Growth, Entrepreneurship and Capital Formation in the United Kingdom's Cycle and Related Industries, 1870 - 1914

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Abstract

The thesis delineates the growth, and the various social, economic, institutional and technological factors supporting the growth, of the United Kingdom's cycle and related industries over the period circa. 1870 - 1914. The emphasis is upon tracing the short- and long-run movements in the industries' outputs up to 1900 (but without the ideal facility of quantitative data directly relating to the aggregate volumes and values of final gross outputs); and upon assessing the links of the industry with the pre-existing industrial structures of the U.K. economy - in terms of the diversification of firms, the origins of the "founding fathers", and of the types and sources of initial capital requirements. The thesis also examines the various elements that pervaded the technological developments, with regard to both final products and the processes of their production, within the cycle industries in the broad. It is additionally concerned with the rise of foreign competition, and the typical or untypical reactions of the British entrepreneurial leaders of the cycle industry to this phenomenon. The thesis ends with a study of the relationships of the firms in the cycle and related industries with the facilities for formal, public, joint-stock company flotations in the United Kingdom, in order to cast some light upon the proposition that the available facilities tended to militate against the expansion of a "new" industry, such as the cycle industry, during the thirty-odd years prior to 1914.

INTRODUCTION

As part-and-parcel of the process of making quantitative assessments of the long-run growth performance of the United Kingdom's economy over the past hundred years, economists and economic historians have invariably found themselves in agreement that, apart from some short-period aberrations (for instance, the 1930's decade), the U.K. economy has been a slow growing economy when compared with the growth achievements of most other industrialised or industrialising economies in the world.[1] Even when the time-span under their review has been shortened from 100 years or more to 40 years and less, the same conclusion has emerged; that the U.K. economy has, comparatively speaking, been a slow grower. In particular, the 40 year period of 1873-1913 has attracted the attention of economic and social historians, not only because the U.K. economy adopted and retained its status as a comparatively slow grower as the process of economic development and industrialisation took root and spread in for example Germany, France, Belgium, Switzerland, Sweden, the U.S.A. (see Table A), but also because the U.K. economy, examined in isolation, showed signs of deceleration (or "retardation") in its growth path. It was once widely accepted that this phenomenon of retardation began during the 1870's - Hoffmann's index of industrial production, and measures of the trend-growth

1. See for example, A. Maddison Economic Growth in Japan and the U.S.S.R. (London. Allen and Unwin Ltd. 1969), PXXi, Table 4; J. D. Gould Economic Growth in History (London. Methuen. 1972), pp.21-34, and especially Table 1.1 on p.22; and D. H. Aldcroft and P. Fearon (editors) Economic Growth in 20th Century Britain (London. MacMillan. 1969), p.38, Table 4. J. D. Gould performs the service of making a critical appraisal of the estimation procedures of some of the main participants in this field of international comparisons, but the broad conclusion concerning the long-run performance of the U.K. economy still stands.

TABLE A

Growth Rates of Real G.N.P. per head in 15 countries 1870 - 1913

(annual average compound growth rates)

Sweden	2.2	Norway	1.3
Denmark	2.1	Switzerland	1.2[b]
U.S.A.	2.1	U.K.	1.1
Canada	2.0	Russia	0.9
Belgium	1.7	Australia	0.8
Japan	1.7[a]	Italy	0.7
Germany	1.6	Netherlands	0.6
France	1.4	Average	1.4

a. 1879 - 1913

b. 1890-1913

(Source: A. Maddison Economic Growth in Japan and the U.S.S.R., p.31) rates in U.K. visible domestic exports being much quoted.[1] But in recent years, quantitative studies geared to the formulation of estimates of real gross and net national income (in total and per head) have moved opinion more towards the viewpoint that "retardation" in the U.K. economy did not exist for much of the 1873-1913 period, and, in so far as it did, was confined to the 13 years succeeding 1899, (see Table B).

Nevertheless, once the feature of relatively slow growth was identified either in terms of international comparisons, or in terms of declining rates per annum over time, during circa 1873-1913, economic and social historians became anxious to provide an explanation; and, logically enough, since the United Kingdom by the close of the nineteenth century was a "mature" industrial economy containing only a relatively small agricultural sector, much of their thinking and research have been concerned with the economic and social dynamics pervading the industrial sector, or major components of that sector, such as iron and steel, coal-mining, textiles, shipbuilding and chemicals. The explanations for the U.K.'s industrial growth performance that have correspondingly emerged, either by examination of the industrial sector as a whole, or by generalisation from particular industry studies, have not usually been of a uni-causal kind and have certainly not coalesced historians into a consensus of opinion as to what type of explanation is the most consistent with the available evidence. In the main, the explanatory mechanisms that have been offered with regard to the U.K.'s economic retardation of the pre-First World War years

1. See W. A. Lewis Economic Survey 1919 - 1939 (London. Allen and Unwin. 1949), pp.74-77; D. J. Coppock "The Causes of the Great Depression" Manchester School XXIX (1961), pp.203-32; "The Depression of the 1890's: A Critical Note", Ibid., XXIV (1956), pp.1-31; "British Industrial Growth during the Great Depression (1873-1896): A Pessimist's View", Economic History Review, XVII (1964-5); and J. R. Meyer "An Input-Output Approach to Evaluating the Influence of Exports on British Industrial Production in the late nineteenth Century", Explorations in Entrepreneurial History, VIII (1955).

TABLE B

Average Annual rates of growth in net national income per head at 1900 prices, in industrial production, and in total visible exports at 1900 prices for the United Kingdom (measuring from peak to peak in the trade cycle)

(per cent)

Years	net national income per head	Hoffmann's index of Industrial Production	total visible domestic exports
1856 - 66	1.6	3.0	2.9
1866 - 71	2.9	3.0	6.9
1871 - 75	1.8	2.4	- 0.6
1875 - 82	0.8	1.6	4.2
1882 - 90	3.1	1.5	2.1
1890 - 99	1.7	2.2	1.2
1899 - 1907	- 0.3	1.2	3.8
1907 - 13	0.5	0.1	2.8

(These are the author's own calculations. The measurement from peak to peak in the trade cycle - the peaks being delineated by the net national income per head data - has been performed so as to give an indication of the growth of the capacity of the U.K. economy. The Sources of the data are those of C. H. Feinstein (for net national income) W. Hoffmann (for industrial production including building) and *Annual Statements of Trade* (for total domestic visible exports) as reproduced in B.R. Mitchell and P. Deane *Abstract of British Historical Statistics* (London, C.U.P. 1962)).

have centred upon the characteristic of technological change in the industrial sector (and the various factors determining it), and have embraced a variety of admixtures of a number of broad propositions, supported by varying amounts of empirical evidence and of deductive thought. More specifically, the broad propositions that have received the economic historian's scrutiny include:-

1. A decline in the "quality" of British industrial entrepreneurship such that it was inferior to what had been prevalent before, and what had emerged or was emerging in other countries. Past economic achievements had socially and psychologically conditioned British entrepreneurs into taking an obscurantist view of new technological developments, of technocratic management, and of scientific and technical education of a formal kind. Past successes had developed within them notions of innate superiority, made them unadventurous and risk-averse, and changed their intuitive objectives from those of short-or long-run profit maximisation to those of social and/or political elevation.[1]
2. An over-riding concern on the part of British entrepreneurs with the design and quality (or performance) of the finished product to the neglect of the processes of its production and marketing. Hence, when confronted with the rise of foreign competitors in their traditional and existing markets, British entrepreneurs sought new markets for their existing style of finished products, or, alternatively, "up-grade" the quality of the finished products;

1. These types of attitudes and forces are listed by H. J. Habakkuk <u>American and British Technology in the Nineteenth Century</u> (Cambridge. C.U.P. 1962), pp.189-194. See also D. S. Landes <u>The Unbound Prometheus</u> (Cambridge. C.U.P. 1969), pp.336-8; and A. J. Levine <u>Industrial Retardation in Britain, 1880-1914</u> (London. Weidenfeld and Nicolson, 1967), passim.

rather than meet the new competition head-on, on its own terms, by improving or changing their techniques of production and their marketing efforts and arrangements, and by "downgrading" (and cheapening the price of) the finished product.[1]

3. the absence of acute inelasticity in the supply of one factor of production or more, relative to the supplies of other factors of production in the U.K. economy. This led to a tendency to meet an expanding demand for a given product, or range of products, by an extension and utilisation of the established and well-known techniques of production, rather than by devising more productive new techniques comprising a factor-saving element, and/or by adopting such new techniques as developed in other, differently endowed, economic environments where factor-saving technological progress was important for sustained economic growth.[2]

4. the introduction of new, growth-inducing techniques of production, in any one section of any one industry, was hampered by the technical inter-relatedness of the existing units of production within the industry. The characteristic of technical inter-

1. This is very much the argument of C. P. Kindleberger in his article "Foreign Trade and Economic Growth: Lessons from Britain and France, 1850 to 1913", Economic History Review, XlV (1961).

2. See, especially, D. H. Aldcroft "Technical Progress and British Enterprise, 1875 - 1914", Business History, July 1966, pp.122-132; and "Factor prices and the Rate of Innovation in Britain", Business History, July 1967.

relatedness meant that the external economies, yielded by any one new technique, to entrepreneurs who were collectively but independently in possession of sequential productive processes based on existing "old" techniques, had, therefore, to be substantial for its adoption.[1]

5. the loss of absolute trading advantages in world markets on the part of British industries (and their leaders). The original trading advantages were based upon a collective monopoly of relatively advanced techniques of production, but they gradually disappeared as knowledge of particular technological processes and product designs spread to other countries. Superior natural resource endowments, lower labour costs and lower transport costs possessed by new foreign producers sometimes whittled away what remaining comparative trading advantages existed in the favour of British manufacturers. The erection of protective tariffs around existing markets exacerbated the situation, but the British reaction to these developments should have been the endogenous one of devising new products for sale on home and overseas markets, stemming from the development of new technologies and discoveries in natural science, and involving changes in the product and institutional structure of the United Kingdom's industrial sector. This latter process, however, was extremely and comparatively slow in taking place within the U.K., since the country had for long neglected the development of facilities for the training and education of natural and applied scientists

1. This constitutes a variant of the "early start" thesis, and as advanced by Thorstein Veblen and M. Frankel. See M. Frankel "Obsolescence and Technological Change in a Maturing Economy", American Economic Review, XLV (1955).

capable of understanding, devising and advancing high-growth "new" industries to supplement the stagnating or slow-growing "old staples" of the Industrial Revolution. Moreover, the institutional and informal arrangements within the United Kingdom's capital markets had ossified in such a manner that they could not (or would not) readily meet the capital requirements of new high-growth industries, such that the latter were, in an insular fashion, thrown back on their own capital accumulations for growth-finance. And, additionally, the existing industrial structure of the U.K. economy was so "over-committed" to certain major lines of activity that the transfer of factor resources in real terms from them to completely new industrial processes and products was difficult if not impossible.[1] The retardation in the U.K. economy of circa 1873-1913 was, therefore, partly the product of a failure to develop, sufficiently rapidly, technologically "new" industries - a failure not shared by countries such as France, Germany and the U.S.A.

The author's interest in the cycle and related industries of 1870-1913 arose chiefly out of a desire to penetrate a little more deeply into the alleged difficulties pervading structural change within the United Kingdom's industrial sector, but also out of an interest in most of the other propositions outlined above. For in one respect, at least, the U.K. cycle industry of the late nineteenth and early twentieth centuries was an a-typical "new" industry. It was a "new" industry which essentially experienced its main technical development and growth within Britain - making the country the world's leader in

1. The notion of "over-commit ment" in British industry has been chiefly the brain-child of H. W. Richardson. See his "Over-Commit ment in Britain before 1930", Oxford Economic Papers, xvii (1965).

the field of cycle production - unlike almost every other "new" industry of the pre-First World War era. Furthermore, like many of the "old staple" industries, it eventually ran into a problem of acute foreign competition both domestically and overseas, but ultimately appeared to face the competition squarely, and attain a position approximating once more to world leadership - at least in terms of the value and volume of cycle exports. Thus the developments, relating to the British cycle industry and as delineated in the following chapters, reflect an attempt to pick-out the "unusual" elements (if any) in a "new" industry's growth and development in the United Kingdom, and, conversely, to isolate the extent to which the industry shared in the blights which seemed to afflict other sections of the nation's industrial activities. Also, since the study is much concerned with issues of technology, there is the accompanying intention of providing a case-study of the factors which can cause (or retard) technological change in an industry of the late nineteenth and early twentieth centuries, and of the factors that can diffuse such technological developments to other countries and, perhaps, other industries.

CHAPTER I

The Origins and Growth of the U.K. Cycle Industry before 1900

Historians of the cycle industry have, in the main, concentrated their attention more upon the technical features of the product than upon the techniques of production and the economic and social forces which generated within the U.K's industrial structure this "new industry" during the last 30 years of the 19th century.[1] Undeniably, the technical development of the bicycle played a large part in the growth of the industry, but the emphasis of this chapter is upon the sources of entrepreneurship and of early capital requirements, upon the industry's structure and growth, and upon the nature of the market that the cycle manufacturers served.

Some Indicators Of Growth.

In the 1860's a number of firms and individuals began to experiment with, and manufacture, two-wheeled velocipedes on the pattern then laid down by Pierre Michaux in France. The Coventry Machinists' Company, beginning cycle manufacture in 1868 and often described as Britain's first cycle-making enterprise, was in fact only one of a number of concerns dabbling in velocipede construction simultaneously in that decade. London's first bicycle maker was Mark Edward Norrington, a scale-maker of South Street, Finsbury Market, E.C., who began making velocipedes in 1864. Messrs. Snoxell and Spencers of Old Street, St. Lukes, London, gymnastic apparatus makers were also manufacturing velocipedes by 1869.[2] Others of note

1. An exception is N. B. Hudson, The Growth and Structure of the Bicycle Industry (M.Sc.(Econ) thesis, University of London, 1960).

2. The Motor Cycle and Cycle Trader, Vol. XCIII, No. 1264, 28th March 1919, p.352.

were Charles Andrew Palmer, formerly a gun implement maker, and trading as Palmer Brothers of Aston, then as Palmer and Holland, and by the late 1870's as the Interchangeable Bicycle Company. Thomas Humber of Nottingham, formerly employed as a blacksmith moulder in the local engineering firm of Manlove and Alliott, began his own cycle-making business in 1868. In Stapleford, Leicestershire, Robert Edlin began making velocipedes during the same year in his blacksmith's workshop after examining a French-built machine in a Nottingham ironmonger's shop. By 1870 he was imitating Humber in constructing cycles with solid rubber tyres, and continued to combine blacksmithying with cycle building until 1885, having moved to Leicester for larger premises in 1875.[1] George Price, lock and safe-maker of Wolverhampton, became a cycle maker in 1869 producing "boneshakers" with wooden wheels under the stimulus of Walter Phillips, an employee.[2] Also working in Wolverhampton at that time was Henry Clarke of Darlington Street, a maker of carriage and perambulator wheels, and who exported wooden wheels for bicycles to France during 1867-68 and commenced to make cycles on his own account until his death in the early 1890's.[3] Newton Wilson of London and Birmingham,

1. The Cycle Trader and Review, Vol. LXI, No. 843, 3rd March 1911, p.482.

2. The Cycle Manufacturer and Dealer's Review, 6th April 1895, p.126. In 1874 Phillips transferred to Wolverhampton's Daniel Rudge, and became Manager of Humber's Coventry factory in 1893. Ibid.

3. W. H. Jones, Story of the Japan, Tin-Plate working, and Iron Brazier's Trades, Bicycle and Galvanising Trades and Enamel Ware Manufacture in Wolverhampton and District (London 1900), p.145. Clarke and a man surnamed Panter were reputed to have devised and built a tandem tricycle during the 1850's upon which they propelled themselves around Wolverhampton "....amid the laughter and astonishment of the natives". Jones says it was the "boneshaker" races on Wolverhampton's Molineux Grounds in the late 1860's that urged the minds of local mechanics, such as Daniel Rudge and John Barratt, to enter the cycle trade. Ibid., pp.145 and 148.

one of Britain's foremost indigenous sewing machine manufacturers, began making cycles in the late 1860's; and by 1869 no less a firm than Tangyes of Smethwick, hydraulic engineers, were building large numbers of Michaux-type velocipedes at their Cornwall works, on which they paid royalties to A. Davis, the London agent of the French Velocipede Company. The Franco-Prussian War, which dealt a severe blow to the nascent French velocipede industry, apparently caused Tangyes to cease manufacture for they had important trade connections with France; though there is a tale that when Joseph Tangye, going beyond the Michaux-type velocipede, produced a bicycle with metal wheels and metal spokes, had his inventiveness squashed by his brother, James, who stipulated "No more toys".[1] By 1870 a Birmingham directory could list the names of 16 velocipede manufacturers in business in that city, three of whom were also gun implement makers, two being sewing machine manufacturers, four engineers and machinists, plus a rivet maker and maker of tinmans furniture, a diesinker, a coachsmith and axletree maker, and a fishing reel manufacturer.[2] By 1871 a fireplace range manufacturer, an engineer and smith, and a sewing machine maker were making velocipedes in the City of London;[3] and Leicester could boast at least one cycle manufacturer in December 1870 viz. Robert Weldon, a wheelwright.[4]

1. Rachel E. Waterhouse, A Hundred Years of Engineering Craftsmanship (London and Birmingham. Tangyes Limited, 1957), p.29.

2. Hulley's Directory of Birmingham, 1870.

3. City of London Directory (W. H. and L. Collingridge, 1871). Kelly's Post Office Directory for London listed 17 velocipede makers in its 1870 edition and 15 in 1871.

4. Leicestershire Trade Protection Society Directory, December 1870.

In the absence of direct information on the value or volume of the U.K.'s cycle output, resort has to be made to other indicators to determine the subsequent growth of the trade. Lists of cycle manufacturing enterprises do not appear in local directories until the 1870's, but if the numbers of firms are anything to go by, and accepting the rough accuracy of the directories, it would appear that the "boneshaker" velocipede fetish of the late 1860's did not precipitate a marked expansion of an indigenous cycle industry until the late 1870's and early 1880's (see Table 1 for the principal cycle-making towns of the Midlands).[1] Further spurts came during the close of the 1880's and in the mid-1890's, with quieter developments occuring in the intervening years. The 1881 Census of Population enumerated 1,072 persons in England and Wales as cycle makers, 400 of whom were located in Coventry and 300 in the rest of the West Midlands, including Birmingham, Aston Manor and Wolverhampton. The 1891 Census of England and Wales gave a figure of 11,524 persons engaged as "bicycle and tricycle maker and dealer" and of these 559 were females. Of the 1891 total, employers numbered 697, the employed 10,160, those working on their own account 304, and others (or no statement) 363 . Of the total enumerated in 1891, Coventry contained 4,059 (35 per cent); Birmingham plus Aston Manor 2,575 (22 per cent); London 922 (8 per cent but no doubt comprising, to a certain extent, the employees in the large London depots of Midland cycle firms); Wolverhampton 643 (5.6 per cent); Leicester 215 (1.9 per cent); and Nottingham 204 (1.8 per cent). The next

1. A view borne out by qualitative information. The Cyclist and Bicycling and Tricycling Trades Review observed in 1881 that the velocipedes made by English coachbuilders "and other kindred trades" secured some demand in the 1860's as cycle-riding became a sport in the hands of its votaries, but it ".....soon palled upon the appetites of its supporters and the newly created trade fell into decay until the improvements wrought by the Coventry Machinists' Company revived its popularity". Vol. 3, No. 106, 26th Oct. 1881, pp.15-16. C. F. Caunter has argued that the Michaux-type of velocipede had declined in popularity by 1872 "....chiefly because of the considerable exertion required to propel its heavy and crude structure". See The History and Development of Cycles (London.H.M.S.O. 1955), p.13.

largest cycle manufacturing centre was Manchester with 81. Additionally, the Irish 1891 Census enumerated 62 cycle workers of all types, and the Scottish Census 142 (68 in Glasgow) making a total for the United Kingdom of 11,728.[1] The Reports of the Chief Inspector of Factories illustrate quantitatively the surges of growth at the turn of the 1880's and during the mid-nineties. The number of factories or departments making cycles in the U.K. in 1890 was reckoned to figure at 131, employing 5,850 males and 245 females - a total of 6,095 for that year compared to the census total of 11,728 for 1891. For factories, departments and workshops making cycles in the U.K. in 1895, 1896 and 1897, the factory inspectorate's data runs as follows:

Factories and departments :

1895	number = 497	total employed = 20,923
1896	number = 721	total employed = 36,405
1897	number = 991	total employed = 42,775

Workshops :

1895	number = 232	total employed = 1,318
1896	number = 434	total employed = 2,856
1897	number = 746	total employed = 4,118

Thus the total number of cycle workers employed in the United Kingdom leapt from 22,241 in 1895 to 39,261 in 1896, and to 46,893 in 1897.[2]

1. N.B. Hudson, op.cit., pp.73-4; Cycle Trade Journal, Nov. 1893, p.690; and Dec. 1893, p.722.

2. Data on cycle-makers employed in "workshops" (as defined by the Factory Act of 1878) is not given for the year 1890. On the Factory Inspectorate's estimates, the U.K. cycle industry grew by a factor of seven in employment terms over 1890-1897, and the average number of employees per cycle factory or department was 46 for the U.K. in 1890, 42 in 1895, 50 in 1896 and 43 in 1897. This tends to the conclusion that growth in the cycle industry during the nineties may fairly be represented by the inflow of firms. Annual Report of the Chief Inspector of Factories and Workshops for the Year 1896 (Command 8561) 1897, pp.143-4, 161, 261 and 320; Annual Report ....for the Year 1897 (Command 8965) 1898, pp.163, 187, 219 and 228; and Annual Report ....for the Year 1898. Part II - Reports (Command 27) 1900, pp.235 and 237. The Returns did not include india-rubber tyre manufacturers.

para. // Trade press reports and profits data help to fill out the picture. A new popularity for cycling was clearly marked in 1880 : ".... at Coventry the trading manufacturers are very full of orders and can scar cely keep pace with the demand, this refers especially to bicycles, many of the works being open from 6 a.m. to 10 p.m...... All the Wolverhampton makers of repute have sent away more machines thus for this season than last, and in some cases double the amount of business has been done. The works are now in full swing; indeed, overtime is being made, and one or two makers report that they can scarcely fill orders fast enough...It is from London that the majority of orders are now being received.... A direct foreign trade is not much cultivated, for makers prefer that merchants should take the risk incidental to that class of business, but a not inconsiderable portion of the bicycles manufactured in Wolverhampton find their way abroad through these channels, and as a result of a certain amount of direct trade, consignments being made to Cincinnati; Boston and Salt Lake City, Paris, Australia and New Zealand and to the Cape..... Indications point to a much larger general demand this season than last for bicycles of all kinds..... Tricycles are not being much manufactured, but the inquiries which are reaching makers are inducing them to contemplate the adaptation of more complete processes to their production, so that an extension of the business is likely. The fittings mostly used by the Wolverhampton bicycle-makers come from Birmingham, but a steady business is being done in fittings by Mr. George Hughes of the Temple Street Works, Wolverhampton..... In Birmingham the few makers also report that they are very full of orders. The makers of fittings - Mr. W. Bown, Messrs. Thos. Smith and Son - are very busy both with the home and export trade.[1] 1880

1. The Sewing Machine Gazette and Journal of Domestic Appliances, vol. VIII, No. 114, 1 May 1880, pp.27-28.

TABLE I

The total number of firms making complete cycles, fittings, components and accessories (including tyre manufacturers and enamellers)[1] in the principal manufacturing centres in the Midlands.

Dates of Directories	Birmingham	Coventry	Wolverhampton	Nottingham	Leicester
1870	16(16)				1 (1)
1873	9(9)				
1874/5		2 (2)			
1876	12(12)				
1876/7	13(13				
1877				6 (6)	2 (2)
1878					4 (4)
1879		15 (15)		7 (7)	
1879/80			19 (19)		
1880					8 (8)
1881	51(43)	17 (16)		7 (7)	
1882	58				13 (13)
1883	52	21 (14)		8 (8)	
1884			24 (24)		14 (14)
1884/5	68(45)				
1885				7	
1885/6				10 (8)	
1886		17 (16)			14 (14)
1886/7	78 (54)				
1887			17 (17)	11	
1888				14 (10)	14 (14)
1889				13	
1889/90					16 (16)
1890	95 (72)				
1890/1		30 (22)			
1891				14	
1892	140 (114)	69 (42)	40 (34)		
1893		64 (35)		31	
1893/4					31 (29)
1894	189 (157)				
1894/5			39 (34)	46 (42)	
1895	198 (152)			51 (42)	25
1895/6					37 (36)
1896	238 (177)	93 (55)			
1897	355 (240)			53	
1897/8			57 (49)		
1898	454 (309)	117 (75)			46 (43)
1898/9				71	
1899	520 (328)		54 (46)		
1900					65 (64)

(Sources : Local Directories)

1. But excluding seamless steel tube manufacturers, and, where identifiable, cycle repairers only. The figures in brackets relate to manufacturers of complete cycles, where these were separately noted in the directories.

witnessed a great boost in the popular taste for tricycles, accompanied by the formation of a Tricycle Association,[1] and for the following year it was reported : "The demand for both tricycles and bicycles of Coventry manufacture has been extremely good throughout the spring and summer seasons, and to meet the increased demand many manufacturers have secured additional plant and premises ...... the tricycle trade is now better than the bicycle trade and shows every sign of enduring at a steady state throughout the winter".[2] The industry was still expanding in 1883: "....there are many large houses that tell us their output of two-wheelers in '83 has not only equalled that of the previous year but exceeded it; and although owing to their generally greatly increased facilities and preparations, and to a much larger field of competition - tending in some degree to equalise the supply to the demand - makers have not been so pressed and 'cornered' in their production of three-wheelers, the increase in the output of tricycles over that of the previous year has been very considerable."[3]

1884 plunged British cycle manufacturers into a process of major product-innovative activity which culminated in the appearance of the straight-tubed, diamond-framed "safety" in 1886 - the cycle of the newly formed partnership of Woodhead and Angois of Nottingham. Makers abreast of the design developments in the mid-1880's continued to prosper. Messrs. Hillman, Herbert and Cooper of Coventry, for instance, who produced their "Kangaroo" design of safety bicycle in an experimental way in early 1884, found such a popular demand for it that they laid down a plant to produce it in quantity.[4] Messrs.

1. The Cyclist, Xmas No. 1880, p.2.
2. Sewing Machine Gazette, vol. IX, No. 132, 1 Nov. 1881, p.24.
3. The Cyclist, vol. 5, No. 220, 2 Jan. 1884, pp.161-2.
4. Ibid., vol. 5, No. 250, 30 July 1884, advert. The "Kangaroo" safety had the general shape of an "ordinary" or "penny-farthing" bicycle but with a much smaller front driving wheel, the drive from the pedals being geared-up.

