TRADITION AND CHANGE: THE SHEFFIELD CUTLERY TRADES 1870-1914

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In the Sheffield cutlery trades, handicraft production in an isolated location determined to a substantial degree the character of the population. Geographical remoteness and the rapid redundancy of early locational factors necessitated concentration on high quality goods, embodying the technical expertise of successive generations of craftsmen. Reliance on quality and craftsmanship reinforced the small-scale,skill intensive structure of the trades. In turn this confirmed the predominant values of pride in craftsmanship and respect for the artisan. The industrial structure permitted independent production and produced a social structure in which social mobility and self-employment were legitimate expectations. Competition and the absence of large-scale mass-production meant that few fortunes were amassed and few major socio-economic gulfs developed between masters and men.

Faced with growing cheap, standardized competition from abroad, the industry continued to stress and rely upon its traditional reputation for the finest quality production, crafted by Sheffield's uniquely skilled workforce. The structure of the industry and aspirations of its members remained essentially intact: changes were piecemeal and cautious, made within the existing ideological and industrial framework.

This study seeks to encompass the range of economic and social relations in this industry: the origins of traditionalism before 1870, developments in the use of new production techniques and raw materials, attitudes to overseas marketing, industrial structure, industrial relations, health and sanitation, community and culture.

By adopting this approach, it reveals various characteristics which contradict the stereotypic image of British industry in the period 1870-1914. Practices considered as irrational were often informed responses to market conditions. Outwork and handicraft production were not necessarily pre-industrial remnants, waiting to be subsumed into large-scale, 'modern' industry. Neither were industries necessarily homogeneous units: like their workforces they remained fragmented and sectionalised. Finally, handicraft production exerted an enormous influence on wider social and cultural relations in Sheffield.

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LIST OF ABBREVIATIONS USED IN TEXT AND FOOTNOTES

C of C	Chamber of Commerce Minutes.
H.W.	Odom, William, Hallamshire Worthies: Characteristics and Work of Notable Sheffield Men and Women, Sheffield, 1926.
I.L.P.	Independent Labour Party.
L.G.	Board of Trade Labour Gazette.
Lloyd	Lloyd, G.I.H., The Cutlery Trades: An Historical Essay in the Economics of Small-Scale Production, London, 1913.
L.R.C.	Labour Representative Committee.
M.O.P.	Men of the Period, Sheffield, 1896.
N.A.U.L.	National Amalgamated Union of Labour.
N.&Q.	Big and Little Guns of Sheffield: Re-issued from the Sheffield Weekly News,'Notes and Queries', 1890-1900, Sheffield, [n.d.].
S.Pollard, History	Pollard, Sidney, A History of Labour in Sheffield, Liverpool, 1959.
S.C.L.	Sheffield City Libraries, Archives Division.
S.D.T.	Sheffield Daily Telegraph.
S.I.	Sheffield Independent.
T.H.A.S.	Transactions of the Hunter Archaeological Society.
Webb Mss.	Webb Trade Union Manuscripts vol.A18,'The Sheffield Trades'.
W.W.	Sheffield and District Who's Who, Sheffield, 1905.
Y.B.E.S.R.	Yorkshire Bulletin of Economic and Social Research.

INTRODUCTION

The characteristics of the British economy in the years between 1870 and 1914 remain a matter of dispute among historians. Much controversy revolves around the question of whether this period was a watershed in Britain's economic growth. Reflecting the debates of the time, special attention has been paid to Britain's place in the world economy, and the loss of the previously unchallenged position of 'first industrial nation'. It is generally agreed that the 'drag' of an 'early start' played an important role in the declining rates of productivity and growth. Newer competitors, like America and Germany, were unhindered by the debris of industrial traditions, in the form of both plant and business methods. In respect of the latter, particular criticism has focused on the complacency of the British entrepreneur in the face of changing markets, technology and forms of production.

More recent contributions to this debate have stressed the nature of world economic development, which made Britain's 'decline' almost inevitable, a 'natural' outcome of economic expansion elsewhere. Yet more recent commentators, armed with more specific, often quantitative data, based on detailed studies of individual industries or regions, have further revised the traditional thesis. Entrepreneurs devised rational strategies in response to difficult conditions - a kind of 'achievement under adversity'.

Further controversy surrounds the demarcation of this period as a watershed in terms of developments in its industrial structure. Until recently, historians have marginalised older forms of production. The persistence of outwork and handicraft techniques has been regarded as a pre-industrial remnant, an aberation which detracted attention away from the 'real' course of industrial development. This would inevitably result in large-scale, heavily capitalized units of production, manufacturing long runs of standardized products. Management was growing more direct, the frontier of control was being pushed forwards. Craftsmen were losing their skills and their determination of the form and speed of production. Commensurately there was formed a more homogeneous and class-conscious labour force.

However, such conclusions have again been criticised for their

reliance on generalizations based on studies of national, leading sector industries. They neglect more detailed, regional case studies which point to the continued buoyancy of traditional forms of production. These often coexisted with more 'modern' industry and were even linked in a symbiotic relationship, serving the demand for small quantities of goods with detailed and often high quality specifications. Such production ensured the survival of small-scale units of production, of craftsmen, outworkers and factors, of informal industrial relations phrased in traditional terminology. Individual identity, as well as communal cohesion, were still closely related to the structure of the handicraft. The form of production was not simply the result of the various states of the labour market, demand and technology, but the outcome of a whole range of wider social and cultural traditions.

A study of the Sheffield cutlery trades provides further evidence for revisionism which argues that generalizations on the nature and performance of the British economy are severely compromised by detailed regional investigation. Industries frequently fail to conform to such broad notions as 'entrepreneurial failure' or 'modernization'. In the cutlery trades, geographical remoteness and the redundancy of initial locational factors, necessitated the concentration on high quality goods, embodying the technical expertise of generations of craftsmen. Reliance on quality and craftsmanship reinforced the small-scale, skill intensive structure of the trades. In turn this confirmed the predominant values of pride in craftsmanship and respect for the artisan.

Faced with growing standardized, mass-produced, German competition, the industry continued to rely upon its reputation for the finest goods, crafted by Sheffield's uniquely skilled workforce. The structure of the industry and the ethos of its members remained essentially unchanged.

The cutlery trades exhibit the close interrelationship between economic forces and social aspirations, and the wider relationship of work to social outlook. The traditions of this interrelationship embraced and further emphasised the domination - in practice, as well as in ideological preferences - of specialized, quality production and local loyalties enhanced by geographical isolation.

Given the existing preconditions in Sheffield, the continuance of handicraft production, cautiously modified to suit changing market considerations, was a rational policy choice. No competitor possessed Sheffield's hard won reputation or abundance of cheap, skilled labour; but equally, in no other location was the handicraft structure of the industry and resultant social structure so deep-seated.

This thesis attempts to approach these problems on three levels. Firstly, as a detailed examination of a highly localized and inward-looking industry, situated in, to use an oft-quoted phrase, the 'largest village in England'. No comprehensive account of these trades has been undertaken since that of G.I.H.Lloyd[1] in 1913, which although a source of invaluable quantitative data, lacks a perspective for any assessment of contemporary political and economic debates. More recent studies[2] have similarly failed to tackle these trades at this period in a comprehensive fashion. Research has been concerned with broader areas, which mention the cutlery trades as one element in such themes as class and political struggle in Sheffield as a whole.[3] Such accounts deal with cutlery as part of the 'light metal trades', to be contrasted in traditions, structure, performance and values with the newer 'heavy metal trades'.[4] Rarely has the subject been considered worthy of study as an individual entirety.

A detailed examination of these trades, which embraces the whole breadth of economic and social relationships, from industrial relations to marketing, firm sanitation to mechanization, reveals the extent of their diversity. There existed no single industry producing a single product, no collective consciousness, few issues that all were forced to confront. The force of tradition was the only unifying factor - strictly local shared values and understandings, stemming from past experiences.

Secondly, this thesis attempts to analyse the way in which national debates impinged on the consciousness and day to day experiences of this community. When mediated through local circumstances and predilections, a fresh perspective is given to such controversies as boy labour versus apprenticeship or Free Trade versus Protection.

Similarly, as local conditions resulted in quite unique attitudes to contemporary debates, so historians' conceptual generalizations have often proved inadequate as methods of analysis for these trades. A third tier of concern is, therefore, an estimation of the way in which such concepts as labour aristocracy, entrepreneurial failure and choice of industrial techniques have to be modified, if they are to remain as useful tools in the assessment of these trades.

Perhaps one reason for the lack of secondary literature which examines this industry lies with the absence of concentrated sources of authoritative, primary information. Instead, material has to be gleaned from a wide variety of sources. Of particular note is the absence of business records. Self-employed craftsmen and small ephemeral firms, who constituted an important sector of producers, were unlikely to have kept sytematic records, and if they did, none have survived. The available documentation is concerned with the largest firms and is therefore unrepresentative of the industry as a whole. Moreover, this data is mainly qualitative, and totally inadequate to attempt quantitative analyses of the profitability or economic rationality of commercial decisions. Whilst information from White's trade directories has been compiled and used to assess quantitative trends in these trades,[5] through necessity estimations remain largely qualitative and impressionistic.

However, this gap has been narrowed by the extensive use of Parliamentary Papers. Although committees tended to rely on similar witnesses for each inquiry, a selection which precluded 'unrespectable' or 'submerged' sections of the community, Parliamentary Papers are useful in indicating broad themes. A detailed examination of the local and trade press permitted the formation of a factual, systematic and chronological account of events, not previously available. This was supplemented by the use of the records of the Chamber of Commerce and the Cutlers' Company, which provided a deeper insight into the attitudes of manufacturers; and of the few surviving records of trade societies, the Sheffield Federated Trades Council and the Webb Trades Union Manuscripts which are sufficiently complete to allow a reasonably accurate insight into the labour history of the cutlery trades.

Finally, a note on the deceptively simple issue of definition. The number and breadth of products defined as 'cutlery' has been, and still is subject to considerable debate; hence the classification of 'the cutlery trades' is similarly ill-defined. Recent definitions have tended to limit the term to the lighter, smaller implements used mainly for domestic and household purposes: pen knives, table knives, forks, spoons, scissors and razors.[6] Other definitions are broader, including a range of heavier, larger tools which have a cutting edge: saws, files, sickles, scythes and shears.[7] For the purpose of this thesis, the definition is limited to those trades which manufactured spring and table knives, steel forks, scissors and razors. The reason for this preference lie with the industrial structures of the trades involved, and the social and economic status and outlook of their workers. Spoons have been excluded because thay are more accurately classified as part of the electro-plate industry which, with its better paid workforce, and greater level of capitalization, was quite distinct from other cutlery trades. Similarly, heavier edge tools have been excluded because they merged more easily with the engineering trades over this period, and increasingly identified with that group, economically, socially and politically, rather than with the cutlery trades. The cutlery trades as defined in this thesis, stand as a group complete in themselves, homogeneous in the identity of their structures, aspirations, problems and terms of reference.

Footnotes

1 G.I.H. Lloyd, The Cutlery Trades: An Historical Essay in the Economics of Small-Scale Production, London, 1913. Similar criticisms can be made of the six volume French work by C. Pagé, La Coutellerie Depuis L'Origine Jusqu'a Nos Jours, Chatellerault, 1869.

2. See, for example, J.B. Himsworth, The Story of Cutlery: From Flint to Stainless Steel, London, 1953; R.M. Ledbetter, 'Sheffield's Industrial History From About 1700, with Special Reference to the Abbeydale Works', M.A., Sheffield 1971; P.C. Garlick, 'The Sheffield Cutlery and Allied Trades and their Markets in the 18th and 19th Centuries', M.A., Sheffield, 1951.

3. See for example, C. Burke, 'Working-Class Politics in Sheffield 1900-1922: A Regional History of the Labour Party', Ph.D., Sheffield, 1983; H.E. Mathers, 'Sheffield Municipal Politics 1893-1927: Parties, Personalities and the Rise of Labour', Ph.D., Sheffield, 1980; C.O. Reid, 'Middle-Class Values and Working-Class Culture in 19th Century Sheffield', Ph.D., Sheffield, 1976.

4. S. Pollard, A History of Labour in Sheffield, Liverpool, 1959, is a good example of this categorization.

5. See appendix 2.

6. For example, D. Linton (ed.), Sheffield and Its Region, Sheffield, 1956, p.297, "the local usage confines the term 'cutlery' to fixed handled knives, spring knives, scissors and cut throat razors".

7. Working Party Reports: Cutlery, London, H.M.S.O., 1947, p.1. The term was defined as follows: " a) Table, dessert and tea knives, carving knives; butchers; palette, shoe and tool knives; steel forks and sharpening steels. b) Spring Knives, i.e., pen, pocket and clasp knives, pruners. c) Scissors, including surgical scissors. d) Long-handled razors." The 1624 Act of Incorporation , which established the Cutlers' Company as a self-regulating body, included within the jurisdiction of the new company, makers of "knives, blades, scissors, shears, sickles, cutlery wares and all other wares or manufactures made or wrought of iron or steel", M. Walton, Sheffield: Its Story and Achievements, Sheffield, 1968, p.72. A similarly broad definition was abopted in the Final Report of the First Census of Production of the U.K., 1907, P.P., 1912, Cd. 6320, p.207.

CHAPTER 1 AN INTRODUCTION TO THE HISTORY OF THE INDUSTRY BEFORE 1870.

Economic factors to some extent explain Sheffield's preference for high quality cutlery production. Sheffield's isolation and distance from markets and, once its own natural attributes were exhausted, its removal from raw material supplies, help to explain its concentration on high quality products. However, it is possible to determine the use of a 'social factor' - what has been termed a traditional "Mass Inhertiance"[1] in the ingrained aptitude of the population for skilled metal working - which gradually came to rival and surpass physical factors in accounting for the location and form of the Sheffield cutlery trades.[2] The nature of the handicraft - the small capital but great skill required, the independence that it allowed, combined with the need to produce high quality items, had a significant impact on the character of the already isolated, distinct local community. Great pride was taken and value set by independent artisan and craft abilities; no great divide separated masters and men; social and economic mobility were widespread. From the earliest times, guild regulations were drawn up which protected and cemented these values and customs, regulations which represented the culmination of these experiences, and ensured their continued vitality and applicability. The breakdown of these restrictions which accompanied the opening up of labour supplies and increased demand of the late 18th and early 19th centuries, marked a hugh upheaval and disruption in traditional understanding and ways of seeing and dealing with problems, a transformation the results of which were never fully accepted or understood by many members of the trades.

i) The Roots of Traditionalism.

The exact origins of the Sheffield cutlery trades are obscure, but there is an abiding local faith and pride in their ancient and illustrious heritage: the frequent citation of the "Sheffield thwitel" mentioned in Chaucer's Reeve's Tale typifies this belief.[3] However, in the 14th century the industry was not yet localized; it was present in various towns and practised by many village blacksmiths,[4] whilst in Sheffield it was still small scale and often

carried on as a dual occupation in conjunction with farming.[5]

Sheffield's production of cutlery, and early monopolization of the industry, is usually accounted for in terms of its possession of all the neccessary raw materials: wrought iron manufactured from local iron and charcoal, water power, and 'natural draughts' harnessed to aid combustion in bloomery furnaces.[6] Such physical attributes were however, reasonably common in the north of England and moreover, were quite soon to be made redundant by advances in iron and steel making technology. The production of iron, from which cutlery was originally made, was recorded in Sheffield as early as 1161,[7] but the local iron ore was highly phosphoric and therefore incapable of being heated to the high temper which was necessary to obtain a good cutting edge. Thus as early as the 16th century, iron ore was imported from northern Europe, and by the 18th century the use of these high quality ores was far outstripping that of domestic supplies, reflecting a preference, even at this early date, for a higher quality raw material to produce a higher quality product.[8] The manufacture of steel in the Sheffield region began in the 17th century but came to centre there after 1740. This was not only the result of the opening of a canal to Rotherham, which facilitated the importation of iron ore, but because the cutlery trades were exercising considerable local 'pull' as a market for steel.[9] The manufacture of superior quality cutlery was assisted by advances in steel making technology by which steel of a more uniform carbon content was produced, which was thus capable of receiving a more consistently and evenly high temper. However, blister steel, manufactured through the cementation process,[10] had a higher carbon content on the outside, from where the heat penetrated, than the inside. For high quality cutlery therefore, a more even carbon content and temper was assured by breaking up these bars of blister steel, and then bundling them together to be reheated and reforged to form double shear steel; for the best cutlery the process would then be repeated to produce triple shear steel. The lack of uniformity in the composition of steel perhaps promoted the obsession of the early cutlers with the allocation of a precise steel for the quality and type of product which was intended: it was to be an enduring predilection. Moreover, the expense of blister steel[11]

necessitated a high quality piece of workmanship to match the standard and price of the raw material. These tendencies, along with Sheffield's developing reputation as a producer of the finest cutlery, were furthered by Benjamin Huntsman's discovery, in about 1740, of techniques to produce steel of an even more uniformly high quality. This search for a steel capable of forming reliable watch springs, culminated in the discovery of means to further refine blister steel, to produce the even more costly crucible steel.[12]

Although these developments entailed the use of different raw materials from the early iron industry, fortunately, Sheffield was once more endowed with the necessary components: ample local ganister and coal, and access to the Baltic iron ore traffic. However, the application of crucible steel to cutlery production proceeded slowly in Sheffield, the long-accepted reason being the conservatism of the cutlers who were reluctant to learn how to handle the new steel.[13] But this account is inconsistent with the constant attempts by local cutlers to ensure means to produce the finest cutlery, and has been contradicted by more recent research which places the responsibility for slow development on a shortage of skilled labour and capital, and dependence on foreign ores.[14] Furthermore, the will and readiness of cutlers to take action to secure superior raw materials is evidenced by the presence of cutlers and toolmakers, who were vertically extending their premises, amongst the first special steels producers.[15] In the post - Napoleonic period some cutlers continued to make their own steel, although this was primarily to ensure a ready supply of steel made to their own specialist requirments, rather than an attempt to effect cost reductions. Concern with quality above cost considerations is also demonstrated by the unwillingness of most cutlery manufacturers to use cheaper Bessemer steel which became available in 1856, largly because it was of a poorer standard.[16]

Obsolescence of initial location factors is similarly true of power supplies. Water power was said to be a crucial factor in the early localization of the cutlery trades in Sheffield: its first recorded usage was in 1350 and major expansion occured in the 15th century.[17] However, steam powered cutlery grinding wheels were introduced in 1786 and having the advantage of a completely regular

and predictable supply of power, soon superseded water driven wheels. Neither will the presence in the locality of rocks suitable for the creation of grindstones, another requisite for cutlery production, explain the tenacity of the trades in Sheffield. Millstone was always a reasonably common substance and furthermore, by the 1880s it was being replaced by cleaner and safer artificial emery wheels.[18]

Thus, whilst tangible geographical factors may explain the original location of the cutlery trades in Sheffield, their localization, tenacity and success is more difficult to account for in such terms, but better explained by less concrete sociological factors: primarily the abilities and outlook of the local workforce. Although these qualities were in themselves the product of geographical remoteness and industrial localization dependent upon initial palpable physical factors, the effects were cumulative: remoteness produced a community in which most of the workforce devoted themselves to the working of particular metals in a particular manner, creating a highly localized, but highly skilled pool of talent. Sociologically, the traditional dual economy of South Yorkshire, based on the skills of the peasant craftsman and farmer allowed the trades to develop without any major or abrupt dislocations in previous values or economic structures.[19] Gradually, the artisanal abilities of these handicraftsmen compensated for the decline of Sheffield's purely physical properties, but also came to shape and direct the form of the industry. That new metal related technology continued to be attracted to the region was largely the result of the skilled labour which was to be found in Sheffield: "The fact that a highly skilled occupation was becoming localized in the district, led to new inventions being bought there as a matter of course, for nowhere else could the same reserve of skilled labour and supervision be found."[20] Similarly, these new developments helped to diversify the industry, thus keeping it buoyant and further concentrating it in the Sheffield region.

As Sheffield's importance as an industrial centre increased, so its geographical isolation was steadily removed as it was linked to the national infrastructure. Until the development of turnpike roads in the 1700s, the sole outlet for Sheffield's goods were the

chapmen and their packhorses, although this did not stop cutlery reaching London in considerable quantities.[21] By the late 17th century Sheffield manufacturers were selling their goods around the country. Exports however, presented considerably more difficulties: the nearest river port was twenty miles away, and the sea a further sixty miles, and despite the persistent agitation of the Cutlers' Company, the centre of Sheffield was not linked by canals to sea access until 1819.[22] However, as early as 1750, cutlery firms were exporting their goods direct to the continent.[23] Although the quality and quantity of road connections improved enormously over this period,[24] it was the advent of rail transport, with its substantial cost reductions, which proved to be the fundamental development.[25] Despite the indifference of the Cutlers' Company, (who realised that railroads would prove to be fatal competition to the canal in which they had invested)Sheffield had a rail link with London by 1840, and with Manchester by 1845.[26]

By 1870, Sheffield's geographical isolation had been overcome, as far as it was capable of being surmounted: it remained remote and removed from main communications arteries, providing a further economic stimulus to the production of high quality goods which had a low bulk to value ratio. However, as the rest of this chapter will illustrate, the peculiar concerns and values of the cutlery trades can only be understood when such geographical factors are understood in conjuction with the social factors they engendered. The predilections and understandings which developed were so tenacious and deeprooted, precisely because they were originally founded on the economic rationality of available raw materials combined with a remote location.

ii) A Craft Industry and a Craft Mentality in the Early Cutlery Trades.

