members' bill, introduced in 1864, sought to establish the user's

⁴² Bradford Observer, 22 October 1879.

⁴³ During 1863 there were at least 48 explosions resulting in 76 deaths. See W. Fairbairn to Sir G. Grey, 13 April 1864.

⁴⁴ Ibid.

⁴⁵ Ibid.

⁴⁶ MSUA Jubilee Book, pp. 32-33.

⁴⁷ W. Fairbairn to Sir G. Grey, 23 May 1864.

financial responsibility for accidents by providing for the compensation of families of persons killed by his neglect or default.⁴⁸

The first firm evidence of government concern about explosions was shown in 1866. Following the collapse of a textile mill owing to a boiler explosion, a civil engineer, one Robert Rawlinson, was sent to investigate and report. He came to the conclusion that it was unwise to place boilers in the main block of any buildings and that there was danger in filling a boiler house from wall to wall with boilers and flues. He recommended that owners of boilers should place them under proper supervision and inspection, a copy of the certificate of inspection being made available for scrutiny by the factory inspector. Thus, Rawlinson favoured the certification of stokers plus compulsory inspection by a private body under the general supervision of the bureaucracy.⁴⁹ The Home Office found Rawlinson's suggestions "practical and valuable". Grey favoured the preparation of a bill to give them effect. Nothing was done, however, until a private members' "Bill to provide for the Periodical Inspection of Steam Boilers" was introduced in the Commons in 1869 by Messrs Sheridan (Liberal), Vickers (Conservative) and Brady (Liberal), MPs for Dudley, Wallingford and County Leitrim, respectively.⁵⁰

This short bill sought to empower the Board of Trade "to issue rules and orders by which a complete and effective system of registering, inspecting, testing and ascertaining the safety and security of steam-boilers in the United Kingdom of Great Britain shall be established".⁵¹ A registrar and inspector-general of steam-boilers would be appointed to carry out a system of inspection devised by the Board of Trade. The bill, which received its first reading on 9 April, aroused the hostility of the private inspection bodies. A Manchester Association memorial containing counter-proposals was delivered to the Home Office. In this and in an interview with the Secretary of State on 16 April, the Association advocated revitalization of existing means of investigating fatalities, rather than new legislation. Every coroner, it was recommended, "should be *empowered and instructed*" to avail himself of the assistance of two engineers unconnected with the works involved. These should attend the inquest, give expert evidence, attribute responsibility to the right person (and not, as was usual, to the stoker).

⁴⁸ A Bill for Compensating the Families of Persons killed by Boiler Explosions, through the Neglect or Default of the Owner [PP, 1864, I], pp. 103-04.

⁴⁹ Report by R. Rawlinson on the fall of a part of Ribbleton Lane Mill, 20 March 1866, HO 45, OS 7605.

⁵⁰ PP, 1868-69, V, pp. 223-24.

⁵¹ *Ibid.*, section 1.

In July, Henry Hiller informed the president of the Board of Trade, John Bright, of his company's views on the problem. It supported more widespread use of engineering experts at inquests, but the National Boiler Insurance Company also suggested a comprehensive system of inspection to be provided by an expansion of existing institutions.

Compulsory inspection by government officers would, we believe, be attended with considerable expense, whilst entailing much inconvenience to the owners of boilers, and would be objected to by the majority of the leading manufacturers of this country, whilst the necessary code of Regulations would most severely interfere with progressive improvements in the construction and working of boilers. Hence the desirability of promoting a more general voluntary action amongst owners of steam boilers.

Hiller went on to suggest that

it might be desirable for government to strongly recommend owners of boilers to avail themselves of the services of the officers of this and similar institutions [...], and if it were intimated by general circular notices to all owners that they would be held liable for any personal injury which might occur through their neglect of this precaution it would doubtless have the desired effect of inducing more general care and supervision, and thus lead to a considerable reduction in the number of explosions etc.⁵²

In the event, the "Inspection of Steam Boilers Bill" was withdrawn on 9 August 1869 without a second reading or any debate. This was probably a result of pressure from the independent inspection bodies, for in July board members of the Boiler Insurance and Steam Power Company visited London to lobby MPs.⁵³ In March 1870 Sheridan introduced a similar bill, which was given a first reading but no debate. On 16 May a Select Committee was appointed on the application of John Hicks, the "Liberal-Conservative" MP for Bolton. It submitted its evidence two months later at the end of the Parliamentary session. On the same day, 21 July, the second inspection bill was withdrawn. The Committee was re-appointed in the following session, recommencing its work in March; its report was signed on 20 June.

The Committee originally comprised fifteen members, though this figure was subsequently increased by four. Liberals, Conservatives and "Liberal-Conservatives" were represented, though the former held an overall majority. Dr Lyon Playfair, Professor of Chemistry at Edinburgh University, provided scientific expertise, whilst three engineers and two lawyers contributed further specialist knowledge. In addition, a number of

⁵² H. Hiller to J. Bright, 20 July 1869 (copy).