Starley and Sutton of Coventry introduced their rear-driving "Rover" safety in 1885, thereby establishing the success of the "safety" design and putting that firm upon a substantial growth path.[1] But the winds of a general economic depression fanned the cycle trade at that time as any other. The Cyclist remarked in early 1886 "....the cycle trade is dependent, like many others, upon the general trade of the country, any enormous advances are not to be expected until commercial circles at large are in a more prosperous condition than they are at present," and later in the year it noted: "The Coventry cycle trade has felt the effects of the widespread economic depression of the year," but that "....all things considered, results have been satisfactory, and, in some cases, abnormally good."[2] Thomas Smith and Sons of Saltley (Birmingham) - now well-established in the industry - fell into the hands of the Official Receiver and was obliged to come to some arrangement with its creditors. Similar events overtook the then notable cycle firms of Robinson and Price of Liverpool, and Warman and Hazlewood of Coventry.[3] 1887, however, saw the beginning of a substantial upswing in demand. By March "The general improvement in trade throughout the country is already having its effect on the cycle trade in Coventry, for most of the firms here are far busier than during the corresponding month of last year"; and by May, among

1. Ibid., vol. 6, No. 273, 28 Jan. 1885, Supplement. Curiously enough, a safety introduced by the Birmingham Small Arms Company in December 1884, and preceding that of Starley and Sutton's was very similar to the latter in its use of a geared chain drive from a bottom-bracket chainwheel to the rear wheel (though the steering front wheel was smaller than the back). The Birmingham firm's product, however, never received the acclamation that greeted that of Starley. The "Rover" safety had two wheels of almost equal size.

2. Ibid., vol. 7, No. 329, 3 Feb. 1886, pp.382-3; and vol. 8, No. 371, 24 Nov. 1886, pp.158-9.

3. Ibid., vol. 8, No. 368, 3 Nov. 1886, pp.87 and 94; and no. 380, 26 Jan. 1887, p.367. Robinson and Price was rescued from oblivion by G. B. Mercer in March 1887 and who became its managing director. The Motor Cycle and Cycle Trader, vol. XC, No. 1234, 30 Aug. 1918, p.172.

Coventry makers, "Orders have simply flowed in upon the manufacturers, and one and all have had their arrangements taxed to the utmost to supply the demand upon them. Generally speaking this demand is especially strong with 'Rover'-type or rear-driving safeties, and in tricycles, with machines of the large-wheeled direct-steering pattern. All houses have been, and are, working overtime, and for some time the Coventry Machinists' Company were compelled to put on a double shift of hands and keep their works going all night to in any way get through their orders...."[1] Wolverhampton makers attested to the unprecedented large outputs at nearly all works, and complained of a lack of capacity relative to the demand, while towards its close The Cyclist reckoned, ".....the season of 1887 has been by far the best experienced by the trade for many years. The demand has not only been larger whilst it lasted, but has also lasted longer by many weeks than in the majority of past seasons in the history of the trade."[2] 1888 was even better : "The cycle trade in this city (Coventry) has in the past two months been wonderfully brisk; in fact, without an exception every house in the trade here has experienced a greater improvement in business than in any former year, and up to now this year may be said to be the best ever known in the trade."[3]

1. Ibid., vol. 8, No. 388, 23 March 1887, p.559; and No. 395, 11 May 1887, p.743.

2. Ibid., vol. 8, No. 395, 11 May 1887, pp.743-4; and No. 414, 21 Sept. 1887, p.1223. George Singer, the Coventry maker, opined in 1888 that the 1887 season was "probably the best we have had since 1883." Ibid., Vol. 9, No. 429, 4 Jan. 1888, p.303.

3. Ibid., vol. 9, No. 459, 1 Aug. 1888, p.1103.

The level of domestic cycle demand maintained its buoyancy until 1891, the selling season of that year not coming-up to expectations, and leaving agents with a "great deal of stock" on their hands. In January 1892 reports from the chief manufacturing centres were discouraging so far as the home trade was concerned, and at the end of the 1892 season the industry was complaining of "bad business and overproduction". The 1893 season began gloomily under the impact of a general commercial depression, a spell of fine weather in the May increased the demand for cycles rapidly only to cease abruptly towards the end of June, and by the end of July the home trade was once more very depressed.[1] The state of the domestic market was no better in 1894: "The season of '94 has fully kept up the reputation of past years for bad trade, and the number of failures and the extent of the liabilities eclipse any previous period. The disastrous cutting of prices and the tremendous competition have left in their train a record which it will be difficult to efface".[2] 1895, however, saw a large revival of home demand - helped by a spell of fine weather in the Spring - which took several of the largest firms from overtime working to day and night shifts, and which reached a climax with the "bicycle boom" of 1896-7.[3] The "boom" ended dramatically, so far as the home trade was concerned, in June 1897 to be followed by the radically changed demand (and supply) conditions of the late 1890's and 1900's.

1. <u>The Cycle Trade Journal</u>, Jan. 1892, p.83; Aug. 1892, p.283; and Dec. 1893, pp.697-8.

2. Ibid., Nov. 1894, p.180.

3. <u>The Cycle Manufacturer and Dealers' Review</u>, 25 May 1895, p.209.

By the mid-1890's the growth of the industry had, nevertheless, become a function not only of home but also of foreign demand. As early as 1880 English bicycles were being shipped to the U.S.A. principally through the house of Cunningham and Company of New York, established for the purpose in 1877. The Pope Manufacturing Company of Hartford, Conn. also did an importing business during the late 1870's but abandoned this in favour of marketing its own "Columbia" cycles manufactured by the Weed Sewing Machine Company.[1] In the Germany of 1879, on the other hand, a cycle rider was scarcely to be seen, the bicycle was regarded as something of a toy "fit only for boys, and a thing entirely beyond the dignity of a man", cycling only being the indulgence of English and American ex-patriots.[2] By 1881, however, the recreation was gaining in popularity particularly through the efforts of T. H. S. Walker, the agent and representative in Berlin of the Howe Sewing Machine Company which had begun cycle construction in 1879.[3] A rapidly expanding Australian demand, especially in Sydney, was noted in 1883, and by 1886 a well-established

1. The Pope Company had acquired every American patent right relating to cycles at this time and accordingly imposed a $10 royalty on each and every machine made in, or imported into, the U.S.A. This, together with duties, transport and dock charges, practically doubled the retail price of an English cycle by the time it arrived, but the English product still maintained a market based on a reputation for superior quality. The "Harvard" bicycle made by Bayliss, Thomas and Company of Coventry was reckoned to be the most popular cycle in America. Pope found that his monopolistic powers lapsed seriously with the expiry of the key Pierre Lallement patent in 1883. The Cyclist, vol. 1, No. 18, 18 Feb. 1880, p.206; No. 29, 5. May 1880, p.289; and vol. 5, No. 217, 12 Dec. 1883, pp.121-2.

2. Ibid., vol. 2, No. 61, 15 Dec. 1880, p.86.

3. Ibid., vol. 3, No. 106, 26 Oct. 1881, pp.15-16.

and growing demand for cycles, under the impetus of cycle-racing, marked Germany, France, Italy, Switzerland, Austria-Hungary, Belgium and Holland.[1] During the winter of 1886-7 export orders from Germany, Italy, France, the U.S.A., and Australia were large enough to keep the Wolverhampton makers "steadily busy", and in 1887 it was observed that "The Continental demand especially is rapidly growing, while Canada and the United States are also taking freely".[2] An (unnamed) Coventry manufacturer opined in 1888, "It would be no exaggeration to say that half of the business that was done last year ....was for foreign markets....the greater bulk of them to Germany. I have no hesitation in saying that the total value of cycles exported from Coventry last year would not be far short of £150,000, two-thirds of which would be sent to Germany."[3] In the autumn of 1887 Messrs. Hillman, Herbert and Cooper deemed the German trade large enough to warrant the construction of a branch factory which employed about 100 people by 1891 at Nuremberg; and an increasing French business led the Coventry Machinists' Company to open a branch establishment in Paris, under the management of the cycle racing professional Paul Medinger, followed by that of the Humber Company in 1888, both to be rewarded by a markedly large increase in French demand in that year.[4] "For several seasons past" ran a

1. Ibid., vol. 4, No. 199, 8 Aug. 1883, p.700; and vol. 7, No. 238, 27 Jan. 1886, pp.347-8; and No. 336, 24 March 1886, pp.528-9. The Rudge Cycle Company of Coventry dominated the French cycle imports until 1886 when "other firms are gradually getting a footing in it". Ibid., vol. 7, No. 360, 8 Sept. 1886, p.1239.

2. Ibid., vol. 8, No. 378, 12 Jan. 1887, p.315; and No. 395, 11 May 1887, p.744.

3. Ibid., vol. 9, No. 430, 11 Jan. 1888, pp.327-8.

4. Ibid., vol. 9, No. 431, 18 Jan. 1888, p.346; and vol. 10, No. 483, 16 Jan. 1889, p.301.

trade report of 1889 "the cycle trade with France has increased steadily, and has lately - during the last season in particular - made very rapid strides. Several firms in this country have already done large business with the French houses, and both sport, pastime and trade in connection with the cycle are very much on the increase on the Continent". Cycle exports grew "enormously" during the following three years - and "taxed the British makers to the utmost" - to invite separate itemization in the U.K. trade and navigation accounts in 1892.[1] The U.S.A. constituted the largest national market, absorbing £255,466 of U.K. cycles and parts in that year, closely followed by France (£238,806) with Belgium, Denmark, Germany, Canada and Holland taking between £39,000 and £82,000 a-piece. During the course of 1893 and 1894 exports to America fell drastically and were down to £24,308 in 1897, but deliveries to Belgium, Denmark, Germany, Holland, Russia, Australia, South Africa and New Zealand increased sufficiently to

1. Cycling, 28 Nov. 1891, p.296. The view of N. B. Hudson (op.cit., pp.32-6) that the expansion of foreign trade helped to alleviate the seasonality of home sales is not fully borne out by the figures for cycle exports for each month. Domestic exports of cycles and parts from the U.K. for 1892-94 (inclusive) were, on average:

	£		£
January	78,837	July	102,687
February	87,158	August	68,979
March	121,413	September	49,416
April	131,390	October	39,719
May	149,730	November	38,415
June	138,972	December	61,354

The seasonal nature of exports during the early 1890's was due to Europe and North America, and not countries in the southern hemisphere, providing the largest overseas markets.

carry total domestic exports from £915,856 in 1892 to a peak of £1,855,604 in 1896. The development of a Russian market was particularly rapid during the early nineties despite that country's poor roads, legal restrictions on cycling in some towns, and a climate that permitted enjoyable cycling for only three or four months in the year "and then there is as a rule too much rain to make things pleasant". Russia absorbed £117,558 of U.K. cycles and parts in 1895 and £84,168 in 1896, making it the fourth largest market in the former year and the eighth in the latter. Exports to British South Africa and Australia expanded the most rapidly during the course of 1896, making Australia the U.K.'s largest single cycle market in that year.[1] In 1897 exports were somewhat less than the 1896 level at £1,430,820 and then declined precipitately to a nadir of £530,590 in 1900.[2] This expansion of foreign demand had led more British firms to establish permanent depots abroad by the mid-1890's. The Quadrant Cycle Company of Birmingham - established in 1881 - had depots in America and France though it closed them in 1894, when they ceased to be profitable outlets. George Singer opened depots in Paris and in Boston, Massachusetts, U.S.A. J. K. Starley and Company had a depot in Paris; while the Coventry Machinists' Company had made an agreement with the Austrian Small Arms factory at Steyr, that enabled the Austrian firm to manufacture the "Swift" cycles for a minimum royalty of £1,000, and to establish agencies to retail them thoughout Austria, Italy and South Eastern Europe generally (and avoid paying the prohibitive Austrian import duties). Triumph Cycle of Coventry established a separate enterprise in Nuremberg in 1896 - with a 25 per cent share of its capital - to supply the German, Swiss and Balkan markets. By 1896 the Premier Company had established another works at Eger in Austria and two depots in Paris and one in Berlin.[3]

1. <u>U.K. Trade and Navigation Accounts</u>; and <u>Cycle Manufacturer</u>, 10 Aug. 1895, p.34.
2. <u>U.K. Trade and Navigation Accounts.</u>
3. <u>Times</u>, 26 Oct. 1895, p.3; 8 June 1896, p.6; 15 June 1896, p.4; 26 Oct. 1896, p.11; and 13 Feb. 1897, p.3. <u>Economist</u>, 4 July 1896, p.868.

Varying degrees of commitment to particular foreign and home markets partly account for the variety of fortunes in the cycle industry - as shown by the net profit figures of the growing number of joint-stock cycle companies (see Table 2) - in the first half of the 1890's, though nearly all shared in the prosperity of the late 1880's and of the "bicycle boom", and in the subsequent depression. The collapse of the American market in 1893 and the poor home season of that year obviously hit Rudge, Humber, Triumph, the Coventry Machinists' Company, and Warman and Hazlewood hard. Warman and Hazlewood ascribed its weak profitability during the 1894 season to the state of the American market and to a pervasive trade depression in the U.K., but noted that the Continental demand for the Company's products had increased.[1] On the other hand, for Humber and Company, 1894 "...had been the most prosperous year in the history of the company", mainly because their French trade had increased by over 50 per cent. over the previous year.[2]

The expansion of home and foreign demand had also helped to produce by the mid-1890's a number of sizeable enterprises in the cycle industry (see Table 3) as well as hundreds of much smaller ones. Some were the outcome of mergers and take-overs. Humber and Company, for instance, was publicly floated in June 1887 to acquire Humber and Company of Beeston, Notts., C. N. Baker's Coventry Cycle Company (founded in 1871), and the Express Cycle Works of Wolverhampton (established by J. Devey, an alcoholic blacksmith in 1873).[3]

1. Cycle Trade Journal, Dec. 1894, p.215.
2. Ibid., Nov. 1894, p.189.
3. Times, 17 June 1887, p.13.

TABLE 2

The net profits of certain joint-stock, cycle and component manufacturing companies

Trading year ending in	Rudge Cycle	Humber and Company (trading profits)	Raleigh Cycle (including debenture interest)	Star Cycle	Triumph Cycle	Perry and Company
	£	£	£	£	£	£
1888	24,122					22,768
1889	28,763	15,953	1,862			24,196
1890	35,532		4,662			25,492
1891	29,814	25,318	7,947		2,334	27,656
1892	13,038	29,663	8,092	2,440	4,354	28,501
1893	- 14,864 (trading loss) subsequently merged into Rudge Whitworth	19,842	8,791	4,635	2,194	28,332
1894		39,194	14,323	5,538	3,409	27,942
1895		59,607	14,536 (17 months)	6,341	8,071	29,683
1896		66,251	19,295 (8 months)	17,130	15,320	42,021
1897		70,940	19,783	18,937	17,879	55,259
1898		20,126	under reconstruction		3,522	41,415
1899		- 12,504	11,661 (5 months)		343	39,665
1900		9,767 (5 months)	11,631 (excluding debenture interest)		7,502	36,266

	Coventry Machinists' (Swift Cycle)	Quinton Cycle	Warman and Hazlewood (trading profits)
	£	£	£
1890	16,461		
1891	13,569		9,785
1892	- 5,711	4,254	
1893	- 25,972	4,772	- 3,520
1894	- 27,006	4,572	1,880
1895	reconstructed and refloated	2,866 and purchased by New Beeston Cycle Co. Ltd.	
1896			9,721 (net profits for 5 months)
1897	55,845		11,753 (net profits)
1898	33,946		under reconstruction
1899	24,999		
1900	5,139		

(Sources : various trade journals, company prospectuses, and company reports in national and local newspapers)

TABLE 3

The principal firms in the cycle and components manufacturing industry of the 1890's

Makers of complete cycles	1897 issued capital	Net profits for 1896/7 (excluding depreciation and debenture interest)	numbers employed
	£	£	
Singer Cycle	800,000	75,396	600 (1890)
Premier Cycle (Hillman, Herbert and Cooper)	700,000	78,133	500 (1891) 1,100 (1896)
Humber	500,000	57,761	800 (1895) 1,000 (1896)
Swift Cycle (Coventry Machinists' Co.)	375,000	54,229	1,000 (1896)
Elswick Cycle	250,346	16,100 (15 months)	80 (1891)
Osmond Cycle	218,543	-	230 (1896) 600 (1898)
Rudge-Whitworth *	205,426	38,035	1,200 (1895)
New Howe Cycle and Sewing Machine	wound-up in Feb. 1897		800 (1892)
Raleigh Cycle	200,000	19,783	260 (1891) 57(1889 600 (1896)
Rover Cycle	200,000	21,946	-
Raglan Cycle and Anti-Friction Ball Co. (Taylor, Cooper and Bednell)	170,000	39,326 (including debenture interest)	570 (1891) 600 (1894)
Triumph Cycle	170,000	17,879	-
Hearl and Tonks Cycle and Components	160,000	13,222	500 (1896) 750 (1897)
Starley Brothers and Westwood Manufacturing Company	160,000	23,050	-
New Rapid Cycle	150,000	11,239	-
Enfield Cycle	125,000	29,484	-
New Centaur Cycle	125,000	22,920	-
Star Cycle	120,000	16,477	-
Alldays and Onions Pneumatic Engineering	120,000	18,301	-
Trent Cycle	100,000	-	-
Ormonde Cycle	85,000	4,092 (18 months)	-
New Townend Brothers	80,000	12,298	-
Bayliss, Thomas and Co.	80,000	11,807	400 (1894)
Brookes Cycle	75,000	17,131 (17 months)	-
Humber and Goddard	70,127	-	-
New Buckingham and Adams Cycle	70,000	12,078	100 (1891)
New Hudson Cycle	66,466	10,088	-
Smart and Parker	60,000	3,777	-

(Table 3 continued........

TABLE 3 (continued)

Makers of complete cycles	1897 issued capital	Net profits for 1896/7 (excluding depreciation and debenture interest)	numbers employed
	£	£	
James Cycle	50,000	10,902	160 (1891)
Progress Cycle (E. J. West)	50,000	8,107	-
Quadrant Cycle	47,527	9,336	-
Calcott Brothers	45,007 (1901)	-	200 (1894)
Badminton Cycle and Components	42,500	-	-
Coventry Cross Cycle (Warman and Hazlewood)	40,720	11,753	-
Riley Cycle	38,000	10,833	400 (1896)
Mutual Cycle Manufacturing and Supply Company	31,450	-	300 (1896)
John Marston	40,000 (1895)	"Private" company	-
New Beeston Cycle (ex. - S. and B. Gorton Limited and Quinton Cycle Company Limited	580,000	under reconstruction in November 1897	380 (1891)
Makers of Components and Accessories			
Perry and Company	630,599	55,259	2,000 (1892)
Birmingham Small Arms	406,300	88,346	3,124 (1897)
Joseph Lucas	200,000	27,130 (1897/8)	300 (1891)
J. B. Brooks	200,000	23,676 (1897/8)	500 (1896)
Brampton Brothers	200,000	14,027 (1897/8)	1,000 (1897)
New Jointless Rim	200,000	18,346 (8 months)	-
Middlemore and Lamplugh	180,000	16,908	-
Cycle Components	175,000	66,639	900 (1896)
New Eadie Manufacturing Company	141,095	-	-
Bown Manufacturing Company	108,040	-	1,250 (1894)
Beeston Tyre Rim (Barton and Loudon)	72,582	-	-
Joseph Appleby	70,000	-	-
Miller and Company	70,000	11,661 (15 months)	300 (1893)
Albert Eadie Chain Company	65,000	4,287 (7 months)	-
R. F. Hall Limited	65,000	-	-
Abingdon Works	60,400	18,301 (15 months)	-
W. A. Lloyd's Cycle Fittings	34,518	6,044	-
Edward Lycett	unincorporated	-	250 (1898)
Auto-Machinery Company	-	-	200 (1903)
Hans Renold	unincorporated	-	-

Table 3 (continued........

TABLE 3 (continued)

Makers of Pneumatic Tyres	1897 issued capital	Net profits for 1896/7 (excluding depreciation and debenture interest)	numbers employed
	£	£	
Dunlop Pneumatic Tyre	5,000,000	610,437	800 (1896)
Amalgamated Pneumatic Tyre Companies	1,300,000	-	-
Clipper Pneumatic Tyre Company	150,000	- 7,862 (18 months ending 30th Sept. 1898)	-
Rubber Tyre Manufacturing Company (Dunlop Rubber Company)	140,000	-	-
Tubeless Pneumatic Tyre and Capon Heaton Limited	225,000	-26,390	-
Trench Tubeless Tyre Company	170,000	-	-
Preston-Davies Tyre and Valve Company	128,517	- 3,820	-
"Non-Collapsible" Tyre Company	110,000	-4,400	-
Puncture-Proof Pneumatic Tyre	100,000	-	-
"Grappler" Pneumatic Tyre and Cycle Company	80,000	4,576	-
Jewel Pneumatic Tyre	52,000	-	-
Palmer Tyre	48,000	10,083	-

* Rudge Cycle alone employed 764 hands in Coventry in 1893 - *Cycle Manufacturer*, 6 April 1895, p.126.

Sources: For issued capital - *Stock Exchange Yearbooks* and *Burdett's Official Intelligence*
For profits - Ibid, and company reports in trade journals, and national and local newspapers
For numbers employed - information gleaned from the trade press.

Rudge-Whitworth was a merger between the Rudge Cycle Company of Coventry and Birmingham's Whitworth Cycle Company in 1894. 1896 saw the amalgamation of Starley Brothers of Coventry with Frederick Westwood's company in Birmingham, and of the St. George's Engineering Company with A. Whitehouse and Company, both of Birmingham, and forming the New Rapid Cycle Company. Five separate enterprises in Birmingham - Thomas Warwick and Sons, Hudson and Company, the Westwood Wheel Company, J. Harrison Carter, and the R. F. Hall Manufacturing Company - merged in 1894 to form the Cycle Components Manufacturing Company, and James A. Lamplugh of Birmingham joined with Coventry's Middlemore and Company in 1896 to form the cycle saddle business of Middlemore and Lamplugh. The grandest and most ill-fated merger scheme of all was that of the Amalgamated Pneumatic Tyre Companies, floated in 1897. Promoted by a syndicate which included the notorious Henry J. Lawson and E. T. Hooley, and with the highly qualified blessing of the Dunlop Pneumatic Tyre Company, the combination was designed to establish a dominant position in the market for - and raise the prices of - the cheaper kinds of pneumatic tyres (i.e. the wired-on type), in which the Dunlop Company, with its important "Clincher" tyre patent and non-wired-on tyres, was losing interest. The new concern involved the Beeston Pneumatic Company, the Turner Pneumatic Tyre Company, Scott's Standard and the Woodley tyre companies, all established during the pneumatic tyre company promotion "boom" of 1893-4 but by mid-1897 rather sickly enterprises as a result of inter-company price competition and expensive court-room battles over patent rights and licences. A derisory public response to its flotation, however, the qualitatively superior products, and the market power, of the Dunlop Company, and a falling price trend for tyres in the post-"bicycle boom" years, drove the Amalgamated Company into reconstruction in 1900 and again in 1901, and finally into liquidation in 1906.[1]

Cycle Enterprises And Britain's Existing Industrial Endowment.

Not all the principal companies in the cycle and components trade had their origins solely in that trade or were completely concerned with it. For many, cycle manufacturing was the outcome of a diversification policy. The Coventry Machinists' Company, Messrs. Hillman, Herbert and Cooper, and Messrs. Starley Brothers of Coventry sprang from the sewing-machine manufacturing industry, as did ten makers of cycles and parts in Birmingham and three in Leicester, including the William Bown Manufacturing Company, Buckingham and Adams Limited, and the St. Georges' Engineering Company, all of Birmingham. Outside the Midlands the sewing machine firms of Bradbury's of Oldham and Howe of Glasgow also entered cycle and component production. The mass-producers of arms and

1. Economist, 24 July 1897, pp.1055-6; Cycle Manufacturer, 31 July 1897, pp.14-15; and Times, 31 Dec. 1901, p.13. Cycle Components and Rudge-Whitworth did not escape teething troubles. The former made a trading loss of £1,415 during its first year (1894/5) due to the "scattered and disorganised" layout of its plant prior to the construction of its new premises in Bornbrook, Birmingham, and to an unremunerative seamless steel tube plant which it hived-off to a separate company (the Components Tube Company) in 1897. It also lost the engineering abilities of Edward Warwick, its general manager, who left for the U.S.A. to supervise the opening of Samuel Snell's new tube factory in Toledo. Rudge-Whitworth had a deficiency of £27,924, by the end of its first trading year, as a result of key personnel departing for other rival firms, the preparations for the Spring selling campaign falling into arrears, and of a depreciation of stocks stemming from a change in the fashion of cycles that took place at the start of the 1895 season. Cycle Manufacturer, 21 Dec. 1895, p.276; 18 Jan. 1896, pp.318-20; and 4 June 1898, pp.204-5.

ammunition provided the important cycle firms of Birmingham Small Arms and the Abingdon Works Company, as well as a couple of enterprises that entered the trade in 1895-6, Kynoch Limited and the Holford Engineering Works of Birmingham of Gatling gun fame. In fact, Birmingham gun makers of all types provided some 40 cycle and component making firms during the last 30 years of the 19th century.[1] The London arms manufacturing trade saw the Arms and Ammunition Manufacturing Company, Messrs. Tolley and Son, and Cogswell and Harrison and Company (established in 1850) diversify into cycle production in 1897.[2] J. B. Brooks and Company and James A. Lamplugh sprang from Birmingham's saddlery, harness and leather goods trade to become cycle saddle makers, as did 13 other ephemeral and lesser known enterprises. Messrs. Smart and Parker and Brampton Brothers had their origins in Birmingham's brassfounding industry; Perry and Company added cycle chain making to their steel pen business in 1885; John Marston of Wolverhampton turned from tin-plate working, japanning and enamelling to cycle manufacture in 1887; Hans Renold in Manchester established his business in 1879 to manufacture driving chains for textile machinery but by the 1890's the bulk of his output was going to the cycle industry; and Brookes Cycle of Birmingham stemmed from the bedstead making firm of Messrs. J. H. Brookes in the early 1890's. With respect to diversification, the connections between the nascent cycle industry and the existing industrial activities of the Midlands were indeed very close. According to local directories, some 45 engineers, machinists, diesinkers, rivett makers and millwrights in Birmingham became cycle and component manufacturers

1. According to local directories.

2. Cycle Manufacturer, 26 June 1897, p.482; 11 Dec. 1897, p.243-4. A. Merwyn Carey, English, Irish and Scottish Firearms Makers (1954), p.18.

during c.1870-1900, plus 12 toolmakers, and stock-and-die makers, 33 stampers, brassfounders, metal moulders, casters and metal spinners, 12 general merchants, shop-keepers and factors, and 10 wire-and metal-merchants and ironmongers. There were also 7 blacksmiths, locksmiths and gasfitters, and a few drawn from each of a wide variety of manufacturing and commercial activities e.g. umbrella making (Thomas Warwick and Sons in 1878), watch and jewellery making, coach and axeltree manufacture, tobacconists, coal and timber merchants, japanners and enamellers, drapers, tailors and milliners, pawnbrokers, button and clasp makers, and so on. In the Nottingham of c.1873-1898, 37 lace and hosiery machine builders,carriage and bobbin makers, jacquard makers, millwrights and machinists diversified into cycle manufacture as well as five blacksmiths and locksmiths, and one or two each drawn from spring-making, electro-plating, feather-bed purifying, chemical manufacturing and what-not. Prominent among firms that diversified into the cycle trade in Coventry before 1900 were enterprises situated in the local ribbon and hosiery industries (7 in all); in Leicester, gasfitters, whitesmiths, framesmiths, blacksmiths and machinists (6); and in Wolverhampton, lock and safe makers (6) and jap anners and tinplate workers (5). Again according to local directories, 26 per cent of all new entrants into Birmingham's cycle industry before 1900 were previously established in some other trade. For Nottingham the figure was 49 per cent; in Coventry, during the years prior to c.1898, 11 per cent; in Wolverhampton before 1900 22 per cent; and in Leicester 26 per cent.