At the root of the pervasive craft mentality in these trades was the concern for the finished product. As illustrated above, these preoccupations were the economically logical outcome of a remote location with waning physical attributes, which maintained its hold on the industry on the basis of the specialist skills of its workforce. Craftsmen who undertook such trades were necessarily skilled, independent and aware of their abilities, possessing an

outlook which reflected their economic circumstances and which, in turn, further strengthened obsessions with the quality of the product.

Concern for the standard of the product can be seen in the early specialisms which developed in the trades. Before 1624, there arose geographical specialisms, according to which better quality goods were made in the centre of the town than in the outlying villages, whilst the villages began to produce particular types of cutlery: Shiregreen cutlers manufactured forks, Stannington cutlers razors and scissors.[27] In the late 17th century, subdivisions developed according to the type of cutlery. In pursuit of a finer finished product, such divisions were rigorously enforced according to ordinances, (records of which exist from as early as 1565[28]) by which the cutlers regulated themselves. By an Act of Parliament of 1624 the cutlers of Hallamshire and six miles beyond were made a self-regulating autonomous corporation, with powers of detailed supervision of the trades: laws and penalties were drawn up which were intended to ensure the quality of the product and the skill of the craftsman, whilst revenue was assured through the fees obtained from penalties, and the granting of marks and freedoms. The rule of 'one man, one trade' was insisted upon,[29] whilst deceitfully made or marked goods were outlawed, and searchers appointed by the Company to hunt them out.[30] So from an early date, Sheffield cutlers realised that their livelihood was dependent upon the production of, and a reputation for quality wares. Their desire to monopolize the trade in such goods is illustrated by their regulations which barred 'foreigners' from participation in the Hallamshire trades, and also ban the sale of cutlery parts to non-Hallamshire men.[31] This abliity to retain exclusive control of the industry through such guild restriction which regulated both the form and standard of production, was a privilege the loss of which many cutlers would find it extremely difficult to accept.

The next specialism to develop was the subdivision of the processes of production entailed in the manufacture of a particular product: for example table knife forging, grinding and hafting became separate trades, as did pen and pocket knife forging, grinding and hafting.[32] The separation of the grinding and forging

operations occurred first, in the mid-18th century, but the distinction between the forger and cutler was not widespread until after 1800, and even later in some trades. This specialization, which speeded up production, but retained an ever perfected quality, was a response to the increased demand which accompanied the transport developments of this period. Moreover, "the decomposition of a handicraft into its different partial operations,"[33] the main feature of advances in most industries at this time, was particularly applicable in these trades, where production, necessarily divided into forging, grinding and hafting, lay itself open to subdivision. The tools, space and capital needed to undertake any branch of production were both few and inexpensive, but the skill required in such handicrafts was commensurately great.[34] Whilst the huge variety of goods which were manufactured meant that production processes varied almost ad infinitum, the following is a broad outline of the techniques involved in each stage of production.[35]

For his trade, a forger needed only a reheating hearth, hand bellows, an anvil, hammers and fuel, but the craft involved enormous dexterity, judgement and experience. Forgers of small blades worked alone, whilst those who forged larger table blades employed a striker, who wielded the hammer. A rod of steel was first heated up and drawn out with a hammer until it was roughly blade shaped, and then cut off from the rest of the bar, a process known as 'mooding'. On a second heating, the joint was fashioned to which the handle would be fastened (the shoulder), and on a third heating the blade was smithed over, its shape corrected, and the makers name struck on. The blade would then be hardened and tempered - hardened by heating followed by quenching in a vat of liquid and oil, and then retempered or hammered to reduce the brittleness of the blade, and improve its durability and elasticity. In all these processes, experience was required to wield the hammer in such a way that, whilst economising on effort, the steel was made tensile and, furthermore, in estimating the temperature of the steel, which could be accurately assessed by observing its colour changes.[36] The forging of a razor blade was a particularly skilled trade, the steel needing to be unusually

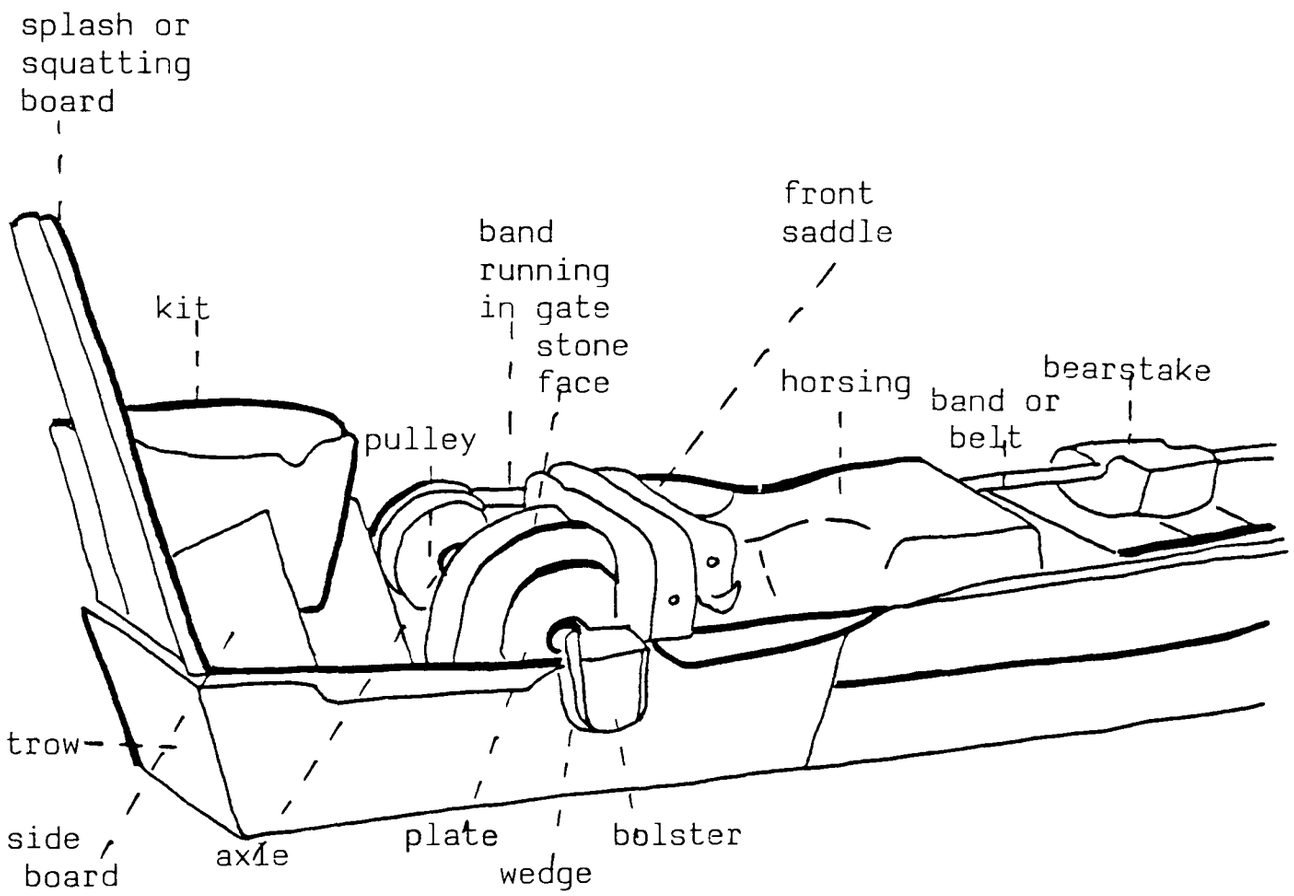
brittle and of differing thicknesses at the back and edges of the blade.

Grinders worked in mills or workshops known as 'wheels', which were divided into rooms called 'hulls'. At the back of each hull was a power shaft with revolving drums, which were connected to the spindles which carried the grindstones that they drove, by means of leather belts or 'bands'. At the front of the room, nearest to the light, were the coarsest sandstones, used in the preliminary grinding process, and behind them, the smaller smoothing and polishing wheels: a set of three such wheels was called a 'trough'. A grinder would sit or lean over the revolving stone, pressing against its surface the blade to be ground. Grinders of large blades sat astride the stone on a wooden saddle, supported by a wooden framework, which was anchored to the floor by heavy chains, as a precaution against the stone shattering or 'bursting' . The stones ran in metal tanks or 'trows', which were set into the floor and contained water which kept the stone wet, thereby stopping the blade from overheating, and keeping down the dust. (See Fig 1.) However, the dust and water sludge, known as 'wheelswarf', covered the apparatus and the grinder. The first grinding process was that of the neck or boulster, on an especially hard, dry stone, followed by rough grinding of the blade to form its convexed shape. The blade was then smoothed and corrected on a finer, harder whitening stone, to remove any deviatons or marks left after rough grinding, and then passed on to be glazed on a small wooden wheel, trimmed with leather and emery grease. The blade would be given a rough and fine glazing to give it a smooth polish, and finally buffed to give it a finished, high polish, on a wooden wheel covered with thick, soft leather, to which iron oxide or 'crocus' polish was applied. Balancing the wheel, dealing with the velocity and hazards of the stone, the dust and flying sparks, giving the blade a smooth surface and good cutting edge, made grinding an equally skilled, but more hazardous and injurious trade than forging.

Finally, a cutler or hafter assembled and adjusted the various portions of the knife. As well as all the necessary parts of the knife, he needed oil, wire, glue and basic tools: drills for boring, files, vices, glazes and buffs. The trade was complicated and diversified by the huge range of handle materials that were

Fig.1 Grindstone for Work on Scissors, Pocket Knives and Razors.

Source: J.B.Himsworth, p.64.



available, from basic wood or celluloid to ivory and mother-of-pearl. To give a table knife a basic wooden handle, flat pieces of wood or 'scales' were riveted to the 'tang' (the end of the blade, fitted into the handle) by boring holes into the tang and wood, through which wire was passed, its stub being hammered flat on a small anvil or 'stiddy'. The wooden handle was then glazed and buffed. One of the many variations on this process, was the hafting of knives in which the tang passed straight up the handle, and was fixed at its end. The trade of the spring knife cutler was considerably more complicated: the variety of styles and sizes was greater and skill was required to ensure that the blades 'snapped' shut, that they did not rub against each other, and that they did not open or close too far and obscure the nail nick.

Each of these processes were in themselves both skilled and labour intensive; collectively the number,complexity, diversity and expertise of the operations were enormous. In Abel Bywater's Sheffield Dialect of 1839, it was calculated that the making of a pen knife entailed 39 different processes.[37] Thus, whilst the handicraft nature of the trades was maintained, subdivision of processes was essential if quality and speed were to be assured.

A further type of specialism was the distinction between high quality, expensive items, and lower quality commoner goods, a distinction which applied equally to the producers of the two different classes of cutlery. The divisions between skilled and unskilled workmen, craftsmen and labourers, noble and ignoble artisans, were old and deep.[38]

That production was so specialized and the goods often unique, that it was the craftsman with his individual skills, rather than major capital investment who remained the foundation of the industry, had a decisive effect on its industrial structure, which in turn further accentuated the independence of the artisans and their belief and pride in their independent status. The operation by manufacturers of self-contained factories, where all workers were employed directly on the owners' products, had always been alien to these trades. Where a manufacturer owned the premises, some men would devote most of their time to his work, but most rented space by the week, and worked on orders from manufacturers all over the town, including the owner of the premises.

In addition to these privately owned works, there were the 'public wheels', the owners of which had nothing to do with the trades beyond the renting out of space and power to individual workers.[39] Furthermore, scattered throughout the town and its environs, there were hundreds of small workshops, often in lean-to sheds, where outworkers worked up goods for a variety of manufacturers and merchants.[40] As capital requirements were so small - it takes only "one and fower pence to make a cutler"[41] - independent production was common and small master status the legitimate expectation. Advantages of such status were not so much financial or occupational, as manual work was still necessary, and profits were small, but social: a small master was on the first rung of the ladder to large employer status, and even as a very small scale employer, he thereby obtained both moral and social dignity.[42] The atmosphere of social mobility was heightened by the difficulties of making large fortunes before 1850, when mass-production was virtually non-existent, entry so easy, and competition correspondingly severe. The "middle ranks" of the 1830s were described as being "nearer both to upper and lower. The trade here is, as it ought to be, republican and not oligarchic. It is in the town, and not in the hands of a few enormous capitalists."[43] Considerable mutuality existed between masters and men, based on similar economic and social experiences, but also craft loyalties and values. This society, already isolated from the outside world, was dominated by a sence of 'the craft' and 'the trade'. Few immigrants came in the 17th and 18th centuries to broaden these inward-looking values,[44] and the town remained clannish and imbued with the all pervasive culture of the independent craftsman. "The six townships of Sheffield were merely collections of hamlets which gradually merged in the course of urban growth",[45] within which there was "an intense conservatism and parochialism, a distrust of 'outside' agencies, and a belief in self-reliance".[46]

iii) Changes Affected by the Early 19th Century Increases in the Demand for Cutlery.

As Sheffield's production of, and reputation for cutlery manufacture grew, as its raw material supplies were exploited and geographical isolation broken down, so it moved far in advance of rivals elsewhere in England. This was paralleled by the increasing

domination of Sheffield's economic life by the cutlery trades.[47] Approximately 2,000 men were employed in all the cutlery trades in 1700, rising to 7 - 8,000 in 1800.[48] Accurate statistics which exist from 1821 illustrate the enormous growth in employment in the first part of the 19th century: 6,000 were employed in the cutlery trades (as narrowly defined) in 1821; by 1851, 11,000 were employed.[49]

Thus, the most marked feature of the responses of these trades to increased demand, was the preference for expansion of the labour force and the manipulation of the old structure and processes to increase productivity and efficiency, instead of major technical changes or innovation. The use of steam power made little change to actual production techniques, and new machinery was accepted and adopted only reluctantly.[50] Fundamental to these changes was the opening up of the labour market affected by the legislation of 1814 which stated that "any person may carry on or work in the incorporation trades though not a freeman, and may have as many apprentices as he likes, and for such terms as he may think proper."[51] Although this coincided with the general abolition of the Elizabethan Status of Artificers, which enforced compulsory apprenticeships, in Sheffield it was the culmination of a power struggle with the Cutlers' Company. Whilst the Cutlers' Company theoretically represented all workers, its constitution allowed for its officers to nominate and elect their successors, thereby effectively excluding the rank and file and making it increasingly oligarchic. The larger merchants and factors, who dominated the Company, allowed restrictive regulations to lapse, and finally abolished them, despite the protests and outrage of the associations of freemen and journeymen. Whist it is possible to see this conflict as a clash of old and new economic moralities, guild restrictions versus free market economics, it does not necessarily follow that the industry was subject to an increasingly acute labour/capital polarization, in which traditional values and understandings became irrelevant and forgotten. Although evidence can be found which suggests increasing capitalization, the handicraft processes and mentality remained influential.

It has been said that the early 19th century saw an increase in the number of larger, more integrated firms at the expense of

the small scale, rented unit,[52] which is seen as the emblem of handicraft practices and values. However, such conclusions often rely too heavily on the use of trade directories, which give undue emphasis to the 'works' of the larger manufacturers, whilst underestimating the unquantified masses of outworkers who could not afford a directory entry. A more fundamental criticism of this view however, lies in the traditional organization of the large firms: huge quantities of goods were still obtained from outworkers, whilst many inworkers were in reality, still semi-indepenent contractors. In 1844, a commentator on the cutlery trades stated that "there are several modes of conducting the manufacture, but the factory system is not one of them....there is no large building, under a central authority, in which a piece of steel goes in one door and comes out at another converted into knives, scissors and razors. Nearly all the items of cutlery made at Sheffield travel about the town several times before they are finished."[54] Thus whilst partnerships increased markedly,[55] and companies boasted impressive premises,[56] at root their values and practices remained very much as before. Firms were proud to remain family businesses, and often accounted for their success in such terms;[57] no use was made of the joint stock legislation of the 1850s and '60s.[58] Most manufacturers continued to live at or near their places of business in the city centre, implying that they were still of only moderate means, and still integrally, practically involved in the business.[59] Similarly, there appears to have been little interest or participation in the International Exhibitions held abroad in the 1850s and '60s, symptomatic of a disregard for developments abroad and changing customer requirements.[60]

However, the maintainance of a system which, although rooted in the subsoil of handicraft enterprise, could be manipulated to accommodate considerable capitalist growth and expansion,[61] was not simply the result of narrow-minded, intransigent traditionalism, but to some extent, the product of sound economic judgement. Exploiting the skills of a highly, almost uniquely skilled and able workforce, which had already obtained a reputation for the finest products, the quality of which newer competitors could never match,

was a sensible response to the increasing foreign competition of this period.[62] Manufacturers benefitted from a system according to which men could be directly employed, laid off as trade expanded and contracted, allowing them to increase productive capacity without major capital investment. This was particularly important in these trades where business (especially that with America, which accounted for a third of all Sheffield's production by the late 18th century[63]) was subject to such wide fluctuations.[64] Moreover, by extending and perfecting the division of labour within the existing handicraft system,[65] a huge range of products could be obtained, with the marks of individuality and quality craftsmanship, which had become identified with the name of 'Sheffield'.

The end of guild restrictions and the opening up of the labour market entailed considerable, even insurmountable difficulties for manufacturers who relied on their own, and Sheffield's reputation for fine goods. Once the number and level of expertise of both apprentices and independent producers was no longer stipulated or enforced, inadequately trained men who were capable of only low quality work, flooded the labour market. When trade slackened, such poorly skilled men were the first to be laid off and, out of desperation, often began independent production, making the shoddiest goods, and often undercutting the wages and prices of 'respectable' workers and manufacturers.[66] Individuals were out-manoevred and undercut by factors and merchants who bought up their work at the lowest possible prices, again undercutting other manufacturers and workers.[67] There was considerable agreement amongst both manufacturers and men that they were "not suffering simply from production exceeding a natural demand, an evil which consequent embarrasments always correct; but from an undue production forcing a demand, at the expense of quality, to the permanent injury of both the manufacturers and the workforce."[68]

For all of the workforce, their unusual status, as neither handicraft producer, nor simple wage earner, meant that they receive neither the total value of the work they produce, nor a set wage, but a gross sum from which numerous deductions were made for rent, power and wastage.[69] Payment was according to complicated and only spasmodically revised piece price lists, in which payment and deductions for the huge variety of different patterns, sizes

shapes and processes in a particular cutlery branch were enumerated.[70] Changes in wage rates were calculated in terms of percentage increases or decreases on these lists. Living standards declined consistently from a high point in 1814 to 1850, wage rates falling significantly beyond decreases in the cost of living.[71]

Simultaneously, the format of the working day was changing: an overstocked labour market, low wages and forced unemployment meant longer hours when work was available, and an end to traditional absenteeism and holiday-making.[72] Steam grinding wheels were not subject to the same seasonal availability of power as water driven wheels, and the resultant intensification of labour, in association with the specialization of grinding as a full-time occupation, in the town, created a marked increase in the incidence of bronchial lung disease known as grinder's asthma.[73] Furthermore, many workers were losing the trappings of the independent, educated artisanal status that they once held or aspired to. An increasing number could neither read nor write;[74] children were being employed, often by their parents, from an early age in the least skilled trades;[75] cutlers were said to show apathy and disaffection towards religion, despite their former strong connections with local Dissenting sects;[76] their poverty and irregularity of employment prevented many from depositing funds in saving banks.[77] Such characterization adds weight to the portrayal of cutlers as an increasingly proletarianized group, being steadily expelled from the economic and social haven of skilled artisan status. However, for a substantial and vocal section of the workforce, traditional skills, values and ideals were still alive and meaningful: attacks on their position and craft techniques, and the spectacle of an increasingly degraded workforce beneath them, made them more aware of their skills and status, and the need to maintain them. Predictably, it was these men, who were still sufficiently numerous, skilled and confident, who dominated working-class responses to the changes of this period, and ensured the characteristically traditional framework of policies and action.