⁵³ W. H. Chaloner, *Vulcan. The History of One Hundred Years of Engineering and Insurance 1859-1959* (Manchester, 1959), p. 26.

steam users were present. But although the Committee might be said to have largely comprised MPs knowledgeable about the question under consideration, it is doubtful whether it could have been expected to provide an objective assessment of that question, given its composition and the geographical base of the independent inspection and insurance companies. For example, nine Committee members represented Lancashire constituencies, seven were Lancashire magistrates, the impartiality of whom had been questioned by factory inspectors and others; at least eleven were of manufacturing or merchant backgrounds, whilst four were themselves cotton-spinners; finally, the Committee's chairman, Hick, was a committee member of the Manchester Association.

V

Most of the evidence given to the Select Committee was contributed by engineers, boiler-makers and those connected with the inspection or insurance companies. Though some account was taken of the working man's view, trade-union officials gave no evidence. Witnesses agreed that malconstruction and misuse were the principal causes of explosions. Many concurred that with an estimated 100,000-200,000 boilers in operation, a grave threat to a large section of the population persisted, despite the long existence of independent inspecting organisations.

They are to be found under the pavements of the streets over which we walk, in the kitchens of large hotels and clubs which the public frequent, and in the hearts of our large cities; they are to be found in the basements of factories round which and over which, numbers of hands are employed. In fact, boilers are to be found everywhere, and at present, anyone has a right to lay down a boiler in almost any situation, too frequently to the imminent jeopardy of the lives of those living near it.⁵⁴

In its report the Committee pointed out that although there was considerable agreement between witnesses, on some points "their recommendations on the subject of prevention are very conflicting". In fact, five different solutions were put forward:

- a) Compulsory inspection by an authority recognized by the government.
- b) Compulsory inspection regulated by district boards under the control of a central board.
- c) Compulsory inspection under local-government control but subject to Board of Trade rules.
- d) Compulsory government inspection.
- e) Voluntary inspection with safety standards enforced indirectly by legal

⁵⁴ Select Committee on Steam Boiler Explosions, 1870, q. 134.

sanctions such as threat of prosecution or having to pay compensation.⁵⁵ The Committee was not convinced by arguments for any kind of compulsory inspection. It considered that explosions, particularly those which inspection could prevent, were insufficiently frequent to justify such a recommendation and feared that compulsory inspection would impair steam users' sense of responsibility for safety. Its main recommendations were concerned with strengthening the notion of individual responsibility. These were that

- a) Legislation should establish the user's responsibility for the competence of employees and machinery.
- b) In the event of an explosion the onus of proof of efficiency should rest with the user.
- c) The user of a burst boiler should be required to prove that the accident arose from a cause beyond his control.
- d) The common-law doctrine of common employment, which defeated the suit of an injured employee if it could be shown that his injuries arose from the negligence of a fellow servant, should be abolished.

The Committee's only concession to "collectivism" was in approving the investigation of all explosions, whether or not lives were lost, and recommending that a report of each investigation be laid before the Home Office, which would, in turn, annually present them to Parliament.⁵⁶ These recommendations were very much in accord with the feelings of the private inspection bodies. Indeed, their implementation would undoubtedly have improved the business of the insurance companies and inspection societies. Gladstone's first ministry is traditionally criticised for its unproductive line on social reform. The findings of the Select Committee do little to undermine such criticism.

On 26 July 1871, a private members' "Steam Boiler Explosions Bill", introduced by three members of the Select Committee, including the chairman, and one other, received a first reading. It sought to enact the main recommendations of the recent report,⁵⁷ but lack of Parliamentary time prevented a second reading, and although the bill was re-introduced in 1872, no further progress was made.

There is no evidence of trade-union interest in the boiler question until the mid 1870's, when the issue was raised at the seventh Trades Union

⁵⁵ Summarised by R. B. Longridge of the Boiler Insurance and Steam Power Co. in his *Annual Report* (Manchester, 1871). See Chaloner, *Vulcan*, *op. cit.*, p. 27.

⁵⁶ Select Committee on Steam Boiler Explosions, 1871, pp. 269-70.

⁵⁷ PP, 1871, VI, pp. 201-03. Its promoters were Messrs Hick and Stavely-Hill (Conservative), Mr Miller (Liberal), and Sir Thomas Bazley, described by Dod in his *Parliamentary Companion* as "a staunch Liberal".

Congress, held in Liverpool. Possibly the lack of concern evinced before this juncture was a reflection of the fact that steam-boiler explosions were not confined to one particular industry and therefore did not compel the attention of any one union. However, in 1875 a resolution favouring government examination and certification of engine-tenders and boiler-minders was carried unanimously, the chairman remarking that “no more important resolution had been brought before the congress”.⁵⁸ Subsequently, such resolutions became almost annual conference events. This emphasis upon testing the competence of those in charge of boilers distinguished the union approach from that of all other parties involved. Indeed, the unions claimed that employers and insurance companies rejected certification on the grounds that it would entail higher wages and reduced policy sales.⁵⁹ The TUC saw the basic cause of explosions as being misuse rather than malconstruction or over-use. Delegates did not rule out inspection, but could not place total reliance upon it since it would not eliminate the consequences of individual negligence. Hence, as one spokesman put it, “compulsory inspection of boilers would not satisfy the working-classes”.⁶⁰