The fact that the various manufacturing processes involved in cycle and component construction had technological affinities with a fairly wide range of already well-established industrial activities was a factor which in part explained the diversification behaviour of many firms, and the geographical location of the cycle industry. On the whole, firms in the Midland's metal-working trades that entered cycle and component production were those already experienced in the manufacture of small, even intricate, mechanisms and component parts. Some of Wolverhampton's japan and tin-plate workers, such as Jones Brothers, Orme Evans and Company, and Henry Fearcombe, specialised in the manufacture of cycle gearcases.[1] Forged stampers and piercers, such as Thomas Smith and Sons of Saltley, and Thomas Smith of Aston and Coventry, came to specialise in the production of forged stampings for cycles.[2] It was a short technological step for Perry and Company to add cycle chain making to their steel pen nib trade, and for Brampton Brothers to make a similar move in 1885 from the manufacture of small brass hinges and clasps for carpenters' rules, office ledgers and music cases. H. Miller and Company of Birmingham became cycle lamp manufacturers in 1876, having previously (since 1869) been makers

1. W. H. Jones, op.cit., p.155 "There is little doubt that the metal gearcases made in Wolverhampton have been more successful than those made elsewhere". Ibid.

2. Some firms, for example, William Bown and Thomas Smith of Saltley, gained an initial experience of cycle component manufacture from contracts received from the then principal bicycle and tricycle assemblers. Both Bown and Smith were approached by the Coventry Machinists' Company in 1868 and Smith secured a tender for the manufacture of the steel framework and other fittings incorporated on the first cycles produced by the Company. The Cycle Trader, 15 March 1899, p.470.

of lamps for carts.[1] With respect to the gun-trade it was noted, "A gun-makers workmen naturally have very little to learn before becoming expert at cycle work. The machine men and the filers being equally used to delicate work, and much of the gun-maker's plant is excellently adapted for the making of cycle parts."[2] And in Nottingham: "Lace machines work to a fine degree of tolerance and their construction calls for a high order of engineering skill. It was thus comparatively easy for the lace engineer to adapt his skill in the manufacture of new products. Nottingham's cycle boom is an instance. In the period 1877-1899, more than one-third of the town's cycle manufacturers had previously manufactured lace machines or their components."[3] The Coventry watch-making firm of Settle and Company commenced cycle-making in 1880, "....although practically unacquainted at the time with actual bicycle construction, they contended that the employment of high-class mechanics already skilled in that branch of engineering, combined with their own mechanical knowledge of the delicate and accurate workmanship required in the construction of watches, could not but obtain the desired results."[4] Nevertheless, there were a number of concerns entering cycle and component manufacture whose technological connections with the industry a priori were tenuous to say the least - producers and sellers of textiles and clothing, boot and shoe makers, publicans,

1. The Cycle and Motor Trades' Review, 8 June 1905, p.533.

2. Cycle Manufacturer, 31 Aug. 1895, p.67.

3. J. M. Hunter, "Factors Affecting the Location and Growth of Industry in Greater Nottingham", The East Midland Geo grapher, vol. 3, Part 6, No. 22, Dec. 1964, p.340.

4. The Cyclist, vol. 2, No. 82, 11 May 1881, p.304.

tobacconists, pawnbrokers, printers and stationers, music publishers, cabinet makers, and hairdressers - one of Wolverhampton's first cycle makers, Daniel Rudge, was, for instance, a publican. For certain, in some cases, the link was not so tenuous as it might at first appear. Thomas Warwick, umbrella maker, became in 1880 a specialist manufacturer of cycle wheels and rims (c.f. the spoking of umbrellas and of cycle wheels); E. Payne and Company of Coventry, cork manufacturer, entered the cycle accessory trade during the early 1890's through the production of cycle handlebar grips; and C. W. Bluemel and Brothers (founded in 1860) umbrella and walking-stick makers of London, became cycle mudguard and gearcase makers through the firm's experience of moulding celluloid in the production of fancy handles for walking sticks.[1] In retrospect, The Motor Cycle and Cycle Trader accounted for the heterogeneity of new entrants into the cycle industry in terms of the activities of commercial travellers for component firms: "Travellers were going about explaining that it was as easy as eating pie to put a cycle together with the parts and accessories which they had to sell. Where they could not find a customer already at work some of these commercials had no hesitation in proposing to start anybody who had the requisite shanty in his back yard. So it came about that joiners and coffin makers, blacksmiths and tinkers, plumbers and gasfitters, by scores, to say nothing of barbers and umbrella menders, ironmongers and grocers, with people of every conceivable trade, were dragged in with the promise of unlimited success at little or no risk".[2]

1. One might note at this juncture N. Rosenberg's concept of "technological convergence". Rosenberg argues that if technologies "converge" then the formation of new industries and structural change in an economy is "easy", but if technologies "diverge" the formation of new industries becomes "difficult". See "Technological Change in the Machine Tool Industry, 1840-1910", Journal of Economic History, XXlll (1963).

2. The Motor Cycle and Cycle Trader, vol. LXXXlX, No. 1204, 1. Feb. 1918, p.116.

Additional to the factor of close technological relationships, there was the actual or prospective occurrence of excess capacity working and poor profitability that impelled some of the (eventually major) cycle and component producers into entering the industry in the first place. Cycle manufacture initially came to Coventry in late 1868 when Rowley B. Turner, Paris agent of the Coventry Sewing Machine Company, approached his uncle, Josiah Turner and manager of the firm, with a French order for 300 velocipedes. The order was accepted "As the sewing machine trade had been falling off slightly", though the Franco-Prussian War broke out in 1870 before it could be completed. In February 1869 the firm changed its name and legal status to that of the Coventry Machinists' Company Limited, and, despite some opposition from his directors, Turner continued to manufacture cycles in the 1870's after the French order had lapsed, though the production of sewing machines continued in the early 1870's to be the firm's main concern. The maintenance of cycle production by Coventry Machinists' was no doubt initially helped by Rowley Turner's initiative in securing orders in London, but early difficult trading conditions for the firm were indicated when in 1873 Nahum Salamon, a factor of sewing machines operating from premises in London's Holborn Viaduct, agreed to become chairman and managing director of the Coventry Machinists' Company, having been purchasing the Company's sewing machines "for some time past". He contracted with the Company to reorganise its present factory and expand its business, having already spent some £946 in models, castings and special tools necessary for the manufacture of sewing machines. Salamon also promised to lend capital to the Company, not exceeding £5,000 at five per cent interest per annum, and in return obtained the right to sell the Company's machines at a 20 per cent profit, and take fully-paid shares in the

Company in settlement of any debt due to him. He left the Coventry Machinists' Company a few years later and formed his own cycle business in London in 1880 (the Bicycle and Tricycle Supply Association) specialising in cycles incorporating india-rubber components to check vibration - an idea he had culled from the Coventry Company whose "Special Club" bicycle utilised a suspended rubber spring.[1] The Coventry enterprise was joined in the late 1860's by Newton Wilson and Company, sewing machine manufacturers of London and Birmingham, and by the Franklin Sewing Machine Company of Birmingham. More indigenous sewing-machine manufacturers turned to the cycle industry during a depression in home demand in the late 1870's: the Annual Report of the British Sewing Machine Trade Association declaring in 1878 that "The industrial classes, who are by far the largest customers for sewing machines, have only been partially employed, and consequently the demand for machines has been very much restricted in the home market".[2] Between 1876 and 1880 the Birmingham sewing-machine firms of William Andrews, Thomas and James Crompton, the Kensington Works Company, the St. George's Foundry Company, and William Bown entered the cycle trade; and the Royal Sewing Machine Company of Small Heath followed them in 1880 with cycle manufacture becoming "the most advancing part of the Company's business".[3] In Coventry the sewing machine company of Messrs. Smith and Starley Limited was wound-up in 1879, and James Starley hived-off to form his own cycle manufacturing business (later named Starley Brothers), while Messrs. Hillman and Herbert abandoned the sewing-

1. Alfred Lowe, History and Antiquities of the City of Coventry, 1893-4, p.119; G. Williamson, Wheels within Wheels. The Story of the Starleys of Coventry (1966), pp.45-8; P.R.O., B.T.31, 1463/4417, Memo. of Agreement dated 24 Dec. 1873; and The Cyclist, vol. 2, No. 72, 2 March 1881, p.192.

2. Sewing Machine Gazette, vol. VI, No. 79, 1 June 1878, p.28.

3. Sewing Machine Gazette, vol. IX, No. 124, 1 March 1881, p.21. It was reported that the cycle industry in the Midlands had "been a good deal stimulated by the long depression" in the sewing machine trade, gun trade, and the clockwork and lathe trades. Ibid.

machine trade in favour of cycle production at roughly the same time. The same trade depression even forced the hand of the Howe Machine Company of Glasgow but of American parentage, and dominating with Singer the British sewing machine market. A paltry two per cent dividend out of net profits of £8,965 for 1879 obliged its directors "....to reduce as much as possible the working expenses, in furtherance of which they have taken advantage of the valuable tools and machinery at the factory, and begun, with but slight additional expenditure, to manufacture bicycles feeling confident that they will be able, through their numerous agencies and branch offices, to dispose of a large number with good result".[1] The blow of a trade depression made the St. George's Engineering Company relinquish sewing machine manufacture altogether in 1887, and Bradbury and Company of Oldham - formed as early as 1853 and incorporated in 1874 - became cycle manufacturers upon the advent of another decline in demand in 1893 with its consequent £3,514 loss for the

1. Ibid., vol. V111, No. 112, 1 March 1880, p.27.

firm.[1]

1. Journal of Domestic Appliances and Sewing Machine Gazette, vol. XX, No. 260, 1 April 1892, p.22; and Burdett's Official Intelligence, 1895, p.973. The developments in the British sewing-machine industry of the second-half of the 19th century constitute a story that has yet to be fully told. In outline, the principal factors at work were:- (a) The acquisition for £250 of the English patent rights in Elias Howe's double-thread sewing machine by William Thomas, a London corset maker, in 1846. In England this patent constituted a "master patent" until 1860, and Thomas used his monopoly power to exact high royalties from anyone manufacturing or using sewing machines in this country, or to crush rival manufacturing firms. He consolidated his position by acquiring subsequent patented inventions relating to sewing-machines. By dint of Thomas' activities, Newton Wilson reckoned that an indigenous sewing machine industry had great difficulty in developing in England during the 1850's and 1860's in contrast to the strides made in the U.S.A. (b) An American "invasion" of the British sewing machine market beginning in the 1860's and epitomised by the establishment of branch factories in Glasgow by the Singer Manufacturing Company and the Howe Machine Company in 1867 and 1871, respectively. To this was added the competition of German sewing machine manufacturers who began to supply the English market on a substantial scale during the 1880's. The German sewing machine manufacturers found great favour among English buyers: "This is especially the case in regard to hand machines, which now form such a large proportion of every agent's stock. Compared with other countries England has been slow to develop the trade in hand machines, and this may be partly due to the crude, noisy and incomplete articles for which Birmingham was mainly responsible, often mere toys, put together with a sole view to cheapness, and wanting in many modern improvements, with that perfection of detail lavished on treadle machines as a rule." The German products also appealed to Victorian women on account of their ornately decorated finish. (c) Fluctuations in home demand as determined by swings in the U.K. trade cycle. Relatively small, and in a weak competitive position in face of the mass-marketing techniques of Singer and Howe, downswings in home demand tended to drive English sewing machine makers into liquidation or diversification. In response to Singer's predatory marketing tactics - epitomised by the introduction of its generous instalment-purchase schemes in 1876 and its legal actions to obtain sole use of the trade description "Singer" in the U.K. - 27 British sewing machine makers formed themselves into a defensive trade association in July 1876, initially to finance, collectively, court-room battles. In early 1877 it had a membership of 41 but after about three or four year s duration it faded away.

The criterion of excess productive capacity is detectable for other firms in other trades diversifying into cycle manufacture. John Marston became a cycle maker for his tinware trade was in 1887 "on the downgrade".[1] A declining demand for their walking sticks and umbrellas urged C. W. Bluemel and Brothers to move into the production of cellulose gearcases and mudguards at their Globe Works, London, and, later, at Wolston, Coventry.[2] J. H. Brookes and Company of Birmingham turned from bedstead to cycle manufacture in the early 1890's when the bedstead trade had been delivered a body blow by the U.S.A's McKinley Tariff.[3] In 1894, due to a depression in their industry, Messrs. Rotherham and Sons, "who have the largest business, and the finest plant in the Coventry watch trade", turned to the production of cyclometers.[4] The Palmer Shipbuilding and Iron Company of Jarrow turned its ordnance department over to the production of cycles in 1896, after incurring a net loss of £2,848 during the 1895 trading year, and amidst "unprecedented depression in the shipbuilding and engineering trades".[5] The Wolseley Sheep-Shearing Machine Company of Birmingham, coming very much under the leadership of the young Herbert Austin, entered the cycle trade during May 1897 (with a labour force of 357 men) as a way out of financial misfortunes, caused by the expenditure of large sums of money on repurchasing its defective machines sent abroad (in the interests of its trade reputation), and a weak demand for machine-shearing tools, stemming from sheep farmers' conservatism.[6] Old-established custom gun-making firms

1. Birmingham Gazette and Express, 5 Feb. 1908.
2. Cycle Manufacturer, 27 July 1895, p.9.
3. See G. C. Allen, Industrial Development of Birmingham and the Black Country 1860-1927 (1929), pp.269-70.
4. The Cycle Trade Journal, June 1894, p.109.
5. The words of the Company's chairman. Times, 24 Oct. 1895, p.9.
6. G. S. Davison, At the Wheel. Impressions of the Leaders of Britain's Greatest Industry (London, Industrial Transport Publications Limited, 1931), p.19.

such as Joseph Bourne and Sons, and Isaac Hollis and Sons, of Birmingham, and Tolley and Son and Cogswell and Harrison, of London, moved into cycle fittings manufacture during the mid-1890's since "the gun trade has lately been very slack".[1] But this was a more acute aspect of a long-standing production and marketing problem. Civilian custom gun-making in Britain had been suffering from severe competition from Belgian makers since the early 1870's, especially in guns of the cheaper kind. Civilian gun-production, both in Britain and in Belgium, was organised on domestic-system lines, and was correspondingly labour-intensive. The relatively cheap labour pertaining to civilian gun-production in Belgium afforded the Belgian industry a competitive advantage - "even skilled mechanics earn between 20 and 40 per cent less than in Birmingham".[2] None of the custom gun makers, however, obtained a footing in the cycle trade tantamount to that of the Birmingham Small Arms Company and Abingdon Works - makers of weapons on the repetition principle. B.S.A. initially joined the industry in 1880 "as a matter of compulsion".[3] Orders

1. Cycle Manufacturer, 31 Aug. 1895, p.67; and 11 Dec. 1897, pp.243-4; and A. Merwyn Carey, op.cit., pp.11 and 18.

2. Arms and Explosives, vol. II, No. 21, June 1894, pp.151 and 161. See also G. C. Allen, The Industrial Development of Birmingham and the Black Country 1860-1927 (1929), pp.116-9; D. W. Young, History of the Birmingham Gun Trade (M. Comm. Thesis. University of Birmingham. 1936); American Machinist, 8 July 1897, pp.17-18; and "Artifex" and "Opifex", The Causes of Decay in a British Industry (1907), passim.

3. History of the Birmingham Small Arms Company Limited, 1861-1900 (privately printed), p.2.

for military equipment, most notably from Prussia, had pushed the Company's trading profit from £6,550 for the year ending 30 June 1873 to £31,409 for 1875/76. Thereafter orders (and profits) fell away such that 1878/79 produced a trading loss of £8,982 with the firm's Small Heath works at an "entire standstill" for ten months of that year.[1] Its directors were accordingly in a receptive mood when in April 1880 Messrs. Smith and Lamb of Ipswich suggested that B.S.A. might manufacture their "Otto" patent bicycle as this machine was of delicate design with components which could be machined on the repetition principle. In July 1880 a contract to supply 210 "Otto" bicycles was entered into, soon followed by further orders amounting to 753 cycles. During the next four years, B.S.A. entered more deeply into the cycle trade, mostly making cycles and parts - ball-bearings, hubs, brackets, pedals and "safeties" - to other peoples' specifications and patents. The Company did market cycles at this time under its own brand names - first exhibiting them at the Stanley Club Exhibition in Holborn Town Hall in February 1881 - but even these incorporated components designed and patented by outside people. Its own inventive talents were not revealed until it patented its "safety" bicycle in November 1884 and sold over 1,500 of them before relinquishing the complete cycle making trade.[2]

B.S.A. was emulated by two more Birmingham mass-producers of military weapons, the Abingdon Works Company (established in 1874), and the National Arms and Ammunition Company (established in 1872), who were also experiencing lean times.

1. Ibid., pp. 183-5, 246-8, 272-4, 298-300, and 320-3.

2. Ibid., pp.5-20.

In 1881 Captain Bullock, chairman of the National Company, roundly declared that the contracts they had received from the Government were so small compared with the large size of their works that it had been impossible to make a profit upon them.[1] Abingdon Works began the manufacture of ball-bearings, spanners and spoke tighteners in 1881, adding its patent single link chain in 1885, and, in the event, was the only one of the three firms to stay with the cycle trade throughout the 1880's. The National Arms Company introduced their "National" tricycle in late 1881, but the venture failed to restore their fortunes - the tricycle business was transferred to the Sparkbrook Manufacturing Company of Coventry in 1883, and the arms firm was wound-up shortly afterwards.[2] B.S.A. produced a trading loss of £345 for 1880/81 and one of £4,644 for 1881/82, the directors attributing them "....to want of success in the bicycle manufacture. The amount sold has been inadequate to the necessarily heavy expenses of our large establishment, and the cost of production has exceeded our calculations."[3] Trading profits of £6,801 for 1882/83, £7,072 for 1883/84, and of £7,911 for 1884/85 were not sufficient to prevent a jettisoning of cycle and component production when governmental arms orders suddenly revived in 1885. The manufacture of complete cycles for other firms was given up in October 1885, and at the same time the Abingdon Works Company undertook the future manufacture of B.S.A. pedals, taking-over the entire stock of those in hand at Small Heath. In June 1888 all cycle work was abandoned, and in the following September the tools used for making ball-bearings, and the entire stock of ball-bearings on hand, were disposed of to William Bown.[4]

1. Times, 8 March 1881, p.11.
2. The Cyclist, vol. 4, No. 194, 4 July 1883.
3. History of the Birmingham Small Arms Company, pp.382-4.
4. Ibid., pp.20 and 465.

B.S.A's second (and this time long-standing) entry into the cycle components industry in 1893 was equally precipitated by the factor of excess capacity and falling profits. Government contracts were certainly remunerative - net profits climbed to £62,719 for 1888/89 and remained above the £60,000 level until 1891/2 when they relapsed to £54,902 - but they were also volatile. Net profits fell to £24,660 in the year ending 30 June 1893, there was a lack of orders for quick-firing ammunition, and the firm's Small Heath plant had been out of action for the first five months of the 1892/93 trading year to enable a changeover to the production of a Mark 2 magazine rifle. The idle shell-making plant, containing "...row upon row of semi-automatic copying lathes and other high class machinery...", persuaded the Company to produce cycle hubs in quantity, and by December 1893 about 60 per cent of the shell plant underwent reconstruction for this purpose.[1] The decision proved, on this occasion, to be profitable: in 1895 it was reported that the manufacture of cycle components had "developed beyond the expectations of the directors" and had substantially contributed to an uplift in B.S.A's net profits. These rose to £31,193 for 1893/4, to £43,934 for 1894/5, £54,329 for 1895/6, and to £88,346 for 1896/7. The production of hubs was followed by that of bottom brackets (complete with axles, chainwheels and cranks) and pedals, beginning in the summer of 1894. Cycle chain manufacture commenced in March 1896, and steel balls in the August since English made balls were insufficient to meet the demands of the trade, and the imported German balls used by the Company were tending to deteriorate in quality.[2] The ammunition

1. Ibid., pp.22-6 and 559.

2. Ibid., pp.573-7, 603-4, 629, and 648.

making firm of George Kynoch and Company of Witton, Birmingham, under the leadership of Arthur Chamberlain, took a leaf out of B.S.A's book. In 1896 he revealed to his shareholders the "Feeling that there was no reliance to be placed on profits accruing from the ammunition trade alone, especially from such a trade as theirs, which depended on one customer, the British Government. .....The making of ammunition was a risky business in which they were subjected to keen competition. The consumption was not increasing, but the competition was".[1] Correspondingly, Kynoch was diversifying into high explosives, soap, glycerine, nitric acid, acetone and candle production; and an entry into the cycle trade arose out of a decision in 1895 to install a steel casting shop, utilising the Siemens-Martin process, to supply Birmingham merchants with cast steel products. The desire to make full use of this new department prompted the Company "to content themselves with a small output of cycle components".[2]

The actual or prospective occurrence of excess productive capacity was an important but not universal goad for diversification into the cycle industry. Perry and Company's profits in the pen nib manufacturing business had been rising from £20,905 for 1882 to £23,892 for 1885 - the year it began cycle chain-making - with ordinary share dividends climbing from 5 per cent in 1876, the year of its formation, to $7\frac{1}{2}$ per cent during 1877-80, to $8\frac{1}{2}$ per cent in 1881, 9 per cent in 1882, and to 10 per cent during 1883-88. In 1884 the firm had experienced "a satisfactory year's business, there having been an increase in nearly every department..." and had paid-off £31,000 out of its issued debenture capital of £65,000.[3] Chain-

1. Times, 4 June 1896, p.4.
2. Imperial Chemical Industries Limited, Under Five Flags. The Story of Kynoch Works, Witton, Birmingham. 1862-1962 (1962), pp.29-32; and Times, 1 July 1897, p.3.
3. Burdett's Official Intelligence, 1893, p.1043; and Times, 26 Feb. 1885, p.7. According to J. Perry, the firm manufactured twice as many steel pens as any other British firm in the trade. Birmingham Daily Post, 24 Feb. 1886.

making started in the following year when an employee of long service, Joseph Appleby, patented his own device, available for the firm's exploitation. The Company had, however, previously come into contact with cycle chain manufacture when William Morgan, a Birmingham gun mount manufacturer, produced in 1884 his patent solid roller chain which incorporated split rings. Morgan consulted Perry's about these in the January as a firm well-versed in the techniques of splitting small, thin pieces of metal.[1] The "bicycle boom" of the mid-1890's, in particular, drew into the cycle industry firms whose original activities were still prospering. In Wolverhampton in 1896 "Business in the hardware industries....continues to be of a flourishing character, the bulk of the employers having a considerable amount of work on hand, and in numerous cases difficulty is experienced in executing the orders to date. The order books, as a rule, are well filled, and there will be no lack of work up to the end of the year, while enquiries are also being received with a view of renewing business. The Overseas business is of a very satisfactory character, and in several of the merchant houses the hands have to work beyond the ordinary hours".[2] Yet the tinplate working concerns of Chilton Brothers (later called the New Courier Cycle Company), and Richard Perry, Son and Company began cycle and component manufacturing at this time, as well as Illidge and Son, brassfounders and lock manufacturers, and the old-established firms of Thomas Turner and Company and George Price and Company, lock-and safe-makers - a case of re-entry for the latter enterprise. John Jardine and Company, by far Nottingham's largest maker of jacquard and lace machinery, introduced their "Park" cycles in 1896 when a "Considerable business has been

1. The Engineer, 24 Sept. 1886, p.248; The Cyclist, vol. 6, No. 297, 24 June 1885, Supplement; and The Cyclist Trade Review, 22 Feb. 1906, p.176.