The status divisions between workers were based on a variety of factors. Some commentators have based their deliniations on production processes, marking out the better paid and more skilled trades of forger and grinder as an elite. Such a categorization

would however, amount to an unacceptably large 41% of cutlers being classified as an elite in 1851.[78] Moreover, the expenses of grinders' raw materials, as well as occupational hazards and illnesses which often curtailed employment, compensated for their higher net earnings. Alternative categorizations distinguish between the type of product being made: razor makers were generally better paid, better skilled and more secure than fork makers. However, the most convincing indication of better earnings, status and skill was to be found in the quality of the product being produced, a view evidenced by the presence of large wage differentials in all the cutlery trades.[79] In the spring knife trade in 1840, a few men earnt 40/- per week, the majority 16 - 22/-, but some earnt as little as 12 - 16/- per week: "In the better and finer articles, some may earn 30s. per week, but in general the wages are excessively low."[80] Thus, concern for quality of work, status, independence and guild-inspired craft exclusiveness were to some extent heightened by the creation of a stratum of work and workers from which to defend them. The continued vitality and validity of traditional concerns is well-illustrated by the principles and aims of the craft unions in this period who, by virtue of their continued power and conviction, were a further barrier to the demise of those same traditions.

There was not initially a sharp divide in these trades between freemen who, having served their apprenticeship, paid a fee to the Cutlers' Company to set up as independent contractors, and the skilled journey-men whom they employed: depending on trade, workers were often employers and employed in successive years.[81] These divisions between the two types of skilled men were further submerged with the increased inclusiveness of the freemen's associations, in their opposition to the merchant-factors of the Cutlers' Company, and attempts to re-enforce apprenticeship regulations and general traditional restrictions.[82] With the trade fluctuations and attacks on customary rates of the late 18th century, disputes became quite commonplace for the first time. One of the earliest strikes, in 1787, centered around the efforts of the table knife workers to stop the new practice of thirteen items being counted as a dozen,[83] whilst in 1801, the first of many

strikes was held on the graduating principle.[84] These strikes were met by associations of employers and prosecutions under the Combination Acts.[85] However, the strength of the cutlers in buoyant trade, the absence of significant foreign competition and sufficient deskilled labour to replace the striking craftsmen, is evidenced by the exceptionally high price lists obtained in 1814. A Sheffield Mercantile and Manufacturing Union was formed in 1814 to combat these demands, which were believed to be "immoderate beyond all precedent," and there followed further prosecutions under the combination Acts,[86] and wage reductions which accompanied the poorer trade and general fall in the cost of living after 1814.

The responses of the workers to their declining standard of living and the combinations of employers, were hesitant and backward looking. They were mistrustful of larger-scale combination and continued to favour small societies, a separate one to represent each of the production processes involved in the manufacture of a particular type of cutlery (i.e. table knife forgers, grinders, and hafters societies). This attitude was believed to reflect "that sturdy independence and tenacious adherance to ancient customs and the characteristic self-sufficiency which has always distinguished their members individually."[87] Despite their frequent insolvency and inability to enforce their demands,[88] their parochial craft sectionalism made them incapable of welding their interests in any broader alliance for any length of time. Although various federations did take shape, these were short lived:[88] the benefits of amalgamation were by no means obvious to the local unions, and were to remain so until the industrial militancy of 1911-13.

The aims of these small societies were formed within the framework and terms of reference of the old Cutlers' Company regulations. They stressed restrictive practices, especially the strict application of apprenticeship rules, the importance of quality production and the rigorous application of trade marks, and the need for harmony and understanding between masters and men, based on these foregoing values. Respectable, upright behaviour was expected of trade unionists,[90] and in many ways, these men shared more common values with reputable, principled manufacturers than with the unskilled members of their own trades.[91] Societies

were anxious to prevent changes which would blur the traditional distinctions between skilled and less skilled men, particularly the reduction of wage differentials.[92] They regretted the demise of the guild based unity which had once bound together masters and men, and saw in this change the cause of all the problems which afflicted the industry. The period of the effective operation of the Cutlers' Company's guild restrictions were idealised into an era of familiar, almost brotherly harmony and tranquility: "the respectable manufacturers regarded their workmen almost as families for which they considered it their duty to provide, and when reverses in trade occurred, used to stock up goods... and most reluctantly relinquish their workmen to the parish fund."[93]

The continued desire for, and feasibility of joint regulation of the trades is illustrated by the implementation, albeit short-lived, of two plans to this effect in the 1820s. In 1820, a community plan was drawn up by workmen, masters and poor law administrators, whereby a common fund was formed to provide for the unemployed in the trades, in exchange for the dissolution of the spring knife cutlers union, the poorest society, and efforts were made to return to the moderate 1810 price lists. It lasted only four months, failing as did later attempts at such community regulation because 'unrespectable' small masters and factors continued to undercut prices.[94] A similar plan of 1828, worked out by the journeymen cutlers, in conjunction with the Cutlers'Company and manufacturers, to regularize production and take it away from small masters and factor-masters, failed for similar reasons.[95]

However, guild restriction continued to be discussed and considered a vaguely viable option, because of the unity of interest which still linked many manufacturers and men; perhaps it was belatedly realized by manufacturers of high quality products, for whom the maintenance of Sheffield's reputation was crucial to their own commercial prospects, that the opening up of labour markets had entailed consequences far beyond their control or initial intentions and desires. There existed a general consensus between the 'honourable' sections of both employers and employed, based on common values which were largely the result of shared past experiences and broadly similar economic and social expectations

and understandings. A link, which was to colour and permeate understandings in the industry into the 20th century, was drawn between increased, unregulated competition, involving small masters in particular, and the decline in wages, profits, and, most importantly, standards of quality, which would result in the loss of Sheffield's reputation as the finest quality cutlery producer .[96] The spring knife grinders epitomised these feelings: the end of guild regulation allowed the entry into the trades of many "needy adventurers, men without capital or standing in society, and in many cases without principle," which meant that "immense quantities of the most worthless articles are thrown on to the market, which gradually undermines our character, both at home and abroad."[97]

Thus, an examination of the early history of the industry helps to clarify the form and reasons for the subsequent tenacity of traditional concerns and understandings, by explaining their original foundations and functions. Concern with quality was more than just a whim, but an economic necessity; the handicraft aptitude and skills of the local community were decisive in the continued existence and success of the cutlery trades in Sheffield. Hence the pride in skill and in the excellence of production, the hatred of unregulated competition and unskilled labour which threatened this production, the perceived need for and reliance upon guild restrictions, are realized to be fundamental to the enduring prosperity of these trades in this particular location. This in turn, helps to explain the nature of the ties, in terms of both understandings and economic compulsion, which linked high grade producers, masters and men; in their abhorrence of the unregulated competition of the 'disreputable' factors, merchants and small masters, and in their belief that such production would ruin Sheffield's reputation and, with it their own prosperity.

Footnotes

1. P. Abercrombie, Sheffield: A Civic Survey and Suggestions Towards a Development Plan, London, 1924,pp.9-10. "But there is of course one factor in the existence of Sheffield which is not dependent on externals - the ingrained aptitude of the population for technical work, requiring a high degree of skill - what might be termed its 'Mass Inheritance'. What has happened in Sheffield is (a) tradition (b) a community obviously fitted to accept and maintain the tradition, owing to its natural inherited characters which have been intensified.... Sheffield is then perhaps the largest example of Mass Heredity in an English town and this must exercise a dominating influence upon the continuance of its prosperity. Its remoteness.... may also have contributed something."
2. See, for example, C.H. Desch, 'A Study of Sheffield,' Geography, 1928, vol.XIV,p.497. "In a society the knowledge and skill of one generation does pass to the next. The generations overlap, and men, familiar from their childhood with the details of a craft, grow up in surroundings which favour the development of skill and knowledge in a particular direction. Social inheritance is a real thing, and is one of the most important factors in history." In Sheffield, "The social factor was of greater importance than the geographical."
3. J.D. Oxley, 'Notes on the History of the Sheffield Cutlery Industry,'T.H.A.S,vol.7,1951,p.1. See R.E. Leader, History of the Company of Cutlers in Hallamshire in the County of York, Vol.1, Sheffield, 1906,p.4. For example, it is said that Sheffield cutlers were responsible for the manufacture of the arrows that helped to win the battles of Crecy and Agincourt.
4. A. McPhee, 'The growth of the Cutlery and Allied Trades to 1814,' typed transcript in S.C.L.,1939,p.9. No cutlers were enumerated in the 1379 Poll Tax statistics, suggesting that they were very poor or primarily farmers.
5. Ibid, pp.10-12. Cutlers were present in London, Ipswich, Swansea and Ashbourne.
6. P. Abercombie, Sheffield: A Civic Survey, p.7.

7. G.I.H. Lloyd, The Cutlery Trades: An Historical Essay in the Economics of Small-Scale Production, London,1913,p.67. G.G. Hopkinson, 'The Charcoal Industry in the Sheffield Region 1500-1775', T.H.A.S. vol.8,1963; R.A. Mott, 'The Watermills of Beauchief Abbey', T.H.A.S., vol.9,1969.
8. Lloyd, p.69. Evidence of the importance of imported iron ore is seen in the series of successful battles fought by the Cutlers' Company in the 18th C. to reduce the duties charged on them. G.G. Hopkins,'The Charcoal Iron Industry', p.143.
9. M.W. Flinn and A. Birch, 'The English Steel Industry Before 1850, with Special Reference to the Development of the South Yorkshire Industry', Y.B.E.S.R. vol.6,1954,p.173.
10. K.C.Barraclough, 'The Origins of the British Steel Industry', Sheffield City Museums Information Sheet No.7,pp.3-6. Chests made from refractory material were filled with high quality iron ore and charcoal, sealed, and heated in a coal furnace for five to nine days, after which they were opened and allowed to cool for eight days. The process was thus a long one, a furnace only completing eighteen to twenty conversions per year.
11. K.C.Barraclough, 'The Origins of the British Steel Industry', p.6. The following costs were estimated for steel in 1842:

type of steel	cost of production per ton	selling price per ton
single shear steel bar	£31 - 12 - 0	£48 - 10 - 0
double shear steel bar	£39 - 9 - 0	£55 - 0 - 0
triple shear steel bar	£46 - 0 - 0	£62 - 0 - 0

The cost of the steel is also evidenced by the attempts of the Cutlers' Company to run their furnace to produce cheaper steel 1859-1884. K.C. Barraclough, Steelmaking Before Bessemer,vol.1, London, 1984, p.31.

12. K.C. Barraclough, 'Crucible Steel Manufacture', Sheffield City Museums Information Sheet, No.8. Blister steel was heated in crucible pots, along with other requirements, (depending on customers specifications) such as manganese, until the contents melted. It was then cast into ingots and forged. In 1842, the cost of one ton of forged bar crucible steel was estimated at

£43 - 7 -0, selling at £63.

13. K.C. Barraclough, 'Crucible Steel Manufacture', p.2; K.C. Barraclough, 'The Origins of the British Steel Industry', p.3; R.E. Leader, Sheffield in the 18th Century, Sheffield,1901,p.70. "The wise men of Sheffield obstinately refused to use Huntsman's steel. They complained that it was much harder than anything to which they had been accustomed. But Huntsman found the French more appreciative, and the superiority the foreigners began to attain, thereby raised a competition which forced the cutlers to adopt cast steel." Benjamin Huntsman Ltd., A Brief History of the Firm of Benjamin Huntsman Ltd. 1742-1930, Sheffield,1930.
14. J.G. Timmins, 'The Commercial Development of the Sheffield Crucible Steel Industry', M.A.Thesis, Sheffield University, 1976,pp.5-9.
15. Ibid.p.30. Of ten steel making concerns operating in 1787, six had previously made steel wares, whilst half of the Attercliffe steel makers in 1797 had previously been involved in secondary metal industries.
16. Ibid.p.185; W.M. Flinn and A.Birch, 'The English Steel Industry,' p.175.
17. A. McPhee, 'The Growth of the Cutlery and Allied Trades', p.14. "The lack of small, swift streams doubtless explains the decline of the old cutlery centres of London, York, Beverley, Doncaster, Chester and Gloucester, just as their presence explains the growth of Sheffield after 1500". R.Hawkins, 'The Distribution of Water Powered Sites in Sheffield', Sheffield City Museums Information Sheet No.4.

Sources of Power of Sheffield Cutlery Grinding Wheels

	number of water powered wheels	number of steam powered wheels
1770	133	-
1794	83	3
1841	40	50
1857	16*	80
1865	32	132

(*probably an underestimate, omitting the smaller wheels)

Pollard, History,p.53; Lloyd,pp.443-4.

18. See Chapter 2.

19. D.Hey, The Rural Metalworkers of the Sheffield Region,Leicester, 1972,p.15. "The traditional skills and capital that had been invested, no doubt far outweighed the disadvantages of importing foreign ore along such a bad system of communications, but were the local crafts so well founded because the social structure of the region was particularly well adapted to a system which allowed industry to be carried on alongside agriculture?" See also pp.7-9,60 , small scale farming, in conjunction with the manufacture of cutlery, was still common in Sheffield's outlying villages in 1914. D.Smith, The Cutlery Industry in the Stannington Area, Sheffield, 1977, p.30.
20. C.H.Desch, 'The Steel Industry of South Yorkshire: A Regional Study', Sociological Review, 1922,p.135. See also R.N.R.Brown, 'Sheffield, Its Rise and Growth', Geography, vol. XX1,1936,p.180.
21. A.McPhee,'The Growth of the Cutlery and Allied Trades', p.15; P.C.Garlick, 'The Sheffield Cutlery and Allied Trades and their Markets in the 18th and 19th Centuries', M.A.Thesis, Sheffield University,1951,pp.85-6.
22. A canal was built as far as Tinsley in 1732, but this was not extended the three miles to the centre of the town until 1819. For details see T.S.Willan, The Early History of the Don Navigation, Manchester,1965; A.W.Goodfellow, 'Sheffield's Waterways to the Sea,' T.H.A.S, vol.5,1943,pp.246-54; G.G. Hopkinson, 'The Development of Inland Navigation in S.Yorkshire and N.Derbyshire 1697-1850', T.H.A.S, vol.7,1954,pp.229-251.
23. P.C.Garlick, 'The Sheffield Cutlery Trades', p.86. Broadbents, Kenyons and Roebucks vie for the title of first direct exporter.
24. For details see H.Smith, 'Sheffield: Road Travel and Transport Before the Railway Age', Sheffield City Libraries Local Studies Leaflet. The first turnpike trust in the region was opened in 1756 and by 1760, there were regular passenger coaches between Sheffield and London. By 1787 coaches also left daily for Birmingham, Leeds and Carlisle. That facilities for the regular dispatchment of goods were available is illustrated by the operation in Sheffield in 1821 of 16 carriers and 36 coach operators.
25. H.W.Hart, 'A Brief Survey of the Events Leading up to the

Opening of the Sheffield and Rotherham Railway, 31st October 1838', T.H.A.S.,vol.9,p.271.

Comparative Costs of Modes of Transport from Sheffield to Manchester in the 1830s. (Nature of the commodity not stated)

Mode	Time Taken	Price in Shillings per Ton
canal	8 days	28
road	2 days	34
rail	4 hours	20

26. H.Smith, 'Sheffield: Road Travel and Transport', p.10.
27. D.Hey, Rural Metal Workers, p.9; D.J.Smith, The Cutlery Industry in Stannington, p.19; M.Hemmingfield and B.Woodriff, Forkmaking and Farming at Shiregreen, North Sheffield in the County of Yorkshire,Kingston, 1980.
28. R.E.Leader, Cutlers Company,vol.I,pp.3-10.
29. Ibid., vol.IIp.11. A 1662 bye-law of the Cutlers' Company stated this explicitly, for example, "No user of the trade, mystery or occupation of a cutler for the making of knives shall henceforth use the trade of making or grinding scissors, sickles or scythes."
30. Ibid., vol.II,p.9. A 1625 bye-law of the Cutlers'Company stated that "No person to make knives etc. except he put Steel into the Edges of them, upon pain of 10s. for every offence, and the wares so deceitfully made to be seized and recovered by the Master and Wardens." Ibid.,p.8, "No gold of silver to be put on the blades, bolsters or hafts of any knives, except such as be worth or sold for five shillings the dozen, on pain of 20s".
31. Ibid., vol.II,p.60.
32. A.McPhee, 'The Growth of the Cutlery and Allied Trades', pp.28-29; Lloyd, pp.177-8.
33. K.Marx, Capital, vol.1, London,1982,(Penguin) p.457.
34. For the basic and low value nature of the tools required for cutlery production, see the inventory listed in D.J.Smith,The Cutlery Industry in Stannington, p.18. See K.Marx, Capital,Vol.I,pp.457-8, "Whether complex or simple, each operation has to be done by hand, retains the character of a handicraft, and is therefore dependent on the strength, skill, quickness and sureness with which the individual worker manipul-

ates his tools".

35. For further details on production processes see, P.Smithhurst, The Cutlery Industry, Aylesbury,1987; Lloyd,pp.37-57; C.A.Turner, A Sheffield Heritage: An Anthology of the Photograph and Words of the Cutlery Craftsmen, Sheffield, 1978; J.B.Himsworth, The Story of Cutlery: From Flint to Stainless Steel, London,1953, pp.100-2,125-30; J.G.Jenkins, The Craft Industries, London,1972, p.94; The Penny Magazine Supplement,vol. II, April 1844,p.166; B.Kingsley, A Treatise on Razors, London, 1820.

36. The Penny Magazine Supplement, p.666, cited the following temperature and colour guidelines which were used by cutlers:

Degrees Fahrenheit	Colour of Metal	Item of Cutlery
430	slight yellow	razors
450	pale yellow	
470	yellow	pen knives
490	brown	
510	brown with purple spots	table knives, pocket knives, scissors
530	purple	
555	bright blue	
560	blue	springs
600	blackish blue	

37. Abel Bywater,The Sheffield Dialect, 1839, Sheffield, pp.33-4. His account of "ivvera thing ats dun to a pen knife throot furst tot last", proceeded as follows:

Wa then o'st begin wit blade makker furst:

1st. He mood'st blade.

2nd. Then he tangs it.

3rd. Then he smithies it.

4th. Then he hardens an tempers it, an he's dun we't. Wa then heast spring makker:

1st. He moods it.

2nd. Then he draws tuther end aht an turns it, an's just as menna he'ats fort scale; wa then't blade gooas tot wheel tubbe grun an sich loik.

1st. Nah, thah kno's, we alis groind tang furst, fort mark to be struckn, but ivverra bodda dus'nt.

2nd Then groint blade.

3rd. If its a rahnd ended knoife, tangs is glazed and pollisht.

4th. Then they'r choil'd if they'r not fetheredged ans.

5th. Then they'r grun uppat droi stooan.

6th. Swages is glazed, and backs, if they'r tubbe pollisht.

7th. Wa then they'r lapt.

8th. An then pollisht, an then he's dun we't.

Then heast Cutlers wark al bit warst, bur o think o can mannidge.

1st. He sets scales tot plate.

2nd. Bores t'scales.

3rd. Foiles and fits em.

4th. Nocks em aht an marks springs.

5th. Rahnds springs, an hardens and tempers em.

6th. Then he rasps an sets his cuverin.

7th. Then he matches an pins em on.

8th. Tacks em dahn an dresses t'edges.

9th. Nocks em aht an scrapes t'edges at iron scales.

10th. Puts springs intot hefts.

11th. Squar'st blades an dresses em.

12th. Nails em in joints an sets em.

13th. If they'r stag they want heftin.

14th. (Missed out).

15th. Foils't bowsters.

16th. Ruff buffs t'hefts.

17th. Ruff glazes't bowsters.

18th. Then woips sand off.

19th. Foin buffs em we oil and rottenston.

20th. Foin glazest bowsters.

21st. Then glosses em off an they'r finsht, arnt they Jooa?

Jooa:'Nou lad, not sooa, thahs mist two things. Thah'l loise (wager) if ta dusnt moind'.

Jooa Crocus: 'Wa o can think o nowt else. Wot have a mist, eh?'

Jooa: Dusn't thah know at after't springs is hardened an temper'd, they'r glaz'd an burnisht; an at after he matches an pins em on, he nips em an bores't thick horn hoils, an puts

points in?'

Jooa Crocus: 'Wa mun o did'nt owt to loise for that bit; bur, o avver, let's just reckon hah menny toimes won part or anuther on em gooas throo us hands.'

Jooa: 'Wa then, we'll begin wit blade makker, furst:

Blade makker	toimes 4
Scale and Spring Makker	toimes 4
Groinder	toimes 8
Cutlers or Setters in	toimes 23
	total 39

besoids a menna mooar little jobs, stitch as wettin an woipin etc.