At the request of the TUC Parliamentary Committee, Thomas Burt, the miners’ leader and “radical” MP for Morpeth, brought the question of certification before Parliament on several occasions in the late ’seventies. But, only in 1881, following an epidemic of serious explosions culminating in the Batley disaster, in which sixteen were killed and £3000 worth of damage done, was a further attempt to legislate mounted.⁶¹ The Batley incident, though not the most catastrophic of recent years, prompted Mr Simon, the “Liberal-reformer” MP for Dewsbury, to ask the Home Secretary, Harcourt, “whether Her Majesty’s Government will consider the desirability of legislation for the protection of persons employed in factories and other establishments where steam boilers are used”. Harcourt’s only response was that “the question of legislation on the subject requires careful consideration”.⁶² However, at this time a Boiler Explosions Bill had already received a first reading in the House. Although lack of Parliamentary time prevented this from becoming law, another bill, with the same sponsor, Hugh Mason, and promoted by Burt and fellow trade unionist Henry Broadhurst, was given a first reading in February 1881. Mason, MP for Ashton-under-Lyne, a cotton-mill proprietor and president

⁵⁸ TUC, Seventh Annual Report, Liverpool 1875, p. 27.

⁵⁹ TUC, Eighteenth Annual Report, Southport 1885, p. 27.

⁶⁰ *Ibid.*

⁶¹ Board of Trade Reports [PP, 1880, LXVII, and 1881, XXIV].

⁶² Hansard (Commons), Third Series, CCLVII, c. 1740, 31 January 1881.

of the Manchester Steam Users' Association in succession to Fairbairn, argued that explosions "were still lamentably prevalent". He pointed out that there occurred an average of one explosion per week with one death and two injuries every four days. Joseph Chamberlain, on behalf of the government, expressed his broad support of the bill on account of the "frequency" (sic) of terrible explosions.⁶³

The Boiler Explosions Act of 1882 received the Royal Assent on 12 July. It provided for notice of explosions to be given to the Board of Trade. The Board was empowered to order either a formal or an informal inquiry into the causes of any explosion. The Act defined the word boiler in a wide sense, but since it did not apply to domestic boilers, to those employed in Her Majesty's Service, to those on steamships certificated by the Board of Trade, or to those employed in the mining industries, the Act's scope was limited. Furthermore, as several MPs who spoke on the bill pointed out, the measure was "not one of an extreme character".⁶⁴ It provided for neither the inspection of boilers nor the certification of those who had charge of them. The Board of Trade already undertook *ad hoc* investigations of explosions and the new Act merely formalised the process of inquiry. As Mr MacIver MP argued, "Inquiry was all very well in itself, but there were inquiries already, and if useful legislation were intended, he thought that what was required was to encourage a proper system of inspection."⁶⁵ The Act itself offered neither improved means of redress to those who suffered injury or lost property, nor the prospect of a reduction in explosions.

The Act was, of course, very different from what the trade unions had been seeking in previous years and it is, perhaps, difficult to see why Burt and Broadhurst assisted in its Parliamentary promotion. The answer is mainly to be found in the changed conditions effected by the passing of the Employers' Liability Act (1880), for which the TUC had long pressed. At the 1881 Congress it was claimed that

the effect of the Bill would be to fix ascertained neglect upon the responsible parties; and since under the Employers' Liability Act, employers are liable for injuries caused to their workpeople by carelessness and preventible causes, the Bill might, no doubt, do some service in the prevention of loss of life and limb by boiler explosions.⁶⁶

Certification of minders remained an important consideration for the

⁶³ *Ibid.*, CCLXVI, c. 1351, 22 February 1882.

⁶⁴ *Ibid.*, cc. 1352-53.

⁶⁵ *Ibid.*, c. 1355. For a similar view see TUC, Fifteenth Annual Report, Manchester 1882, pp. 19-20.

⁶⁶ TUC, Fourteenth Annual Report, London 1881, p. 11.

unions, and an attempt to amend the bill to compel this was defeated in the House. In the absence of such a measure, however, union leaders were prepared to accept an Act which held out some hope of reducing “the hitherto reckless loss of life”, and which provided a more scientific and thorough forum for investigation than coroners’ inquests.⁶⁷

From 1884 the Board of Trade published annual reports of inquiries conducted under the Act. These reports were largely of a descriptive nature and offered little in the way of generalisation about the problem or suggestions for further reform. Indeed, the administration of the Act has been described as “easy-going”.⁶⁸ During the ‘eighties a number of union-backed private members’ bills for compulsory inspection, certification or insurance of boilers came before Parliament. Largely owing to opposition from the independent organisations, all failed.⁶⁹ Not until 1890 was a further Act passed, and this was merely to extend existing provisions to domestic boilers, those in HM service, those on British ships and those in mining industries.

VI

The problem of steam-boiler explosions and the legislation to which it eventually gave rise may be related to the controversy in socio-administrative history. Professor MacDonagh’s model of reform as the inevitable reaction to intolerability may be tested in the boiler context. MacDonagh claims that his thesis applies particularly to the years between 1825 and 1875,⁷⁰ and it was during this period that the question of boiler explosions was particularly acute. Statistics for explosions and fatalities suggest that during the 1850’s, and 1860’s there existed a grave situation. Indeed, the chairman of the Select Committee on steam-boiler explosions, who as a committee member of the Manchester Association was surely not given to immoderate views on the subject, described it as a “national calamity”.⁷¹ Such a description might suggest “intolerability”.⁷² But it was as late as 1882 before legislation provided merely for official categorisation and

⁶⁷ TUC, Fifteenth Annual Report, p. 11. The Act provided for investigation of non-fatal accidents with which coroners were powerless to deal.