2. Birmingham Daily Post, 21 Nov. 1896.

done in the building of lace machines and hosiery frames, the former principally for export, and the latter both for home and abroad".[1] Exports of lace-machinery - foreign markets were the principal markets for Nottingham's builders by the 1890's - had been expanding since late 1894, while Jardines doubled their output of lace machinery between 1895 and 1905 and employed about 1,000 men, supplying all over Continental Europe and the U.S.A., with only a fraction of the output going to local manufacturers.[2]

The Cycle Entrepreneurs and their early capital requirements

The main developments in cycle design during the late 19th century were the products of the inventive efforts of "practical men": people who had received little formal education, probably no formal scientific or technical education, but who had some experience of engineering workshop practice. Correspondingly, some of the principal entrepreneurs of the industry were men of this type, and in the 1860's Josiah Turner collected a group of them within the Coventry Machinists' Company, eventually to "spin-off" to form their own separate enterprises. The "father" of Britain's cycle industry, James Starley, was originally a gardener to John Penn, the eminent marine engineer of Greenwich, who eventually placed him under Josiah Turner as a mechanic at Newton Wilson's London sewing-machine factory.[3] In 1861 Turner and Starley left for Coventry to form their own sewing machine manufactory, and by 1870 had recruited

1. Cycle Manufacturer, 14 March 1896, p.74; and Nottingham Daily Guardian, 30 Dec. 1896.

2. Ibid., 31 Dec. 1894; and Roy A. Church, Economic and Social Change in a Midland Town (1966), pp.245-6.

3. Turner was the principal book-keeper there.

from John Penn's engineering workshops William Hillman, George Singer and John Warman who had all served their apprenticeships there. Thomas Bayliss, a gun action maker of Aston, joined them in 1868. Starley and Hillman broke away from the Coventry Machinists' Company in 1870 to establish their cycle and sewing machine business, the partnership enduring until 1874 when Hillman hived-off; ultimately to re-establish contact with William Henry Herbert, a Leicester farmer (who had been in Coventry in 1868 to learn the hardware trade), and to set-up the sewing machine firm of Messrs. Hillman and Herbert in 1876. Herbert took care of the business and financial matters of the concern, while Hillman produced the machines and managed the workshops. George Beverley Cooper joined them as a partner in 1880 and undertook the management of a London depot. He was the son of a naval chaplain and was trained in the West country's cloth manufacturing trade, but finding this business "somewhat dull", he contacted Herbert in Coventry with the idea of exploiting the commercial value of a cycle lamp of his own making. He became a partner within a few weeks since he had capital available for investment in the firm.[1] Starley, upon Hillman's departure, connected himself to Borthwick Smith in order to produce sewing machines, roller skates and cycles to his own patented designs. Joint-stock incorporation followed in May 1877, but upon the demise of the business during the hard times of 1879, Starley immediately formed the purely cycle manufacturing firm of Starley Brothers in conjunction with two of his sons, John Marshall and William (who were equally trained in the practical tradition), and continued

1. The Cyclist, vol. 7, No. 332, 24 Feb. 1886, pp.441-2; and vol. 10, No. 472, 31 Oct. 1888, p.72.

his inventive activities there until his death in 1881. While still a going concern, Messrs. Smith and Starley drew John Warman from the Coventry Machinists' Company to act as their works foreman. Warman, however, left in 1876 and established the cycle-making partnership in Coventry of Warman, Laxon and Company, later to be joined by James and William Hazlewood to form the incorporated enterprise of Warman and Hazlewood Limited in September 1890.[1] Thomas Bayliss left the Coventry Machinists' Company in 1874 to commence cycle manufacture in partnership with John Slaughter, who had received his engineering experience in various London workshops, and John Thomas, who had been acting as a sales representative for the Machinists' Company.[2] George Singer severed his connection in the following year to form another Coventry cycle-making enterprise with the financial aid of a local trimmings manufacturer, James Charles Stringer. Another "practical man" to be spawned by the Coventry Machinists' Company was Henry Sills - locally born - who entered the service of the Company immediately upon leaving school. He was employed there for fifteen years during which time he developed an interest in plating. He established his own plating business in Coventry in 1882, taking his custom from those local cycle manufacturers who previously had to send out of town for the performance of nickel plating work. He prospered until his death, at the early age of 42, in November 1890, whereupon his business was carried on by a F. R. Taylor until merged into the rival Coventry plating firm of Dutson, Ward and Company in 1907.[3]

1. Alfred Lowe, op.cit., 1889-90, p.205.
2. Ibid., pp.196-8; and 1890-91, p.13. The Cycle Trader and Review, vol. LXV, No. 887, 5 Jan. 1912, p.8.
3. Ibid., 1890-91, p.48b.

There were others whose early engineering experience was of a journeyman kind. John Kemp Starley was sent by his father, a Walthamstow market gardener, to acquire a "practical engineering training" under the supervision of his uncle, James Starley. He arrived in Coventry in 1872 at the age of seventeen, and five years later was placed in the cycle manufacturing firm of Haynes and Jeffries, departing in 1879 to establish what eventually became the Rover Cycle Company in conjunction with William Sutton, a Coventry haberdasher.[1] The brothers Samuel and Bernard Gorton were both trained as machinists; Samuel entering the cycle trade in 1876 and rising to become a manager in Humber and Company, until leaving in 1888 in order to begin cycle manufacturing in Coventry in partnership with his brother.[2] The Star Cycle Company of Wolverhampton was founded in 1884 by Edward Lisle, who entered the town's Stafford Road railway sheds to learn engineering for some years before entertaining self-employment with a little saved-up personal capital.[3] Paul Angois and R. M. Woodhead of Nottingham were machinists who had seen employment in local engineering factories before establishing the forerunner of the Raleigh Company in 1886.

The cycle industry, neverthe less, was not governed by entrepreneurs with stereotyped origins. Some stepped from commercial and works management in already established cycle factories into self-employment. Harry James of Birmingham had been acting for some years as works manager to William Andrews' sewing-machine and cycle business before becoming a cycle manufacturer on his own account in

1. G. Williamson, op.cit., pp.62 and 101.

2. Alfred Lowe, op.cit., 1890-91, p.66a.

3. Birmingham Gazette and Express, 15 April 1908.

1880. He had a marked distaste, however, for the commercial and financial side of business life, and this he left from 1891 in the hands of C. A. Hyde, an ex-racing member of Birmingham's Speedwell Club, and later in those of the Arter family (headed by Douglas Arter), who became his firm's sole directors in 1901, having been closely involved in the public flotation of James' business in 1897.[1] The Eadie Manufacturing Company, the Enfield Cycle Company and the Albert Eadie Chain Company were the progeny of Albert Eadie and R. W. Smith. Eadie was previously a sales representative for Perry and Company, and Smith had received a technical education at the Wolverhampton School of Arts supplemented by an apprenticeship in the Wolverhampton works of the Great Western Railway. Prior to his liaison with Eadie, he had been an assistant works manager in the Rudge Cycle Company (having joined the cycle trade with that firm in 1883), and then in 1892 the two of them purchased the needle-making business of G. Townsend of Redditch, changing its name to the Eadie Manufacturing Company and beginning cycle component production.[2] The needle firm, however, upon the initiative of its works manager (an ex-employee at the Government's Enfield small arms factory), had been marketing "Royal Enfield" cycles since 1890 but with little financial success. Eadie and Smith put this aspect of their business upon a firmer footing, and formed their Enfield Cycle Company in 1893. Cycle chain-making developed sufficiently within the Eadie Manufacturing Company to warrant the formation of a separate

1. The Arters were chartered accountants and also members of the Speedwell Cycle Club. James Cycle Co. Ltd., Retrospect and Prospect (Birmingham, 1948), pp.8-13.

2. Cycling, 24 Oct. 1891, p.212; and 7 May 1892, p.253; Proceedings of the Institution of Automobile Engineers, vol. XXVll, 1932-3, p.xxxii; and The Motor Cycle and Cycle Trader, vol. XC, No. 1234, 30 Aug. 1918, p.172.

enterprise in Redditch in 1895 to handle this line.[1] Managerial "spin-off" generated other substantial cycle firms. John Goddard, employed by Thomas Humber for 15 years and eventually works manager at his Beeston factory, joined Humber's only son, William F. Humber, in 1892 to organise Humber and Goddard Limited of Nottingham. They were partnered initially by Robert Cripps, a machinist and cycle-racing man, until he split-off to form his own Nottingham cycle business in 1894.[2] F. J. Osmond was a professional "racing crack" before accepting an executive role in Messrs. Buckingham and Adams in 1891, moving to participate in the management of Birmingham's Whitworth Cycle Company before the year was out, and then establishing with A. C. Hills - a Birmingham seamless steel tube manufacturer - his rapidly growing Osmond Cycle Company in 1894.[3] The ex-road racing Percy Carlisle Wilson had held executive positions in the Howe Machine Company (as assistant works manager), Humber and Company, and Rudge-Whitworth before joining Henry Woodhouse in 1895 to form his Badminton Cycle Company of Deritend, Birmingham.[4] R. H. Lea was a manager in George Singer's works for seven years, and G. J. Francis a manager for four years in Coventry's ball-making Auto-Machinery Company, before combining to establish the partnership of Messrs. Lea and Francis, cycle makers of Coventry, in 1895.[5]

1. The Motor-Cycle and Cycle Trader, vol. LXXIV, No. 1008, 1 May 1914, p.282; and No. 1012, 29 May 1914, p.558.
2. The Cyclist, Vol. 6, No. 308, 9 Sept. 1885, Supplement. Cycle Manufacturer, 29 Feb. 1896, p.58.
3. Cycling, 7 Feb. 1891, p.42; 15 Aug. 1891, p.53; and 3 Nov. 1894, p.254.
4. Ibid., 31 Oct. 1891, p.266. Cycle Manufacturer, 12 Dec. 1896, p.199.
5. Ibid., 5 Oct. 1895, p.123.

The racing paths, the cycling clubs, the desire to exploit some particular innovation, or simply a general interest in cycling or cycle design produced a motley collection of leading cycle entrepreneurs. Thomas Rushforth Marriott and Frederick Cooper, who joined Thomas Humber to form a partnership in 1875, were both racing men: Marriott an amateur specialising in time-trials, while Cooper had been a well-known racing professional. They stayed with Humber until 1885 when the latter dissolved the partnership to attract the financial support of T. Harrison Lambert, a Nottingham lace bleacher, dyer and finisher, and take-over the whole of the business and works at Beeston. Marriott and Cooper stayed with the trade, nonetheless, to continue a relatively small business on their own account.[1] The man who came to lead the Humber Company during the 1890's was Martin D. Rucker. Born in 1855, he distinguished himself at athletics while at Cheltenham College, thereafter becoming engaged in "commercial pursuits" in London. A member of the London Athletic Club, he became a noted cycle rider, and joined the London Bicycle Club in 1874, but in 1880 (and still "a cycle racing amateur of no small reputation") Rucker became interested in a "Devon" tricycle patent and embarked in business on the basis of it in conjunction with Messrs. Maynard and Harris of London E.C. Shortly afterwards he began trading under his own name in London - B.S.A. manufactured his tricycles as they had done with the "Devon" - until his business collapsed in the autumn of 1884. In the following year he was appointed manager of Humber's new London depot, and from this he quickly rose to become the Company's managing director.[2] Membership

1. The Cyclist, vol. 5, No. 220, 2 Jan. 1884, p.162; vol. 6, no. 286, 8 April 1885, Supplement; and No. 295, 10 June 1885, Supplement. H. O. Duncan, The World on Wheels (Paris. no date), vol. 1, pp.350-1.

2. Alfred Lowe, op.cit., 1890-91, pp.106-7; and The Cyclist, vol. 1, No. 22, 17 March 1880, p.221; No. 34, 9 June 1880, p.341; vol. 6, No. 272, 31 Dec. 1884; No. 275, 21 Jan. 1885, p.294; and No. 294, 3 June 1885, Supplement. Interestingly enough, he was the son of a clergyman, but Christian virtue hardly characterised the later years of his cycle-making career.

of Birmingham's Speedwell Club stimulated Charles Henry Pugh, manufacturer of bolts, nuts, washers and screws, into adding a cycle department to his Whitworth works in 1891. In 1893 he assigned the management of it to his two sons, Charles Vernon and John - also members of the Speedwell Club - the former over the commercial side, and the latter, having acquired a diploma in engineering from Birmingham's Mason's College, over technical matters.[1] The father went on to devise a method of producing jointless cycle wheel rims, and was a leading figure in the establishment of the Jointless Rim Company in 1893.[2] This from the beginning was put under the management of Thomas H. Woollen who had received a technical education at Firth's College, Sheffield, and had been hitherto apprenticed to and employed by the steel firm of Leadbetter and Scott.[3] The directorate of the B.S.A. Company had their attention drawn to the renewed production of cycle components in 1893 by their senior assistant to the chief engineer, Thomas Clements - a Swede whose real name was Olaf Pihlfeldt. Clements picked up his interest in cycle manufacture while a draughtsman in the employ of the National Arms and Ammunition Company. He perfected that firm's "National" tricycle and later patented his own designs of ball-bearings, eventually utilised by B.S.A. in 1885. In that year B.S.A. drew him into their fold as a draughtsman and retained him, despite their temporary departure from the cycle industry, by promotion to chief draughtsman

1. Birmingham Gazette and Express, 23 April 1907; and Proceedings of the Institution of Mechanical Engineers, vol. cxxxii (1936), p.591.

2. Cycling, 10 Nov. 1894, p.274.

3. Ibid., 30 Dec. 1893, p.443; and Proceedings of the Institution of Automobile Engineers, vol. XXX, (1935-6), p.xx.

and superintendent of shell manufacture.[1]

A capacity for invention and a desire to commercially exploit it marked Hans Renold and Joseph Appleby, cycle chainmakers. Renold had received a formal engineering training at the age of 18 at the Zurich Polytechnic, spent a short time in the Swiss Army as an artillery officer, and in 1871 joined the Paris engineering works of Claparède et Cie as designer-draughtsman. He left in 1873 at the age of 21 for England where he joined the machinery exporting firm of Felber-Juckers of Manchester, departing in 1877 to form a partnership, with a man named Calvert, as machinery exporters of Salford. This enterprise failed and in 1879, with £300 obtained from the father of his fiancée, purchased the driving chain business of James Slater of Salford. Renold soon encountered a demand by Midland cycle manufacturers for suitable cycle chains for tricycles. Initially he supplied the "common roller" type of chain as made for the textile trades, but this proved technically defective under cycling conditions, whereupon he patented his "bush roller" cycle chain in 1880 after technical collaboration with J. K. Starley.[2] Joseph Appleby launched his own chain-making enterprise after 30 years in Birmingham's pen trade. The success of Perry and Company's entry into the cycle trade, on the basis of his patent chain, in 1885 prompted him to form his own business engaging five of his sons, in 1886.[3]

William Erskin Bartlett, managing director of the North British Rubber Company of Edinburgh, also began to involve

1. History of the Birmingham Small Arms Company, pp.19 and 496. Clements' immediate superior, A. Driver, joined the firm in 1884. He too had been with the National Arms and Ammunition Company - as works engineer - and then with the Sparkbrook Manufacturing Co. Ltd. of Coventry. Ibid., p.404.

2. Basil H. Tripp, Renold Chains. A History of the Company and the Rise of the Precision Chain Industry, 1879-1955 (1956), pp.20-2 and 41. Alfred Lowe, op.cit., 1897-8, pp.231-4.

3. Cycling, 4 June 1898, p.494.

himself with the cycle trade late in life. An American by birth - he was born in Springfield, Mass. in 1830 - he had been with North British Rubber, by dint of family connections, for 20 years when in 1890 he patented his "Clincher" pneumatic tyre. His company began production of the tyre in 1891 and commercially it proved an extremely valuable invention, though Bartlett was never to see its full impact upon the pneumatic tyre industry since he died in 1900.[1] Another immigrant to acquire a prominent position in the U.K.'s cycle trade was Siegfried Bettmann who, born in 1863, came from a wealthy Nuremberg family of timber merchants. Bettmann's father, Meyer, was agent to a Bavarian Landowner. He travelled extensively in Europe as a young man, arriving in London in 1883, and obtaining employment with Kelly's Directories. In 1885 he began a small London cycle export business and teamed-up with Mauritz Johann Schulte, a fellow German and a "crack road rider", in 1887 to establish a cycle manufacturing business, moving it to rented premises in Coventry (at £150 per annum) in 1890 under the name of the Triumph Cycle Company.[2] Another German to enter the British cycle industry during the late 19th century was Johannes Gütgermann, son of a merchant of Oberwinter on the Rhine. His mother had ambitions for him to become an evangelical minister and he spent one year in religious training before three months of compulsory military service, which was brought to an end by his father's death. The event led him to leave the German services and move to Birmingham in 1876 (when aged 19)

1. The North British Rubber Company was established in 1855 by a group of Americans led by Henry Lee Norris, and Bartlett was Norris' nephew. His "Clincher" tyre embodied the principle of a beaded edge secured to a cycle wheel by means of a hooked rim under which theedges of the tyre were held and kept in place by air compression only, whereas all other contemporary pneumatic tyre inventions relied upon cementing or wiring-on to the wheel rim. Sir Arthur du Cros, <u>Wheels of Fortune</u> (1938), pp.145 and 156-7.

2. <u>Cycle and Motor Trades' Review</u>, 5 Jan. 1911, p.7; and <u>Coventry Evening Telegraph</u>, 24 Sept. 1951, p.5. G. S. Davison, op.cit., p.25.

where his father had connections with local nail-makers. After marriage to a Smethwick girl - Elizabeth Ore - in 1884, Gütgermann contacted a man named Barnett who had inherited a pill manufacturing business under the name of Isaac Taylor and Company. He bought the business and used the capital therefrom to subsidise a venture into cycle manufacturing, which he began during the early 1890's in a small workshop off Great Hampton Street, Birmingham. While in search of larger premises Johannes met William Gue, a cycle maker, and the two formed Taylor, Gue and Company, cycle manufacturers and dealers, with premises at Hampton Works, Peel Street, Birmingham, converting the status of the enterprise into a limited liability joint-stock company in December 1896.[1] Like Bettmann and Gütgermann, Edward A. Wilson had no technical background and spent his youth travelling in Europe after a spell of lumbering in the U.S.A. - he was the son of a lawyer but was orphaned at the age of 10. He eventually took up a post as foreign traveller for the Birmingham merchant house of Hudson, Edmonds and Company, and achieved a managerial status within it sufficient to persuade his employers to enter the cycle trade. Financial difficulties ended the firm's life in 1895 whereupon Wilson, in conjunction with a George Patterson who had been making cycles on his own account since 1891, bought the business in liquidation and redeveloped its cycle branch as the New Hudson Cycle Company.[2]

1. R. W. Burgess and J. R. Clew, Always in the Picture. A History of the Velocette Motor Cycle (1971), pp.12-13.

2. Birmingham Gazette and Express, 17 July 1908.

Finally there were the "financial overlords" : men who established new cycle firms or reorganised existing ones, who participated in major decision-making but left day-to-day management to others. The Coventry Machinists' Company had its origins in the philanthropic desire of some Coventry tradesmen to rescue the town from its economic plight caused by a decline in its staple ribbon and watch-making industries. Josiah Turner, James Starley, and an American named Salisbury, were drawn to Coventry to establish their sewing machine factory in 1861, not only by a plentiful supply of skilled watch-making labour, but also by £2,000 and suitable premises provided by a group of local businessmen headed by the Rev. Sidney H. Widdrington. In June 1863 the new firm was incorporated into the European Sewing Machine Company Limited, with a subscribed capital of £3,610 from 23 of Coventry's tradesmen and professional classes, but wound-up in August 1867 " by reason of its liabilities" (the result of a patent dispute with the predatory William Thomas) and subsequently re-started as the Coventry Sewing Machine Company.[1] Incorporation into the

1. In the shareholders' lists of the European Sewing Machine Company neither Turner, Starley nor Salisbury appear as subscribers of capital. The Company was, in fact, one of a number of "new trades" introduced into Coventry during the 1860's upon the initiative of the Rev. Widdrington and local business and professional people. The others took the form of The Coventry Cotton Spinning and Weaving Company Limited (started in November 1860); The Coventry Elastic Weaving Company Limited (started in 1862); and the Leigh Mills Company Limited (established in 1864 and a deliberate attempt to introduce the Bradford woollen and worsted trade). P.R.O., B.T.31, 786/465c; Alfred Lowe op.cit., 1896-7; and Curtis and Beamish's Directory of Coventry, 1874-5, pp. XXXIV - XXXV.

Coventry Machinists' Company Limited in 1869 with a subscribed capital of £5,000 in £50 shares saw fewer subscribers than before but no new men:

John Gulson - silkman - £500

James Marriott - builder - £500

William Franklin - ribbon manufacturer - £500

David Spencer - draper - £500

John Sutton - clothier - £800

Joseph Banks - currier - £250

Richard Robbins - miller - £450

Thomas Clarke - auctioneer - £500

James Maycock - draper - £500

Thomas Browett - solicitor - £500

It was from these that the Company's directorate was drawn, with Josiah Turner's role purely that as manager.[1] They were successful, well-heeled, Coventry businessmen, middle-aged, and, in the cases of Sutton, Banks, Franklin, Spencer and Gulson, came to be eminent in local politics and charitable activities. A man of similar standing in Coventry, but perhaps entrepreneurially more active, was George Woodcock, who joined his father in 1860 in the solicitors' practice of Woodcock and Twist. From this basis he developed a variety of business interests: he became one of the proprietors of the weekly "Coventry Standard", and in 1874 founded the watch-making business of G. Croft and Company, placing it under the management of a Mr. S. G. Wootton. In 1877 he established the Coventry Art Metal Works Company, which endured until 1880 when the business was transferred to a Henry G. Churchill of Marsden, Huddersfield.

1. P.R.O., B.T.31, 1463/4417.

During the same year (1877) he went in for property development by the purchase of Coventry's "King's Head" hotel, together with an adjoining boot shop and an auctioneer's offices, demolishing the buildings and constructing another hotel on the land. Woodcock's operations extended to the cycle trade in 1879 when he purchased the business of Messrs. Haynes and Jeffries and the premises of the recently defunct enterprise of Smith and Starley, thereupon forming the business of the Tangent and Coventry Tricycle Company under the management of H. J. Lawson. The death of Wolverhampton's Daniel Rudge in 1880 supplied the opportunity to purchase Rudge's cycle business from his widow and within the year Woodcock had transferred it and its principal mechanic, Walter Phillips, to premises in Coventry with the racing, "hill demon", Harry Osborne as manager. By 1883 he had gradually merged his two cycle enterprises to form D. Rudge and Company and the Coventry Tricycle Company, subjecting it to "private" incorporation in 1886 and a public flotation in 1887 by which means he hoped to contract his financial stake.[1]

The St. George's Engineering Company owed its business life to Alderman John Cornforth, who was proprietor of the Berkeley Street Wire Mills in Birmingham and part-proprietor of the Birmingham Screw Company until both concerns were absorbed by Nettlefolds Limited in 1880. In 1877 Cornforth took possession of Newton Wilson's sewing machine premises in Birmingham - he had advanced Wilson £21,183 in various sums with security - when that business folded in the February through "various heavy losses, coupled with the stagnation in trade", and resuscitated the enterprise as the St. George's Foundry Company.[2]

1. The Cyclist, vol. 1, No. 27, 21 April 1880, p.271; and Vol. 2, No. 72, 2 March 1881, p.189. Alfred Lowe, op.cit., 1890-1, p.164.

2. Sewing Machine Gazette, vol. IV, No. 50, 1 March 1877, p.43; and vol. IV, No 51, 15 March 1877, p.41.

Diversification into the cycle trade prompted the renaming of the firm to that of the St. George's Engineering Company in 1882, and the appointment of Charles Andrew Palmer to manage the cycle department in 1884. Apart from running his own Interchangeable Bicycle Company, which disappeared some time during the early 1880's, Palmer, a well-known cycle-racing man, had seen service with the sewing machine- and cycle-making firm of William Andrews and, in 1881, with the B.S.A. Company. Upon John Cornforth's death in 1888, Palmer managed the business on behalf of his widow until he bought it outright in 1890, subsequently converting it into a limited company in 1894.[1] Nottingham's Raleigh Cycle Company, though founded by the two machinists, Woodhead and Angois, owed its growth to the intervention of the entrepreneur-financier, Frank Bowden, son of a Bristol merchant, ex-clerk to Hong Kong's principal Law Officer, and who had made his fortune as a young man in Hong Kong real estate and stock and share deals. The Far Eastern climate had, however, impaired his health and he returned to England in 1885 for Harrogate's waters, and took to cycling in the South of France during the winter of 1886-7, in an effort to restore his constitution. Impressed by the machines turned-out by Woodhead and Angois in their small workshop, Bowden joined them in partnership in 1887 with an offer of capital to extend the business, displacing William Ellis, a Nottingham "lace gasser", who had been fulfilling this role on a more modest scale. A "private" incorporation followed in January 1889 with Bowden accepting an allotment of 4,000 £1 shares, and Woodhead and Angois 2,000 each. A not-too-successful public flotation in December

1. The Cyclist, vol. 9, No. 444, 18 April 1888, p.663; Cycle Trade Journal, Aug. 1895, p.168; History of the Birmingham Small Arms Company 1861-1900, p.6.

1891 gave Bowden a controlling interest in the firm, his family subscribing for 38,922 shares (out of an issued share capital of £65,996), with Woodhead holding 7,154 and Angois 7,159. Forceful and growth-minded, he took-over the commercial side of the business, leaving the engineering aspects to Woodhead and Angois, but by 1894, dissatisfied with their policies, Bowden had purchased their interests and virtually pushed them out; he replaced their expertise with that of George P. Mills, a graduate of Liverpool University College, and amateur cycle racer, who had passed through two Liverpool marine engineering firms before joining the cycle trade in 1884 as a draughtsman at the Ivel Cycle Works, Biggleswade, and becoming works manager of Humber and Company's Beeston factory in 1890. In 1894 Bowden extended his interests by an active involvement and financial stake in the establishment of the Fairbanks Wood Rim Company of Draycott, Derbyshire, placed under the management of Alexander Davidson ("not only a thoroughly practical engineer, but also a scientist and linguist of no mean order"), but then his health began to handicap him again. Davidson was transferred to manage Raleigh's new Lenton works, D. W. Bassett, commercial manager with Humber and Company since 1884, was appointed general manager of Raleigh, and the ex-cycle racing ace, Frank Shorland, was drawn from the New Beeston Cycle Company to act as Raleigh's London sales manager. Until financial crises hit his firm in 1898 and 1899, Bowden went into semi-retirement.[1]

1. History of Raleigh Industries (privately published), pp.1-13; Proceedings of the Institution of Mechanical Engineers, vol. 158, (1948), p.480; Cycle Manufacturer, 19 Oct. 1895, p.144; 15 Feb. 1896, p.39; and 14 November 1896, p.147. P.R.O., B.T.31, 4320/28064 and 5218/35386. Cycling, 24 Feb. 1894, p.85; and 10 Dec. 1898, p.481. Frank William Shorland, born at Orton near Wolverhampton in 1871, began his commercial career as a clerk but distinguished himself as a cycle racer in 1888 when he began to ride a "Geared Facile", produced by the Crypto Cycle Company of London and in whose offices he was employed by 1892 while racing for the firm. He then transferred to Humber and Company Limited to act as sales manager. After his days with Raleigh, Shorland became secretary and general manager in 1908 of the motor-car business of Clement-Talbot Limited, and was appointed managing director of it in 1914. H. O. Duncan, The World on Wheels, vol. 1 (Paris, no date), pp.902-5.