38. R.E.Leader, The Cutlers'Company, vol.II,p.7. The distinction was being made as early as 1624.
39. S.Pollard, History, p.56. In 1824, the Soho grinding wheel, a public wheel in the centre of Sheffield, was rented out to several grinders who occupied between ½ and 4 troughs, paying for them by the week.
40. This structure had changed remarkably little by 1914. See chapter 4 for details.
41. B.R.Dyson (ed.), A Glossary of Words and Dialect Formerly Used in the Sheffield Trades, Sheffield, 1936, p.4.
42. R.E.leader, Sheffield in the Eighteenth Century, p.14. "But he was now the employer of others. And in the moral dignity accruing therefrom lay all the difference. The employed might mean only a man and a boy; a striker and an apprentice; but the cutler was his own master: a freeman in truth. And that achieved, nothing but a few years of patient saving stood between him and the office of master of the Cutlers' Company."
43. John Parker, A Statement of the Population etc. etc. of the Town of Sheffield, Sheffield, 1830, p.18; G.C.Holland, Vital Statistics of Sheffield, London, 1843,p.62,p.68; G.C.Holland, Inquiry into the Conditions of the Cutlery Manufacture, Sheffield, 1842,p.10.
44. E.J.Buckatzsch, 'Places of origin of a group of Immigrants into Sheffield 1624-1799', Economic History Review,Vol.II ,p.50. 2/3 of immigrants came from places less than 20 miles from Sheffield,

and less than 1/10 from places more than 40 miles away. That foreign cutlers came to Sheffield in large numbers in the 16th and 17th centuries to escape religious prosecution in Europe, is a view now broadly discredited: see J.Oxley, 'Notes on the History of the Sheffield Cutlery Industry', pp.4-10.

45. D.Smith Conflict and Compromise: Class formation in English Society: a Comparative Study of Birmingham and Sheffield, London,1982,p.30.
46. Ibid.,p.31.
47. E.J.Buckatzsch, 'Occupations in the Parish Registers of Sheffield 1655-1719', Economic History Review, 2nd. series, Vol.I,1949. By 1719 cutlery workers formed 50% of the male population of working age. A similar indication of rapid growth in the 18thC. is presented by the increase in the number of buildings, mark rents and freedoms registered by the Cutlers' Company; see A.McPhee, 'The Growth of the Cutlery and Allied Trades', pp.23-27.
48. P.C.Garlick, 'The Sheffield Cutlery Trades',pp.16-17.
49. Lloyd, pp.158,445-6.

Trade	No. employed in 1824	No employed in 1851	Percentage increase
Table knife forgers & strikers	400		
hafters	1,000		
grinders	450		
total	1,940	3,750	48
Spring knife blade forgers	240		
hafters	1,470		
grinders	360		
spring forgers	120		
total	2,190	4,000	45
Razor forgers & strikers	80		
hafters	120		
grinders	250		
total	450	800	44
Scissor forgers	147		
filers	196		
dressers	110		
grinders	238		
finishers	115		
total	806	1,200	33
Fork forgers	280		
grinders	200		
total	480	650	26
TOTAL	5,866	10,400	44

50. See Chapter 2.
51. Quoted in Lloyd, p.136.
52. John Baxter, 'Origins of the Social War: A History of the Economic, Political and Cultural Struggles of Working People in South Yorkshire', vol.1,Ph.D. thesis, Sheffield, 1976,pp.20-21;301-304; vol.II,pp.397-399. Baxter does however, focus on all the cutlery trades, including the heavier branches not covered in this study, in which capitalization was greater than in the lighter branches.
53. See appendix 2: The structure of the Industry, p.
54. The Penny Magazine Supplement, April 1844,p.168; Thomas Allen, A New and Complete History of the County of York, London, 1828-31, vol.V,p.51. "The manufacturers, for the most part, are carried on in an unostentatious way, in small, scattered shops, and nowhere make the noise and bustle of a single great iron works". See also P.P.1865,XX, Report upon the Metal Manufacturers of the Sheffield District , by J.E.White, Appendix to the Fourth Report of Children's Employment Commision, case 20,(p.46).
55. J.Baxter, 'Origins of the Social War', p.300.
56. See for example, Joseph Rodgers and Sons Ltd., Under Five Sovereigns, Sheffield, 1911.p.19.
57. Ibid., pp.7,14.
58. P.C.Garlick, 'The Sheffield Cutlery Trades', pp.74-5.
59. R.S.Passmore, 'The Mid-Victorian Urban Mosaic: Studies in Functional Differentiation and Community Development in Three Urban Areas 1841-71', Ph.D.,Sheffield, 1975,p.126.
60. C.Page, La Coutellerie Depuis L'origine Jusqu' à Nos Jours, vol.VI, Chatelerault, 1896,pp.1464-5.
61. See R.Samuel, 'The Workshop of the World', History Workshop Journal, no.3, 1977,p.8.
62. P.P. 1833, V, S.C. on Manufactures, Commerce and Shipping, 1833,(590), S.Jackson,qs2957-59.
63. P.C.Garlick, 'The Sheffield Cutlery Trades', pp.93,145. 6,000 workers were employed in the manufacture of goods for America, 9,000 on those for the domestic market, and 3,000 on those for all other markets. The fluctuations in trade in the 1830s, which were largely caused by swings in American demand, became

known as the "hunger and burst" system, see Lloyd, p.341.

64. See, for example, P.C.Garlick, 'An Old Sheffield Cutlery Firm: the House of Nowill 1786- 1825', T.H.A.S.,vol. 7, 1954. S.Pollard, Three Centuries of Sheffield Steel: The Story of a Family Business, Sheffield, Marsh Bros., 1954.p.35-41.
65. T.Allen, A New and Complete History, pp.52-3.
66. G.C.Holland, Diseases of the Lungs from Mechanical Causes, London, 1843,p.62; J.Baxter, 'Origins of the Social War', p.300.
67. See Chapter 4.
68. G.C.Holland, Inquiry, p.20.
69. See Chapter 6 for details.
70. E.g. Prices of Scissor Forging: 1817 Statement Revised and Corrected with Additions to 1844, Sheffield, 1844; Revised List of Forging Pen and Pocket Knife Blades of 1810, Sheffield, 1844.
71. P.P. 1824, V, S.C. on Artisans and Machinery, 5th Report, 1824, (51), Adams, Bullock and Ward, p.404; P.P. 1833, IV, S.C. on Manufactures, Commerce and Shipping, 1833,(590), J. Milner,qs. 11584-91.

Index of Piece Rates 1810-1851.

Trade	1810	1817-18	1831	1833	1835-6	1842	1851-2
spring knife	100	80	75	55	63-78	38	100
table knife	100		75-100	60	75	30-40	
fork	100			65	63	40	
razors	100		80	90		50	

Source: J.Baxter, 'Origins of the Social War', p.618.

72. Pollard, History, p.39; D.Reid, 'The Decline of St. Monday 1766-1876', Past and Present, no.7,1976; E.P.Thompson, 'Time, Work-Discipline and Industrial Capitalism', Past and Present, no.38, 1967; S. Pollard, 'Factory Discipline in the Industrial Revolution', Economic History Review, 2nd Series , vol.XVI, 1963-4; P.P.1833, IV, S.C. on Manufactures, Commerce and Shipping, J.Milner, qs. 11632-3.
73. For details see G.C.Holland, Diseases of the Lungs; T.Allen, History of the County of York, p.53.
74. Ibid.p.79; P.P.1843, Second Report of the Children's Employment

Commission, Report by J.C.Symons Esq. on the Trades of Sheffield, vol.XIV.

75. P.P.1843, X1V, J.C.Symons' Report; P.P.1865, XX, J.E.White's Report, p.3.

76. E.R.Wickham, Church and People in an Industrial City, London, 1957,pp.35,38. Cutlers formed a stronghold of local puritanism during the Civil War, and also the Dissent of the 1680s P.P.1843,X1V, J.C.Symons' Report, P.P. 1865,XX. J.E.White's Report, pp.10,19.

77. G.C.Holland, Vital Statistics,pp.134-34.

78. C.O.Reid, 'Middle Class Values and Working Class Culture', pp.34-5.

79. Average Earnings in the Cutlery Trades(in Shillings)

Trade		1833	1850
table knife	forgers	21-35	27-40
	grinders	27-40	27-32
	hafters	18-27	17-27
spring knife	forgers	21-31	18-35
	grinders	20-40	20-40
	hafters	15-25	16-30
razor	forgers	26-30	24-33
	grinders	18-50	21-48
	setters-in	18-40	15-30
scissor	forgers	23	28
	grinders	35	35
workboard hands		26	24

Source: Lloyd, p.211.

80. G.C.Holland, Vital Statistics, pp.181-2.

81. F.Hill, An Account of Some Trade Combinations in Sheffield, London, 1860, p.364; J.Baxter, 'The Origins of the Social War',p.16.

82. J.Baxter, 'The Origins of the Social War', p.58; Lloyd,pp. 123,265; P.P.1833,IV, S.C. on Manufactures, Commerce and Shipping, J.Milner, qs.11574-6. Freemen's associations were established in 1785-91, and revived in 1833, comprising both masters and journeymen.

83. A.McPhee, 'The Growth of the Cutlery and Allied Trades', pp.51-2; Lloyd, p.241; See chapter 6, pp.194-5.
84. A. McPhee, ' The Growth of the Cutlery and Allied Trades', p.53; See chapter 6, p.181.
85. J.Baxter, 'The Origins of the Social War',p.150; F.Hill, An Account of Some Trade Combinations,p.526; G.C.Holland, Vital Statistics, p.207; Lloyd,p.244.
86. P.P. 1824, S.C. on Atisans and Machinery, Fifth Report, Adams, Bullock, Ward, pp.401-3. The union comprised 401 firms and 600 masters, with £6749 of funds. See also Lloyd, pp.251-55, 459-69.
87. Lloyd, p.268.
88. P.P.1833,IV, S.C. on Manufactures, Commerce and Shipping, J.Milner, qs.11606-10.
89. J.Mendelson, W.Owen, S.Pollard and V.M.Thornes, Sheffield Trades and Labour Council 1858-1958, Sheffield, 1958, pp.14-18. The first alliance was the Sheffield Mechanical Trades Association of 1822, which included six branches of the Cutlery Trades, but like all such alliances, its unity was shortlived. The first permanent alliance, the Alliance of Organised Trades of 1838 also broke up soon after its foundation, as did the first national organisation, the National Association of United Trades for the Protection of Labour, formed in 1845, which was based in Sheffield.
90. Crookes: The History of a Sheffield Village, Sheffield, 1982,p.64. In 1830, a grinders' society fined a member £12 for drunkenness, whilst in 1844, a grinder who drank too much, and failed to support his family, was wheeled through the village in a barrow by the society members.
91. See C.O.Reid, 'Middle Class Values and Working Class Culture in 19th Century Sheffield - the Pursuit of Respectability', in S.Pollard and C.Holmes (eds.), Essays in the Economic and Social History of South Yorkshire, Barnsley, 1976,p.278. Reid argues that until about 1850, divisions along the lines of 'respectable' and 'unrespectable', which cut across divisions between masters and men, were far more relevant to Sheffield than purely class based divisions.

92. See, for example, To the Journeymen Table Knife Hafters in the Scale Tang Line, Sheffied, 1844, S.C.L.,M.P.3965.
93. Report of the Committee of the Journeymen in the Spring Knife Trade Appointed for the Purpose of Taking into Consideration the Propriety of Applying to Parliament for an Act for the Better Protection of the Incorporated Cutlery Trades, Sheffield, 1821; see also Reply of the Committee of the General Grinding Branches of Sheffield to the Earl Fitzwilliam's Speech at the Cutlers' Hall, 15th September 1844, Sheffield, 1844.
94. P.P. 1833, S.C. on Manufactures, Commerce and Shipping, vol.IV, J.Milner,qs. 11616-7; J.Baxter, 'Origins of the Social War',p. 319.
95. J.Baxter, 'Origins of the Social War', p.311; F.Hill, An Account of Some Trade Combinations, p.537.
96. G.C.Holland, Inquiry,pp.11-21; P.P. 1833, IV, S.C. on Manufactures, Commerce and Shipping, John Milner, qs.11600-3.
97. Report of the Committee of the Journeymen in the Spring Knife Trade, pp.8,15.

CHAPTER 2 RAW MATERIALS, MECHANIZATION AND NEW INVENTIONS.

In the period under consideration, the Sheffield cutlery trades experienced few marked or rapid advances towards mechanized production, nor were there many widely adopted departures in the application of new raw materials, or in product design. The industry as a whole remained committed to the traditional principles and practice of high quality production which embodied the use of the best possible raw materials and the manual expertise of craftsmen. Even when new techniques were adopted, it was generally with reluctance and a vague sense of shame that Sheffield's valuable and hard won reputation for the finest cutlery was being sacrificed. Her trading reputation, associated with high quality, durable, specialised cutlery, was treated as sacrosanct by many manufacturers and men. Mechanization was associated with poor quality raw materials and even fraudulent trade marking practices; most manufacturers would have gladly abandoned the production of common cutlery by mechanized processes to foreign competitors or lesser producers in Sheffield, if the market would have allowed such a policy. The recurring conclusion was that Sheffield should exploit, as far as was possible, those assets which her competitors could not attain or imitate: an exceptionally skilled workforce, an ablilty to produce a huge diversity of specialized designs, and a trading name and reputation unequalled by any competitor in both cutlery, or its major constituent, steel.

The failure of the British manufacturer to appreciate the value of new technology and to install new machinery apace with his German and American competitors has been interpreted as important evidence in arguments which cite 'entrepreneurial failure' as the major reason for the perceived loss of vitality in and even retardation of the British economy after 1870. Moreover, entrepreneurial inertia was believed to be the result of conditions seemingly epitomised in Shefield: the drag of an 'early start', complacency, and the general unresponsiveness of British society to change - "the force of tradition dies hard with the British people and this more than anything else seems to have influenced the

outlook and actions of British industrialists and their employees. So long as it was possible to make an honest penny, British entrepreneurs were content to jog along in the same old way, using the techniques and methods which their ancestors had introduced." [1]

However, whilst traditional considerations were undoubtedly important in shaping attitudes and policy in these trades, it is possible to demonstrate that these principles were frequently the result of careful reflection on market conditions and moreover, were quite rational economic choices, based on the recognition of the value of abundant cheap skilled labour, and a worldwide commercial reputation. Production had been founded on these principles for centuries, and was not, therefore, even if it had wanted to change, free to develop along the lines of its newer foreign competitors. Even if the skilled workforce and specialised production had been scrapped, Sheffield would have been forced to compete on equal terms and in the same markets as foreign competitors, whereas quality, craft production set Sheffield apart from her competitors. Moreover, it is possible to show that Sheffield's manufacturers did adopt new technology, but cautiously and when it suited their evaluation of their position and market conditions.

1870-1889

i) Mechanization and Product Design

The first part of this period was notable for the absence of any significant application of mechanized production techniques to these trades. Although steam power had concentrated production into factories in the city centre,[2] it had little immediate impact on the actual processes of production - even in 1893 no operation was completely mechanized.[3] Although machines were available and widely used in Germany and America,[4] their employment in Sheffield was generally both delayed and halting; even the transition to the steam hammer, debatably the real revolution facilitated by steam power, was a slow process.[5] The stamping of table knife blades out of specially prepared sheets of steel, whilst it was introduced in 1858,[6] did not come into common usage until the 1880s.[7] Machine forging processes were developed for steel forks and spring knives,[8] but the method of 'flying'scissor blades from sheet steel, although

demonstrated in Sheffield by a French inventor in 1862, did not become firmly established until 1892.[9] Grinding and hafting processes underwent even less mechanization than forging.[10] Machine grinding was introduced in the 1850s and was continually improved by Sheffield manufacturers and inventors, until by the mid-1880s, reasonable quality blades could be produced at great speed.[11] In the hafting processes, machinery was applied to the tedious process of filing bolsters, whilst power driven borers were four times faster and involved the application of much less force than hand boring.[12]

Neither manufacturers nor workmen were particularly worried or abashed by the lack of mechanical advance in their industry; infact power driven production was firmly associated with poor quality raw materials, low ablility workmen, and dishonourable firms who, in producing shoddy goods, were sacrificing Sheffield's communal reputation to serve their own ends. The old and reputable houses continued to boast their reliance on traditional production techniques and associated with them, high grade raw materials and skilled workmen. Firms were anxious to state (and frequently overstate) their use of "the latest improved machinery and appliances",[13] which allowed them to conduct all operations on the most advanced lines, but they were ever more eager to stress that this was in conjunction with the employment of many craftsmen who perfected the finish of their cutlery.

Whilst this reliance on traditional values and practices may have been partly the result of inertia and even the dogmatic confidence of the Sheffield industry, it seems that such assurance had a sound rational basis, and that the industry had a fair understanding of its position. The city was fully aware of the mechanical advances being made in Germany and America and of the common, standardized goods that were being produced in ever expanding quantities. In these circumstances, it was arguably more rational for Sheffield to rely upon and to loudly expound the virtues of its historically and industrially unique attributes: the generations of exceptionally skilled craftsmen and the production of some of the best steel in the world. Fine steel and fine

craftsmen were both cheaper and more widely available here than anywhere else, enabling an enormous and diverse range of top quality 'one off' goods to be produced to a high standard and more cheaply than anywhere else in the world. As C.K.Harley has argued,[14] British neglect of new machinery techniques were often less associated with entrepreneurial apathy or failure, as with the abundance, cheapness, discipline and ability of skilled British workmen. Labour-saving machinery, when adopted abroad, was normally to compensate for a lack of skilled labour, and necessarily resulted in the production of more standardized mass-produced goods.

Furthermore, the best and most expensive cutlery still had an appearance significantly different from that of cheaper varieties, and whilst ever snobbery and prestige dictated a desire for the best goods, there would always be a market for the best cutlery.[15] To a considerable extent the market made important demands of manufacturers, who were not free to change their modes of production entirely at their own will. Roseberg found that "Across the whole range of commodities, we find evidence that British consumers imposed their tastes on the producer which seriously constrained him with respect to the exploitation of machine technology. English observers often noted with some astonishment that American products were designed to accommodate not the consumer but the machine".[16] High quality products had become almost synonymous with the trade mark 'Sheffield' and these were the type of goods which most consumers had come to expect from the city.

This being the case, it seems that the Sheffield industry applied itself to the communication of its special assets to as wide an audience as possible, whilst also stressing the inability of competitors to match or imitate these advantages. The skill of the Sheffield cutler was often treated as if it had an imbred, almost mystical quality. One manufacturer contrasted a Sheffield craftman's ability to "feel" a blade, with the workings of the machines he had observed in America: By 'fingering' his blade, the Sheffield grinder "effects all those dainty touches and delicate gradations which no machine, nor no man using a machine can impart".[17] Ruskin too, had a similar respectful admiration for the

Sheffield cutlers and the pride they took in their work: "Upon the maintenance of this pride, the maintenance of Sheffield's supremacy in the manufacture of cutlery largely depends. The best knives are, and always will be, made by hand, and the qualities which are necessary to this system are in Sheffield's hereditary. In dexterity of handling, rapidity of execution, perception of results and honest zeal, the Hallamshire forger and grinder are unapproached".[18] Such a respect for 'hereditary' talent was in marked contrast to attitudes in the American cutlery industry, where Sheffield craftsmen were felt to be too proud and conceited. In America "the honour which he expects to receive belongs only to these who can make the machinery to do the work which before devoured the men".[19]

Until the 1890s at least, machinery was simply incapable of producing the quality of cutlery that most Sheffield manufacturers wanted to sell. However, they were willing to consider and apply new technology when it could be incorporated into their conception of how the industry should progress. Many manufacturers would freely use machines for "drilling, boring and other operations in which its uniformity and exactness made it superior to hand labour, but have far too much regard for the quality and reputation of their best goods to substitute machine work in departments where the highest excellence can only be attained by the employment of the intelligent use of hand labour".[20]

Furthermore, many machines were still at an early stage of development and were quite incapable of producing goods of a fine finish, as well as entailing such negative side effects as, for example, the creation of an excessive amount of dust.[21] It has often been suggested that the various problems with prototype machinery made it more sensible for individual firms to delay purchase until the various 'bugs' had been ironed out.[22] The experiences of the Sheffield trades were with the production of small quantities of goods of a specific nature, often to the customer's order, which made the transition to mass production techniques and the loss of the ability to make minute specifications, a difficult and painful process.