⁶⁸ Chaloner, *Vulcan*, p. 31.

⁶⁹ TUC, Sixteenth Annual Report, Nottingham 1883, p. 17.

⁷⁰ O. MacDonagh, “The Nineteenth Century Revolution in Government”, in: *The Historical Journal*, I (1958), p. 61.

⁷¹ Select Committee on Steam Boiler Explosions, 1870, Appendix I, p. 579.

⁷² MacDonagh, “The Nineteenth Century Revolution in Government”, *loc. cit.*, p. 58, singles out the Factory Act of 1844 as a prime example of intolerability prompting reform. Statistically, steam-boiler fatalities were, by the 1850’s, exceeding those for the entire textile industry covered by the Factory Acts.

enumeration of the problem. It is interesting that this was passed at a time when the incidence of explosions and fatalities, possibly owing to technological advances, was past its peak (see Table 2).

Table 2

Date	Explosions	Fatalities	Date	Explosions	Fatalities
1870	66	82	1878	52	49
1871	55	55	1879	46	44
1872	62	62	1880	36	71
1873	66	66	1881	36	40
1874	68	68	1882	39	37
1875	50	50	1883	42	31
1876	40	95	1884	37	24
1877	47	53	1885	38	33

Source: Chaloner, *Vulcan*, p. 25.

It is difficult to explain why, from about 1870, the number of deaths fell whilst the use of boilers increased dramatically (see graph). There is evidence of technological improvements in design and construction during the 'fifties, 'sixties and 'seventies. Longitudinal stay bolts and gusset plates connecting the flat ends of boilers to the shell were introduced in the 1850's; the practice of flanging end plates instead of using angle irons to make a seal dates from about 1866. During the 1870's drilling and machine riveting became normal construction techniques. Perhaps most important, from 1865 mild steel, with its greater tensile strength, replaced wrought iron as a manufacturing material. All these developments may have contributed to an improving safety record in the last third of the century.⁷³ However, the decline in fatalities may also have been due, in varying degrees, to the impact of private inspection, to improvements in medical care, which turned potential fatalities into non-fatal accidents, to improved standards of care by managers and workers (a result of better education and a reflection of the high level of capital investment in skilled manpower?), and to the operation of the Employers' Liability Act.

Absence of interventionist legislation during the period of putative intolerability confirms criticism that the MacDonagh thesis is not of general application. The incidence of explosions and fatalities, high as it was, did not provoke government intervention. Of course, it may be argued that this was because the threshold of intolerability was not crossed. But such a contention would only serve to underline the shortcomings of the concept

⁷³ Dickinson, *A Short History of the Steam Engine*, op. cit., pp. 159-72; Thurston, *A History of the Growth of the Steam Engine*, op. cit., p. 343.

of intolerability. As Jenifer Hart has pointed out, this is unsatisfactory because it cannot be tested.⁷⁴ It may be questioned by pointing to conditions which failed to produce reform, yet, by definition such conditions cannot have been intolerable since they were, in fact, tolerated. Therefore, in the last analysis, reservations raised by the steam-boiler example cannot undermine a model which possesses its own validation procedure. However, if we are unable directly to rebut stage one of MacDonagh's thesis, we can at least claim that it represents an oversimplified functionalism which is unhelpful in explaining the processes leading to social reform. On the other hand the "pro-Benthamites" provide little assistance either, for Benthamism inspired intervention no more than intolerability. We are left with the question of why the steam-boiler problem failed to provoke intervention.

Explaining a negative is bound to involve a degree of speculation owing to problems of evidence. However, it is reasonable to assert that the absence of concerted pressure for intervention was an important factor. In other words, no important parties consistently desired it. Hence middle-class opposition was not countered, at least until the TUC took up the issue, by a popular movement for reform; moreover, the relevant government departments were reluctant to extend their responsibilities to encompass steam-boiler explosions. Thus, a letter from "Government authorities" to a coroner requesting official examination of some burst boilers stated that "it was not probable that any large company would allow accidents to happen if they could prevent them, as they were usually attended with great expense to themselves as well as loss of life."⁷⁵ But the same argument was invoked to oppose government regulation of coal-mines, and yet mining legislation backed by inspection was introduced in 1842. The role of inspection and insurance organisations was obviously significant in the steam-boiler context. These bodies acted not as mere obstructions to reform, as employers' associations in other industries sometimes did; they had a creative side and purported to improve safety standards. Thus, in the steam-boiler sphere there existed a serious situation which gave rise to remedial measures, which might be called voluntary self-inspection, on private rather than state initiative. MacDonagh describes the appointment by the state of "executive officers" (inspectors) as "a step of immense, if unforeseen, consequences".⁷⁶ The consequence of the Manchester Association's action in establishing an inspection service was almost cer-

⁷⁴ J. Hart, "Nineteenth-Century Social Reform: A Tory Interpretation of History", in: *Past & Present*, No 31 (1965), pp. 48-50.