Unquestionably, no one acquired an entrepreneurial and financial grip upon the cycle industry of the 1890's tantamount to that of Harvey du Cros and his seven sons. He was a Dublin man of Huguenot descent, born in 1846 and educated at Dublin's King's Hospital ("blue coat") school. He began his working life as a clerk in the Dublin office of a Scottish firm of paper manufacturers, rising to a managerial position and ultimately becoming a partner. By the age of 40 he was a prosperous man and a firm advocate of the athletic life; he encouraged his sons to be cycle racers and he himself assumed the office of president of the Irish Cyclists' Association. The surprising victory of J. Hume riding a cycle fitted with pneumatic tyres - made according to the design of J. B. Dunlop - over Arthur du Cros, at the Queen's College sports, Belfast, in Spring 1889, ignited within the family an interest in the veterinary surgeon's patented invention. Dunlop, however, had his tyres made by the Belfast cycle firm of Edlin and Sinclair, and was only tempted to permit the formation of a separate enterprise to exploit pneumatic tyre manufacture by William Bowden of Bowden and Sweden, cycle agents of Dublin, and J. M. Gillies, who managed a Dublin newspaper, the "Freeman's Journal". Both were friendly with du Cros and invited him to join the project, whereupon he accepted but "....stipulated as a condition of his co-operation, that he should assume complete control, appoint the directors, write the prospectus and make the issue to the public" - stiff terms to which Bowden and Gillies acceded.[1] Du Cros floated his company in November 1889 with a £15,010 public share issue, not fully subscribed, to acquire Dunlop's patent of 1888, the business of Edlin and Sinclair, cycle manufacturers, and that of Richard Booth's Cycle Agency of Dublin; the last providing

1. Sir Arthur du Cros, op.cit., pp.78-80; H.O. Duncan, op.cit., pp.589-99; and J. B. Dunlop, The History of the Pneumatic Tyre (Dublin, no date), pp.32-5.

the Company's initial premises and the means to bring to cycle makers' and the cycling public's attention the advantages of the pneumatic tyre. The seven sons were pulled out of school or their places of employment and put into the service of the new company, while J. B. Dunlop was put on the board of directors, and R. W. Edlin and Finlay Sinclair placed in managerial positions.[1] The net profits of the Pneumatic Tyre Company and Booth's Cycle Agency Limited climbed astonishingly from £2,660 for 1889/90 to £21,975 for 1890/1 and to £220,007 for 1894/5 (see Table 4).[2]

1. Sir Arthur du Cros, op.cit., pp.81-2 and 91. R. W. Edlin was the son of the pioneering Robert Edlin of Leicester. He initially joined the Rudge Cycle Company, and moved to Belfast to take charge of Rudge's cycle depot there, forming his independent cycle business in partnership with Sinclair in 1887. He left du Cros' Pneumatic Tyre Company shortly after its foundation for self-employment in the tyre industry in Birmingham. J. B. Dunlop - a difficult man - resigned his directorship in 1895, over a dispute with the du Cros' with regard to the payment of royalties by the Company's French adjunct and went on to associate himself with the formation and promotion of the Tubless Pneumatic Tyre and Capon Heaton Company Limited. Ibid., pp.130-44. Cycle Trade Journal, Nov. 1892, p.330. Cycle Manufacturer, 25 Dec. 1897, p.276. The Cycle Trader and Review, vol. LXl, No. 843, 3 March 1911, p.482.

2. Cycle Manufacturer, 16 May 1896, advert.

TABLE 4

The Profits of the Pneumatic Tyre Company Limited
1889/90 - 1896/97

Trading year	Profits from premiums on new issues (£)	net profits earned (£) (excluding premiums)
1889/90	-	2,660. 1. 2.
1890/91	187.10. 0.	21,974.18. 1.
1891/92	10,040.18. 6.	48,595. 5. 5.
1892/93	100,000. 0. 0.	149,319. 4. 9.
1893/94	-	157,183.17. 2.
1894/95	75,000. 0. 0.	220,007. 7. 8.
1895/96 (Sept. 30 to April 25, 1896)	-	215,985. 6. 0.
1896/97 (11 months and 5 days ending 31 March 1897)	-	610,437. 0. 0.

(Sources: various trade journals; local and national newspaper reports; and Stock Exchange Yearbooks).

The growth and profitability of the enterprise - re-located in Coventry in 1891 and refloated as the Dunlop Pneumatic Tyre Company Limited in May 1896 - laid the basis of the du Cros family's entrepreneurial empire. Booth's cycle agency business, substantially expanded, was hived-off in 1893 to form the publicly-floated John Griffiths Cycle Corporation Limited with Arthur du Cros on the board, and with Harvey du Cros eventually assuming the role of chairman, and to run a world-wide chain of cycle agencies.[1] In 1896 the Australian agencies of the Corporation were grouped into a separate publicly-floated company, the Austral Cycle Agency Limited, and on the board were placed Harvey, Alfred and George du Cros.[2] The Austral Agency, with its headquarters in Melbourne and with branches throughout the Australian colonies, according to an American commentator, "really rules the Australian market" - holding the agency for many of the largest British firms, especially Humber, New Rapid, Premier, Raleigh, Singer, Swift and Bown Manufacturing.[3] Du Cros finance and initiative on the formation of the Cycle Components Manufacturing Company in 1894 - they held 23,928 shares in the firm which had cost them £77,448 and licensed it to manufacture the Warwick tyre - placed Harvey du Cros in the

1. The new company was named after the company secretary of Pneumatic Tyre. Until replaced by Harvey du Cros, Griffiths acted as chairman. Cycle Trade Journal, Nov. 1893, pp.685-6.

2. Times, 15 Dec. 1896, p.15.

3. Cycle Manufacturer, 14 Sept. 1895, p.89.

chairman's seat, and Arthur and Harvey jun. (managing director) on the board. This proved a useful connection when the interests of the Dunlop Pneumatic Tyre Company (chairman and managing director, Harvey and Arthur Du Cros, respectively) warranted the purchase, in 1896 and for £100,000, of the patents and plant relating to the production of the Westwood rim from the Components Company.[1] Promoter's profits were also garnered when, in January 1897, the seamless steel tube plant - of doubtful profitability - belonging to the Components Company, was sold for £50,000 to a separate but successfully floated organisation, the Components Tube Company with a board led by Harvey du Cros jun.[2]

Loans and credits "to a large amount" to Byrne Brothers of Birmingham (established in 1855) secured for the Dunlop Company from 1894 regular supplies of rubber from experienced rubber goods producers; the relationship becoming closer when the Birmingham firm enlarged its factory exclusively for tyre work and was publicly floated in 1896 as the Rubber Tyre Manufacturing Company, with Harvey du Cros jun. on the board.[3] During 1900-1 the Rubber Tyre Manufacturing Company was taken-over almost entirely by the Dunlop Pneumatic Tyre Company and renamed the Dunlop Rubber Company. In 1894 an investment of £20,000 by Harvey du Cros, in the debenture stock of the Coventry Machinists' Company, was rewarded by 1896 by the appointment of Alfred and Harvey du Cros jun. to the board, Harvey jun. becoming managing director in 1897, "after much pressure and on the understanding that he should be at liberty to resign if he found himself unable to attend to the affairs of the company".[4] The family's directoral responsibilities ramified

1. Cycle Manufacturer, 7 Jan. 1899, pp.310-11. The rim was deemed to be the most suitable for the fitting of Dunlop tyres.

2. Ibid., 7 May 1898, pp.204-5, and 14 May 1898, pp.218-9. Times, 30 Jan. 1897, p.15.

3. Sir Arthur du Cros, op.cit., pp.208-9; Times, 13 June 1896, p.8.

4. Cycle Manufacturer, 25 May 1895, pp.210-16. Times, 26 Oct. 1896, p.11; and 18th Nov. 1897, p.13.

with the progress of the Dunlop Company: the sales of Dunlop tyres in France was initially performed from 1890 exclusively, and under licence, by the largest of French cycle manufacturers, Adolphe Clément; and from 1893 by the Compagnie Française des Pneumatiques Dunlop, from which Clément collected royalties as a consideration for the surrender of his original selling licence. In 1896 Clément's interest was liquidated by a lump sum payment raised by the flotation of a new Dunlop Pneumatic Tyre Company (France) Limited under its managing director, Arthur du Cros.[1]

The instances of diversification by established firms and the parts played by Woodcock, the du Cros' and the others showed that the cycle industry did not have an insular entrepreneurial, capital and financial development. Relationships with the existing, established, economic structures of the U.K. were close, even if often on a local basis. It was true that both Perry and B.S.A. financed the expansion of their cycle component divisions from accumulated reserves and ploughed-back profits, though by August 1898 the B.S.A. Company had run-up a bank overdraft - on account of its machine-tool purchases - of £80,985. This it managed to reduce to £3,769 in September 1898, mainly by an issue of a nominal £50,000 of 5 per cent mortgage debenture stock at £111½ per cent to the Birmingham Metal and Munitions Company Limited - a private deal arranged by Herbert Chamberlain.[2] Most of the leading firms took part in the public company flotation "boom" of 1896-7, caused by an upward surge in cycle demand, high profitability and "cheap money". Rudge and Humber (in 1887), Premier and Raleigh (1891) and William Bown (1893) underwent public flotation earlier; but even before and without

1. Times, 10 Aug. 1896, p.4.

2. History of the Birmingham Small Arms Company Ltd. 1861-1900, vol. II, pp.760-70.

this technique, cycle entrepreneurs attracted inflows of "outside capital" - sometimes from the very start of their commercial existence. Messrs. Thomas Townsend and Sons, silk manufacturers of Coventry and Nuneaton, established the Centaur Cycle Company of Coventry in 1876 under the management of Edward Mushing, a local milliner, hosier and haberdasher, who left his business in the hands of his wife.[1] By 1892 Joseph Fielding Johnson, a Nuneaton wool merchant, had a stake in the business: a "private" incorporation awarding Charles B. Townsend 1,498 £10 shares, Edward Mushing 430, Goerge Gilbert, the works manager, 162, and Townsend and Johnson jointly 1,360, out of an issued capital of 3,454 shares.[2] The Raglan Cycle and Anti-Friction Ball Company of Coventry began life in November 1889 as Taylor, Cooper and Bednell Limited with a subscribed capital of £5,812.10s., the major portion coming from Coventry's Turrall family. George Taylor, Caleb. T. Cooper and Alfred Bednell, the cycle engineers in the enterprise, held only 25 £10 shares each. Alfred Turrall, butcher and farmer, held 300, while Charles Turrall, ribbon manufacturer, possessed 200, and Edgar and Edward Turrall, merchant and ribbon manufacturer respectively, subscribed for 100 a-piece. By December 1895 the Company had a subscribed capital of £29,775 on an additional share issue of 2770 £10 units, 2,700 being allotted to the Turrall family jointly with

1. Alfred Lowe, op.cit., 1889/90, p.200.

2. P.R.O., B.T.31, 5368/36863. Johnson has been described as "part-founder" of the Centaur Company. He became the first mayor of Nuneaton, alderman of the borough and of the Warwickshire County Council and J.P. for the County. The Motor Cycle and Cycle Trader, vol. LXXXIX, No. 1200, 4 Jan. 1918, p.12.

John P. Hughes, a Coventry wine merchant, and in December 1896 made a successful £170,000 public flotation.[1] Similarly, the Riley Cycle Company originated in Bonnick and Company Limited established in February 1890 with a subscribed capital of £950. The majority of the 168 £10 shares initially issued were allotted to Coventry's Riley family: Basil Riley, tailor and hosier, held 40 as did William Riley jun. and Herbert J. Riley, trimmings manufacturers. William Riley sen., "gentleman", held 20 while Alfred Bonnick, the actual cycle maker, also had 20. By March 1895 the shareholders had put a total of £4,440 into the business, but the Rileys, prompted by the decline in Coventry's textile industries, moved into more active management of the concern, purchased the shares held by Bonnick and other managerial personnel in 1894, such that of the 444 shares issued, only 7 - owned by Jesse Griffiths, one of the firm's managers - remained outside their possession.[2]

1. P.R.O., B.T.31, 4616/30291.

2. P.R.O., B.T.31, 4689/30893; and A. T. Birmingham, Riley. The Production and Competition History of the Pre-1939 Riley Motor Cars (1965), pp.1-2. William Riley jun. took over the management of his father's weaving business in 1870. He foresaw the death-knell of Coventry's weaving industry, according to one report, with the Education Acts which followed that of 1870 and which made it impossible for child labour to be available in the required quantity. The lower social status and cheaper labour of Germany and Austria slowly prised the weaving trade from Coventry's hands. The Rileys had their feet in both the cycle and fine weaving trades for six years, finally abandoning the latter in 1896. G. S. Davison, op.cit., pp.87-88.

In July 1896 they put their business through an under-subscribed £40,000 public flotation, but nonetheless endured as the Riley Cycle Company until 1938.

Since it had acquired a licence to manufacture tyres under the "Clincher" patent in 1894, a thorn in the side of the Dunlop Pneumatic Tyre Company was Palmer Tyre, established in October 1893 as a "private" company to purchase 8 patent rights from John F. Palmer of Riverside, Illinois. An initial cash subscription of £3,750 from 15,000 partly paid-up £1 shares was sufficient to set the enterprise going in Birmingham, with Birmingham businessmen as prominent shareholders. C. H. and C. V. Pugh of the Whitworth Cycle Company held a total of 3,700 shares but, in addition, there was Alfred F. Bird, the baking and custard powder manufacturer (holding 2,000); John Taunton, partner in John and Joseph Taunton, metallic bedstead makers (holding 1,000); and John F. Wright, originally a gas stove manufacturer of the firm of John Wright and Company (with 2,000). These were well-established, Birmingham manufacturers, but there were also investments by William Martin (1,000 shares and a Birmingham architect), Clarkson Booth (2,000 and a "manufacturers' agent" of Moseley), and by the Rudge Cycle Company and the India-Rubber, Gutta Percha and Telegraph Corporation Limited. Rudge held 1,000 shares in the name of its company secretary, James Gutteridge; and India-Rubber and Gutta Percha held 3,000 - 2,000 in the name of Christian Gray, its board-member and chief engineer of Kent, and 1,000 in that of William Tyler of London, its company secretary. This allocation of shareholdings had at least two portents: it presaged the merger between the Rudge and Whitworth cycle enterprises, and the ultimate take-over of Palmer Tyre by the large rubber processing and cable manufacturing concern. In the interim, Palmer Tyre was guaranteed secure and regular supplies of processed rubber from experienced rubber manufacturers (just like the Dunlop Company desired); and India-Rubber and Gutta Percha, who had been making solid tyres for cycles at its Silvertown (London) works since about 1887, was afforded an excellent entry into the pneumatic cycle tyre trade.[1] The firm was put initially under the general managership of J. H. Price, a long-serving member of London's Stanley and North Road cycle clubs, but he resigned in October 1895 in order to promote the manufacture of his own design of cycle tyre.[2] In the previous March the issued capital of the Company was increased from £30,000 to £48,000 to accommodate subscriptions from the Premier Company, St. George's Engineering, and J. K. Starley and Company, and C. A. Palmer and C. V. Pugh became joint managing directors. Under a series of agreements made with the India-Rubber, Gutta-Percha and Telegraph Corporation during the late 1890's and 1900's, the management of Palmer Tyre was consigned to this concern which in 1902 acquired the bulk of its share capital.[3]

Bowden, Woodhead and Angois and J. K. Starley, in 1889, and George Singer, Barton and Loudon, and John Marston in 1895, resorted to "private" incorporation mainly to limit their liabilities, with little or no injections of additional "outside capital" involved until the advent of public flotation. Since the formation of his own business in 1879, however, J. K. Starley had exchanged his partner, William Sutton, in return for the financial interest of Birmingham's

1. P.R.O., B.T.31, 5677/39641.

2. Cycling, 24 March 1894, p.154. Cycle Trade Journal, Oct. 1895, p.206. Cycle Manufacturer, 5 Oct. 1895, p.123.

3. Cycle Manufacturer, 30 March 1895, p.112 and 27 April 1895, p.168.

Edward Allday, who by June 1895 held £13,497 of J. K. Starley and Company's issued share capital of £29,885.[1] In 1886 George Woodcock incorporated his Rudge Cycle Company to enable him to dispose of a two-thirds interest in it - amounting to £68,475 - to 29 business and professional people mostly working in Birmingham. The largest contributions came from John Padmore, gold refiner of Birmingham (£15,000), John Taunton, the Birmingham bedstead manufacturer (£15,000), and William Martin, the Birmingham architect-surveyor (£14,775). Charles Wallis (who was eventually to become chairman of Rudge-Whitworth, and a partner in the firm of Collings and Wallis of Birmingham, nail-makers, merchants and factors), invested £1,890. George Padmore, gold refiner, invested £615, and Edwin Padmore of the firm of Thomas Padmore and Sons, pearl-workers, £750. John Taunton's family partners, Joseph and Leonard, invested £6,000 and £1,005, respectively.[2] Likewise, Hillman, Herbert and Cooper in the same year liquidated £15,400 of their business for cash to introduce the shareholding interests of Robert Dalton, Alexander Rotherham and George Twist, manufacturer, silk dyer, and solicitor, respectively, and all of Coventry. The original three partners nevertheless maintained a large stake, collectively holding £8,000 in debentures and £36,600 in ordinary shares.[3] George, Frederick and Samuel Townend of Coventry, beginning cycle manufacture in 1890, were able, through incorporation in 1891, to allot a half-share of their business to Joshua Perkins, a local coach lace manufacturer, who invested £7,500; the same proportionate

1. P.R.O., B.T.31, 4581/30004.
2. P.R.O., B.T.31, 3602/22151.
3. P.R.O., B.T.31, 3626/22338.

share being maintained by the Perkins family as the capital of the Company rose from £15,005 to £17,355 by 1896 - the year of its successful public flotation.[1] Though a going concern for less than two years, "private" incorporation in 1890 enabled S. and B. Gorton of Coventry to liquidate half of their interest and to draw a total of £3,510 in equal amounts from George Darlinson (a local silk merchant), Henry Fisher (a Birmingham lamp manufacturer), Frederick Fulwell (a Coventry ribbon maker), Charles Iliffe (surgeon and Coventry's coroner), Walter Iliffe (surgeon of Kendal, Westmoreland), Thomas Mercer (a local watch maker) and from James Whittindale (a Kenilworth estate agent).[2] Bettmann and Schulte's Triumph Cycle Company obtained £1,827 from incorporation in 1890, partly to liquidate outstanding debts, and principally from George Sawyer (London manager of the depot of the American White Sewing Machine Co. - £518), Philip Schloss (a manager of St. Albans - £210), William Bown (the Birmingham cycle components maker - £350), and Albert Tomson (a Coventry ribbon manufacturer - £350), though there were 12 smaller subscribers including three French engineers - Bettmannhad lived in Paris before moving to London - and Rowley B. Turner by then a Brussels merchant. Before a public flotation in 1895 further share issues raised £1,662 from 9 new holders: Alfred E. Fridlander, a Jewish Coventry watch-maker invested £1,032.10s., a G. A. Everitt, landowner and county magistrate, of Knowle Hall, Warwick, £350, and Bettmann's family in Nuremberg

1. P.R.O., B.T.31, 5062/34024.

2. P.R.O., B.T.31, 4657/30617.

£164.10s.[1] C. H. Pugh's Whitworth Cycle Company widely exploited personal and business contacts to raise, in May 1893, £8,972.10s. of additional capital from 57 investors, the biggest subscriptions coming from James Whitfield, a Birmingham brassfounder (£2,500), Edward Beesley, a Birmingham gold chain maker (£500), Frank Parkes, an edge tool manufacturer of Erdington (£500), Harvey du Cros (£500), and Robert Dyson, a Rotherham manufacturer (£500).[2]

Clearly, if Raglan, Riley and Palmer Tyre are anything to go by, the financial requirements for a durable entry into the cycle trade were not necessarily great. As late as 1896 Alick Sargeant Hill could establish his prosperous Coventry Chain Company with an initial working capital of £300, rented premises in Dale Street, Coventry, a number of cycle chain-making machines that he had purchased in the U.S.A., and a lease on the steam-power provided by a carpet-beating firm next door.[3] The Speedwell Gearcase Company of Birmingham - still going - began in June 1897 in rented premises in Broad Street, with £1,500 invested by way of debentures by Ephraim Cutler, a glass merchant, plus a lease on his firm's millpower.[4]

1. P.R.O., B.T.31, 4859/32255. In 1890 George Sawyer was also instrumental in founding the Hire Traders' Protection Association - "to clean hire-purchase of the bad odour in which hire purchase was associated" - and was treasurer of it for the first 8 years of its existence and then became its president. He invested in and eventually became a director of Dover Limited floated in May 1897 until the time of his death in 1926. Hire Traders' Record, 1 April 1926. Fridlander (1840 - 1928) had been concerned in the foundation of the Leigh Mills Company formed in Coventry during the depressed years of the 1860's caused by the collapse of ribbon weaving. K. Richardson, Twentieth Century Coventry (1972), p.15.

2. P.R.O., B.T.31, 5583/38867.

3. Basil H. Tripp, op.cit., pp.72 and 78.

4. Business Records of the Speedwell Gearcase Co. Ltd., Minute Book 17 June 1897 and 10 Feb. 1914.

William Montague Hawnt began a cycle manufacturing business in London in 1895 in partnership with a Joseph Mason. Hawnt only invested a capital of £30 and Mason £100. The business prospered and branches were established in Birmingham and Cairo. In 1905 a Mr. Cook bought Mason's interest for £5,000 and put an additional £200 in the business. Unfortunately, Cook withdrew from the partnership in 1907 and Hawnt had to carry on the business alone, with his own remaining capital, only to go bankrupt in 1908.[1] In order to commence the mass production of cycle chains in March 1896, the directors of the B.S.A. Company estimated that the requisite new buildings would cost £3,900 and the machinery, engines and tools £5,924.15. 0d - a total of £9,824.15. 0d.[2] Naturally, people conceived the idea of establishing new enterprises on a grander scale, making use of joint-stock incorporation and public issues. The Dunlop Company began this way and another of note was Clipper Pneumatic Tyre Limited. Clipper Tyre, surviving until 1954, began life as a £150,000 flotation offer of March 1897, £120,000 of which was payable for licences to manufacture tyres and rims under patents - including the "clincher" - held mainly by the Dunlop Company.[3] Big capitals and successful flotation issues were not, however, sufficient conditions for durable commercial viability. The high profits of the Dunlop Company in the 1890's attracted inventors, company promoters and investors alike to the pneumatic tyre field. The public subscribed £512,000 for the £20,000 of paper offered on the flotation of the

1. The Cycle and Motor Trades' Review, 10 March 1910, p.266.

2. History of the Birmingham Small Arms Company Limited 1861-1900, vol. II, pp.629-31.

3. Times, 10 March 1897, p.16. Dunlops were accordingly suspected of having a substantial investment in the concern. Cycle Manufacturer, 16 July 1898, p.335.

Puncture Proof Pneumatic Tyre Company in May 1893, but the enterprise was in the process of liquidation and reconstruction by November 1895. Beeston Pneumatic Tyre was launched with a successful £60,000 issue in June 1893, but by September 1897 sought salvation by forming part of the Amalgamated Pneumatic Tyre Companies scheme. The fully-subscribed Bowley Pneumatic Tyre and Cycle Company - a £35,000 flotation of May 1896 - was in voluntary liquidation in April 1897.

Facilitating the small financial requirements for entry into the cycle industry were the opportunities for renting suitable premises in some urban areas, hiring mill-power and machinery, drawing upon trade credit, buying cycle parts from the component and accessory producers, and the sending of work out - especially nickel plating and enamelling - to be performed by specialist operatives. The acquisition of land and buildings by way of a lease was particularly common. S. and B. Gorton took their premises in Friar's Lane, Coventry in 1889 on a seven year lease.[1] The substantial business of the Hearl and Tonks Cycle and Components Manufacturing Company, built from 1891 by the efforts of Edward Hearl, and William and Henry Tonks of Birmingham, was housed in two rented factories: its original Imperial Works for £25 per annum and its additional Victoria and Albert Works for ten times that amount.[2] Charles H. Pugh of the Whitworth Cycle Company established a firm in 1893 to manufacture his patent jointless felloes (i.e. wheel-rims) by taking the Plume Works at Aston, Birmingham, upon a 21 year lease and at a rental of £250 per annum. The firm - the Jointless Rim Company - prospered rapidly enough to justify incorporation in December 1893

1. P.R.O., B.T.31, 4657/30617 op.cit.

2. Times, 2 July 1896, p.15.

and a £10,000 public share issue in the following January.[1]

In Nottingham nascent cycle manufacturers located themselves in the tenement factories constructed to serve the capital requirements of small lace manufacturers, and in which "Space, with power, light and water provided, could be rented very cheaply, thus facilitating the entry into industry of manufacturers possessed of small capital".[2] Humber, Cripps and Goddard, for instance, commenced cycle manufacture in Nottingham's Windley's factory in Roden Street until growth demanded more spacious workshops at Colwick Vale. The types of premises required by incoming cycle manufacturers did not, apparently, have to be very specific with respect to design. Taylor, Cooper and Bednell Limited located itself in a mill previously occupied by a ribbon manufacturer. Messrs. Hotchkiss, Mayo and Meek of Coventry tookover premises previously utilised by the Coventry Watch Movement Manufactory. The Keen Cycle Company Limited of Coventry began in a workshop formerly occupied by a tailor. Prior to 1900 some 14 Birmingham cycle and component manufacturers established themselves in premises previously occupied by tailors, drapers and outfitters, and six in grocers' shops.[3]

1. P.R.O., B.T.31, 5742/40189; and Cycling, 20 Jan. 1894, p.13. The enterprise also served as an additional catalyst, drawing the financial interests within the Rudge and Whitworth cycle companies together. The principal shareholders in the Jointless Rim Company in May 1894 were C. H. Pugh (2,020 fully paid up £5 shares); C. V. Pugh (100); J. V. Pugh (134); George E. Wright, manufacturer of Solihull (430); John F. Wright and George E. Wright together (400); William B. Avery, managing director and chairman of W. and J. Avery Limited of Birmingham, the scale-makers (150); and Allan Whitfield, a Birmingham manufacturer (173). The Wrights represented the Rudge interest. Ibid.

2. J. M. Hunter, "Factors Affecting the Location and Growth of Industry in Greater Nottingham", East Midland Geographer, vol. 3, part 6, No. 22, Dec. 1964, p.340.

3. Information culled from local directories.

Competition in Cycles and Market Control in Tyres

The size of requisite starting capitals in the cycle trade contributed towards an ease of entry and of exit. Local directory information indicates that in Coventry, up to 1901, 219 firms entered the cycle, components and accessory industry but 120 left. In Birmingham, before 1900, 1,028 enterprises joined the industry while 508 failed to stay the course, while Nottingham saw 120 firms enter and 50 leave. Wolverhampton could count 150 new entrants, up to and including 1900, and 68 departures. For many life tended to be short. Of the 196 firms entering the Coventry trade before 1899, 76 (or 39 per cent) endured for four years or less, with 63, according to directories, lasting for 10 years or more. Wolverhampton saw 41 per cent of its new entrants into the cycle trade before 1900 survive for four years or less and only 20 per cent for more than nine, while in Birmingham some 54 per cent of new firms entering the trade before 1896 had expired within four years. In Nottingham, too, 52 per cent of the new entrants of 1886-1898 endured for no more than four years and only 28 per cent for ten or more.