As so often happened, a compromise solution was developed.

whereby machines were used, but they were usually the inventions of the individual manufacturers, operated on their premises alone, and designed with highly detailed specifications and hence a limited usage. The range of patterns and designs that most manufacturers continued to insist upon, and their rigorous individuality and secrecy as producers, provided insufficient stimulus for engineers to design or manufacture machines, the demand for which would be too small to justify the cost of development.[23] Firms at the time[24] and even present-day commentators stress that the fine adjustments and perfect finish required of the best cutlery can only be given by hand: "If scissors are cut....along the whole length of the blade, the final adjustment in their assembly needs a skilled putter together. Folding knives will only 'walk and talk' that is the blades will only open easily and spring back into the centre of the knife with a click, if a cutler has seated each blade. Materials such as mother-of-pearl and ivory are not suitable for machine methods. The higher quality wares are likely to remain craftsmen's productions".[25]

The expense of Bessemer and crucible ~~shear~~ cast steel, and of natural hafting materials, made them as yet unsuitable for manipulation by machinery, and consequently a firm association developed in the minds of many 'respectable' manufacturers and men, that mechanization was synonymous with poor quality goods, and even false marking and the betrayal of trading reputations. The clear association between these factors is illustrated by a description given by a trade unionist in 1886,of the table and butchers' knife trade, where there were four recognized systems of producing the blades: "Firstly by hand, which is the system adopted by all respectable firms for their best goods, and in many instances the commoner qualities; secondly forging by machine, commonly called "goffing"; thirdly, flying or stamping out of common Bessemer sheet steel, and fourthly the system of producing the blades from common pig iron".[26] The trade unionists in particular, felt that the whole concept of mechanization and its necessary consequences were a contradiction and subversion of all the values and techniques on which Sheffield's past and future prosperity were believed to be based.[27]

Trade union opposition to new technology was intense and reasonably successful, albeit not the decisive force in the non-implementation of new machinery that manufacturers often stated it to be. Although the power of the unions had been a strong influence in the 1840s, 50s and 60s,[28] by the 1870s, trade union policy was little more than a supplementary reason, and arguably an excuse used by already unconvinced manufacturers, for the avoidance of machinery. The scornful contempt with which craftsmen treated the new inventions is illustrated in the names by which they referred to them: the new power glazers were called "werelegig polishers" whilst a "gobbed on" bolster referred to a bolster which had been soldered on, instead of being forged in its entirety.[29]

Whilst opposition was phrased in terms of concerns for quality and the maintenance of a trading reputation, these often disguised far more self-interested considerations. In strictly practical terms, mechanization "had the same effect as it had in most towns; it has tended to reduce wages, and has reduced wages, and always will".[30] This was particularly the case when manufacturers claimed that the cheaper production was new to them, and thus a market had to be 'forced' for it, which obliged the payment and acceptance of lower wage rates.[31]

Wages were also reduced, as was the craftsman's status, by the subdivision of labour and deskilling which many realized to be the unavoidable consequence of mechanization. The creation of an unskilled and deskilled labour force was, in turn, seen as the starting point of sweating and excessive competition at the cheap end of the market.[32]

At a more abstract level, machinery, with its 'scientific' approach, contrasted sharply with the craftsman's traditional and almost folklorish understanding of his trade. The craft was passed from generation to generation; precise judgements by hand and eye took time and aptitude to perform to perfection. But mechanization struck heavy blows to the whole mystique of the craft, and on a practical level, often involved the curtailment of the workers' traditional discretionary powers, as production skills were taken out of their hands and placed with technicians. Only recently it was stated of cutlers that "As craftsmen, they have a great belief

in the value of practical experience as a way of acquiring a knowledge of one's medium and a corresponding disbelief in the power of some young fellow in a lab to sit down and without any 'know how' of the craft, work out answers to problems from abstract principles - principles which they, life-long craftsmen, cannot understand".[33] As has been indicated, many manufacturers were at this stage prepared to acknowledge and to continue to use these skills instead of replacing them, often inadequately, by machines.

However, perhaps as a result of the exalted position given to hand labour by most trade unionists, there was only a very slow realization that hand labour could be subdivided, degraded and sweated just as easily, if not more easily than under the impact of labour saving machinery. The sweating of hand labour infact became more intense as it came increasingly into competition with cheap mechanized production at the bottom end of the market. The very ease with which the cutlery trades could be made more productive through further subdivisions of labour and subcontracting, thus guaranteeing a continued diversity of patterns and styles, without the expense of the purchase of machinery and expansion of premises, was a major reason why manufacturers found themselves able to compete effectively without large-scale mechanization for so long.[34]

Further evidence of the awareness of Sheffield's cutlery manufacturers, and of their appreciation of market conditions, lie in the numerous instances of their willingness to implement new technology as and when they considered it to be prudent. During the bitter and protracted strike in the scissors trade in 1876, substantial steps were taken towards mechanization in order to counteract the restrictive practices of the unions,[35] and in 1886 it was stated that the depression "has stimulated invention in labour saving appliances", and "has enabled us to keep up the gross volume of our trade....the introduction of machinery has largely increased the productive power of some of our staple trades".[36]

Moreover, whilst few old-fashioned, prestigious firms would admit to the employment of much machinery[37] even in this period, there were some newer firms which were much more ready to exploit the new technology. James Drabble and Co. were using machinery in all their production processes by 1862, although they were the only firm to do so in Sheffield at that time.[38] By 1889 Staniforth's

output of machine forged table blades had reached 7000 to 8000 dozen per week and demand for them was so great that more new machinery was installed.[39] Another such firm was John McClory and Sons, who by 1888 were freely admitting to the production of cheap, but decent and attractively finished goods, and even chastised the elitism of the old-established houses: "A few years ago, partly owing to the apathy of the older firms, who in a great measure confined themselves to the manufacture of the more expensive classes of cutlery, the enormous trade in cheap and middle class goods seemed likely to fall into the hands of German rivals."[40]

However, it seems that these firms who ventured into the world of machine-made cutlery were more recently established than the well-known 'giants' like Rodgers and Wostenholms,[41] and were presumably more capable of coming to terms with lower quality production as they did not have the reputation and associated trading responsibilities of the older established houses. It appears that for many of the older firms, there was a great loss of prestige and status, almost a betrayal of their ancestral reputation, involved in producing and marketing common goods. As late as 1946 the Working Party Report on Cutlery still felt obliged to stress that it was quite possible to market lower quality cutlery "without loss of prestige and self-respect".[42]

Concerns with quality, and the realization and exploitation of the value of Sheffield's trade mark and skilled craftsmen, were similarly all-pervasive in attitudes towards product design and development. Considerable time and emphasis were placed on the design of additional features, or improvements to existing products, if these developments would enhance the quality, uniqueness or usefulness of the original product. Very rarely however, did these developments lead to the creation of a totally new form of product or design. From the mid-1850s, there was little change in the length and design of cutlery,[43] and product development concentrated on minor adaptations, which overall, markedly improved the capabilities, operation and quality of the goods, but did not alter their basic form.[44] Typical developments included a rotary penknife which kept its blades from the dust,[45] a blade for a sportsman's knife which could take virtually any attachment;[46] a method of fixing table knife blades to their ivory handles which prevented any

unscrewing;[47] case cutlery packaged in attractive boxes[48]; and fork guards.[49] Such designs were eagerly patented by the inventing firm, and were considered to be a further sign of the firm's reputation for, and interest in quality precision workmanship.[50]

More substantial alterations of design, which involved considerable shifts from traditional ways of producing or understanding a product, were undertaken with far more reluctance. In the same way that new machinery was often delayed, there usually ensued a long delay between the patenting of a new product and its commercial manufacture in Sheffield. There was no lack of inventive talent or foresight amongst so many skilled and dextrous craftsmen and practically minded manufacturers, but there appears to have been a reluctance and even inability to put ideas into practice. The hollow-ground razor for example, which became an extremely popular speciality of the cutlery producers of Hamburg was not manufactured in large quantities in Sheffield until the late 1870s, although it was patented by a Sheffielder in 1828,[51] and advertised by a local firm in the Iris in 1842.[52] By the time production in Sheffield was attempted on a large-scale, it was a difficult struggle to win back sales from Hamburg, which had now acquired a reputation for the best hollow-ground razor - and a reputation was a crucial factor in the high-class cutlery trades.

These delays and failures to keep ahead were commonly blamed on the resistance of the men, who were accused of opposition to all innovations. Their usual form of resistance was to demand what manufacturers claimed were excessive prices for work on new products, and to charge 'extras' at exorbitant rates, both of which were completely out of proportion with the amount of work done. Manufacturers complained that even if the new pattern involved less work for the men, who should therefore be paid less, the men always demanded a higher price on principle. "The effect of this policy is not only to prevent the development of the trade, but to severely cripple it",[53] claimed a table knife manufacturer, who had "several new patterns by me, which I am confident would take well, if my men would only charge for them in proportion to the work that is in them, and so let me sell them at a reasonable figure; but they refuse to do so, and they remain in my drawer, and we go on turning out the old patterns".[54]

It is clear that workers did demand high prices for new products, when they were able to enforce their demands, but this ability diminished as the period progressed.[55] However, it seems unlikely that the unions, even in this earlier period of comparatively greater strength, would have been capable of single handedly holding back developments if the manufacturers had been committed to their implementation. The men themselves were frequently the designers of new products and patterns, and claimed that being the inventor, they were the most competent judges of the amount of work and therefore payment involved in a new design.[56] The unions believed that new patterns were being used as a method of bringing down the price of labour; they would not be resisted if they provided a fair wage.[57] Craftsmen were generally reluctant to abandon their hard won skills for the new techniques which new products often involved.[58] They were accustomed to the old work, often the owners of all the necessary tools, and were reluctant to recommence the laborious process of learning different techniques in which, because of their advancing age, they believed it to be impossible to attain such high expertise and therefore wages.[59] As few old hands would learn new techniques, there were fewer craftsmen available to teach the new skills to the next generation.

However, manufacturers also seemed to be quite content to diversify along tried and tested lines, adding further variations to the already bewildering range of available patterns. By the late 19th century, the number of patterns and designs in all shapes and sizes was quite astonishing and advanced Sheffield's reputation as a producer of small, detailed orders of precise almost customer-made quality cutlery.[60]

ii) Raw Materials

Attitudes towards the choice of raw materials illustrate a similar preoccupation with the production of reputable, high-class goods and with the reluctance to make changes which contradicted traditional understandings and the perceived reasons for success. The craftsmen mistrusted devices and materials which had not won the sanction of their own usage as well as that of many previous generations of artisans. For employers, financial pressures to introduce cheap raw mateials were probably mitigated

by the overwhelming importance of labour costs in the total costs of production.[61] Moreover, amongst the 'respectable' members of the trade, the period was marked by a growing concern over, and even disgust with a buying public which was increasingly unaware of, or unable to distinguish the different types of raw materials used in its cutlery, to such an extent that it seemed indifferent to the quality and durability of the cutlery that it purchased.

For the grinders, the most significant change of the period was the introduction of emery grinding wheels which replaced traditional grindstones and avoided many of the dangers to health and safety which were inherent in the use of the grindstones.[62] The emery grinding wheel was introduced into Sheffield in the 1880s by a local engineer, but it was slow to win acceptance amongst the grinders. The reason for its unpopularity stemmed from the fact that the properties of the new wheel were so unlike those of old grindstones, that to use it involved a certain amount of relearning and adaptation. The emery wheel could not initially run in water and thus became very hot, sometimes causing the knife blade to heat up and lose its temper. However, the wheel was developed to enable it to run in water like grindstones, but unlike the latter, it retained a good 'cut' for 12 to 18 months. It ran safely at 5,000' per minute - a speed which made it unnecessary to exert as much pressure on the blade, thus making grinding lighter and quicker. Despite these advantages the wheels were adopted only slowly, partly because of the innate traditionalism of the grinders, and partly because of the expense of the emery wheels: £6 to £7 was a significant outlay for a grinder even if the manufacturer allowed payment in instalments.[63]

For the industry as a whole, the most influential developments in the uses of raw materials were in the field of hafting materials, where the rising and eventually exorbitant prices of natural materials forced manufacturers to consider cheaper substitutes. The rise in the cost of ivory in the early 1870s inflated prices by 30 to 100%,[64] and although in 1874 they began to fall again,[65] they rose to new peaks in 1875,[66] a result of the competition of an increasing number of foreign manufacturers for an ever decreasing supply at the major auctions. By 1881 further huge increases in

the price of hafting materials were once more forcing up the list prices of cutlery.[67] The cost of Manilla shells rose from £160 to £240 per ton, in just ten months,[68] whilst ivory had doubled in price between 1879 and 1883, until it was fetching £1,000 per ton.[69] The largest cutlery manufacturers attempted to keep their prices down by combining ivory cutting, which was generally a separate industry, with their cutlery production,[70] but it was an impossible task whilst an expanding market brought an ever diminishing supply of ivory.[71]

Faced with such circumstances manufacturers were forced to experiment with and use various substitute materials. Celluloid was first used in the late 1860s, vulcanite, ebonite and xylonite were in wide usage.[72] Considerable quantities were used in the production of cheaper cutlery, the largest and most prestigious firms experimenting with, and pioneering its uses. They were presumably keen to make economies on that part of the tool which would not effect to its essential quality - its cutting edge, and thus, as far as possible, retain a reputation for a fine and durable blade, but at a reduced cost. Moreover, these makers were anxious to attempt to underline the qualitative advantages of the new materials.

Illustrating the readiness of the institutions of the trade to encourage and support inventive and new approaches and initiatives, the Cutlers' Companies of Sheffield and London held a joint exhibition in London in 1879, at which awards were given to firms for technical excellence and the implementation of new ideas in the trades. Winners included a firm who had developed the manufacture of celluloid fork handles which retained their appearance and durability in hot climates [73] - a product obviously designed to appeal to the cheaper colonial market. Joseph Rodgers, the most prestigious firm in the trades, were at the forefront of these developments and were keen to broadcast their successes. By 1879 they were manufacturing "ebonite secure handle table cutlery"[74] in large quantities, and again stated their reasons in terms of concern for the quality of the product, and not its cost: it would neither crack, lose its finish, nor become loose, as bone and horn frequently did in hot climates, and it weighed much less. The cheapness

of these substances was stated almost as an afterthought, the firms being anxious to convince purchases that celluloid would "ere long become the recognised staple material" and ivory would "no longer be regarded by any class as indispensable".[75]

However, it remains debatable how far these companies were themselves convinced of this, and to what extent their customers were ready to believe them. There was still a large body of purchasers who would always want ivory, horn, bone or mother-of- pearl handled cutlery, precisely because it was so expensive and an obvious sign of affluence and 'good taste'. Moreover, these were the consumers for whom many manufacturers and workers in Sheffield were most ready and able to cater. If traditional materials were really a thing of the past, why were noted manufacturers still so keen to advertise their presence and extensive purchases at the various quarterly ivory sales?[76] Moreover, considerable time, effort and money were spent in finding more economical ways of using traditional hafting materials, but in such a way that the cutlery could still be marketed as 'the finest quality'.[77]

However, the greatest controversy concerning the use of newer, cheaper raw materials surrounded the types of steel used in the production of cutlery blades. The quality and durability of Sheffield blades were felt to be the major factor in the fame and continued prestige of the city's products. The use of cheaper steels, and particularly when these blades were falsely marked so as to imply that they were of a higher quality, was seen by many manufacturers and men as a dishonourable betrayal of Sheffield's commercial history and fame, and in cutting the links between the trade mark 'Sheffield' and high class goods, a policy that would fatally damage her future trade. If enough cheap steel was used, Sheffield's trading reputation would become akin to that of Solingen or Conneticut, and as it was believed that foreign competitors could produce these goods far cheaper anyway, Sheffield would lose customers on two counts: those requiring the best goods would lose faith in the 'Sheffield' trade mark, and those wanting low prices would still find it cheaper to buy elsewhere. Infact by 1886, the use of poor steel and its false marking were frequently

cited as fundamental causes of the depression in the cutlery trades.[78]

Inevitably, the craftsmen of the industry saw the use of cheap steel as an unavoidable consequence of the increased use of machinery, but were both despairing and indignant that the customer appeared to know and care so little about these distinctions. The whole question of the type of steel used by manufacturers thus became one of the touchstones of the attitudes that distinguished what were believed to be 'respectable' manufacturers from the 'unrespectable'. As so often in this industry, commercial respectability was closely associated with a respect for and adherence to time-honoured notions of trade etiquette, the values and practices which had made the industry great.

The type of steel which produced the finest cutting edge was crucible steel. It has recently been suggested that the quantity of crucible steel made in Sheffield was still increasing right until the end of the century: over 100,000 tons were turned out per year.[79] Although the fast growing tool and crinoline trades consumed a substantial amount of this output, the cutlery trades remained an important outlet for steel-makers, absorbing "a much greater quantity of steel than is generally supposed."[80]

Increased production did not however, appear to reduce the cost of this expensive metal. This was partly because the crucible steel makers remained very much a part of the old, small-scale steel making world, with cautious, conservative ways and the physical constraints of cramped central locations,[81] far removed from the world of the new bulk steel makers. Their conservatism may have been to some extent associated with their close relationship with the cutlery housed they served. Marsh Brothers, for example, "remained a family firm, relying as they had been want to do on their own capital only; they were too deeply interested in the small, old-fashioned cutlery and special steel trade to plunge into the unchartered sea of bulk-steel with its new science and new outlook".[82]

Technical and cost cutting developments which were affecting this industry were largely ignored in Sheffield, mainly because the purchasers believed that established methods produced the finest

steel - hence the unpopularity of the Siemens Furnace in Sheffield.[83] Small, speciality steel makers survived because the tool and cutlery manufacturers with whom they traded were prepared to bear the expense of speciality steels, often produced according to their own specifications.[84] The largest, celebrated cutlery firms placed such emphasis of the standard of their steel, that they considered it worthwhile to produce it for themselves. Joseph Rodgers decided on their own steel production in 1887, and went to considerable lengths to purchase sites.[85] However, they stressed that the reasons for this policy of "obtaining control of the whole process of manufacture" were to maintain the principles of the company motto - quality first.[86] The reputation of a quality steel manufacturing firm could be made or broken by the approval or disapproval of its cutlery producing customers.[87] For example, John Vessey and Sons were former cutlery manufacturers who realised the market potential for speciality steels in an industry that cared so much about quality and detailed specifications. They became producers of "steels specially suitable for the manufacture of all kinds of cutlery, especially pen and pocket knives, surgical instruments, razors, scissors....butchers knives and cutlery of every description."[88]

Even cutlery manufacturers who operated on too small a scale to contemplate their own steel production,frequently stressed the superior qualities of the steel they bought and used. This policy of linking the notions of the best quality steel with the best quality cutlery and then constantly reiterating the connection to the buying public was aguably a conscious and sensible strategy on the part of the Sheffield cutlery manufacturers. It further helped Sheffield, as the famous home of quality steels, to retain the 'quality gap' that separated her from her foreign rivals. Thus, Camille Pagé, the noted cutlery specialist could still affirm in 1896 that Sheffield cutlery had "une reputation montrée qu'ils devait surtout à la qualité superieure des aciers qu'ils emploient."[89]

However, with the development of a growing market for medium to low priced goods, and of machinery for manipulating lower quality steel, the manufacture of cutlery which used Bessemer steel became increasingly common in Sheffield. Nevertheless the consensus

opinion of the trade, in public at any rate, was that such production was somewhat disreputable and discreditable, and that it would do very little for the reputation or the pocket of the individual manufacturers or the Sheffield trades as a whole. The stamping of cheap blades with indications of a higher quality was treated, again in public, as a cardinal sin and betrayal of everything for which the Sheffield trades believed themselves to stand.

The use of Bessemer steels was thus inextricably linked to the scandalous and distasteful world of false marking and fraudulent commercial practices. In an industry noted for and constantly reiterating its concern for quality, the use of Bessemer steel, correctly or falsely marked, was inevitably a cause for wide-ranging comment and criticism, all of which damaged the reputation that the trades so desparately wanted to uphold. The whole issue developed into a scandal of national proportions,[90] with The Times reporting that half of Sheffield's cutlery was infact made from Bessemer steel,[91] allegations which were corroborated by The Ironmonger.[92] Whilst notable manufacturers did their utmost to reinstate confidence in the industry,[93] the problem was that section of manufacturers who felt no loyalty to these traditional values and in their 'selfishness', jeopardized the credibility of the majority.

To the leaders of the local craft unions, the use of Bessemer steel was an almost sacrilegious betrayal of all the principles they held dear. Such practices, especially when combined with fraudulent marking were believed to be the main cause of the depressed state of the trade, but also the decline in their wages and status, as skilled workmanship was both unnecessary and unachievable on poor quality steel. They quoted the American consul in Sheffield who had publicly stated that the thousands of tons of Bessemer steel which were sold by Sheffield cutlery manufacturers as crucible steel every year would "very speedily destroy all confidence in Sheffield steel, and render abortive the enterprise of our manufacturers and skill of our workmen, for it is useless to put good workmanship upon bad materials."[94] Even if a fine finish had been needed for a Bessemer blade, it was far more difficult for the craftsman to harden and sharpen this type of steel.[95]

Thus, such poorer quality raw materials like, and at the same time closely related to mechanized production techniques, could not be separated from fears of deskilling and the decline of craft techniques.

1889-1914

i) Mechanization and Product Design

This second period was marked by a far more concerted and large scale application of new machinery, techniques and raw materials. As the effectiveness of machinery increased and it became possible to produce a standardized, neat, middle quality item - which foreign competitors were both manufacturing and selling in large quantities to the expanding lower quality market - resistance to new developments became less judicious. Moreover, labour shortages at home, and the growing realization amongst trade unionists that working at factory based machines could ensure much better pay and conditions than sweated handicraft outwork, ensured that both employers and employed were more ready to consider change.