⁷⁵ *Mining Journal*, 24 November 1855.

⁷⁶ "The Nineteenth Century Revolution in Government", p. 59.

tainly to delay government intervention. But it is significant that government departments, despite recommendations from coroners' juries and factory inspectors,⁷⁷ were by no means anxious to extend their responsibilities to the steam-boiler sphere. Experience did not lead them to conclude that compulsory inspection by the state, adopted in so many areas of social policy, was appropriate. We have seen how, in the 1860's, the Home Office and Board of Trade vied to avoid gaining a new duty of regulation. As late as 1879 a Board of Trade official informed the Under Secretary at the Home Office "that it is not usual, nor is it desirable, that the State should interfere to regulate the manner in which trading concerns like these associations carry on business."⁷⁸

Perhaps in reaction to Dicey's view of the years 1830-70 as a period of legislative quiescence, historians now often emphasise the extent of "collectivisation" in mid century. But while it is clearly an over-simplification to characterise this period as one of *laissez-faire*, equally, it is a mistake to ignore the vitality of the voluntary principle. As the *Edinburgh Review* put it in July 1861: "It is a distinctive trait of this country and a trait of which we are proud, that we manage our affairs ourselves and without the intervention of the State." Hippolyte Taine noted some years later that "Private societies abound. [. . .] It is sufficient to walk through the streets and turn over the newspapers or reviews, to divine the number and importance of these institutions."⁷⁹ The example of steam-boilers emphasises the influence that could be exerted by a private society. But this was no isolated instance; in the fields of education and health, in particular, private enterprise was important in retarding state intervention.

Private inspection, though highly significant in deterring state action, was never effective in controlling explosions. This was not because of inherent inefficiency or incompetence — safety records were good —, but because submission to inspection was not compulsory. Henry Hiller estimated that in 1870 fewer than 20,000 of the nation's boilers were subject to independent inspection.⁸⁰ This, on the most generous estimation, represented a figure of less than 20 per cent. Moreover, it was suggested that the companies who insured or paid for inspection were those with a

⁷⁷ See Half-Yearly Reports of Assistant Inspector Walker [PP, 1873, XIX], pp. 236-37; [PP, 1874, XIII], pp. 18-19; [PP, 1875, XVI], pp. 93-94. On juries' recommendations see Report of Inspector (of Mines) Willis [PP, 1877, XXIII], pp. 506-07, and Returns of All Fatal Accidents from Boiler Explosions in the United Kingdom in the Years 1875 and 1876 [PP, 1877, LXVIII], pp. 374-75.

⁷⁸ 24 November 1879, HO 45/9480/87937.

⁷⁹ H. Taine, *Notes on England* (London, 1873), p. 205.

⁸⁰ Select Committee on Steam Boiler Explosions, 1870, qq. 723-24.

safety-conscious management, who maintained their plant in good working order anyway.⁸¹ Independent inspectors could not threaten clients who misused or employed dangerous boilers with any sanctions. Charles Thompson, chairman of the National Boiler Insurance Company, informed the 1870 Committee that in the event of a boiler failing to satisfy inspection standards, his company had no power to condemn; it could only refuse to renew the insurance. He knew of instances in which defective boilers, disowned by National Boiler, had continued at work, sometimes with disastrous consequences.⁸² Henry Hiller told of difficulties encountered by his company in persuading clients to close down boilers for their periodic examination. Most were reluctant to lose output by stopping production and the insurance company was forced either to discontinue the policy or to undertake an external and, necessarily, more limited inspection.⁸³ Voluntary private inspection did little to eradicate the "intolerable situation".

VII

The remainder of this paper explores the connections between social reform and the legal system, first, in the context of steam-boilers, then more generally. Any explanation of the pressures for reform of the law affecting boiler safety must take account of the prevailing legal situation, for the steam-boiler question, like many nineteenth-century socio-industrial questions, arose because of the inability of existing legal institutions to safeguard the defenceless or to protect the common environment. In theory, common and criminal law protected persons and their property against the irresponsible, negligent or avaricious steam user. Injured parties could gain financial reparation through the courts. The ancient law of *deodand*, repealed in 1846 and replaced by Lord Campbell's *Fatal Accidents Act*,⁸⁴ offered redress to the dependants of persons killed by explosion; the coroner's inquest allegedly provided a check on steam users for, if an explosion had fatal consequences, an inquiry would assess whether criminal neglect had been involved. Thus, the courts seemingly encouraged users' sense of responsibility by providing indirect induce-

⁸¹ *Ibid.*, q. 286.

⁸² *Ibid.*, qq. 559-62.

⁸³ *Ibid.*, qq. 707-11.

⁸⁴ By the nineteenth century the *deodand* system comprised estimation of the value of a death-causing instrument by a coroner's jury. The assessed sum might then be paid to the bereaved family regardless of the fault of any party involved in the accident. See H. Smith, "From *Deodand* to *Dependency*", in: *The American Journal of Legal History*, XI (1967), pp. 389-403.

ments to safe working. Any user whose boiler exploded was liable to suffer at least financial loss.