Ease of entry and of exit meant an irritating degree of price competition for the well-established cycle makers from the "small men", the quality of their products being, in reply, impugned. In flourishing 1888 it was reported: "The chief evil of the current state of business is the competition of the small makers of inferior cycles, who are said by the larger firms to adopt somewhat extreme means for the manufacture of machines which may sell because of their cheapness. In some cases such cycles are said to be from 30s. to £2 less in price than those of well-established makers."[1] And in 1896 it was noted that the

1. The Cyclist, vol. 9, No. 448, 16 May 1888, p.768.

"severe competition" from the "garret man" - who "deems his costs to be minimal by not allowing for depreciation, repairs, overheads etc., but who floats in and out of the trade according to the prosperity of trade" - enforced "a rigid economy in the cost of production".[1] In the early 1880's it may well have been the case that "The majority of makers of cheap machines have but small premises, little or no expensive machinery, and no depots; they use the commonest material obtainable, obtain cheap labour, do as little fitting as possible, and for the most part do not advertise; all of which accounts for the difference in price between a £4 machine and one at £20".[2] During the course of the "boom" of 1896-7 and after, however, the "little man" had the support of the specialist, large-scale, cycle component manufacturers; and he and his cheaper product were reckoned to have got hold of an abnormally large slice of the cycle trade at a time when many of the largest concerns were tardy in introducing a cheap but reliable machine aimed at a potentially wider cycling public.[3]

The principal makers of complete cycles could exercise little control over the competitive activities of their smaller brethren, unlike the du Cros' and their tyre companies whose policy objective from the beginning was to secure a commanding monopoly position in the U.K. and European pneumatic tyre trades. In 1890 this objective was threatened by the discovery that J. B. Dunlop's patent of 1888 had been anticipated in 1846 by R. W. Thompson's patent relating to pneumatic tyres for carriage wheels, and in order to recover and consolidate his position Harvey du Cros purchased a number of patents

1. Cycle Manufacturer, 23 May 1896, p.178.
2. The Cyclist, Vol. 3, No. 116, 4 Jan. 1882, pp.139-40.
3. Cycle Manufacturer, 19 June 1897, p.471; 9 July, p318; and 10 Sept. 1898, p.83.

covering important technical improvements to pneumatic cycle tyres - the major ones, in the event, proving to be Welch's patent for wired-on detachable tyres (acquired in May 1891), Charles Wood's tyre valve (patented in March 1891), and the "Clincher" patent of 1890 belonging to W. E. Bartlett of the North British Rubber Company. Initially, together with Palmer Tyre, the du Cros' held only a licence, granted by North British Rubber in return for royalties, to exploit the advantages of the "Clincher" patent, but in 1896 they acquired the patent outright. The price was £200,000 cash plus the concession of a licence to the North British Rubber Company, the necessary finance being raised by the £5 million Hooley flotation of the Dunlop Pneumatic Tyre Company. Given their own attitudes and policies, and the experience of North British Rubber with the requisite technology, the du Cros' marvelled at the lack of aggressiveness, and the willingness, of Bartlett and his Company to part with the "Clincher" patent,"....for by the sheer strength of their position a monopoly was more in their reach than ours, although it is true that the Founder Company had the prestige and publicity of having been first in the field".[1] But thus powerfully armed, the Dunlop

1. The purchase did, however, avert an incipient court-room battle between the Pneumatic Tyre Company and North British Rubber over the conditions of the licence granted to the former. Cycle Manufacturer, 25 April 1896, p.135. Bartlett and the North British Rubber Company had, it would seem, an aversion to repeated litigation. According to Francis J. J. Glynn, writing in 1900, the reasons that impelled North British to dispose of its Clincher patent were that the enormous success of the Clincher tyre caused so many infringements of the patent to arise such that the firm, in order to protect its rights, would have been continuously involved in lawsuits concerning it. Also by selling the patent to the Dunlop Company, on the terms agreed, North British Rubber would experience no further trouble in that direction and would thus be able to devote all their energies to the manufacturing and commercial side of their business. The Cycle Trader, 19 Oct. 1900, p.72. See also his book History of the Clincher Tyre and Rim (1900).

Company systematically set out to control or exterminate rival concerns; the element of control over the activities of most other established pneumatic tyre companies being exercised, by virtue of the key patents held by the Company, through a rigid licensing policy. The rigidity of it was spelled out by Basil Gee, chairman of the Turner Pneumatic Tyre Company in 1897. The licences granted by Dunlops were mainly of three types: (a) under J. B. Dunlop's original patent only - one such licence had been taken out by the firm of Charles Mackintosh and Company, india-rubber manufacturers, but in the context of the mid-1890's "....it is for all practical purposes useless"; (b) under the Dunlop and Welch patents and to a pattern to be left at the Dunlop Company's warehouse "so that they can always compare a tyre being put on the market today with the original exhibited in their possession"; (c) under the Dunlop-Welch patents on condition that the tyres manufactured should always sell at a price equal to the scheduled price of the Dunlop Company for the time being - "Now, I should be sorry to endeavour to compete with Mr. Harvey du Cros on his own price, so that you may take it as rather a negligible licence".[1] The policy of his Company, claimed Harvey du Cros in 1896, was to grant licences to (and collect royalties from) manufacturers only on classes of tyres which the Dunlop Company did not make, and warned licencees that they would be attacked in the courts "If they chose to act dishonestly".[2] Under such conditions, the Puncture-Proof Tyre, the Grappler Tyre Company, Turner Pneumatic Tyre, the Scottish Pneumatic Tyre Company, Preston-Davies Tyre and Valve, the Detachable Pneumatic Tyre Syndicate, the Beeston Pneumatic Tyre

1. Ibid., 31 July 1897, p.16.

2. Ibid., 16 May 1896, p.168. Palmer Tyre was still able to retain its 1894 licence to the "Clincher", after Dunlop's purchase of the patent, so long as it paid royalties but at a rate never less than £3,000 a year. Ibid.

Company, Scott's Standard, the "Non-Collapsible" Pneumatic Tyre Company, and the Woodley Tyre Company, eked out a desultory commercial existence during the 1890's - Preston-Davies being punished for "dishonesty" in 1895 (and costing it £1,000), Puncture-Proof in 1897-8 (costing it £267.5s. in damages), and the Detachable Pneumatic Tyre Syndicate in 1899 (Dunlop's suit killing-off this weakly financed enterprise first formed in February 1894).[1]

Non-licensed pneumatic tyre firms and their innovating entrepreneurs were pursued ruthlessly throughout the nation's courts with legal suits and injunctions for infringements of the Dunlop-Welch and "Clincher" patents. An action against R. W. Edlin, the Pneumatic Tyre Company's ex-manager, drove that tyre maker into bankruptcy in March 1895.[2] During its financial year ending in June 1898 the Dunlop Company engaged in 152 legal actions, 140 of which were for patent infringements began during the year. 25 interim injunctions and 95 perpetual injunctions were obtained, and 30 disputes were settled at an early stage. In December 1899

1. Times, 28 May 1898, p.5; and 16 Feb. 1900, p.4. Preston-Davies purchased the business of the Scottish Pneumatic Tyre Company in July 1897 for 60,000 £1 ordinary shares, in order to acquire that Company's tyre patents and strengthen its position with respect to the holding of Dunlop-Welch licences; and was rewarded by the small profit of £3,187 for the year ending 31 August 1898, as against the previous year's loss. The Puncture-Proof Pneumatic Tyre Company was merged into the Detachable Pneumatic Tyre Syndicate in January 1898, since it possessed a Dunlop-Welch licence but no tyre design which did not offend the Dunlop Company. The Detachable Syndicate had both a Dunlop-Welch licence and a design of tyre which, it thought, (mistakenly as it turned out) it could sell at less than Dunlop tyre prices under its licence terms. It suffered, however, from a lack of working capital. Ibid; Economist, 31 July 1897, p.1112; and Stock Exchange Official Intelligence, 1899, pp.1414-5.

2. Cycle Manufacturer, 25 Dec. 1897, p.276.

Harvey du Cros asserted that, since the formation of the Dunlop Pneumatic Tyre Company in May 1896, "no fewer than 730 actions had been taken to enforce the company's rights, and he calculated that they had spent from £100,000 to £120,000 of the shareholders' profits on these actions".[1] Additionally, in pursuit of its policy of getting near exclusive representation on the retail market, the Company made 85 agreements with U.K. cycle manufacturers and 1,336 agreements with cycle agents.[2] Of the non-licensed, only the Tubeless Pneumatic Tyre and Capon Heaton Company, in cases taken so far as the House of Lords, formally survived the Dunlop Company's legal onslaughts, but the protection of its patents cost the firm dear, and, in any case, its product proved to have insufficient commercial appeal. By 31 August 1898 it had an accumulated debit of £45,997 on profit-and-loss account, and had paid no dividends. During the 1896/7 trading year, it had made a loss of £26,930 because of litigation with the Dunlop Tyre Company and "a want of experience in manufacture" that had incurred £13,000 in experimental work.[3] By 1903 it was defunct.

Alternatively Dunlops left the non-licensed manufacturers alone to find their own way to a commercial death, probably because the du Cros' felt they offered no effective competitive challenge. Their old crony, William Bowden of Dublin, tried to emulate their success by a participation in the formation of Seddon's Pneumatic Tyre Company of 1892, which purchased the patents of E. H. Seddon relating to the manufacture of pneumatic tyres, and the businesses of Jennings and Company of Manchester, Pain Brothers

1. Times, 20 Dec. 1899, p.3.
2. Ibid., 9 July 1898, p.326.
3. Tubeless Pneumatic Tyre was formed in 1896 to acquire the inventions of H. A. Fleuss and J. W. Smallman for improvements in pneumatic tyres, plus the business of Capon Heaton Limited, india-rubber and tyre manufacturers, of Lifford and Hazlewell Mills, near Birmingham. Stock Exchange Official Intelligence, 1899, pp.1496-7. Cycle Manufacturer, 6 Nov. 1897, pp.184-5.

Limited, and William Bowden, cycle agent, of Dublin. Offshoots, in the form of Seddon's Pneumatic Tyre Company (French Patents) and Seddon's (Continental) were floated mainly in Dublin in 1893. For 1892/3 the parent company paid a large dividend, but a large proportion of the distributed profits resulted from patent sales and not from ordinary trading receipts. The du Cros' left the Seddon companies to make trading losses in the following financial year, and in 1894 the three parts were merged to form the International Tyre Company Limited with E. H. Seddon as chairman. Seddon pumped £19,000 of his own money into the new company (taking debentures at 5 per cent plus a mortgage on its real estate as security), but an attempt in February 1895 to raise £25,000 by way of debentures from the shareholders met with little response, as did a £50,000 preference share issue made in the following April.[1] The year's trading for 1894/5 showed a loss of £40,000 - attributed by the directors to losses in the retail cycle branch of the Company's business, and to the acquisition of a large stock of defective tyres from one of the old component companies, sold at well-below cost price. By September 1895 the International Company was in the hands of the Official Receiver.[2]

Palmer Tyre, though, possessed a valid licence under the "Clincher" patent, and the Amalgamated Tyre Companies were formed in 1897 with Dunlop's apparent blessing, yet given the du Cros' monopoly objective, co-existence was uneasy. Harvey du Cros attempted, by devious means, to deaden the commercial prospects of Palmer Tyre

1. 4,400 shares of 5 shillings each were allotted. Cycle Manufacturer, 21 Sept. 1895, pp.101-2.

2. Ibid. Similarly, the "Jewel" Pneumatic Tyre Company, formed in 1897, was dead by November 1902 without any formal action by Dunlops. Likewise, Trench Tubless Tyre, put into liquidation in 1899, though established only two years previously.

upon its very foundation in 1893. Some of the directors of the Rudge Cycle Company, financially involved in the establishment of Palmer Tyre, were intent on marketing Palmer tyres in conjunction with the sale of Rudge cycles, and expected the full co-operation of their recently appointed general manager, R. L. Philpot, drawn from the New Howe Machine Company of Glasgow.[1] Du Cros in July 1893, however, lent Philpot £1,151 to purchase shares in the Rudge Company, but maintained a lien upon them as security for the money, and simultaneously warned the new general manager that he was planning to challenge the validity of the Palmer Tyre patents (Philpot received a letter from du Cros, dated 19 July 1893, which contained the sentence, "I expect eventually to put Mr. Palmer in a somewhat awkward position, or his syndicate, or your Company, as the case may be", but he failed to show the letter to his employers or to Palmer Tyre). Perhaps not fortuitously, Rudge Cycle found du Cros' debtor "running down" the Palmer tyre in the course of his duties, and, when challenged upon the point, proffered his opinion that it was not a good tyre, and was subsequently dismissed, on the (alleged) grounds of prolonged absences from his office and work.[2] In 1898

1. Cycling, 29 April 1893, p.268; and Cycle Manufacturer, 25 May 1895, pp.210-16. Philpot first entered the cycle trade in 1887 by joining Humber and Co. Ltd. as their first business representative on the road, and "was most successful in opening accounts with established firms of ironmongers and similar traders who had not previously realised the possibilities of the bicycle as a commercial proposition". The Motor Cycle and Cycle Trader, vol. XC, No. 1228, 19 July 1918, p.50.

2. All this came to light when Philpot brought an action before the Queen's Bench Division against the Rudge Cycle Company for wrongful dismissal. Du Cros, in 1894, immediately and obligingly obtained another post for Philpot: in the Coventry Machinists' Company wherein he rose to the position of managing director by 1896, only to be dismissed again in 1897 for supplying Swift cycles to his father, in breach of certain agreements made by the Company with the John Griffiths Corporation. Ibid. Cycling, 25 Nov. 1898, p.425.

the principal entrepreneurs of Palmer Tyre and Dunlops crossed swords again - "there is no love lost between the two companies" - when the former reduced its tyre prices, and when the latter thereupon issued an ultimatum that it would revoke Palmer's "Clincher" licence on the grounds that it had contravened its terms and conditions.[1] The threat, however, was an empty one, and Palmer Tyre's riposte - to sue the Dunlop Company in the High Court for infringement of three of their patents in May 1899 - was equally unproductive when Justice Wells gave judgement in favour of the Dunlop Company on all three counts.[2]

The du Cros' policy with respect to the formation of Amalgamated Tyre was either ambivalent or extremely cunning. The tyre companies participating in the Amalgamation were certainly fearful of Dunlop's competitive strength: as Van Praagh, solicitor to the promoters, explained to the shareholders of Beeston Tyre in July 1897, the companies of the proposed Amalgamation were then competing furiously among themselves, cutting prices and depreciating the quality of their products "so that there was a danger of the Dunlop soon knocking the other tyres out of the market". Failure to concert the efforts of the four companies might mean "that any one of the four companies that might succeed in killing the other three would come alongside the Dunlop Company. It was thought better for all concerned to try and get an amalgamation....."[3] Additionally, litigation was pending between the Dunlop Company and Scott's Standard Company and between Dunlops and Turner Pneumatic Tyre over alleged infringements of Dunlop's patents, but the promoters of the

1. Cycle Manufacturer, 9 July 1898, p.322.

2. Times, 31 May 1899, p.13; and 26 June 1899, p.16.

3. Cycle Manufacturer, 31 July 1897, pp.14-15.

Amalgamated scheme managed to quell this by paying royalties to the Dunlop Company, in way of compensation, out of their promotion profits.[1] The du Cros', for their part, supplied an investment of Dunlop capital, amounting to £100,000, in the Amalgamated Companies' debenture stock; an end to expensive litigation; the services of their chairman, the Earl de la Warr, who sat on Amalgamated's board; and an undertaking to leave the field for the cheaper, non-"Clincher", tyres for Amalgamated's exploitation.[2] These arrangements placed the Dunlop Company in an advantageous and powerful position with regard to the Amalgamated Tyre Companies. If the Companies prospered, Dunlops would benefit by dint of their investment interest and royalty revenues, but if they faltered Dunlops would have prior lien on their assets, and could determine their future survival or hasten their demise by a debenture holders' action. Through the Earl de la Warr, the du Cros' could possibly exert some control over Amalgamated's policies, and, in any case, they knew that they were marketing a superior pneumatic tyre (the price of which could be adjusted to Amalgamated's advantage or disadvantage), without relinquishing the legal right to compete directly in Amalgamated's field if this was deemed necessary.

Immediately after the flotation of the Amalgamated Tyre Companies in August 1897, it became clear that the du Cros' were prepared to give them little quarter. The Economist indeed remarked cynically in 1897: "It has been asserted, and probably with a large amount of truth, that the new amalgamated company is simply a smart piece of engineering on the part of the Dunlop Company to regain control of

1. Ibid.

2. Times, 16 Aug. 1897, p.11.

certain companies which, working under Dunlop licences, threatened to impair the prosperity of the parent company..... .....the Dunlop Company began to find its children getting out of hand".[1] The Dunlop Company sent out a circular to its agents instructing them to deal only with Dunlop, Warwick and Clipper tyres, much to the distress of the Earl de la Warr who was not even consulted about its contents. On 10 September 1897 de la Warr got the directors of both Dunlops and Amalgamated Tyre to meet and come to terms, with the result that the Dunlop Company agreed to withdraw its circular and permit its agents to deal in Amalgamated tyres on the same terms as it permitted them to deal in Warwick and Clipper tyres.[2] In a subsequent interview with a reporter from the Westminster Gazette, however, Harvey du Cros stated that between the two companies "There will be friendly rivalry. We must keep and extend our own business...... .....I cannot give away the birthright of my own shareholders; my first duty is to them, as it always has been. ....We shall endeavour to sell our own tyres by the means in our power, and they will endeavour to sell theirs. That has been the understanding all along, and no one could, with reason, expect otherwise". As to the embarassment of de la Warr, du Cros said, "With his high social rank he can scarcely be expected to regard the matter from an entirely commercial standpoint. I can quite understand the exceeding difficulty of his position".[3] The du Cros'

1. Economist, 21 Aug. 1897, p.1202.

2. Cycle Manufacturer, 18 Sept. 1897, pp.102-3. The du Cros' had a direct financial interest in the Warwick and Clipper tyres, manufactured by the Cycle Components Company and the Clipper Pneumatic Tyre Company, respectively. The terms contained in the original circular were that agents would receive a 2/6d rebate for every cycle sold with Dunlop tyres and a 2/- rebate for cycle sold with Clipper or Warwick tyres. Alfred Lowe, op.cit., 1897-98, p.106.

3. Ibid.

attitude towards Amalgamated Tyre showed itself later. In 1899 the Dunlop Pneumatic Tyre Company challenged the Amalgamated Tyre Companies on the issue of royalties payable to the Dunlop Company; and the dispute was taken to arbitration - initially by Lord Ludlow but he retired, "owing to indisposition", in favour of Sir Edward Fry. And, again in 1901, Ronald C. Power of Amalgamated Tyre complained that the Dunlop Company was "making difficulties" on the question of the renewal of its licences.[1]

The monopolistic policies of the du Cros family and their tyre companies invited, naturally enough, retaliation by a number of cycle makers and agents as well as by other tyre manufacturers. In the Spring of 1896 there was an attempt to form a Pneumatic Tyre Defence Association - subscription one guinea - designed to combat the legal suits of the Pneumatic Tyre Company, but it came to nothing.[2] In September 1897 members of the Cycle Manufacturers' Trade Protection Association met in Coventry to protest at Dunlop's action in raising their tyre prices from 67 to 70 shillings for the 1898 season (except to those agents who agreed to sell Dunlop tyres only), and to form a Free Tyre Traders' Association.[3] In the following December a deputation from the new Association's Wolverhampton branch - consisting principally of John and Charles Marston of the Sunbeam Cycle Company, Frank Parkyn of the Olympic Cycle Company, and H. Chilton of the New Courier Company - was received by Sir Courtenay Boyle, permanent secretary at the Board of Trade. The deputation complained of an abuse, on the part of Dunlops, of the prevailing Patent Laws, and John Marston asserted that unless he signed the Dunlop Company's

1. The Cycle Trader, 8 Sept. 1899, p.448; and Times, 31 Dec. 1901, p.13.
2. Cycle Manufacturer, 14 March 1896, p.78.
3. They claimed ".....it was calculated to seriously interfere with the freedom of trade, and to be prejudicial to the best interests of the public" Alfred Lowe, op.cit., 1897-98, p.106.

makers' and agents' agreements, the public must pay about £1 extra for Dunlop tyres fitted to his firm's cycles. Boyle promised the Board of Trade's consideration of the matter and advised the deputation of the provisions under the Patent Acts for petitions for the granting of compulsory licences. A Wolverhampton Tyre Syndicate Limited with a capital of £1,000 in £1 shares was subsequently formed in February 1898 to acquire and work inventions relating to pneumatic tyres, and to apply for compulsory licences at the Board of Trade under section 22 of the Patents Act of 1883. Such an application was duly made in the October with respect to the "Clincher" and Welch patents, the Board of Trade conceding that there was a prima facie case and giving the Dunlop Company fourteen days to appeal.[1] A Board of Trade tribunal, refereed by a Mr. Bousfield Q.C., dealt with the petition in March 1899 but adjourned its meetings sine die to give the contending parties an opportunity to arrange a compromise.[2] They never did, and during the following September it was rumoured that the Wolverhampton Syndicate, having been once more refused a license by the Dunlop Company, had lodged a fresh appeal with the Board of Trade to acquire a compulsory license. But no formal procedures were undertaken, and a year later, The Cycle Trader, in response to an enquiry, could assert that the Wolverhampton Free Tyre Traders' Syndicate ".....has not been heard of for months".[3]

1. Cycle Manufacturer, 25 Sept. 1897, p.106; 18 Dec. 1897, p.266; 19 Feb. 1898, p.68; and 22 Oct. 1898, p.154.

2. Times, 28 March 1899, p.14.

3. The Cycle Trader, 22 Sept. 1899, p.554; and 5 Oct. 1900, p.664.

The failure of the Wolverhampton Syndicate to check the market power so vigorously sought by the Dunlop Pneumatic Tyre Company meant that the type of competitive structure pervading pneumatic tyre manufacture in the 1890's continued until shortly before the expiry of the key "Clincher" and Welch patents in 1905. There was an ease of entry, but exits from pneumatic tyre production were expedited by the injunctions issued by the courts at the behest of the Dunlop Company. Conceivably, the refusal of Dunlops to permit a widespread adoption of the technical features covered by the "Clincher" and Welch patents could have acted as a brake upon the rate of design improvement embodied in the finished products, through a severe limitation of the number of entrepreneurial minds and hands able to devise, test and market new "Clincher" and Welch type tyres without interference. But even those few given access to the exploitation of the "Clincher" and Welch principles, such as Palmer Tyre, the North British Rubber Company, and the Amalgamated Companies (and their separate predecessors), failed to make final product improvements significant enough to have a wide market appeal, and correspondingly reduce the large share of the British home market held by the Dunlop organisation. Certainly, Palmer Tyre and the North British Rubber Company were not short of the financial backing and of the expertise in rubber technology that might have been necessary for successful innovation. The du Cros' were smart enough not only to acquire the "Clincher" patent rights and base their tyre designs upon it, but also to keep abreast of and to utilise such design improvements that, in the event, maintained the allegiance of much of the cycling public.

Yet by no means were they technically-trained, technically-minded men; their forte in this respect was institutionally-embracing or buying-in such technical expertise as they required to exploit the market opportunities they perceived. This was a characteristic of other business leaders that emerged in the U.K. cycle and related trades in the late nineteenth century. Cornforth, Woodcock, and Frank Bowden were wealthy men of business, but with no special technical aptitudes, from the start. They were potentially ripe for the attractive life-style of the "gentlemen" yet they chose to stay with commerce and manufacturing industry in the broad: financing, organising, re-organising and managing firms for profits. To a degree, therefore, the "exceptional" rise of the "new" cycle industry in Britain was due to the interest and activity of men of means who did not share, in toto, the leisurely cultural and social aspirations, and risk-aversion, that have been reckoned as pervasive over Britain's established business leadership at that time. Such men also epitomised two more features of the cycle industry's growth during the late nineteenth century viz. its lack of insularity with regard to the acquisition of capital resources in real and money terms, and a corresponding lack of insularity and narrowness with regard to the recruitment of entrepreneurial personnel. The cycle and related industries were not deemed such relatively high-risk industries, even in their early years, that men of substance would not invest in them purely for monetary rewards. In Coventry, Birmingham and Nottingham, cycle makers in need of capital, even for setting themselves up, could successfully turn to the entrepreneurial establishment in the existing (and often local) economic infrastructure. In this they were helped by the fact that the capital requirements of most cycle firms before 1896 were not so overwhelmingly large as to place an inevitable and unbearable strain upon the resources of "privately" interested business and professional people engaged in other economic activities. Any potential necessity for an insularity in the build-up of real stocks of capital assets was also attenuated by the lack of very specialised technical requirements in terms of premises and power supplies (and even plant) on the part of cycle manufacturers; and this in turn enabled the transfer of physical resources from a variety of established industrial and commercial activities in the U.K. to the production of complete cycles, components and accessories. Hence, diversification into the cycle trade by firms established in other manufacturing fields was common, the Birmingham Small Arms Company could adopt its shell-making plant to cycle component production in 1893, and cycle firms rented factories and workshops already constructed and available for occupation in existing industrial and urban areas. The sources of entrepreneurial recruits to the U.K. cycle industry were wide before the turn of the century because entrepreneurial talent and capital for entry did not necessarily have to be possessed by one and the same person; because diversification into cycle-making by established firms was industrially wide-ranging, and not surprisingly accompanied by entrepreneurial leaders and talents already within those firms; and because the pedal cycle itself was not such a scientific piece of advanced engineering technology that it required a specific and high-grade scientific education and technical training to be invented developed and its basic principles understood. Of the diversifying firms and their leaders, some, significantly, were family businesses, but they lost no vigour on that account in, firstly, moving into the cycle industry because of its profitable prospects, and, afterwards, growing strongly within it. For sure, entrepreneurial sloth did not suffuse the "family enterprises" of Thomas Warwick and Sons, Charles H. Pugh, F. Brampton and Company (later called Brampton Brothers), the Rileys, Joseph Lucas, H. Miller, and C. W. Bluemel. With regard to the factor of technology, the cycle was well within the ken, as an integrated collection of mechanisms, of the "intelligent artisan" and of men willing to appreciate its basic mechanical principles by observation and cycle-riding experience. In this light, the cycle industry, as a "new" industry, was able to take root early and to flourish in nineteenth century Britain because its development demanded, technically, little more than the traditional, empirically-based aptitudes of the British engineering craftsman, and the ideas of mechnically-minded men, who, from their standpoints of racing and/or touring, were interested in cycle design and improvement. This does not mean to say that scientifically or technically trained men failed to make any contribution by failing to enter the industry in entrepreneurial or managerial capacities; or that artisan-type cycle entrepreneurs were utterly uninterested in the general natural scientific principles underlying empirically-devised products. R. W. Smith, Hans Renold, John V. Pugh, Thomas H. Woollen, George P. Mills and Horace Dover received formal scientific and technological instruction in their early years, which was valued by themselves or by partners and capitalist-entrepreneurs as an element in their entrepreneurial qualities. Technicians such as Thomas Clements, P. L. Renouf and Alexander Davidson, who all assumed major managerial responsibilities in the 1890's, could discourse on a theoretical plane as much as on the practical.[1] But then again the techniques of cycle and component production advanced during the 1890's to make the skills of these types of men that more important, and, given this, the cycle industry developed because its doors to executive positions were open to the more scientifically-minded.