However, mechanization and innovation in these trades never amounted to anything approaching a wholesale transformation. Conventional practices and values were never discarded and changes were more in the nature of variations, initiated only with great caution: the old system was modified and adapted but never abandoned. The reasons for this were threefold: mentally and psychologically, traditional values and understandings had sunk such deep roots; the old system still contained considerable commercial vitality; and finally, it coexisted quite easily and efficiently side by side with newer developments.

The larger-scale conversion to mechanized techniques of production in Sheffield came with the successful development of such machines by competitors, and their use to capture the ever expanding low to medium quality market. German and American manufacturers had become particularly proficient with razor and scissor making machinery, which had reached a high level of perfection by the 1890s.[96] By the early 1900s, Sheffield cutlery firms were importing such quantities of German stamped scissor and razor blades, and finishing them in their own workshops, that a Remscheid firm established itself in Sheffield in 1902, to serve this market.[97]

Production of the blanks was completely mechanized; they were neat and well-finished, and stamped out at a rate of 1,000 per day, whilst two men could only hand forge five to six dozen in the same time.[98] By 1913, the Cutlers' Company was threatening to prosecute (under the Merchandise Marks Act) anyone who used imported German blanks in goods which they marked 'Sheffield', action which necessitated the establishment of another German firm in Sheffield.[99] many manufacturers were said to prefer such products, finding them "superior in finish and neatness to local products , which enabled the finishing process to be performed with less expenditure of time and labour".[100] Increasingly, the assumption that mechanized techniques could only produce poor quality cutlery, was being publicly questioned. The challenge thrown down by the razor grinders in 1894 to machine forged and flied producers, to manufacture a similarly high quality blade, was taken up with gusto,[101] but until the end of this period, arguments continued to rage about the merits of the two systems for cutlery production.[102] Sheffield manufacturers patented razor and scissor grinding machinery in the 1880s which possessed the additional virtue of making a neater blade which requiured less finishing.[103] However, as always, the machinery did not approach the levels of perfection which manufacturers required for best quality cutlery: the best razor blades, and the edges of the blades of cheaper razors were still hand-ground by craftsmen,[104] and it was not until 1910-15 that the heaviest razors could be machine ground, or the 'shoulders' cut in by machine.[105] The production of razor blanks by hydraulic presses, did not make significant advances in Sheffield until after 1903,[106] whilst machine table blade grinding only became widespread in Sheffield after 1911[107] and machine table and pocket blade forging not until 1914.[108]

Thus mechanized production, whilst it was making strides in Sheffield was still both delayed and halting in its adoption, certainly in comparison with America or Germany. It was not until 1905 that it could be declared that "There is no doubt that the machine age has now been entered upon. After years of experimenting and the expenditure of large sums of money, the stamped blade has been brought to such perfection that of some patterns they are

almost if not quite equal to the forged article."[109]

However, such reports must be treated with caution. "They persistently exaggerate the importance of invention, so that even in the most resolutely handicraft sectors of production, it often seems - on the evidence of single instances - that mechanization is about to take off. The trade reports from Sheffield in The Ironmonger, for instance, are filled with trials of machinery in the late 1860s and 1870s, yet the Sheffield trades remained overwhelmingly handicraft right down to 1914."[110]

Accompanying these improvements in available machinery, and equally, if not more important in convincing manufacturers, and pushing them towards their adoption, was evidence that the market for cheap and medium standard cutlery was large, expanding and very lucrative, whilst that for high quality expensive goods was not experiencing anything like the same expansion. The demand for cheap, standardized goods for the colonies was increasing as,during the 'Great Depression', was the demand amongst the British working classes for a similarly standard, affordable item.[111] Thus, from the 1890s, it is possible to discern a gradual change of emphasis: the realization that Sheffield's industry could not survive, let alone thrive on expensive production alone;[112] and concurrently, attempts to reconcile cheaper production with it, and its producers previously ignominious reputation.

However, whilst lower quality production was now publicly divulged by most leading manufacturers, for many it was still accompanied by an obvious sense of unease. That a firm also manufactured handmade, top class goods was usually mentioned in the same breath as discussion of their standard products, and these latter, and their purchasers, were treated somewhat condescendingly and patronizingly.[113] The traditional uneasiness at having to participate in such trade was reaffirmed by a trades unionist in 1892[114]: "Makers of the best cutlery are ashamed at the present state of things, but they are so often induced to deal in these common class of goods because they are ordered along with their better quality. Except for that, some would not deal in that common quality." It was frequently and emphatically stressed that two different markets were in existence, and that cheap goods were not directed at the discerning American or European buyer; they were

only intended for "the tastes and pockets of the ever growing populations of distant lands, at the present in course of development".[115]

Nevertheless, Sheffield's manufacturers, unlike their American counterparts, never really adapted themselves to the ever increasing demand from the developed nations for a well-finished 'throw-away' item like the American safety razor:[116] durability and lasting quality were standards too deeply ingrained in most Sheffield producers, to allow the easy adoption of this type of production. Thus in 1911, the Cutlers' Company was still finding it necessary to remind its members that "low quality goods are demanded in commerce".[117] However, it too was still disgruntled that this had to be the case; that so many consumers either could not, or worse still, would not pay the price for a superior article: "needless to say, the Company would be glad to see all Sheffield goods of the best possible quality, but it must be born in mind that low priced goods are needed, and that the standard of quality of low priced goods could not possibly be higher than that the material should be the best which can be afforded at the price consumers are willing to pay."[118]

Compounding these pressures towards increased mechanization were those affecting the supply of labour within Sheffield itself: manufacturers cited union mil itancy, intransigence and traditional practices as important in inducing them to introduce machines to reduce the men's bargaining power by replacing their skills. In the 1890s it was claimed that unions not only prevented the introduction of machines,[119] but combined this, in periods of good trade, with other restrictive practices which, in limiting the number of men in the trade, ensured their retention of a powerful bargaining position.

During the boom conditions at the turn of the century, The Times published a vitriolic attack on the cutlery unions in which it described these supposedly deliberate policies in which they persisted, despite the fact that trade was flooding away to more efficient, reliable, mechanized competitors.[120] Furthermore, whilst there was acknowledged to be much less time and work involved in the production and finishing of machine made cutlery,

the unions attempted to maintain the same rates as they earned on hand forged goods. The Times concluded that the only solution was "a greater resort to machinery, for the purpose both of securing more freedom and overcoming the restriction on labour difficulty... every fresh trouble that arises is regarded as offering a further incentive to the invention or the adoption of machines which can be worked by more or less unskilled labour."[121]

However, the issue was considerably more complicated and circular than this view would suggest. For whilst unions may occasionally, at certain boom periods and in certain branches of the trade, have been sufficiently powerful to stop the introduction of machinery, they were generally far too weak and ineffective to successfully implement such a policy. Rather, successful resistance was largely dependent upon the prior existence of a labour shortage in a branch of the trade, which in turn was normally the result of the displacement of labour which accompanied an earlier implementation of mechanized production. Labour saving devices reduced the skills and status of craftsmen who sometimes left the trade themselves, and often refused to apprentice their sons to it. Thus, the position of the skilled craftsman grew stronger when good trade brought general labour shortages, especially when Sheffield was still attempting to maintain a reputation based on the work of such artisans.

Overall however, manufacturers and their journals appear to have exaggerated and overreacted to the supposed power of unions as a factor in forcing them to adopt machinery. It is of course possible that this was a preconceived policy which provided an excuse and motive for their introduction of machines and 'common' production, which appeared worthier and less blatent contraventions of traditional values, than admitting that it was done for profit motives alone.

The machine forging of scissor blanks, introduced into Sheffield on a large scale by the 1890s, was publicised not so much as a profit guided manoeuvre, as much as a defensive action to ensure a regular supply, which would not be dependent on "the caprice of the workmen" whose nonchalant attitude to their work caused manufacturers to declare that "the world will not wait until

it pleases the scissor forgers of Sheffield to do their work."[122] Similarly, machine table blade grinding was said to have been given a great boost in 1913 by "the fear of trouble with the grinders."[123] Razor forgers were blamed for the difficulties encountered in introducing machinery to this trade in the 1890s, particularly in their refusal to "abate one jot from the statement price, although there might not be one quarter of the work to do".[124] The issue was as clear to The Ironmonger as it was to The Times: machinery was introduced mainly because of the "many customs and rules of the trade unions, which have worked more harm to the hands they are professedly intended to benefit, than tyrannical and greedy employers, high tariffs and foreign competition combined. The genius who originally drafted the rule forbidding the artisan to take more than one apprentice, and him only if a son, displayed as much wise foresight as the poor Ludddites and other machinery wreckers."[125]

However, this opinion was vigorously denied by various trade unions, for example the razor forgers who claimed, with some justification, that men had left the trade as a result of the shortage of work which had accompanied the importation into Sheffield of German razor blanks, leaving insufficient men to cope with a sudden boom in demand.[126]

Labour shortages which did force manufacturers to consider a mechanized alternative were general rather than selective or skill orientated, as was plainly illustrated in the unusually busy periods of the turn of the century and 1911-13. The chronic labour shortages in these periods were not the result of deliberate trade union policy as much as the fall in demand for labour following the McKinley Tariff and the development of machine techniques which resulted in a surplus of labour competing for a declining amount of work, and the low pay and conditions associated with such circumstances. Thus, when trade improved, many cutlers deserted the industry for openings which arose in alternative Sheffield industries, most of which, by 1900, offered "better paid and more congenial employment."[127] than the cutlery trades. Whenever possible, young men left the industry, and sons were apprenticed elsewhere.[128] However, the resultant worsening labour shortages

necessitated the further use of machinery for the prompt execution of orders in the 1911-13 boom.[129] Some machines were introduced with the express intention of employing semi-skilled, preferably juvenile labour in the place of skilled adults. Of Peache's patent grinding machine it was stated that "a youth of average intelligence can feed machines which will grind 2,000 blades a day," [130] whilst another manufacturer installed machinery because it required "labour of only moderate skill...work that you could train any steady, attentive man taken straight from the street to do in a very brief period."[131]

Union resistance to mechanization was therefore still firmly linked with efforts to resist deskilling, but it is doubtful whether their power and practices were as instrumental as manufacturers sometimes suggested. Moreover, some trade unionists seemed increasingly aware that mechanized production could infact entail considerably better opportunities for workers than those endured by sweated, manual, domestic workers. Robert Holmshaw, in his report to the Mosely Industrial Commission in 1903, was aware that the extensive mechanization of American cutlery factories allowed greater productivity without commensurate effort on the part of the workers. Thus, "labour saving appliances and up-to-date machines are welcomed by the men because, whilst lightening the work, they do not mean the reduction of wages."[132] Machines brought better working conditions and more sophisticated management which cut out the time lost by the men in fetching and carrying work from the various workshops.[133] Similarly, the delegation of trade unionists which visited Solingen on 1907, whilst critical of the limited skills of the German cutlers, were impressed by the advantages and improvements which mechanization necessitated: "The workshops of Solingen and their methods of production are easier than those employed by the Sheffield cutler, and....they are able to produce more quickly by their methods than by ours."[134]

However,it would still be a mistake to exaggerate the extent of the transition to mechanized production, and an even greater mistake to generalize about it, and overestimate the extent to which changes were welcomed by masters and men. A variety of sources indicate the continued dominance of handicraft methods with

-in the trades. Foreign observers were particularly surprised by the survival of what they considered to be antiquated methods,[135] whilst The Ironmonger continued to be a constant critic of what it perceived to be the apathy and economic backwardness of the Sheffield cutlery trades. A typical criticism struck deep at the roots of the conservatism and love of tradition which made it difficult for manufacturers to adapt to new circumstances: "It is impossible for an outsider to come in contact with any considerable number of persons engaged in the production of cutlery and kindred goods in that city without noting the strong spirit of aversion to change which runs through it, and explains why knives and tools of today are pretty much the same design as those of twenty or more years ago. To make matters worse, the absence of change for so long a time, has created in many minds that fatal idea that ... no further improvement of any practical value is possible ...it is impossible to get any novel ideas... turned into practical account, inasmuch as the workmen, unless their daily bread depends upon it, cannot be induced to forge new patterns."[136] Even A.J.Hobson, a leading Sheffield manufacturer and exponent of the virtues and values of mechanization, still complained in 1907 that the issue was "a very difficult problem to solve; it will not be solved in five years, or in ten years or perhaps in twenty years for many branches."[137] Practical descriptions of the cutlery production processes also convey a picture of an industry with an essentially handicraft base, dependent upon craftsmen who possessed the necessary " aptitude, skill and delicacy of touch which are the outcome of nature and experience."[138]

The same sentiments were never far from the minds of the most renowned, prestigious cutlery houses, who loathed the compromise and loss of reputation involved in association with common products.[139] Most of the long standing prejudices concerning common goods had never been overcome. When the Canadian Manufacturers Association, on a visit to Sheffield, mocked the primitive techniques used in the cutlery trades, the response of the Sheffield Chamber of Commerce bristled with the traditional values and the continued confidence placed in them. The Chamber wondered "whether the critics had ever tried shaving themselves with a wholly machine

-made razor, or using a pocket-knife with stamped instead of hand-forged blades. If they had, they might not be so surprised at the retention of human skill and knowledge in preference to mere mechanism in the production of articles of such close personal utility ... they left the cutlery works of Sheffield with a fair supply of the real article... and it is hoped that they will learn to appreciate the value of quality."[140]

Moreover, it seems that there continued to be considerable sense in perpetuating Sheffield's production and equally her image as a producer of high quality cutlery. Foreign tariffs which mounted consistently throughout this period always excluded low value, common cutlery to a far greater extent than the high quality products which the domestic industry was incapable of producing.[141] Sheffield continued to be virtually the only manufacturer in the world of certain handmade specialities, such as shear steel carving forks, for which there was a good demand right up until the 1930s.[142] Many of the most successful Sheffield cutlery houses still maintained that their prosperity was the result of their continued allegiance to the high quality, largely handmade production, on which their reputation had been built.[143] 'Artistry' in production was emphasised by both masters and men as another facet of Sheffield's wares that helped to maintain her reputation and which could not be imitated by competitors. Mechanization, which stifled decorative and diverse patterns, could well put paid to this unique and respected aspect of the trade.[144]

A reputation , a standard of quality automatically associated with a trade mark, was believed by many Sheffield manufacturers to be all-important. This was the reason given by many for the ease with which machinery had been adopted in Germany, where there were no traditions of high quality, 'one off' production by old, small-scale manufacturers. "The Germans, as a rule, always appear to aim at 'big business', and lay themselves out to produce economically any pattern which promises to sell in large quantities. They have no use for oddments and the wasteful attention to orders for '¼ dozens of no.413', the curse of many a Sheffield manufacturer."[145] It was believed that the Germans could afford to use large-scale component manufacturers and produce standard common cutlery because

they had no such traditions of and for quality: "The German's, coming from the cast metal, had a demand in quantities for simple patterns and they have made an improvement by stamping; if we had taken up stamping at an early stage we should have made a depreciation in our goods, and not so well have satisfied our customers."[146] This then, was firmly associated with the continued importance of market demands and expectations of the Sheffield cutlery trade. A huge range of good, specialised products was still expected by the consumer, and catered for by the large firms who continued to invent and patent ever more complicated, inessential products.[147] Moreover, many purchasers who could have been bulk buyers and consequently helped to create conditions favourable to mechanization - particularly the army and navy - where themselves often conservative adherents to old, obsolete, highly individualistic patterns, for which it was pointless to use machinery because "when an order is obtained, it means new dies, tools and so forth, which may never be needed again, as there is little continuity in government work."[148]

Thus, for reasons of both customary psychological preferences, but also for rational economic reasons concerning the nature of their market, many manufacturers found large-scale mechanization and the production of 'long runs' of goods unfeasible. A scissor stamping machine, for example, would need to make 8 to 900 dozen pairs of the same scissors in order to work economically, but this could be two years supply of a typical Sheffield pattern, which would chronically overstock the firm.[149] Thus the productivity and economy of the machine would be seriously hindered by the constant need to change dies and make adjustments to the machine.[150] Manufacturers therefore, continued to subscribe to the old compromise solution of inventing their own specialist machinery, suited to their own particular production and often jealously guarded as a trade secret.[151]

ii) Raw Materials

Although the period after 1890 witnessed significant advances in the development and application of the raw materials used in the cutlery trades, these received a predictably cautious and suspic-

ious response from both manufacturers and men. The psychological link between, and attachment to 'the finest raw materials', 'hand craftsmanship' and commericial respectability remained as strong as ever.[152] The best known firms continued to publicise the fact that there was no difference in the standard of the steel used for their high and common quality cutlery, and that economies stemmed solely from the type of hafting material used: natural or imitation.[153] This, it was stressed by implication, was in sharp contrast to less reputable firms and foreign producers.[154]

A number of Sheffield steel firms continued to manufacture special requirement cutlery steels, produced in small quantities, and often to individual requirements.[155] The local interest in this subject is illustrated by the discussion held by the Sheffield Technical School Metallurgical Society in 1892, which debated "Which is the best material for table blades: crucible cast or shear steel?"[156] The use of commoner steel was not even countenanced. Moreover, the opinion still prevailed that to produce the finest cutlery, different specifications of steel were necessary for the various descriptions of cutlery. "Cutlery steel is treated in so many different ways, that it is simply impossible to get a steel suitable for all kinds of work. One man wants a steel to weld on to an iron tang. Another wants a soft steel, to punch, free from seams, and to harden well... one cutler wants a knife to carry a rough cutting edge; another requires a smooth cutting edge"[157]

Although it was recognised that price had become a major factor in determining the type of steel used, it was still unquestionably agreed that shear steel should be used whenever possible. William Wardley, representing the working forgers, epitomized the opinion of these craftsmen when he stated that the durability and quality of a shear steel knife made it a much better buy, in the long term, and "manufacturers should not go in for competition so keenly, so far as raw materials is concerned."[158] The link was explicit between the quality of steel, the ability of the craftsman, and the reputation of the firm: "whilst hand forging is in the interest of the steel and improves it, goffing deteriorates its quality... nineteen out of every twenty blades made under a goff hammer are made out of common raw material, manufacturers having more sense than to put their best qualities under the goff, because

of course, the results would be against them."[159] In the course of the discussion, some of the extremely antiquated production techniques of the most famous houses, and their belief in traditional practices to ensure the best results were plainly illustrated: some firms still kept their shear steel bars for six to eight months before rolling them, as this was said to ensure a better quality blade.[160]

The actual mode of production of the best quality steel had changed remarkably little from its earliest inception,[161] until the revolutionary developments of 1912-13 which disrupted virtually every possible traditional understanding and principle. Harry Brearley, working in Firth's steel laboratories, discovered a formula for the production of stain resistant steel, which although originally intended for rifle barrels, he realised had significant potential for cutlery production.[162] Samples of the new steel were worked into knives by two local cutlery firms, but both were unimpressed and dismissive.[163] One firm said that the steel was "unsuited for cutlery steel: it is too hard to work and is almost impossible to grind, and the polished surface is dirty and a bad colour."[164] Firth's reached a similar conclusion, believing that stainlessness was in any case, "not so great a virtue in cutlery, which of necessity must be cleaned after each use."[165] Brearley claimed that the first cutler asked to make up knives from the steel had replied "Bloody likely, it would be contrary to nature".[166] Its unpopularity with the cutlers stemmed from their inability to treat the steel like ordinary steels: it had to be goffed by machine, and would not react easily to ordinary hardening and tempering techniques; it clogged the surfaces of the grindstones and was confused with carbon steel in the production processes. Thus "neither the structure nor the compostion of the metal gave the results for which for generations the forgers and grinders manipulating the older shear and carbon steels had looked."[167] Impossibly demanding tests were set up for the knives of the new steel, and various rumours were spread which claimed that a cut from a stainless steel knife was highly poisonous and dangerous.[168] These prejudices, combined with dislocation caused by the First World War caused significant delays in the introduction of the new steel.

However, In July 1914 Brearley did manage to find a cutlery manager at Mosley's who was willing to attempt further tests. Although initially unsuccessful, because they refused the inventor's advice on how to treat the new steel, this firm did obtain good results and were praised by Brearley:" They looked well ahead; they did not expect too much of the steel; they realised that some improvements in appliances and skill in handling them were possible, and the excellent knives they produced justified their optimism".[169]

Further movements towards a more scientific and strictly technical approach to cutlery production at the end of this period were evidenced by developments in the scientific testing and analysis of the properties of various steels and the cutlery made from them, using such techniques as chemical analysis, heat and cooling curves and microscopes.[170] That such methods were gaining acceptance illustrate the steady departure from the traditional 'rule of thumb' techniques. Although alien to the world of cutlery producers, such developments were hard to ignore because they aimed at the manufacture of even more predictably high quality steel and cutlery, objectives which had always been so dear to the industry.