In fact, injured workmen stood little chance, for much of the nineteenth century, of succeeding in a claim for damages against an employer. Few possessed the means or the support necessary to finance an action. Those who did were likely to encounter the almost insuperable legal obstacles of common employment, *volenti non fit injuria*, and the contributory negligence, which would defeat them unless they could establish that the employer himself had been personally negligent.⁸⁵ In large-scale industry this was seldom possible. A factory sub-inspector, Charles Trimmer, informed a Select Committee in March 1840 that he knew of a case in which a coroner's jury placed a deodand of £10 on a steam-engine following a boiler explosion. But such fines were hardly of a magnitude to induce users to adopt greater precautions in the raising of steam, particularly as, according to Trimmer, juries rarely laid deodands on machinery.⁸⁶ Lord Campbell's Act was similarly inoperative in the steam-boiler sphere. John Ravenhill, an engineer who gave evidence to the 1871 Committee, was not aware of any action having been brought against steam users under the Act.⁸⁷ We have mentioned above the difficulties of coroners and jurors in assessing complex technical evidence. But juries, drawn from the middle classes, were also criticised for their tendency to acquit industrialists despite "the clearest evidence"⁸⁸ of guilt. Thus, although the law threatened to penalise errant steam users, a boiler-maker summed up the position: "I hardly know how the law stands, but they do not seem to suffer very much now — in fact nobody seems to suffer very much except those who are hurt by the explosion."⁸⁹

The failure of legal institutions to come to terms with technological change generated pressure both for the revitalisation or reform of those institutions and for their replacement by new procedures for protecting life and property. Witnesses before the Select Committee tended to approach the boiler question with a common purpose — improvement of safety standards — and with a general view of enforcing users' responsibilities.

⁸⁵ P. W. J. Bartrip, "Injured at Work: The Employers' Liability", in: *New Society*, XLIII (1978), pp. 595-97; T. Ingman, "The Origin and Development up to 1899 of the Employer's Duty at Common Law to take Reasonable Care for the Safety of his Employee" (Ph.D. thesis, Council for National Academic Awards, 1972).

⁸⁶ Select Committee Appointed to Inquire into the Operation of the Act for the Regulation of Mills and Factories [PP, 1840, X], qq. 2808-10.

⁸⁷ Select Committee on Steam Boiler Explosions, 1871, q. 962.

⁸⁸ *Ibid.*, 1870, q. 1442. The same point was repeatedly made by factory inspectors during the fencing controversy of the 1850's. See Bartrip, *Safety at Work*, op. cit., pp. 33-34.

⁸⁹ Select Committee on Steam Boiler Explosions, 1871, q. 1454.

Opinions on how to achieve these goals varied considerably, however. Some called for coroners to make greater use of expert evidence or for Lord Campbell's Act to be made more effective – others favoured the creation of new administrative machinery. No doubt interested parties were aware, if only vaguely, of Benthamite thought and the gravity of the human problem with which they were confronted. But there can be little doubt that their opinions were moulded by appreciation that the conventional legal framework was failing to respond to the effects of rapid technological advance. In the steam-boiler sphere the strength of *laissez-faire* interests, both in and out of government, forestalled far-reaching reform. But the 1882 Act, a compromise between the conflicting interest groups, created a new judicial tribunal which, it was hoped, would unearth the evidence on explosions more extensively, effectively and impartially than the coroner's court. In other areas of industrial safety and welfare, factories, mines and railways for example, similar failures and pressures resulted in centralised inspection by officials with considerable administrative and quasi-judicial discretion to order safer working conditions and allocate compensation. Hence, it is generally recognised that the starting point of almost all nineteenth-century social reform was industrialisation, a process which either created a range of new problems or magnified those already existent.

Redress for those injured by the new conditions of production might, theoretically, be obtained through recourse to the law. An obvious difficulty here was the social and economic inequality between plaintiffs (working men) and defendants (mine owners, factory masters etc). But such inequality existed before the Industrial Revolution and did not prevent successful actions by the lower orders. According to English common law, masters in the eighteenth century and before bore a duty of care to several categories of worker.⁹⁰ Thus, unreasonable chastisement of an apprentice could sustain an action for damages.⁹¹ Moreover, there was an obligation to feed an apprentice where the latter was in his employer's household, and to provide medical advice and assistance.⁹² In 1801 a factory master was sentenced to twelve months hard labour for assaulting, over-working and otherwise neglecting an apprentice.⁹³ Eighteenth- and

⁹⁰ See L. M. Friedman and J. Ladinsky, "Social Change and the Law of Industrial Accidents", in: *Columbia Law Review*, LXVII (1967), p. 52.

⁹¹ Ingman, "The Employer's Duty", *op. cit.*, p. 8.

⁹² *Ibid.*, p. 11.