1. This was revealed especially when the Institute of Cycle Engineers was formed in the late 1890's, and before which papers written by cycle entrepreneurs and managers were read.

CHAPTER 2

Technological Advances, circa 1870 - 1896

SEAMLESS STEEL TUBES.

The commercial experience of the majority of the principal British cycle manufacturers, during the formative years prior to the "bicycle boom" of 1896-7, instilled into them the belief that the success of individual firms, and the growth of the industry generally, depended to no small extent upon a continuous annual process of product invention, innovation and refinement. It was a belief not without foundation. The Michaux-type velocipede of the 1860's, with its wooden wheels and frame, and iron tyres, was a heavy, cumbersome machine - it weighed between 50 and 60 pounds - required a considerable amount of physical exertion to put it in motion, was productive of uncomfortable amounts of vibration, and widely condemned by the medical profession for its propensity to produce headaches and hernias in the rider.[1] Correspondingly, cycle manufacturing entrepreneurs and engineers, year-in, year-out, devoted much of their energies to the question of cycle design. There was the problem of reducing cycle weights without a sacrifice of essential strength. There was a need to reduce vibration, to promote an ease of locomotion and a comfort in posture in order that the demand for cycles be expanded. It was, in part, a result of this endeavour that new industrial activities were created, or older ones given a marked demand and technological fillip. In the early 1880's, for instance, cycle manufacturers were already using steel tubing for the front forks of "Ordinary" bicycles, and the advent of the "safety" designs of 1884-5 made the use of "springy" steel tubing almost imperative, since the "safeties"

1. Earl of Albemarle and G. Lacy Hillier, Cycling (1895 edition), p.66.

incorporated a much greater amount of frame metal and presented problems of unwelcome vibration. Cold-drawn seamless steel tubing of thin gauge was deemed the best since seamed (i.e. welded) tubing was more prone to fracture (along the seam), the seam by itself adding weight to the tubular frame members, and in any case was less "springy". Fortunately, for cycle makers and cyclists, the technology of seamless steel tube production underwent a marked but quite independent advance during the mid-1880's. The problem overcome was how to convert a solid steel billet into a tube suitable for working and drawing in a cold state.

The earliest patented invention covering the manufacture of seamless steel tubes was devised by a J. M. Stirling of Birmingham in 1854, and involved hammering, drawing or rolling a tube from a heated cylindrical piece of cast steel with the tubes drawn to the required size, prior to any further processing, with mandrils and dies such as were used for drawing softer brass tubes. The subsequent reduction of the thickness and corresponding extension in length of seamless tubing, by drawing such tubing in a cold state through fixed dies, had been continuously carried on in the Birmingham brass and metal trades since the early nineteenth century, and the same process was capable of being employed in the final reduction of steel tubes - the "draw -bench" of the endless chain type being the machine most generally used.[1] "The manufacture of seamless steel tubing, as first suggested or adopted, comprised no new process or method of treatment, but was merely an application of the old or known appliances for dealing with the new material".[2] During the third-quarter of the nineteenth century,

1. Edward C. R. Marks, The Manufacture of Iron and Steel Tubes (2nd ed. 1903), pp.24-5 and p.108; and Gilbert Evans, Manufacture of Seamless Tubes, pp.19-21.

2. E. C. R. Marks, op.cit., pp.24-5.

however, some scantily recorded improvements in seamless steel tube manufacture had been taking place. The firm of Christophe, Hawkesworth and Harding of London and Paris laid down hydraulic machinery of new design for drawing weldless steel tubes in the 1860's, and supplied such tubing to Birmingham rifle-barrel makers and for other engineering purposes, but their process was, apparently, "costly and difficult". Active at about the same time was the merchant William Charles Stiff of Birmingham, partnered by F. H. Lloyd and C. Faulkener of Wednesbury and Birmingham, respectively. He devised a number of improvements and an increased business in weldless steel tubing was done, but - and for reasons unknown - Stiff dissolved his partnership with Lloyd and Faulkener in 1872 in an agreement which precluded him from entering the seamless steel tube trade for ten years. At the end of this time, however, Stiff established his own business again, called the Credenda Cold Drawn Seamless Steel Tube Company, in conjunction with Herbert B. S. Bennett and Thomas W. Piggott, in Ledsam Street, Birmingham.[1] The main technological breakthrough came not long after with the process of Max and Reinhard Mannesmann, steel-makers of Dusseldorf, patented in the U.K. in January 1885, by which solid steel ingots could be rolled into seamless tubes, of desired dimensions and suitable for subsequent cold-drawing, using a mandril and conical rolls. In 1886 the two German brothers approached the Landore Siemens Steel Company Limited near Swansea, hitherto producing sheets, sections and armour plates, and tube production began there towards the end of 1887 under the direction of a Swiss engineer, Julius Pfau. The Landore Company went into voluntary liquidation in 1888 when the Mannesmann brothers acquired its assets and began their own British steel tube company.[2]

1. Cycle Manufacturer, 16 May 1896, p.167; and P.R.O., B.T.31, 4024/25649.
2. G. Evans, op.cit., p.22; and Times, 29 Oct. 1888, p.3.

The introduction of the Mannesmann process detonated further inventive activity designed to cheapen the cost, and improve the quality, of seamless steel tubes. W. C. Stiff and the Credenda Tube Company followed quickly in 1885 to patent their own method of processing steel ingots for tube production.[1] A James Robertson patented a process in 1888 - improved in a patent of 1890 - whereby seamless steel tubes were produced using a fixed die and a mandril.[2] William Pilkington of the Birmingham Climax Steel Tube Company took out patents for a series of inventions during 1889-1893 concerning the construction of machinery for rolling metal tubes with the object of reducing the diameter and drawing down the tubes while in a cold state and without the requirement that the metal should be annealed after each operation.[3] More importantly, Ralph Carl Stiefel, brought by Pfau to superintend the Mannesmann Company's drawing office and later to become the works engineer, improved upon the Mannesmann process during the course of 1895-7 by designing machinery to pierce steel billets and produce tubes by means of discs and not conical rollers. He left the Mannesmann works in 1895 and went to the U.S.A. where he filed a patent for a piercing machine. He subsequently filed for patents in England and Germany and, despite Mannesmann's law suits, became Mannesmann's most active competitor and was "......

1. By "Drilling, boring, or punching a small axial hole in an ingot or bar, and afterwards enlarging the said hole to the required diameter by a drawing process". G. Evans, op.cit., pp.23-4.

2. A steel billet was placed in the die and a mandril forced through it, a hydraulic regulating stem being employed to prevent the metal from being forced through the die in advance of the mandril. The tubing produced was made by the special shape of the die to squirt back over the mandril so that the tube and mandril moved in opposite directions. E.C.R. Marks, op.cit., pp.70-1.

3. Ibid., p.56.

hailed as the pioneer of the seamless tube trade in markets hitherto supplied from English sources". He went to be superintendent of the Ellwood Weldless Tube Company of Ellwood City, Pa., and then in early 1898 was appointed general mechanical engineer of the Shelby Steel Company of Shelby, Ohio.[1] More innovation and commercial competition came along with Ehrhardt's process, invented by Heinrich Ehrhardt of Dusseldorf in 1891, and introduced into the U.K. in 1897 with the formation of Universal Weldless Steel Tubes (Ehrhardt's Process) Limited - an enterprise which, however, had ceased to be an effective trading concern by 1904.[2]

In 1886 British cycle manufacturers probably looked to the Credenda Company more than any other for supplies of cold-drawn seamless steel cycle tubing, but this firm had no monopoly, patent or otherwise, of the cold-drawing process, and the increasing demands of cycle makers for thin gauge tubing were supplemented by those of marine engineers, boiler makers, gas and steam engine builders and so forth. New seamless steel tube drawers arrived on the Midlands scene to take up the advantages proffered by favourable markets and the new processes. In 1891, for example, Arthur, Joseph, Herbert and Walter Chamberlain of Birmingham each invested £1,500 to form the Endurance Seamless Tube and Vial Company Limited in that city, together with John Harrison, a Handsworth manufacturer, who contributed £1,000, John Arthur Harrison, a coal merchant, who invested £100, and George Hookham of Birmingham who put in £1,500 and who, like Arthur Chamberlain, sat on the board of G. Kynoch and Company Limited.[3] In 1892 twenty-one

1. Stiefel's process was an improvement in the sense that no torsional strain or disturbance to the longitudinal arrangement of the metal's fibres was imparted. Ibid., p.40; G. Evans, op.cit., p.22; and American Machinist, 13 Jan. 1898, p.34.

2. G. Evans, op.cit., p.24.

3. P.R.O., B.T.31, 5120/34521.

Birmingham industrialists, merchants and professional people combined to invest a total of £3,032 in order to establish the British Seamless Steel Tube Company of Smethwick; the principal instigator of the business being Robert Wootton, a Birmingham merchant, who contributed £1,000 (and held all the 100 £1 founder's shares issued) and concentrated upon the manufacture of tubing for cycle frame members and cycle components and upon a patent serrated liner.[1] Other companies in business by the early 1890's to exploit the technique of cold-drawn seamless steel tube production included Hudson and Company - a firm, originally established by James Hudson in 1883 and publicly floated in 1892, and which eventually concentrated upon tubing for cycle wheel rims and cycle frame members in leased premises at Selly Oak and at Bournbrook, Birmingham. There was the business of A. Hills at the Perfecta Works, Aston, begun in 1891 and floated in 1896 as The Perfecta Seamless Steel Tube Company Limited; also that of The Star Tube Company belonging to Messrs. Taunton and Hayward of Birmingham who began to supply cycle makers in 1887; and that of Messrs. Nossiter and Holt, founded in Birmingham in 1891 as a "private" limited company under the style of the Concentric Seamless Steel Tube Company. Others were Rose Brothers of Halesowen near Birmingham, The Metallic Tube and Flask Company Limited, A. Smallwood and Company of Birmingham, Hudson Brothers Limited of Kings Norton, The Birmingham Climax Steel Tube Company Limited, the St. Helens' Tube and Metal Company in Lancashire, The Weldless Steel Tube Company of Birmingham, and Brotherton's Tube Company Limited initially started

1. A liner was a short piece of tubing inserted inside that part of a frame tube which was to be brazed to a lug, the object being to strengthen the frame tubing where joints occurred since brazing had the effect of weakening tubular metal. P.R.O., B.T.31, 5315/36365; and Cycle Manufacturer, 23 Feb. 1895, p.59.

by John Brotherton and Francis Simms of Wolverhampton.[1] As for the Credenda Tube Company itself, the partnership that formed its financial basis was dissolved by mutual consent in October 1887 with William Stiff taking over the entire business, subsequently in December 1887 to link-up with, and receive the financial backing of, the principals of the large engineering concern of Sir Joseph Whitworth and Company of Manchester. In the following January the "private" Credenda Seamless Steel Tube Company Limited was registered with an issued share capital of £25,520. The chief holders were Richard C. Christie, barrister of Virginia Water, Staines, and chairman of Whitworths (£5,000); the engineer and director of Whitworths, Manassah Gledhill of Manchester (£5,000); Herbert H. Smith-Carrington, engineer of Stockport and also a director of Whitworths (£5,000); William R. Lake, patent agent of London (£1,000); William H. Jacques, engineer of London (£500); and William Stiff, now managing director of the newly incorporated firm (£9,000). In February 1893 the financial link with Whitworths was attenuated when the Credenda Company was put through a successful £66,670 public flotation, and even further when it was refloated in August 1896.[2]

1. Birmingham Daily Post, 19 March 1894, p.1; Cycle Manufacturer, 2 May 1896, p.143; The Cyclist and Bicycling and Tricycling Trades Review, vol. 8, No. 392, 20 April 1887, adverts., p.15; The Midland Daily Telegraph, 23 Nov. 1896; The Stock Exchange Official Intelligence, 1899, pp.1364-5, 1440-1, 1496-7 and 1562; Times, 8 May 1896, p.14 and 30 Jan. 1897, p.15; and P.R.O., B.T.31, 6766/47614.

2. The Birmingham Daily Post, 25 Feb. 1893, p.4.; The Cyclist, vol. 9, No. 418, 19 Oct. 1887, p.40; and P.R.O., B.T.31, 4024/25649.

While there is no evidence to suggest that the Mannesmann brothers had the specific technical problems of cycle manufacturers at the forefront of their minds, the connections between innovation in ball-bearing design and manufacture, and in chain transmission, on the one hand, and cycle-making on the other, were close. With regard to ball-bearings P. L. Renouf, a cycle engineer who successively in the 1890's managed the works of Humber Limited, William Bown, J. H. Brookes and Accles Limited, once stated: "Up to the present the cycle engineer has had to feel his way in the subject of ball bearings in the school of experience, unassisted by outside influence .....", and it was during 1876-77 that, pragmatically, Thomas Humber in Nottingham, Daniel Rudge in Wolverhampton and William Hillman in Coventry almost simultaneously began to design, experiment with, and then manufacture them as an improvement upon the plain or roller bearings hitherto used for cycle wheel hubs.[1] Their ideas, however, did not overcome the problem of adjustment occasioned by wear and it was left to a Joseph Hughes to take out a patent in September 1877 covering a ball-bearing adjustable both vertically and laterally. The patent right was acquired in early 1878 by the Birmingham sewing machine fittings maker, William Bown, who commenced to manufacture his "Aeolus" ball-bearings for the front wheels of "ordinary" bicycles under its specifications, and exact royalties from other cycle manufacturers who made their own adjustable bearings. Daniel Rudge was one maker who duly paid-up and before his death in 1880 was the first to introduce ball-bearings to the design of cycle pedals, while

1. "Ball Bearings as Applied to Cycles", in Proceedings of the Cycle Engineers' Institute, vol. II, 1900, p.53; and Engineering, 3 Nov. 1893, pp.527-8.

Humber added ball pedals to his machines for the first time in that year.[1] Aided later by the introduction of J. K. Starley's "safety" bicycle in 1885, ball-bearings spread from hubs and pedals to bottom brackets and handlebar stems, and, by the early 1900's, to free-wheel systems; and a number of cycle and cycle component makers commenced the manufacture of balls for the trade. The Abingdon Works Company of Birmingham was one of the first in 1881 to add steel balls to their range of cycle components, spanners and spoke tighteners.[2] In February 1885 the directors of B.S.A. resolved to entertain the manufacture of ball-bearings for sale to the cycle trade, and entered into negotiations with William Bown and Thomas Clements with regard to the use of their respective patents, accepting licences from Bown and Clements in the May, and getting into production by the September.[3] At the turn of 1886-7 William Hillman formed his Auto-Machinery Company Limited of Coventry with a capital of £20,000 "which was subscribed in a few days, privately". The twenty ball-making machines initially employed - and attended by three girls - were entirely automatic, designed and made on the firm's premises and could produce balls at the

1. The Cyclist, vol. 1, No. 34, 9 June 1880, p.342; and Cycle Manufacturer, 4 June 1898, pp.261-2. Thomas Humber, however, was reluctant to pay tribute to Bown, and in a legal action brought by Bown in 1883 managed to convince Mr. Justice North that a cycle made by him in the summer of 1877 contained bearings the design of which anticipated Hughes' patented specification - only to concede, a year and a half later, in a Court of Appeal case instigated by Bown, that he was mistaken in his previous assertion that he had made a Bown-type ball-bearing before the sealing of Hughes' patent. Cyclist, vol. 4, No. 195, 11 July 1883, Supplement, and vol. 6, No. 275, 21 Jan. 1885, p.295.

2. Ibid., vol. 2, No. 95, 10 Aug. 1881, advert.

3. History of the Birmingham Small Arms Company Limited, 1861-1900 (priv. printed), vol. 1, pp.18-20.

rate of one-a-minute. The New Howe Machine Company of Glasgow and B.S.A. (after its second entry into the industry in 1893) made balls and ball-bearings for their own components in 1891 and 1896 respectively, and another firm to supply the cycle trade, The Anti-Friction Ball Company Limited of Coventry, was formed and employing its self-made automatic machinery in 1891.[1] When ball-bearings were initially fitted to cycles, the balls were made of case-hardened iron - ".... naturally an unsuitable material as the case-hardening must have rendered the task of finishing the balls truly spherical almost impossible" - and then of ordinary Bessemer steel; but the Auto-Machinery Company used the hardest known brand of close-grained crucible cast steel, in wire form, as the raw material, although this involved a sacrifice in the rate of output. Bessemer steel balls, "....of which a great many ....for bearings are made", still required case-hardening and were prone to shatter, or so reckoned the manager of that firm, and in this empiricist manner was a new branch of engineering friction science born.[2]

Thereafter, later on in the 1890's, large-scale ball and ball-bearing production, by firms specialising in this field of activity, passed over to the Americans and Germans. To the former because of the advances made there in the designs of auto-screw machine tools that could produce steel balls at a phenomenal rate; and to the latter because of their advanced machine-tool know-how and because of their endowment of natural and applied scientists. The theoretical and

1. The Cyclist, vol. 8, No. 388, 23 March 1887, p.559; Cycling, 27 June 1891, p.373, and 21 July 1894, Supplement; Engineering, 3 Nov. 1893, pp.527-8 ; and History of the Birmingham Small Arms Company Limited, vol. 2, p.648.

2. The Cyclist, vol. 8, No. 388, 23 March 1887, p.559 ; and Engineering, 3 Nov. 1893, pp.527-8.

mathematical approach to ball-bearing design was, at any rate, begun by Professor Stribeck in 1898 and commissioned by the Deutsche Waffen and Munitionsfabricken of Berlin, Stribeck producing what became known as "Stribeck's Laws".[1] Factories for making steel balls in Germany increased from five in 1896 to 25 in 1897 with production rising from 1½ million to 4½ million gross. Schweinfurt in Bavaria came to dominate the European ball-bearing trade as it contained "the largest firm in Europe for making steel balls" and employing 600 men in 1897.[2] The German prowess was demonstrated when the B.S.A. Company, requiring large inputs of steel balls for its cycle components, at first ordered 100,000 gross of steel balls from Germany at an average price of one shilling per gross. This price was fifty per cent below that of English made steel balls without any perceptible difference in quality. Furthermore, when the Company decided to manufacture its own steel balls, it turned initially to the Berlin machine-tool firm of Ludwig Loewe for the requisite automatic machinery.[3] In January 1898 American entrepreneurs found it worth their while to exploit their expertise within the U.K. with the establishment of the Hoffmann Manufacturing Company Limited.

When British cycle manufacturers required chains they did receive outside help. The "ordinary" bicycles and lever-driven tricycles of the late 1870's were not chain-driven until James Starley modified his Coventry Lever Tricycle, first patented in 1876, to

1. A. W. Macauley, Handbook on Ball and Roller Bearings (1924), p.8.

2. Diplomatic and Consular Reports on Trade and Finance (Foreign Office), No. 2158, 1898, p.14.

3. History of the Birmingham Small Arms Company Limited, vol. 2, pp.634 and 648.

incorporate chain transmission in 1877. Not knowing where suitable chains could be purchased for the manufacture of his "Royal Salvo" quadricycles, introduced also in 1877, Starley made them himself, but later resorted to a Manchester firm who supplied him with a type of roller chain - possibly the product and technological spin-off of the small-scale inventive activity going on in Lancashire at that time in connection with the development of chain-transmission for cotton textile machinery.[1] A James Slater of Salford had provided a breakthrough in chain-transmission for textile machinery with his "bowl chain", patented in 1864, and "...the first significant step towards the modern precision chain". He established a small chain-making business in Salford which Hans Renold purchased for £300 in 1879.[2] During the same year Renold made contact with James Starley's nephew, J. K. Starley, who had just established his own cycle manufacturing business in Coventry. The younger Starley had conceived of an improved form of roller chain suitable for cycle

1. Geoffrey Williamson, Wheels within Wheels. The Story of the Starleys of Coventry (1966), p.56; and Alfred Lowe, History and Antiquities of the City of Coventry, 1897-8, pp.231 and 234.

2. Basil H. Tripp, Renold Chains. A History of the Company and the Rise of the Precision Chain Industry 1879-1955 (1956), pp.22 and 38. The Slater chain was an attempt to tackle the problem of pin wear at the point of engagement with the wheel teeth. "The pin did not engage the teeth direct. Instead it was enclosed in a free roller, called a 'bowl'. The invention still left unsolved the problem of improved articulation; the (side) plates were relatively thin, they bore directly upon the pins, with the result that the holes in the plates became enlarged and the plates themselves cut into the pins when turning under load". Ibid., pp.38-9.

locomotion, and conveyed his ideas to Renold, who in return designed a "bush roller chain" for cycles according to his own conceptions, and patented it in 1880. It afforded the property of countering the high rate of pin wear engendered by cycle design and by cycling conditions, combined with a satisfactory degree of articulation; and until the expiry of his patent in 1894 Renold was the sole supplier of bush roller chains in England.[1] He maintained no monopoly, however, of the cycle chain market, nor of inventive talent, and his bush roller chain was not deemed by all cycle manufacturers - even after the advent of the "safety" - to be technically the best available. Other manufacturers and inventors entered the field with their own cycle chain designs. By March 1885 the Abingdon Works Company were producing their patent single-link, roller-type chain which afforded a good accuracy of pitch (whereas former designs tended to yield irregular pitches) and could be shortened by removing only one link whereas previous models had their links in pairs necessitating the removal of two links.[2] At

1. Ibid., p.41. Tripp is wrong in ascribing the development of Renold's bush roller chain to J. K. Starley's innovation of the rear-driven "safety" bicycle. The former came in 1880; the latter in 1885. The new design of chain was an improvement upon the Slater invention of 1864. "Instead of the plates articulating directly on the pins, the pair of inner plates were mounted on the ends of bushes and articulation occurred between the pin and the bush, the bearing surface extending across nearly the whole width of the chain. Slater's 'bowl' was retained, but was mounted on the outside of the bushes. This was the first design that catered effectively for both of the basic requirements. The construction lent itself, moreover, to the incorporation of subsequent improvements in metallurgy and manufacture. It may be said with truth that this was the most important of the inventions upon which the precision chain industry has been built". Ibid., pp.40-1.

2. The Cyclist, vol. 6, No. 285, 25 March 1885, Supplement PX.

about the same time, the brass-founding firm of F. Brampton and Company of Birmingham began marketing their self-lubricating chains for tricycles and "safeties" to the designs of George Illston,[1] and the Birmingham pen-making combination of Perry and Company Limited began to manufacture their roller link chain called the "Reliance" - unlike Renold's bush roller it had no side plates but only links of circular section.[2] // By the beginning of the 1890's, most chain transmission manufacturers had settled for the production of "block" chains, including Hans Renold himself. With these the inter-link was a shaped block pierced at each end to take the pin bearings, and, given the state of metallurgical knowledge at that time, had better wearing properties than the roller chain though the latter afforded "sweeter running".[3] Renold had a hand in the technical evolution of the block chain and applied for a patent for this design in 1885, "but by some strange chance" failed to file the final specification in time for a "master" patent position. In a trade circular he relinquished any claims to the sole rights of manufacture in 1888, and F. Brampton and Company were quick to begin the production of their own hard steel block cycle chains in the autumn. Perry and Company followed in 1889 with their patent pen-bush block chain produced from pen steel, and designed to prevent the rivets turning in the side plates of the chain and to transfer friction from the soft steel rivet to a hardened steel bearing.[4]

1. "The special feature of construction consists in making the centre pieces in two parts, and hollowing them out, filling the centre with a plumbago preparation, the result being that the chain virtually lubricates itself, every joint working in a box packed full of practically inexhaustible lubricant". Ibid., vol. 7, No. 357, 18 Aug. 1886, p.1155.

2. Ibid., vol. 8, No. 387, 16 March 1887, Supplement PVll.

3. Cycle Manufacturer, 10 Dec. 1898, pp.252-3.

4. B. H. Tripp op.cit., p.42; Basil H. Tripp, Renold Limited 1956-1967 (1969), p.38; and The Cyclist, vol. 10, No. 475, 21 Nov. 1888, adverts., p.7.

The concepts of the block and bush roller chain-drives were transferred, with appropriate modifications, to a host of other industrial activities, but within the cycle trade itself the half-inch pitch bush roller chain gained the ascendency in the late 1890's. Helped by the expiration of Renold's 1880 patent and improvements in the qualities of steels used, new chain manufacturers with new ideas concentrated upon the design and production of bush roller chains to establish them in public favour. Hans Renold believed that one-inch pitch roller cycle chains were the only ones which could be manufactured in such a way as to give satisfactory service, but J. W. Bayliss, head of Perry and Company's cycle department, showed that half-inch pitch chains could perform equal service and Renold moved towards his standpoint by beginning the production of a $\frac{5}{8}$ inch pitch chain in November 1898. Two new chain-makers of the 1890's, Charles Garrard and Company and Alfred Appleby's Chain Company, both of Birmingham, pioneered improvements in the method of fixing the pen-steel bushes in the side-plates that obviated the possibility of the bushes working loose, and Alfred Appleby secured an improvement by increasing the diameter of the rivets or bearings hitherto commonly used.[1]

PNEUMATIC TYRES.

In their quest to reduce the increased factor of vibration consequent upon the introduction and widespread adoption of "safety" bicycles in the 1880's - vibration was combatted in "ordinary" cycles by the large diameter of the front driving wheel - cycle manufacturers received conclusive assistance from the invention of J. B. Dunlop's

1. Cycle Manufacturer, 26 Nov. 1898, p.218; and 10 Dec. 1898, pp.252-3. B. H. Tripp, Renold Limited, p.39.

pneumatic cycle tyre in 1888, and its commercial exploitation by the Du Cros family beginning in November 1889. The pneumatic tyre not only reduced vibration but also increased the "pace" of the "safety" bicycle, and in time sealed the fate of previous and only recently invented anti-vibratory devices such as "spring frames" and "cushion" tyres.[1] Yet it was not accepted by all British cycle manufacturers with a ready and equal alacrity, and in its early form was in need of considerable technical improvement. It was not detachable from the wheel rim, it was puncturable and yet extremely difficult to repair, and was relatively bulky, requiring cycle manufacturers to redesign their cycle wheel rims and frames. Both J. K. Starley and E. Mushing, of the largest cycle makers, derided the pneumatic tyre during the early nineties, though the Dunlop-du Cros product soon received the encouragement of C. A. Palmer of the St. Georges' Engineering Company and M. D. Rucker of Humber, who in December 1889 applied for licences to supply and fix pneumatic tyres to their cycles. In reply the Pneumatic Tyre Company resolved that, in addition to its own agency outlet, a licence be extended to not more than ten makers at a royalty of ninepence per wheel, but upon Palmer and Rucker's joint demand that only four outlets be permitted, the Board reconsidered its decision and resolved to throw their tyre open to the whole cycle manufacturing trade.[2] Even so, a survey conducted at the close of the 1891 season revealed the initially slow penetration of pneumatics into the cycle market.