The extention of the application of artificial hafting materials met with far less concern or opposition . This was partly because their use had now been sanctioned by time, partly because ivory prices continued to soar,[171] but also because the handle did not effect the essential cutting quality of the cutlery. 1896 was the busiest year yet for xylonite and celluloid dealers,[172] and as prices escalated, new types of xylonite were produced which were near perfect imitations of natural materials.[173] By 1905 Sheffield cutlery houses were using more imitation hafting material than real,[174] but the sheer demand pushed up celluloid prices by 10 to 20% between 1906 and 1907.[175] By 1913, the price of natural materials was so exorbitant that they had been almost displaced by substitutes, with only the very finest and most expensive cutlery still incorporating real ivory pearl or horn.[176] However, the acceptance of this change by the industry would not have involved too great an abandonment of its principles. Natural materials had become quite simply too expensive, whilst imitation had become so fine that they were a perfectably acceptable choice which no longer involved the stigma of price cutting cheapness.

Throughout this period, raw materials and the way in which they were crafted, remained a focal area of concern and debate within the Sheffield trades. The developments in the availability and application of new materials and techniques were, in themselves, rarely devastatingly new or revolutionary departures. Nevertheless, attitudes within the industry to such changes were extremely cautious. Whilst there was a general awareness and appreciation of developments, they were only adopted when they had been sufficiently tried and tested and most importantly, when they were understood to be compatible with the commercial strategy and reputation which the industry had created, and was attempting to maintain for itself.

There was considerable sympathy and common ground between the older, more reputable manufacturers, who constituted 'the voice' of the trades, and the craftsmen who spoke for the skilled workers and craft unions. Both appreciated the unique quality and reputation of Shefield's craftsmen and steel, and the fame of a trademark built on these attributes. Unique quality and diversity of production marked Sheffield out from all its competitors. Undoubtedly this reliance upon customary practices to ensure traditional quality, immersed sections of the trade in a kind of psychological inertia and narrow-mindedness. This resulted in certain inabilities to appreciate changing conditions - demand in particular - which made them disparaging and condemnatory of those who 'stooped' to common production, and embarrassed when they themselves finally felt the need to participate in that market.

Overall however, it is possible to see their actions as moderately flexible within a given framework which was essentially commercially rational. Even for those that decided, either openly or clandestinely, to attempt some common production and reduce their prices, the ease with which this industry could be adapted to cost reductions through division of labour and subcontracting, made the purchase of machinery even less of an inevitability.

Thus, by 1914, the industry had moved a considerable way towards the acceptance and implementation of new raw materials and techniques. However, this was done by compromise and cautious adaption which meant that the touchstone of these trades - commercial respectability and a reputation for the finest goods -

remained intact, and continued to colour all new departures. The Sheffield industry thus managed to retain its prestigious and exceptional links with the past, which whilst suiting the temperament of its practitioners, also enabled it to continue to mark itself out from competitors, retaining a well-known niche and name of its own.

Footnotes

1. D.H.Aldcroft, 'The Entrepreneur and the British Economy 1870-1914', Economic History Review, XVII, 1964,p.133. For further discussion of this view, see D.H.Aldcroft, 'Retardation in Britain's Industrial Growth 1870-1913', in D.Aldcroft and H.W.Richardson (eds.), The British Economy 1870-1939, London, 1969; H.J.Habakkuk, American and British Technology in the Late 19th Century: the Search for Labour Saving Inventions, Cambridge, 1962; D.Landes, 'Technological Change and Developments in Western Europe, 1750-1914' in H.J.Habakkuk and M.Postan (eds.), The Cambridge Economic History of Europe, vol.IV, Cambridge, 1965; L.G.Sandberg, 'The Entrepreneur and Technical Change', in R.Floud and D.McCloskey (eds.), The Economic History of Britain, vol.II, London,1981; D.McCloskey and L.Sandberg, 'From Damnation to Redemption: Judgements of the Late Victorian Entrepreneur', Explorations in Economic History, XI, 1971.
2. See chapter1, p. 11.
3. S.Pollard, History, p.126.
4. Lloyd, p.375-9; 394-5; The Ironmonger 15.3.1880, vol.23, p.660.
5. P.C.Garlick, 'The Sheffield Cutlery Trades in the 18th and 19th Centuries', p.78.
6. S.I.,9.1.1858.
7. P.P.1888,XXVI, Factory Inspectors' Reports, c.5328, p.37; J.Himsworth, The Story of Cutlery, p.74.
8. S.Pollard, History, p.129.
9. Ibid.
10. Lloyd, pp.185-7.
11. Ibid., p.187; S.I., 24.5. 1884; 22.12.1884.
12. P.P.1865, J.E.White's Report, case 199 (p.43).
13. British Industrial Publishing Company, Industries of Sheffield: A Business Review, Birmingham, 1888, pp.32, 39, 43, 92.
14. C.K.Harley, 'Skilled Labour and the Choice of Technique in Edwardian Industry', Explorations in Economic History, XI, 1974.
15. The Ironmonger, 25.7.1885, vol.34, a letter from America concluded that although there was no longer any real demand for British cutlery in America, "There is a limited demand for certain high-grade, English goods, which are sold on their traditional reputation, and command a price which bears very little relation to the actual value of the goods as compared with corresponding American makes...

these fine goods however, will probably always continue to be sold, as there are people who want them without any regard to price".

16. N.Rosenberg, Perspectives on Technology, Cambridge, 1976, p.191; See also S.B.Saul, 'The Market and the Development of the Mechanical Engineering Industries in Britain 1860-1914', Economic History Review, XX, 1967; R.Samuel, 'The Workshop of the World', History Workshop Journal, III, 1977, p.55
17. English Illustrated Magazine, August, 1884, p.666.
18. Ibid, p.665.
19. The Iron Age, quoted in S.I. , 7.8.1880.
20. Pawson and Brailford's Illustrated Guide to Sheffield and Neibourhood, Sheffield, 1879, p.253.
21. P.P. 1865, XX, J.E.White's Report, case 199 (p.43); R.Samuel, 'The Workshop of the World', pp.51-2; Pawson and Brailford, 1879,p.253.
22. L.G.Sandberg, 'The Entrepreneur and Technological Change', p.101; N.Rosenberg, p.191.
23. N.Rosenberg, p.159. Even in 1946, The Ministry of Labour and National Service found that "mechanization has not produced a standardized machine technique. Each maker has devised machines suited to his particular products". Ministry of Labour and National Service, Industrial Conditions in the Cutlery Trades, Report by the Cutlery Council, H.M.S.O., London, 1947, p.4.
24. Pawson and Brailford, 1879, p.256; The Ironmonger, 22.1.1887, vol.37, p.124, a high quality knife needed 60-100 "handlings" and "it has not been found profitable by any machinery to reduce the number of these operations more than 10 or 20 per cent in this branch of the cutlery trade." The Implement and Machinery Review, 1.10.1898, p.23290, "The difficulty is in grinding, no machine having yet been introduced for successfully accomplishing that operation; it requires intelligence, and that cannot be put into a machine".
25. G.P. Jones and H. Townsend,'The Rise and Present Prospects of the Sheffield Cutlery Trades', International Cutler, vol. 3, Feb 1953.
26. P.P. 1886, XXI, R.C. on the Depression in Trade and Industry, 2nd Report, 1886, C.4715, S.Uttley, q.1143.
27. Ibid., q.1144; P.P.1889, XIII, S.C. on the Sweating System, 3rd Report, 1889, C.4715, S.Uttley, q.24844; P.P.1890, XV, S.C. on the Merchandise Marks Act(1887), 1890, C.7586, C.Hobson, q.1204.
28. For example, see R.W.Cavill, 'Personal Reminiscences of Cutlery Manufacture', typed manuscript, S.C.L., M.P.184L, when a steam hammer was installed in Sheffield

in the late 1850s, "the table blade forgers in the town, believing that their living was endangered by this new invention, organised a rattening gang to destroy the machine; however, Mr. Lawson (its owner) heard of their intention in time to summons the police and Yorkshire Dragoons. The gang was driven away suffering numerous casualties, and the machine was saved". See also P.P.1865, XX J.E.White's Report, p.2.

29. B.R.Dyson, A Glossary of Old Sheffield Trade Words, pp.24,28.
30. P.P.1889, XIII, S.C. on Sweating, H.F.Davis, q.25373; P.P.1829,XXXVI, R.C. on Labour, 2nd Report, 1892-94, C .9795, Wardley, q.13960.
31. P.P.1886, R.C. on the Depression, Uttley, q.1214.
32. P.P.1889, XIII, S.C. on Sweating, Uttley, qs.24443, 24447, 24861.
33. H.C.Baker and S.Mitchell, 'Some Factors affecting Technical Progress in the Cutlery Trades', Occupational Psychology, vol.34, 1960, pp.48-9,51.
34. See chapter 5, pp. 155-7.
35. S.I.,30.3.1876.
36. P.P.1886, XXI, R.C. on the Depression, Belk, q.2659.
37. Pawson and Brailford, 1879, p.258.
38. S.I.,28.5.1862.
39. The Ironmonger, 21.12.1889; 9.8.1890; 8.11.1890.
40. British Industrial Publishing Company, Industries of Sheffield, 1888, p.80.
41. Ibid., p.96.
42. Working Party Reports: Cutlery, p.8.
43. H.R.Singleton, A Chronology of Cutlery, Sheffield, 1973.
44. R.Floud, The British Machine Tool Industry 1850-1914, Cambridge, 1976, p.31.
45. S.I.,7.5.1874.
46. S.I.,23.1.1880.
47. S.I.,15.1.1880.
48. British Industrial Publishing Company, Industries of Sheffield, 1880, p.83.
49. Ibid., p.91.
50. Ibid., pp.35,91; Implement and Machinery Review, 1.7.1882, pp.4425-6.
51. J.B.Himsworth, The Story of Cutlery, p.144.
52. H.Tatton, Henry Tatton's Heeley Notebook: Sketches from Heeley's History, Sheffield, 1986, p.8.
53. S.I.,11.10.1873; The Ironmonger, 15.1.1887, vol.37, p.89.
54. S.I., 11.10. 1873.
55. S.I.,27.1.1877; 30.11.1877; 21.12.1877; 11.1.1878, the price of work on the new

'Shaw' knife, for example, which was selling well in America in the late 1870s, caused disputes which were so intense that they were taken to court.

56. S.I., 20.10.1873.
57. S.I., 21.11.1877.
58. S.I., 2.2.1884, the secretary of the Razor Grinders Union, for example, believed that low payment was the principle reason for the unpopularity of hollow grinding amongst the Sheffield grinders; the work was considerably better rewarded in Germany. Thus, whilst ever they were in a position of a skill which still commanded a good wage, there was no real incentive to learn further skills.
59. Ibid.
60. J.B.Himsworth, The Story of Cutlery, pp.56, 132, 136, shut knives, for example, ranged from "pen and pocket with one to eight blades, fleans and scribers, clasp, lock, budding, grafting and corn knives, sportsmen's and champagne knives...with round, square and nick joints, nail-nick, long nail-nick, notch hollow, steptang, catchsides, spear and castrating shape blades, iron and brass webbs, scale and bolster shadows, equal ends, round reverse and flat backs, "Wharncliffe" and "Congress" shapes".
61. P.P.1886, XXI, R.C. on the Depression, Belk, qs. 2839, 2841; S.I.,16.11.1872.
62. See chapter 7, pp. 229-243, 'Health'.
63. J.B.Himsworth, The Story of Cutlery, p.65.
64. S.I., 28.12.1872.
65. S.I., 14.3.1874; 7.3.1874.
66. S.I., 4.12.1875.
67. S.I., 25.11.1882.
68. S.I., 10.2.1883.
69. S.I., 24.4.1883.
70. Joseph Rodgers and Sons Ltd., Under Five Sovereigns, Sheffield, 1911, p.27; British Industrial Publishing Company, Industries of Sheffield, p.27; Christopher Johnson and Co., Patterns and Price Lists, 1873, S.C.L., M.D.2378.
71. S.I., 5.5.1879.
72. S.Pollard, History, p.129; J.B.Himsworth, The Story of Cutlery, p.73.
73. S.I., 5.5.1879
74. Pawson and Brailford, 1879, p.256.
75. British Industrial Publishing Company, Industries of Sheffield, p.27.
76. Joseph Rodgers, Under Five Sovereigns, pp.25-27.
77. S.I.,1885, Such a technique was that developed by C.Ibbotson, a well-known cutlery manager, whereby strips of ivory or pearl were soldered on to wooden or

white metal handles, making them 30 - 60% cheaper, but still the legitimate 'genuine' item, S.I. 21.7.1885.

78. P.P.1886, XXI, R.C. on the Depression, S.Uttley, q.1143; P.P.1890, XV, S.C.on the Merchandise Marks Act(1887), Hobson, q.1204; P.P.1892, XXXVI, R.C. on Labour, W.F.Wardley, 19244.
79. J.G.Timmins, p.194; K.C.Barraclough, 'The Production of Crucible Steel in Britain by the Cementation and Crucible Processes', Journal of the Historical Metals Society, vol.8,1874, p.106.
80. J.G.Timmins, p.209.
81. S.Pollard, Three Centuries of Sheffield Steel: The Story of a Family Business, Sheffield, Marsh Bros., 1954, p.42.
82. Ibid., pp.29-30, 42.
83. J.G.Timmins, p.234; The Ironmonger, 15.1.1887, vol.37, p.88, some Sheffield steel firms offered cheap steel, but their old customers were reported as being dissatisfied with its quality, preferring the original better quality steels.
84. J.G.Timmins, p.209.
85. Joseph Rodgers bought a water powered forge at Leppings Lane in 1890, moved to a tilt at Oughterbridge in 1894, and then to Middlewood forge in 1903. They also produced their own cast steel from 1894, and in 1907 bought the large Sheaf Island works from William Jackson and Co., Under Five Sovereigns, p.9.
86. Ibid., pp.9, 25.
87. G.Tweedale, Sheffield Steel and America: A Century of Commercial and Technological Interdependence, 1830-1930, Cambridge 1987, pp.32, 97. G.Tweedale, Giants of Sheffield Steel: The Men Who Made Sheffield the Steel Capital of the World, Sheffield 1986,pp.50-51; S.Pollard, Marsh Bros., p.33.
88. The Century's Progress: Yorkshire Industry and Commerce, London, 1893,p.124. A few other firms also combined the production of steel and cutlery, for example, Wingfield Rowbothams who acted as general merchants, cutlery merchants, blister, cast and shear steel makers, British Industrial Publishing Company, Industries of Sheffield, p.109.
89. C.Pagé,La Coutellerie, vol.VI, p.1482.
90. See chapter 3, pp. 83-90.
91. Reported in S.I., 10.11.1879.
92. The Ironmonger, 14.2.1880.
93. S.I., 10.11.1879, one manufacturer wrote that respectable cutlery houses "continue to use the same fine brands of steel as those by which their reputations were originally founded, and the care and skill used in manipulation were never so great as at present".

94. P.P.1886, XXI, R.C. on the Depression, S.Uttley, q.1143.
95. Ibid.; S.I. 23.7.1878.
96. S.I., 11.8.1894; 18.8.1894; 22.9.1894; The Ironmonger, 1.3.1887, vol.34, p.140.
97. S.I., 5.4.1902; 17.11.1902.
98. S.I., 5.4.1902.
99. S.I.,1.5.1913; 16.4.1913.
100. S.I.,1.5.1913; 22.7.1899; The Ironmonger, 15.3.1880, vol.23, p.660.
101. S.Pollard, History, p.102.
102. S.I., 12.1911, The first in a series of letters on the subject.
103. S.I., 15.10.1894; 3.8.1889; The Ironmonger, 1.10.1898, p.23290.
104. J.B.Himsworth, The Story of Cutlery, pp.90-92, 148.
105. Ibid., p.148.
106. P.P.1908, III, Departmental Committee on the Truck Acts, 1907, Cd.4444. A.J.Hobson, q.12478.
107. P.P.1911, XXII,Factory Inspectors' Report, cd. 5693, p.51, ibid., 1912, XXV, cd. 6239, p.62.
108. S.Pollard, History, p.204.
109. S.I., 11.2.1905.
110. R.Samuel, 'The Workshops of the World', p.14.
111. C.Wilson, 'Economy and Society in late Victorian Britain', Economic History Review, XVIII, 1965; S.B.Saul, The Myth of the Great Depression, London, 2nd. edition, 1986, pp.30-34;
112. See chapter 3.
113. Sheffield and Rotherham Up-To-Date, Sheffield, 1897, p.129: In discussing the production of George Butler's, it was stated that "not only is the finest grades of goods manufactured by them, but those for the millions are not overlooked". Of Needham Veall and Tyzack's production, it was stated that "preparation and manipulation are regulated by a scientific knowledge, combined with the highest order of workmanship", ibid, p.126. Christopher Johnson's informed their Indian customers in the early 1880s, that whilst they had sent samples which represented "the highest class of sportsman's knife,...our manufactures also include every description down to the commonest article which goes largely into your market", Christopher Johnson, Foreign Letter Book, 1879-1883, S.C.L.,M.D.2368.
114. P.P.1892, XXXVI, R.C. on Labour, W.F.Wardley, q.19628.
115. Sheffield: Cutlery Capital of the British Empire, Sheffield, 1919, p.20.
116. From the American Cutler, quoted in G.Tweedale, Sheffield Steel and America, p.128.

117. Cutlers' Company Records, Annual Report, Jan. 1912.
118. Ibid.
119. S.I., 18.8.1894; 24.9.1894.
120. The Times, 26.12.1901.
121. Ibid.
122. S.I., 13.9.1913; 7.2.1914.
124. S.I., 16.2.1897.
125. Quoted in S.I., 12.5.1890.
126. S.I., 6.5.1890.
127. S.I., 1.9.1900; 18.1.1896.
128. S.I., 1.9.1901.
129. S.I., 26.10.1912; 24.1.1913; 15.3.1913; P.P.1892, XXXVI, W.F.Wardley, qs.19244-5 19356; the Labour Gazette, Nov.1893, p.150; The Times, 23.6.1897.
130. S.I. 3.8.1889.
131. P.P.1910,VIII, R.C. on the Poor Laws and Relief of Distress, 1909, cd. 5066, A.J.Hobson, q.88405; S.I.,28.5.1910.
132. R.Holmshaw in the Mosely Industrial Commission, quoted in S.I., 18.4.1903.
133. Ibid.
134. The Metal Worker, vol.I, Nov.1907, p.233; vol.II, Nov.1908 p.24.
135. Chamber of Commerce Records, Annual Report, Feb.1906, S.C.L., L.D.1986/6.
136. The Ironmonger, quoted in S.I., 7.4.1900.
137. P.P.1908, III, Committee on the Truck Acts, A.J.Hobson, q.12434; P.P.1910, VIII, R.C.on the Poor Laws, A.J.Hobson, q.88379.
138. J.Pendleton, 'Industries of Sheffield: Fact and Romance', in Sheffield in 1902: A Survey of the City at the Beginning of the 20th Century, p.25, Sheffield, 1902; S.I.,13.2.1889.
139. Sheffield and Rotherham Up-To-Date, pp.123, 134.
140. Chamber of Commerce Records, Annual Report, Feb.1906, S.C.L., L.D.1986/6.
141. See chapter 3, pp. 80-3.
142. J.B. Himsworth, The Story of Cutlery, p.102.
143. Handicrafts that Survive: Souvenir of the Master Cutlership of Mr. A.J.Hobson, 1902-3, no publication details, 1903; in 1921, Joseph Rodgers and Co. still accounted for their success in terms of "old methods and old servants", The Metal Industry, vol.19, 1921, p.83.
144. J.B.Himsworth, The Story of Cutlery, pp.154, 92; P.P.1908, III, Committee on the Truck Acts, A.J.Hobson, q.12478; The Metal Worker, vol.I, Nov.1907, p.235.

145. The Metal Industry, 6.2.1920, p.105.

146. P.P.1910, VIII, R.C. on the Poor Laws, A.J.Hobson, q.88376; Handicrafts that Survive, p.38, "It is by reason of this diversity of tastes...and the consequent variety of patterns, that the making of pen and pocket knives remains to so great extent a handicraft which offers comparatively little opening for the introduction of machinery".

147. See for example, the patents of Wheatley Bros., and Needham, Veall and Tyzack, S.C.L., N.V.T.5 and 9.

148. S.I., 3.6.1905.

149. P.P.1910, VIII, R.C. on the Poor Laws, A.J.Hobson, q.88376.

150. Ibid.

151. Most of the large and important firms developed their own specialist machines. At Needham, Veall and Tyzack's "most of the machinery here is only known and used by themselves, being the invention of one of the late principals", Sheffield and Rotherham Up-To-Date, p.127.

152. Ibid., p.126.

153. Ibid., pp.122, 135, 138; At Needham, Veall and Tyzack's, it was stated that "the first and most essential factor in the production of reliable cutlery is, of course, the raw material, and in this connection, it may be stated that from the earliest period of its establishment and subsequent progress of this house, none but the very finest steel, specially hardened and tempered, by skilled craftsmen for the purpose for which each article is intended, has been used - a policy we are sure the firm has no intention of departing from", p.127.