⁹³ *Ibid.*, pp. 13-14; B. L. Hutchins and A. Harrison, *A History of Factory Legislation* (London, 1926), p. 14. See *R. v. Jouvaux*, *Lancashire Gazeteer*, 4 July 1801; *R. v. Self* (1776), 1 Leach 163; *R. v. William Smith* (1837), 8 Carrington and Payne 153; *Winstone v. Linn* (1827), 1 Barnewell and Cresswell 460.

some early-nineteenth-century judgements implied that masters bore similar responsibility for all servants.⁹⁴

However, during the first third of the nineteenth century, judicial interpretation of the master's duty of care turned increasingly against plaintiffs. Thus, in *Wennall v. Adney*, Rooke J. rejected the concept of a duty of care on the grounds that

If the general principle contended for by the plaintiff were to be adopted as a rule of law, many persons who are obliged for the purposes of their trade, to keep a number of servants, would be unable to fulfil the duty imposed upon them by the law. It must be left to the humanity of every master to decide whether he will assist his servant according to his capacity or not.⁹⁵

Here, then, was a "policy" decision, ignoring precedents, which denied, it has been said, "the employee any protection on the dubious ground that, if such liability were to become established, the employer might be unable to bear the burden".⁹⁶ Similar judgements abounded in the first half of the nineteenth century. Perhaps the most famous of these is that of Lord Abinger in *Priestley v. Fowler*, the first recorded High Court case of an employee suing his master for damages as a result of personal injury incurred in the workplace.⁹⁷ Abinger, finding for the defendant, admitted that in the alleged absence of precedents his judgement was based on "general principles", specifically, the wider consequences of a decision for the plaintiff which, he foresaw, would impose unacceptable burdens on capital. Abinger's colleague on the Court of Exchequer Bench in this case, Parke B., was himself responsible for a notorious decision on the use of relays in factories, which he upheld on the grounds that it was improper to restrain the exercise of capital and property.⁹⁸

Of course, all this raises important questions about the impartiality of judges and the extent to which they were imbued with *laissez-faire* sympathies. The nineteenth-century judiciary has been seen as originating from a social background which rendered likely a sympathetic attitude

⁹⁴ For example, *R. v. Inhabitants of Christchurch* (1760), 2 Burrow 945; *R. v. Winterset* (1783), 3 Douglas 298; *R. v. Inhabitants of Sutton* (1794), 5 Term Reports 657; *Cooper v. Phillips* (1831), 4 Carrington and Payne 581; *Newby v. Wiltshire* (1785), 4 Douglas 284; *Scarman v. Castell* (1795), 1 Espinasse 270; see Ingman, "The Employer's Duty", pp. 17-20, 35-38.

⁹⁵ *Wennall v. Adney* (1807), 3 Bosanquet and Puller 247.

⁹⁶ Ingman, "The Employer's Duty", p. 27.

⁹⁷ *Priestley v. Fowler* (1837), 3 Meeson and Welsby 1.

⁹⁸ *Ryder v. Mills* (1850), 3 Exchequer Reports Welsby, Hurlstone and Gordon 852; E. Hodder, *The Life and Work of the Seventh Earl of Shaftesbury* (London, 1886), II, p. 199; Henriques, *Before the Welfare State*, op. cit., p. 111; M. W. Thomas, *The Early Factory Legislation. A Study in Legislative and Administrative Evolution* (Leigh-on-Sea, 1948), pp. 311-12.

towards capital.⁹⁹ The common-law “doctrines” which prevented most injured workers from successfully pursuing a common-law action for much of the nineteenth century have been called fictions – invented by the judges to sustain the prevailing economic and social *status quo*.¹⁰⁰ Indeed, it is reasonable to conclude that, whether by design or accident, many judicial decisions in this area did have such an effect.

For our purposes it is necessary to explain why there was a change in the attitude of the judiciary from one tending to protect labour in the eighteenth century to one bolstering capital in the first half of the nineteenth. An explanation is perhaps to be found in the changing social structure of the period, brought about by industrialisation, which saw the decline of quasi-feudalistic society based on mutual obligation, responsibility and privilege, and the birth of social class dominated by the cash nexus. Professor Perkin has identified an “abdication of the governors” whereby “property” rejected its social obligations but sought to maintain its privileges. This process consisted in a “deliberate dismantling of the whole system of paternal protection of the lower orders which had been the pride of the old society and the justification of its inequalities”.¹⁰¹

The judiciary was not isolated from such developments; indeed, it helped to facilitate them. Thus, the eighteenth-century judiciary may be seen as upholding the rights of servants by enforcing the quasi-feudal obligations of masters, whereas its nineteenth-century counterpart, perhaps acting within a class rather than a paternalistic framework, enforced the privileges of rank and wealth whilst overlooking its responsibilities. Sir Henry Maine’s “status to contract” theory may also explain changing legal attitudes. Briefly Maine’s thesis, developed in his influential *Ancient Law*, was that society had gradually changed from one in which “the relations of Persons are summed up in the relations of Family [. . .] towards a phase of social order in which all these relations arise from the free agreement of individuals”. In other words, whereas in primitive, and perhaps all non-industrial societies, the individual possessed certain rights and duties as a result of birth and position within the family, in modern, or what Maine called “progressive” societies, individuals created their own social standing by means of contract.¹⁰² In theory, the growth of contract,

⁹⁹ B. Abel-Smith and R. Stevens, *Lawyers and the Courts* (London, 1970), p. 46; J. Morgan, “The Judiciary of the Superior Courts, 1820-1968: A Sociological Study” (M.Ph. thesis, London, 1974), esp. ch. II.

¹⁰⁰ Ingman, “The Employer’s Duty”, chs II and III; Bartrip, “Injured at Work”, loc. cit.

¹⁰¹ H. Perkin, *The Origins of Modern English Society* (London, 1969), p. 184.