154. The Metal worker, vol.II, no.23, Nov.1908, p.244. The Federated Metal Trades of G.B. sent a delegation to visit cutlery producers in Solingen, where they were impressed by the technical proficiency of the machinery, but scathing that so much poor quality steel was used.

155. Visits and Excursions at the Sheffield Meeting of the Iron and Steel Institute, Sept. 25th - 29th, 1905, London, 1905; Handicrafts that Survive, pp.14-19; Marsh Bros. Works Notebooks, 1910-11, S.C.L., M.232.

156. Jounal of the Sheffield Technical School Metallurgical Society, 1892, pp.161-176.

157. Ibid., 163.

158. Ibid., p.167.

159. Ibid., p.169, Wardley talked about forging steel in terms of an art form: goffing hammers "thugged" a blade, whilst skilled hand forging "kneaded it like clay".

160. Ibid., pp.166, 170-1.

161. The Times, 23.6.1897. D.Flather, 'Crucible Steel: Its Manufacture and Treatment', Proceedings of the Staffordshire Iron and Steel Institute, 1901-2.

162. H.Brearley, Knotted String: Autobiography of a Steel Maker, London, 1941, p.126; S.Pollard, History, p.225.

163. H.Brearley, Stainless Steel: The Story of its Discovery, reprinted from the Sheffield Daily Independent, 2.2.1924, pp.12-13.

164. G.Tweedale, Sheffield Steel and America, p.77.

165. Ibid.

166. Ibid.

167. J.B.Himsworth, The Story of Cutlery, pp.74-5.

168. Ibid.

169. H.Brearley, Stainless Steel, pp.14-15, 13.

170. The Ironmonger, 21.12.1901, pp.506-7; W.H.Hadfield, Cutlery, Stainless and Otherwise from a Scientific Point of View, Sheffield, 17.12.1919.

171. Ivory prices soared in the 1870s, because of a continued limited supply and increasing competition at sales from German and American buyers (S.I., 5.1.1889). Although prices fell in the early 1900s, they returned to their 1898 peak in 1905, (S.I.,5.8.1905) and continued to rise until 1914 (S.I., 31.7.1909; 29.4.1910; 26.4.1913).

172. S.I., 19.12.1898.

173. S.I., 3.9.1898.

174. S.I., 18.3.1905.

175. S.I., 13.4.1907.

176. Lloyd, p.54.

Chapter 3 Trade Patterns and Their Contemporary Evaluation

Opinions of both employers and workers concerning the decline in world trade and severe depressions of this period, differed widely with the circumstances: sometimes the problem was felt to rest with false marking, at other times with tariffs or excessive wage rates. Most attention and debate was directed towards short-term problems on the demand side. These were usually outside the direct realms of the trades themselves, and thus avoided structural or marketing faults within the industry - faults or problems which necessitated action by the industry. Although towards the end of the period there was discussion of the importance of mechanized production and advertising campaigns, such criticism often came from people outside the city and industry, whilst manufacturers who voiced and practised such novel ideas were often branded as 'unrespectable', traitors to the principles which had made Sheffield great.

This chapter is not an attempt to apply hindsight to judge or analyse 'entrepreneurial failure' in the field of exports, but endeavours to understand the reasoning and priorities of those involved in the industry. Why were they obsessed with seemingly peripheral and dated issues, yet unable to tackle even the idea of faults and problems within their own procedures and beliefs? There appear to be broadly two reasons for this: the acute sectionalism of the industry in terms of both products and markets, which in reducing the occasions of like experiences, inhibited the ability to think and act in terms of large-scale, common causes; and secondly and more importantly, the continued adherence to traditional values and practices - particularly the value of quality, which made it difficult to accept, let alone embrace, new ideas. There was considerable economic rationality in the policy of far reaching product differentation, specialization and quality production, which quite successfully insulated the firms who marketed such products, from the competition of mass-produced German and American goods. However, such a strategy necessarily limited horizons and made it difficult to branch out into a wider market, whilst inevitably also concent-

rating too much attention on demand conditions, rather than the factors within the firm which had brought about such a high degree of specialization.[1]

Trade Patterns and Levels[2]

The small amount of information available on the sales of cutlery to the domestic market, renders difficult any estimation of the relative importance of home and foreign demand to the Sheffield cutlery trades. Less attention was directed to domestic demand because this market was considerably more stable, easier to satisfy with a traditional high quality item, and more accessible to the personal sales techniques of the cutlery houses. Moreover, the domestic demand, although it accounted for approximately half the value of the U.K.'s cutlery sales in 1907,[3] was generally smaller than this. It assumed more importance as the overall values of foreign sales dropped, and in the years when this demand was particularly slack, as in 1899-1901. As it was the export market on which attention was focused, in which changes in demand and selling techniques were demanded, and in which greatest sales and profits could be achieved, emphasis will be placed on the supply of that market in this section.

Statistically, exports of cutlery have to be treated separately before and after 1898, as before this date they were incorporated with exports of hardware, whereas after 1898 they were treated independently. Before 1898, exports fluctuated remarkably widely. They peaked in the all-time boom year of 1872, when export sales reached £5,000,000, and again in 1882 and 1889 with exports of £4,100,000 and £3,180,000 (see graph 2). Troughs occured in 1879 and 1886 when only £300,000 and £280,000 of cutlery were exported, falling even lower to £180,000 in 1894, with little improvement on that situation by 1898.[4] Despite the amplitude of variation, the overall trend was towards a significant decline in the value of exports after the boom of 1872-4. This tendency was confirmed by manufacturers who gave evidence before the Royal Commission on the Depression in Trade and Industry of 1886.[5]

Cutlery exports, when classified independently, equalled only a quarter of the value of previously indistinct hardware and cutlery totals (see graph 3). From a low point of only £56,000 of exports in 1898, trade improved fairly steadily, apart from sharp lapses in 1906 and 1908, and then increased sharply to reach £880,000 in 1912.

In the first part of this period, the most important market for cutlery was America, but American demand was particularly prone to sharp fluctuation (see tables 4 & 5). The peaks in exports to this market came in 1872 (£350.000) and 1882 (£250,000), whilst troughs were in 1876 (£125,000), and 1885 (£150,000). Also vitally important, but similarly unstable, was the Australian demand for hardware and cutlery (see table 5). Next in importance came the S. American and Indian markets, which imported between £250,000 and £450,000 of cutlery and tools from the U.K. annually. In the early 1870s, Germany too had been a large importer of British cutlery, but as her own production increased, her imports declined accordingly. Finally Canada, Russia, Holland, France and British South Africa (see graph 4) were all quite large importers. However, in all the above mentioned markets, with the exceptions of British India and Australia, the value of cutlery and hardware exported from Britain declined considerably from its peak of the early 1870s. Similarly, virtually all markets experienced peaks and troughs of demand within a year of each other: peaks in 1872-3, 1880-2, and 1888-9; troughs in 1878-9 and 1885-6.[6]

In the second part of this period, Australia was, by a significant margin, Sheffield's best market for cutlery, although as in the earlier period, its annual imports continued to fluctuate enormously: between £110,000 and £170,000. Australian demand peaked in the same years as general demand for cutlery peaked (see graphs 4 & 11), in 1891, 1896, 1900, 1907, and 1912. Its troughs were similarly experienced when cutlery exports generally slumped: in 1894, 1898, 1904, and 1908. America by this period, had ceased to be a top ranking importer of Sheffield's cutlery, and by 1912, was importing a lesser value than Canada, S.America, British India, S.Africa or Germany (see

graphs 4 & 8). Canada and S.America were, by the end of this period, very lucrative markets, importing between £55,000 and £120,000 of cutlery annually (see graphs 4 & 9), as were British S.Africa and India. Germany imported a stable, but small amount of cutlery until 1909, after which time her imports increased suddenly, to reach £65,000 by 1912. France, Holland and Russia all imported under £10,000 of cutlery a year from the U.K. (see graph 4).

Imports of cutlery into the U.K. rose sharply between 1903 and 1907, from £30,000 to £150,000, (see graph 7), but after this date remained very stable.

Seasonal Trends in Trade

Seasonal trends, although they could be disrupted and completely altered by cyclical booms and slumps, remained an important, and fairly accurately predictable feature of the cutlery trades, as they had been for as long as anyone could remember. This seasonality, combined with the inconsistency of demand from one year to the next, was a significant factor in dissuading manufacturers from adopting mechanized, factory production.

Trade in January was usually quite poor, unless the orders from the previous Christmas had been so large that trade was carried over into the New Year, or unless there was a general upturn in trade which caused retailers to buy in stocks. However, both these circumstances became gradually rarer as the Christmas season became better organized and began earlier; and as changes in fashion became more pronounced, thus making retailers less willing to build up stocks of what could very quickly become outmoded designs. Letter orders would begin to arrive in January and travellers would normally start their journeys at the end of this month. Trade was sometimes hampered however, by severe weather conditions, which made the transport-ation of goods difficult, and discouraged people from shopping.

The second quarter of the year was normally busier than the first, as trade picked up, until the lull which occurred between the summer and winter seasons, in May and June. In anticipation

of the breaks, work would increase markedly before the Easter and Whitsuntide holidays, the lengths of which would depend on the state of trade. In busy periods, holidays would be reduced to a minimum and summer and winter stock taking would be similarly shortened, although the men would compensate by taking unofficial breaks, particularly when the weather was fine. When trade was slack, manufacturers would take advantage of the breaks to close their works for as long a period as possible, and use up stocks. Summer holidays, until the early 1900s were taken over a long period, as the policy of shutting down the works whilst all employees took their vacations at the same time, did not become general practice until after 1905. Before this, holidays would drag on indefinitely, extended in an impromptu fashion, when trade and the weather were good. It was widely acknowledged that throughout most of this period, the men did not really settle down to their work again, until after the break for the Doncaster Race meeting of early September. There continued to be a traditional observance of all time-honoured festivals, which were slow to die out. These included the normal breaks for Christmas, Easter and Whitsuntide, but also half a days holiday on Shrove Tuesday and the same on traditional, although no longer significant quarter rent days.[7]

When trade was reasonable, no time of the year in the cutlery trades was ever completely slack, largely because of the huge variety of markets which were served. From March, for example, Indian and Chinese demand fell off, as their hot weather season approached, but orders increased from British and continental holiday resorts, and from the liner companies. Similarly, just as the important American demand fluctuated widely from year to year, so it fluctuated throughout the year: business generally peaked in the quarter which ended in September, whilst the troughs, although harder to predict, usually came in the quarter which ended in March (see graph 6). The amplitude of variation in this market was greatest in the early 1870s when the annual demand was at its highest: some quarter periods would see exports of £80 - 90,000, whilst in others American imports would reach only £20 - 30,000. These variations declined markedly as

the total value of cutlery exports from Sheffield to America fell.

The industry was normally slack in September, but picked up in October, as the Christmas season began in earnest. In the earlier part of this period, the Christmas season still began very late, often as late as the end of November, making work intense in the month before Christmas. However, the traditional exertion of 'calf', 'cow' and 'bull' weeks, (being the last three weeks of mounting and excessive exertion before Christmas) was already outmoded at the beginning of this period, as factory legislation in particular, put paid to such ritualised overwork.[8] Inproved and speedier communications, increased factory production and rapidly changing styles, were all stimuli which necessitated an earlier start to the Christmas season, as orders were placed earlier, until what had at one time been the busiest weeks of the year, often became the slackest ones as orders were completed and dispatched for sale well before Christmas. November and December were virtually always the busiest months of the year: a good Christmas season could dramatically improve the trade levels of an otherwise slack year. Christmas holidays, like all other holidays, were dependent on the state of trade, and could be extended from a week to a month.

The Attitudes of the Industry Towards its World Trade

In the earlier part of this period, foreign competition was not seen, or at any rate admitted , to be a serious problem. In 1885, whilst the Master Cutler recognised the increasing German competition (facilitated as he understood it, by the longer hours, greater frugality and lower wages of German cutlers) in neutral markets, this was not seen as any great threat: Sheffield was confidently believed to be able to hold its own.[9] Interestingly, it was the smaller and less prestigious houses who at this stage were most ready to acknowledge the intensity of foreign competition with its successful use of mechanized forms of production.[10] In the home market, foreign competition was never likely to assume large proportions, mainly because of the distictive style of Engish cutlery.[11] By the 1890s severe

competition in neutral markets was more readily acknowledged. Many manufacturers realized that they had been "too apt to sneer at our German competitors",[12] as they, and the Americans turned out increasing quantities of cheap, stylish, well-finished and packaged cutlery. However, German competition declined sharply after the 1890s, as their prices increased. Sheffielders generally were unwilling to discuss foreign competition without dismissing the issue in terms of the value and applicability of cheap mechanized production - a subject on which many, at least in public, still expressed firmly antipathetic views.[13] It was normally left to outsiders to raise the issue.[14] Many producers continued to adhere to the policy of maximum possible product differentiation, "designed to exploit the marginal differences in quality, and by creating the impression that the differences were greater than they were in reality, many British firms were able to serve a degree of oligopoly power."[15] They relied upon the ingrained preferences of some consumers for products which possessed the actual and social value of 'craftsmanship'. Such producers were shielded from and felt to be less threatened by foreign production of cheaper mass produced items. Even when firms did produce cheaper items, they still attempted to give them the market advantage of their trade mark and that of 'Sheffield'.[16]

Throughout this period, whenever foreign competition was discussed, it was rarely dissociated from the issues of tariffs and the fraudulent use of Sheffield trade marks, which therefore phrased the problem in traditional terms of quality and reputation, whilst also removing the onus of action from Sheffield's manufacturers. Both tariffs and false marking were seen by the Sheffield industry as unjust changes to the old rules of the game, which in shutting out or imitating Sheffield goods, merely acknowledged their superiority and the impossibility of their being matched under fair and normal trading conditions.[17] Foreign competition was therefore, often defused as an issue which reflected American and German trading ability, or the nature of market demands. Moreover, once seen in these terms, little could be done apart from bemoaning the injustice of politicians and the commercial dishonesty of some traders: nothing more

searching or introspective was felt to be necessary. To some extent, such attitudes reflected the inability, or at least unwillingness of Sheffield manufacturers to come to terms with the fact that the market for expensive, quality goods was no longer as buoyant as it had been, and that many consumers now wanted a cheaper item which competitors were now ready to supply. Their inertia could also have been a reflection of the practical difficulties involved in attempts to switch from specialized to more general, common production.

Tariffs had important consequences in terms of both long and short term trade flows. A huge increase in demand would take place immediately before a hostile tariff, as retailers stocked up with goods whilst the price remained low; but this would be followed by a commensurate fall in exports until retailers were forced to selectively restock, albeit at a far reduced level.

Most significant was the American Mckinley Tariff of 1890, which replaced ad valorem duties with much higher specific ones of between 100 and 200%. As with virtually every tariff of this period, it excluded cheap and medium quality cutlery which the now protected domestic industry could produce, but was far more lenient on the higher quality, specialized cutlery which its own producers could not attempt to manufacture.[18] The purpose of the act was recognised to be "to crush out as far as possible all importation",[19] and indeed, the boom that preceded the act was never repeated, as importation of all but the finest and most specialized items ceased.[20] Thus, Sheffield cutlery was believed to be beaten not on its own merits, but shut out without a chance,[21] a fact particularly galling to firms which had made considerable efforts to research a market, and manufacture accordingly.[22] Sheffield manufacturers, through the Chamber of Commerce, paid considerable attention to the details of new tariffs, and went to much, though usually unsuccessful, trouble to have them revised.[23]

Problems were not, however, limited to the actual closing of a formerly lucrative market: the anticipation of a change would also dislocate trade. Exports to Canada slumped before the reduction of the tariff in 1898, whilst the expectations of a

significant reduction in the Mc'kinley tariff, although unfounded, also dislocated trade. Moreover, growing uncertainty, as tariff barriers were erected all over the world,[24] created increasingly severe bouts of panic and despondency amongst manufacturers,[25] and despair that even those markets which remained open were often obstructed by biased customs officials.[26] However, whilst high quality cutlery was generally exempted from such duties, it was further useful valid ammunition to those manufacturers and men who regarded such goods as the only type that Sheffield should be manufacturing anyway. A correspondent in the Sheffield Independent, realising that the proposed French tariff of 1881 would wipe out Sheffield's exports of cheap cutlery, still felt that "it would be no great evil, as Sheffield would then have a chance of regaining her name for turning out cutlery that would stand the test of any inspection, and for which the consumer abroad would be glad to pay well".[27]

The practical results of the debate on tariffs were, however, minimal. They produced a limited impetus to find and exploit some fresh markets (see forward), but more often the result was political debate. This, although heated, detracted attention from the internal problems of the Sheffield trades, and was never about to result in the implementation of any practical policy.

The Free Trade versus Protection debate was the crucial trade issue affecting manufacturers at two stages in this period: in the late 1870s and 1880s and the early 1900s, the same periods, broadly, in which the debate was a central national issue. In the 1870s, this was sparked off by the discourse between the local Liberal M.P., A.J.Mundella, and steel maker Frederick Brittain,[28] but it seems that most cutlery manufacturers and workers remained firm adherents to Free Trade principles. Charles Belk, a former Master Cutler and a Conservative, believed that Protection, in increasing the costs of imported commodities, would increase the price of British exports, and remained commercially, as well as morally wrong, as well as politically inexpedient.[29] Free Trade was "an ever present help in prosperity, our sheet anchor in times of deep depression".[30] Other cutlery manufacturers were similarly fearful that British

protection would simply lead to more retaliatory duties which, in increasing the costs of imported raw materials, particularly Swedish bar iron and hafting materials, would cripple the cutlery trades.[31]

When the question of tariffs reemerged to occupy the centre of the trade debate again in the 1900s the cutlery industry remained a supporter of Free Trade principles. A.J.Hobson, Sheffield's most prominent cutlery manufacturer, was also the city's leading exponent of Free Trade, and although a staunch Unionist, defended it on Liberal platforms,[32] and in the local and national Chambers of Commerce.[33] He, like the influential local Liberal Free Trade pamphleteer of the period, Frederick Callis, continued to believe that the cutlery trades were too dependent on imported raw materials to risk the imposition of retaliatory duties.[34] The trade union leadership expressed similar convictions,[35] but such political and moral commit ments were not condusive to the re-evaluation of Sheffield's international competitiveness.

Similarly outraged, but vague and unconstructive in practical terms, were the attitudes of the Sheffield trades to fraudulent marking of cutlery, which although a relatively minor and peripheral problem, was blown up out of all proportion because of its association with traditional values of quality, commercial honesty, and a trading reputation.

The main practices involved in false marking were the stamping of cutlery with the names of reputable houses, or the name 'Sheffield' by dishonest traders in Sheffield or abroad; the stamping of poor quality blades with the false indications of quality, such as 'warranted shear steel', or 'cast Steel' on Bessemer or pig iron blades; and the marking of machine made goods as 'hand made'. Originally, it was believed that these were practices only stooped to by German competitors, but in the 1880s a storm arose, as the extent of the frauds within Sheffield became known.

Trade and merchandise marks had, since the beginnings of the cutlery trades in Sheffield, been crucial in the establishment of reputations and their identification with quality; their supervision had become a vital feature of the work of the Cutlers'

Company.[36] After 1801, trade marks were explicitly recognised as the property of their owner,[37] and with the increase in trade with non-English speaking lands, became an ever more important indicator of quality.[38] Thus they "had been employed from the dawn of the industry as the guarentor of quality and the proof of authorship...to the consumer it has become the main evidence of quality, the criterion on which he must place implicit reliance, since only technical expertness could enable him to distinguish one grade from another".[39] Moreover, the very name 'Sheffield' had become simiarly associated with high quality products, and was seen by many manufacturers and most men, as a collective asset, the protection of which should be communal and crucial.

As early as 1870, sections of the manufacturing community were taking an interest in, and steps to prevent the sale of German goods with 'pirated' Sheffield trade marks, and the Chamber of Commerce played an important role in the framing of the 1872 Customs Consolidation Act.[40] The status of the Cutlers' Company in this regard, was elevated considerable in 1875, when it was made the official trade mark registration authority for Hallamshire, a level of autonomy afforded to no other centre.[41] Furthermore, in 1883, its trade mark jurisdiction was extended to cover other items of iron or steel, with or without a cutting edge.[42] Such authority helped these official institutions of the trades to reinforce their status, moral and practical, as symbols and upholders of all that was commercially reputable and honourable, whilst generally increasing the attention given to the issue of trade marking.

Thus, the revelations that Sheffield manufacturers, and moreover, formerly esteemed members of the same Cutlers' Company, were participating in commercially dishonest practices, and trading away Sheffield's communal reputation for their own profit, were all the more shocking. The whole issue clearly illustrates the split that was developing between those manufacturers and men, broadly classified by contemporaries as 'respectable' producers, who continued to defend and act according to traditional commercial values and morality, particularly in their concern for the value of a trading reputation based on the sale