¹⁰² Sir H. S. Maine, *Ancient Law* (London, 1905), pp. 140, 252-53, 259; J. Stone, *Social Dimensions of Law and Justice* (London, 1966), pp. 125-26, 137-40; G. Feaver, *From Status to Contract. A Biography of Sir Henry Maine, 1822-1888* (London, 1969), ch. V;

which for Maine was a distinguishing feature of the nineteenth century, liberated the individual; in practice, of course, it proved unfavourable to contracting parties possessed of inferior social and economic standing. Whether the judiciary's changing role should be interpreted in terms of calculated class bias or an unconscious reflection of classical economic theory, social and legal change, is a question which probably cannot be conclusively settled. However, there can be little argument that the effect of the trend in judgements was antipathetic to the interests of labour.

Since the legal trends described above appear to represent a general swing away from doctrines protecting the servant towards those protecting the master at a servant's expense, the law and the legal system can in a sense be said to have failed to adapt to technological and social change in so far as they failed equitably to settle the tensions and grievances arising from what Dr Hartwell has called the "major discontinuity" of the Industrial Revolution.¹⁰³ The consequences of this failure can be seen in the unionisation of labour in order to balance the strengths of labour and capital, the growth of statute law for the protection of the workforce (with a resulting elevation of Parliament's importance as a legislative body), and increasing state intervention, often, in theory at least, as an independent arbiter, in social problems.

Thus, if we take the course of factory legislation, the first Factory Act, the Health and Morals of Apprentices Act, and later measures, can be seen as faltering attempts to establish or restore certain standards of treatment for apprentices and "free" children. The need for intervention to protect factory apprentices was obvious enough, for the new conditions of labour, whereby they were shipped from cities to remote Pennine workshops, deprived them of any protection which the law might offer. Adults were, of course, deemed capable of looking after themselves and avoiding unfavourable contracts of employment. As for the "free" children, intervention was necessary because the common law was rendered powerless to protect them owing to the collusion of interests between parents (perhaps the victims of economic necessity) and manufacturers. The continuing failure of the prevailing legal system to enforce the will of Parliament led in 1833 to the establishment of a central inspectorate which, initially, had considerable *judicial* power enabling it to by-pass the courts and fine offenders

Otto Kahn Freund, *Selected Writings*, ed. by M. Partington (London, 1978), see ch. 3: "A Note on Status and Contract in British Labour Law", pp. 78-86; id., "Blackstone's Neglected Child: The Contract of Employment", in: *Law Quarterly Review*, XCIII (1977), pp. 508-28; K. Foster, *From Status to Contract: Legal Form and Work Relations, 1750-1850* [Warwick Law Working Papers, III] (1979).

¹⁰³ R. M. Hartwell, *The Industrial Revolution in England* [Historical Association Pamphlet] (London, 1965), p. 3.

“on view”.¹⁰⁴ In 1844 this power, rarely used and unwanted by an inspectorate anxious to be accepted by masters and workers, many of whom were deeply suspicious, was withdrawn. But, subsequently, the inspectorate was involved in a series of clashes with the courts over interpretation of the law and gradually evolved enforcement procedures enabling it largely to circumvent the courts.¹⁰⁵

Of course, this process was not duplicated in every area of social policy. Elsewhere, developments were affected by what had happened and was continuing to occur in the factory question. Thus, it became increasingly common for an inspectorate to be appointed at an earlier stage than was the case in factories. Furthermore, as Richard Tompson reminds us, reform was by no means always the result of a popular movement which, to some extent, was responsible in the case of factories.¹⁰⁶ Hence, the reform process can only be understood by examination of the particular rather than by reference to a stereotype. But a question which has greatly exercised historians has been identification of the factor(s) generating reform – especially the respective roles of circumstance and ideology. Whilst the consensus of opinion has been for organic growth generated by prevailing conditions and needs, the causal link between regeneration of social policy and the need for such a development has been vague. Thus, MacDonagh writes of “the intolerable situation” whilst functionalists refer to things happening because they had to happen.¹⁰⁷ Such “explanations” are, in fact, not explanations but the negation of explanation. It is the contention of this paper that what is implicit in such terms is not only social and administrative breakdown, long recognised as the corollary of industrialisation in Britain, but the failure of the law and legal system to come to terms with such breakdown.

¹⁰⁴ 3 and 4 Will. IV, c. 103. See T. K. Djang, *Factory Inspection in Great Britain* (London, 1942), p. 33; Hutchins and Harrison, *A History of Factory Legislation*, op. cit., pp. 41-42; Henriques, *Before the Welfare State*, pp. 95-113; Thomas, *The Early Factory Legislation*, op. cit., p. 69.

¹⁰⁵ W. G. Carson, “White Collar Crime and the Enforcement of Factory Legislation”, in: *British Journal of Criminology*, X (1970), pp. 383-98; P. W. J. Bartrip and P. T. Fenn, “The Administration of Safety: The Enforcement Policy of the Early Factory Inspectorate”, in: *Public Administration*, forthcoming; Bartrip, *Safety at Work*, pp. 22-45.

¹⁰⁶ Tompson, *The Charity Commission*, pp. 15-27.

¹⁰⁷ See Goldthorpe, “The Development of Social Policy in England”, loc. cit., pp. 51-56.