1. "Spring frames" incorporated joints controlled by springs that enabled the frame to give slightly in a vertical direction. Messrs. Linley and Biggs of London (with their "Whippet" bicycle) and the Midland Cycle Company (with its "Olympia") were the first to bring out such an arrangement in 1885 and 1886 respectively, and by 1888 the Coventry Machinists Company, Humber and Company (under a patent held by Messrs. Woodhead, Angois and Ellis), and the two London firms of Messrs. Moore Brothers and Messrs. Patrick and Company had all introduced their own types. The Engineer, 18 Feb. 1887, pp.134-5 and 10 Feb. 1888, pp.118-9. C. F. Caunter, The History and Development of Cycles (London H.M.S.O. 1955), p.35.

2. Sir Arthur du Cros, Wheels of Fortune (1938), pp.89-90.

TABLE 5

Percentage of total tyres of various designs supplied by certain cycle manufacturers, 1891.[1]

	cushion	Dunlop Pneumatic	Clincher Pneumatic	Boothroyd Pneumatic	solid
Rudge	75	10	-	-	15
Centaur	50	10	1	-	39
Harry James	48.5	32	3	0.25	16.25
Warman and Hazlewood	50	5	1	-	44
Sharratt and Lisle	50	20	-	-	30
Trent Bridge Cycle Company, Nottingham.	28	12	20	-	40

(Source: see footnote)

1. These percentages were furnished by the Cycle Trade Journal and taken from replies to a questionnaire sent out by the Journal to both manufacturers and agents. 49 of these replied to the questionnaire in "a satisfactory manner". For cushion tyres the average percentage of supply was 46.5; for Dunlop pneumatics - 19; for Clincher pneumatics - 9; and for Boothroyd pneumatics - 5.7. Cycle Trade Journal, Nov. 1891, Supplement, pp.2-3.

But widespread acceptability developed rapidly in the ensuing years as the problems of detachability and repair, of road grip, and of improved resistance to puncture were tackled and overcome.[1] Thomas W. Robertson, a racing cyclist employed by the du Cros' from June 1890 to manage their tyre repair department, invented a detachable pneumatic tyre, held on to the cycle wheel rim by means of fastened wires, and patented in November 1890. A better design of detachable tyre, incorporating endless wires running through the outer-cover edges, was patented by Charles Kingston Welch in September 1890, followed by a similar design patented by J. B. Dunlop in April 1891. In May 1891 Harvey du Cros paid £5,000 (for the British and Belgian), £1,000 (for the French) and £1,500 (for the American) to acquire sole rights to Welch's patents. Welch had previously asked William Warne and Company of Tottenham, an old established firm of rubber manufacturers, to make his tyres but was informed that his ideas were impracticable, but the du Cros' took a different view and, astutely, employed Welch as one of their company's technical advisors from June 1892.[2] Also in 1891 came Woods' valve (patented in the March) invented by Charles Woods, a cotton spinner and brother of Frederick Woods, a director of the Pneumatic Tyre Company. This device took the place of J. B. Dunlop's valve which did not permit deflation of the tyre, and was duly acquired by the du Cros interest, becoming practically universal for pneumatic

1. A number of inventors made claims to have devised completely puncture-proof pneumatic cycle tyres during the 1890's. Patents were taken-out, and joint-stock companies formed with the intention of exploiting them, but commercially the puncture-proof tyre remained a chimera.

2. du Cros, op.cit., pp.105-6, 109-116, and 133. J. B. Dunlop, The History of the Pneumatic Tyre (no date), p.43.

cycle tyres.[1] During the same year W. E. Bartlett's "Clincher" tyre and rim (patented in October 1890) appeared on the cycle market, produced by Bartlett's North British Rubber Company of Edinburgh, and, in the event, an important invention, in which the inner tube and outer-cover with beaded-edge were held in place on a hooked wheel rim by air compression.[2]

The du Cros' and their Pneumatic Tyre Company of Dublin were businessmen enough to acquire rights to the most commercially exploitable pneumatic tyre improvements, including the "Clincher", but a host of new tyre firms and new tyre inventions followed in their wake. I. W. Boothroyd, general manager of the Crypto Cycle Company of London, invented a single tube pneumatic tyre in 1890 and had it produced and marketed by Messrs. Capon, Heaton and Company, rubber goods manufacturers of Birmingham. The tyre was subsequently improved by H. A. Fleuss and J. W. Smallman to embody the "Clincher" principle, and became known as the "Fleuss" with the manufacture still performed by a publicly-floated Tubeless Pneumatic Tyre and Capon Heaton Company Limited (of June 1896). The Dunlop Company tried to kill it off during the twelve months ending December 1898 by three High Court actions for patent infringements, but, exceptionally, failed to do so - at least directly - since the "Fleuss" tyre, the judges ruled, did not incorporate an inner-tube as did the designs

1. "Woods asked £1,000 for his invention", recalled Arthur du Cros, "and the company being poor, offered him the alternative of a royalty of threepence a valve, or to purchase all their supplies from him at elevenpence each. Woods, however, stuck to his decision and received his £1,000, thus missing a fortune". du Cros, op.cit., p.148.

2. Ibid., p.145.

possessed by the Dunlop Company.[1] Single tube tyres for long remained popular with racing men on account of their light weight and ready detachability, and a design, invented and patented by John Fullerton Palmer of Riverside, Cook County, Illinois, formed the original basis of the Palmer Tyre Company Limited established in Birmingham in 1893. The tyre incorporated and exploited in novel fashion the technical properties of layers of wound threading: "....in place of the one or more layers of canvas which are used to strengthen ordinary tube tyres, the inventor winds spirally around the inner tube a continuous thread, keeping the turns just clear of each other. This layer of thread is then buried in a rubber coating, and another spiral is wound across the first the reverse way; again the threads are buried in rubber, and a thickened 'tread' affixed to come in contact with the ground. The absence of inter-thread friction and the directness of the pull in the line of strain are said to be the reasons of the undoubted pace of this tyre, repairs of which are effected by the introduction of rubber plugs, as in other tube tyres".[2] The Palmer Tyre Company was, in the first instance, financed jointly by the India-Rubber, Gutta Percha and Telegraph Works Company of London, and by the Rudge and Whitworth cycle-making interests. // Pneumatic tyre inventors naturally turned to existing, established rubber goods producers for technical advice and manufactured rubber supplies. While still experimenting on his own account in conjunction with Edlin and Sinclair, cycle makers of Belfast, J. B. Dunlop initially obtained his rubber materials from Messrs. Thornton and Company of Edinburgh, then from

1. Cycle Trade Journal, Oct. 1891, p.37, and April 1894, p.67. Times, 9 Dec. 1897, p.15, 5 April 1898, p.15, and 13 Dec. 1898, p.13.

2. Earl of Albemarle and G. Lacy Hillier, op.cit., p.284. By "tube tyres" the authors were referring to pneumatic tyres without separate inner tubes.

the Silvertown Company of London, and finally from Messrs. W. E. Bates, rubber manufacturers of Leicester. Bates were the first manufacturers to supply Dunlop with a circular endless cover, and in time manufactured pneumatic tyres themselves - and survived despite legal harassment from and the competition of the du Cros' Dunlop Pneumatic Tyre Company of the late 1890's.[1] The du Cros concern itself in its early days depended upon outside sources of processed rubber supply; its plant in Dublin in 1889 consisting of six sewing machines in an attic above Booth's cycle agency, a few wooden racks and some scissors. Component tyre parts were purchased from other firms and mainly assembled by hand, but the du Cros' had the vision to see that "The paramount necessity was to build or buy our own rubber mills, equipped with a laboratory and testing department to which we attached prime importance at a time when in England they were prone to be neglected".[2] Accordingly in 1893 they opened commercial relations with Byrne Brothers of Birmingham, who had been conducting a general rubber goods business since 1855, for supplies of rubber materials, and in August 1894 further cemented the connection by furnishing trade-credits and loan capital to enable Byrne Brothers to expand their operations. A permanent investment of capital followed in 1896 accompanied by the enlargement of their factory for tyre work exclusively, and its flotation as the Rubber Tyre Manufacturing Company Limited - later to be renamed the Dunlop Rubber Company.[3] Arthur du Cros recorded "....the impossibility in those days of obtaining the services of experienced technical

1. J. B. Dunlop, op.cit., p.31.
2. du Cros, op.cit., p.206.
3. Ibid., pp.208-9.

managers trained in the British rubber industry. All such men were principals in the comparatively few manufacturing firms of importance, or were held under strict agreement, and accordingly were not available. The Company, therefore, had to serve its apprenticeship as rubber makers, adopted a liberal policy of replacement, and, in course of time, evolved its own technicians, often by trial and error - an anxious and expensive method".[1] The strength of the du Cros' position lay in their commercial acumen, their private financial resources and in their acquired patent rights. Firms such as W. E. Bates and the North British Rubber Company had the technical knowledge but this by itself was insufficient to outflank and surpass a rapidly growing Dunlop Pneumatic Tyre Company.

Once the popularity of the pneumatic tyre among cyclists was established during the early 1890's other rubber goods producers, in addition to Bates and the North British Company took the initiative to try to enter the tyre market directly; so too did some cycle makers, either singly or in combination, though sometimes with little or no long-term success. By the summer of 1893 the Lancashire Rubber Company of Pendleton, Manchester, was manufacturing "Acme" pneumatic tyres, "on a substantial royalty" relating to the patent rights covering the inventions of a Mr. Mansell Jones, but the activity was transferred to a short-lived flotation, the Acme Pneumatic Tyre and Brake Company Limited.[2] In 1895 the

1. Ibid., pp.209-10.

2. Times, 7 July 1893, p.15.

Leyland Rubber Company Limited was making extensions to its works at Leyland near Preston, the growth of the tube and tyre trade into which it had recently entered necessitating a new wing 300 feet by 40 feet and two to three stories high.[1] The enterprise was merged with Stanley Morrison and Company Limited of London and with the Birmingham India-Rubber Company in May 1898 to form the durable and growing concern of the Leyland and Birmingham Rubber Company Limited. The East London Rubber Company had begun producing pneumatic tyres by 1896 and continued despite successful legal onslaughts, on grounds of patent infringements, from the Dunlop Company in 1897.[2] And prior to its participation in the ill-fated Amalgamated Pneumatic Tyre Companies scheme of 1897, the Hyde Imperial Rubber Company Limited of Stockport, manufacturer of golf balls and general articles of rubber ware, had a moderately profitable spell in producing its "Woodley" detachable tyre.[3]

As with so mahy of the new pneumatic tyre companies of the 1890's, their own or acquired patents formed the basis of established cycle makers' entry into this field.[4] In 1893 the Birmingham cycle

1. Cycle Manufacturer, 10 Aug. 1895, p.33.
2. Times, 9 Dec. 1896, p.4, and 10 May 1897, p.16.
3. The Midland Daily Telegraph, 2 Dec. 1896.
4. So numerous were the patents taken-out with regard to pneumatic tyres during the early nineties, and the threat of litigation over patent infringement so endemic, that the Cycle Trade Journal took a misguided tilt at the Patent Office: "The terrible confusion which has arisen in Pneumatic Tyre patents is entirely due to the behaviour of the Patent Office officials, and in stigmatising the whole business as a gigantic farce, we sincerely believe that we are but re-echoing the sentiments of hundreds of Patentees of Pneumatic Tyres, whose money has gone on patent fees for worthless pieces of paper in the shape of Letters Patent". Further, the Journal alleged that the existing patenting arrangements ".....enables big corporations to patent inventions right over the heads of poor inventors, and to use pressure with these very patents to crush out the smaller fry". But as Alfred J. Boult, the well-respected London patent agent, pointed out, the weakness in the English patent system lay in the patent laws and not in the Comptroller and his staff in the Patent Office: so long as specifications were formally in order - and novelty in design or process was not a necessary prerequisite for the award of Letters Patent - the Office had no choice but to accept them. Ibid., Feb. 1894, Supplement, p.18, and March 1894, Supplement, pp.1-2.

rim-making firm of Thomas Warwick and Sons Limited went in for the production of their "Warwick" tyre (though the patents covering its design were held by the du Cros family), and the "Warwick" continued to be marketed after the rim company was merged into the Cycle Components Company Limited during the following year.[1] William Starley of Starley Brothers of Coventry devised his own "Psycho" pneumatic tyre and established his short-lived Patent Tyre Company Limited in 1894 in an adjunct to Starley Brothers' main cycle factory building.[2] During the following year a number of notable cycle-makers financially interested themselves in the Patent Self-Sealing Air Chamber Syndicate Limited which was formed to exploit an American invention of an allegedly non-puncturable tyre: Bayliss, Thomas and Company, Calcott Brothers, the Centaur Cycle Company, Humber and Company Limited, Harry James of Birmingham, the Leyland Rubber Company, John Marston Limited, the Premier Cycle Company, the Quadrant Cycle Company, the Sparkbrook Manufacturing Company of Coventry, Starley Brothers, and the Westwood Manufacturing Company. Frederick Westwood and Henry G. Priest- the latter of the Quadrant Cycle Company - undertook the management of the affairs of the Syndicate from its offices in Birmingham, and a £20,000 public issue of shares in the July attracted total applications amounting to £43,000. On this basis it survived until 1905 when it was financially reconstructed, with a reduction of its paid-up capital to £15,000, and renamed the Self-Sealing Rubber Company Limited.[3]

1. Ibid., Oct. 1893, p.651.

2. Ibid., April 1894, p.67.

3. Cycle Manufacturer, 27 July 1895, p.10, and 10 Aug. 1895, p.32. The Stock Exchange Yearbook, 1908, p.2125.

In addition to the exercise of their own engineering ingenuity, and the maintenance and the encouragement of inventive processes in spheres of industrial activity which they thought concerned them, many prominent cycle manufacturers had a personal or vicarious association with the cycle racing sport, precisely with the objective of product improvement in view although advertisement also figured in their calculations. Even by the 1890's, when the cycling recreation was firmly established, British cycle makers maintained young "speed men" ("makers' amateurs" as they were sometimes derogatively dubbed) in their employ: "These young 'speed men' are constantly on the look-out for anything that will improve their pace, and any new device or alteration in design, introduced by other firms, is quickly noted by them, and they are not content until it is embodied in their own machines. In that way it is tested thoroughly and, if found satisfactory, it soon takes its place amongst standard patterns".[1] Some few firms objected to the employment of racing men on the grounds that they neglected their day-to-day commercial duties and demanded extra holidays for training purposes, "....but from our own observation we have found this to be by no means invariably the case...... .....We look upon the retention of one or two good riders, as cycle experts, as by no means a bad investment. Some of the very best designers have been known as prominent racing men".[2] In 1885 J. K. Starley owed three major improvements to his newly introduced "safety" - direct steering, raked head, and adjustable saddle position - to Stephen Golder, a Coventry competition cyclist, and certainly the racing track produced some cycle entrepreneurs notable for their

1. Cycle Manufacturer, 31 Aug. 1895, p.61.

2. Ibid.

contribution to the technical side of the trade. William Chater-Lea combined cycle road-racing with the receipt of his engineering experience with Messrs. Linley and Biggs, makers of the "Whippet" cycles, before beginning his own cycle component business in London in 1890 at the age of thirty; and G. P. Mills, while still a competition road-racer, was employed as a draughtsman at the Ivel Cycle Works of Biggleswade during 1884-87, and was responsible for cycle design when he subsequently joined A. W. Gamble to form a cycle firm in Biggleswade that endured from 1888 to 1890.[1] In pursuit of innovation, J. K. Starley and Company and other makers during the early 1890's tried the method, "with some success", of issuing circulars to cycle agents to acquire opinions of their firms' machines, to have defects pointed-out and possible improvements suggested.[2] Keeping abreast of the current fashion, to be in production of the latest models was deemed vital for survival and expansion during the first thirty years of the British industry's life, and change could come quickly: "A couple of seasons ago the drift of demand was all in favour of tricycles", it was reported in 1887, "but since the introduction of the low safety or 'Rover' pattern there has been a reaction in favour of that class of bicycle, which are being preferred now to the high machines even for racing purposes".[3] The misfortunes afflicting some makers in the early 1890's drew the comment: "As season follows season it becomes more and more obvious that to be out of the fashion means to be out of the trade..... The Coventry Machinists', Rudge and Company, and others, till the beginning of '94, were drifting slowly but surely behind the times; making sound and good machines, certainly, and of the best material, but by no means of the best designs".[4]

1. C. F. Caunter, op.cit., p.35. Proceedings of the Institution of Automobile Engineers, vol. XXII, 1927-8, PXXIV. The Cyclist, vol. 9, No. 465, 12 Sept. 1888, p.1294.
2. Cycle Manufacturer, 31 Aug. 1895, p.61.
3. The Cyclist, vol. 9, No. 417, 12 Oct. 1887, p.17.
4. Cycle Manufacturer, 2 Feb. 1895, p.13.

In this volatile commercial environment the shareholders in Rudge and in Coventry Machinists', as public companies, came to exert a more than passive influence upon policy. William Grinyer, who had spent fourteen years with the Machinists' Company and who had risen to general manager, was sacked in 1894 upon the report of an investigating shareholders' committee, and was replaced by R. L. Philpot.[1] Philpot came from Rudge - dismissed, in fact, but not for lack of energy or incompetence - and Rudge had management problems of its own, compounded by an exodus of entrepreneurial and engineering talent: the death of George Woodcock, and the departure of Walter Phillips and R. W. Smith to other firms, all in the course of 1892-3.[2] As a consequence of its ordinary dividend falling from 15 to 8¾ per cent during the 1891-2 season, a body of shareholders made representations to the Company's directors, upon which J. R. C. Taunton relinquished his post of managing director in favour of J. F. Wright, with the corollary that the valuer to the Company was changed. Wright found both stock and plant "grossly overvalued" (for instance in 1892 £3,000 was accredited to additions to plant in the balance sheet whereas only £803 was actually spent on plant in the 1891/2 trading year) and, additionally, that ".....the type of cycles being turned out was quite old-fashioned, much of the material used was bad, and still they were paying exorbitant prices for material". Representations by Wright to his board during 1892

1. Alfred Lowe, op.cit., 1893-4, pp.96, 102 and 253.

2. Phillips was drawn out by the offer of Humber and Company Limited to take charge of their extensive Coventry plant. Smith left to join Albert Eadie in forming the Eadie Manufacturing Company. As cycle engineers they continued to be held in high regard. It is probable they felt they were leaving a sinking ship.

secured no changes in management or policy until May 1893 which meant trading under the "old system" for nearly the whole of the 1893 season. Taunton (also chairman of the Company) and another director, Marten, both due to retire by rotation, were nevertheless re-elected at the 1893 annual shareholders' meeting, but the resolution was passed that two more directors be appointed - in the event, Charles Wallis and G. Brodie, both of Birmingham - and a committee of six shareholders be formed to discuss with the directors the formation of a new board.[1] Wallis and Wright decided to steer their enterprise towards a merger with the Whitworth Cycle Company, but at both Coventry Machinists' and Rudge, the new brooms had their effect: "Now these firms have, and deserve, the reputation of turning out some of the most thoughtfully-designed cycles that can be bought" was a verdict of early 1895.[2]

The processes of product invention and refinement, and the level and nature of the demand enjoyed by both the individual firm and the industry, were therefore very closely linked. "The constant changes and improvements introduced in the manufacture help to sustain the demand, as the machine of one season is practically superseded the next; but the main factor of the business is still the extension of the practice of cycling to new classes and purposes, including parcels conveyance and advertising".[3] It was to expand the market that the principal makers, especially during the 1880's, adopted a policy of product diversity, such a policy itself involving invention and modification. The "ordinary" (or "penny-farthing") bicycle as

1. Cycle Trade Journal, Nov. 1893, pp.681-2, and Jan. 1894, p.14.
2. Cycle Manufacturer, 2 Feb. 1895, p.13.
3. The Cyclist, vol. 8, No. 392, 20 April 1887, pp.661-2.

developed during the 1870's was essentially a male athlete's machine - appealing not at all to the physically fragile or those too nervous to cope with its potential perils. Correspondingly, considerable effort was expended by cycle makers in the late 1870's and early 1880's to devise machines which would accommodate the latter class of person. Many different designs of tricycles, quadricycles, dicycles and bicyclettes appeared on the market, including James Starley's Coventry Lever Tricycle in 1876, the Coventry Rudge Bicycle originally devised by H. J. Lawson in 1878, Starley Brothers' "Royal Salvo" quadricycle also introduced in 1878, and, in the year previous, the Coventry Machinists' Company successfully produced their rear-steering "Cheylesmore" tricycles, and George Singer introduced his tricycle incorporating a large, single, rear driving-wheel.[1] In 1882 Bayliss Thomas of Coventry were the first to produce a tandem tricycle, and "Sociables", or side-by-side machines, came into vogue, although they were slow, heavy and cumbersome.[2] E. C. F. Otto's patent dicycle was taken-up and produced by the Birmingham Small Arms Company in 1881, and in 1884 William Hillman patented and began to manufacture his "Kangaroo" design of bicycle, a much lower mount than the"Ordinary" and copied by several other makers.[3] As a result of their own and others inventive activity no one manufacturer concentrated upon one design of cycle, and the cycling enthusiasts of the late nineteenth century, in their efforts to accommodate themselves as best they could to the stresses of their preoccupation, differed widely in their cycle design requirements.

1. C. F. Caunter, op.cit., pp.27-8.
2. Ibid., p.30.
3. Ibid., pp.18 and 26.

Makers hence felt obliged, with maximum sales and growth in mind, to produce simultaneously from the one factory a variety of models, even going so far as to accept orders for one-off jobs. Such production policies, and market environment, were encouraged by the "best advice": "....to enjoy anything like the full amount of enjoyment that can be got out of the pastime of cycle-riding", wrote two contemporary authorities on the subject, "a man's machine should be built to his measure with the same solicitude that his tailor displays in producing his coat".[1] In 1880 whilst "some few" manufacturers kept a large number of their standard patterns in stock, the others only made to order, usually straight from the ultimate customer and sometimes incorporating the customer's own ideas as to design.[2] By the advent of the 1887 Stanley Show - the industry's principal annual exhibition event - all the leading manufacturers, if the accounts of their exhibits are anything to go by, were prepared to make up to a dozen or more differently designed types of cycle: "ordinary" cycles, tricycles, tandem tricycles, sociables, "safety" bicycles and so forth. Starley Brothers of Coventry proposed to market a racing "Psycho" safety, a roadster "Psycho" safety, "Psycho" tricycles in several varieties with optional two or four bearings to the axle, and with or without direct steering, a "Psycho" tandem, and a side-steering "Salvo" tricycle. The Howe Machine Company of Glasgow planned eleven different types of tricycle for the 1887 season, seven varieties of bicycle and three different designs of tandem tricycle. The Coventry Cycle Company, soon to form part of

1. Earl of Albemarle and G. Lacy Hillier, op.cit., p.22.
2. The Cyclist, vol. 1, no. 26, 14 April 1880, p.261.

Humber and Company, had eight different patterns of bicycle on the market at the beginning of 1887, ten in tricycles, five in "safeties" and two in tandems. Humber and Company itself had at least eight different types of cycle on its 1887 lists, while, more modestly, J. K. Starley and Company settled for two varieties of its "Rover" safety, a "Roamer" tricycle, a "Rover" safety with anti-vibration springs, and a tandem tricycle.[1] During the early 1890's the basic design of the British cycle settled down around the concept of the diamond-frame safety, which satisfied the requirements of the majority of British cyclists, old and young, male and female, although the manufacturers were still much concerned with problems of detailed refinement, attempting to secure each year a "better" model of bicycle than they marketed during the last. Moreover, the nature of the demand for cycles was by no means homogeneous despite the new widespread similarity in the outlines of cycle design. The New Howe Machine Company was marketing in 1893 eight models of cycle, including a "Cripper No. 20" tricycle, upon each of which accessories could be added as extras. Likewise, in the following year, J. K. Starley and Company had eight models on its retail lists - various types of "roadsters" and "racers", ladies' models and gents' available in different wheel and frame sizes, and intended to fulfill every expected cycling taste.

Not surprisingly, the continuous process of product invention and refinement, and the diversity in product design, had its implications for the techniques of cycle production; and, in a kind of interacting manner, was the result of, and tended to generate, a particular set of entrepreneurial attitudes. The production of a standard design of cycle, on the part of any one firm, for longer than one or two seasons was a commercially hazardous operation, as, too, was the long-run

1. The Cyclist, vol. 8, No. 380, 26 Jan. 1887, Supplement, pp.4-5; vol. 8, No. 381, 2 Feb. 1887, adverts., p.19, and Supplement; and vol. 8, No. 395, 11 May 1887, p.743.

production of cycle components for stock. To plan production of complete machines and parts on a big scale was to court a high degree of risk: "The rush with which orders came in the busy season renders it extremely advisable that stock should be made in the slacker times of the year, but the very variable nature of the cycling taste causes the making of stock on anything like a large scale to be a matter of considerable risk and anxiety to the manufacturer, and he requires to be well-acquainted with the views of the cycling public to put in stock with any chance of success".[1] Miscalculation of the level and type of cycle demand in 1893 cost the Coventry Machinists' Company £3,376.13.11d in depreciation of stock by the close of the trading year with further amounts of stock-on-hand deemed to have simultaneously depreciated at a loss of £4,854. 7. 4d.[2] The final output of a cycle manufacturing firm of the late nineteenth century could become technically obsolete only too rapidly if fixed patterns and models were adhered to for any lengthy period of time, and the buying habits of the cycling public were thought to exacerbate the situation. The successive crop of inventions and innovations in cycle designs each year ensured that many cyclists disposed of last year's machine and bought a new one: "..... no matter how excellent the novelties of one season may have been, there is an apparently insatiable call for the super-excellent products of the new year. What becomes of the old machines does not clearly appear. They may possibly be shipped off to not over-critical residents in distant parts of the world, or they may mysteriously disappear; but in either case they do seem to be disposed of in consonance with the desire for constant change which appears to

1. Ibid., vol. 7, No. 364, 6 Oct. 1886, p.1323.

2. Cycle Trade Journal, Jan. 1894, p.14.

possess the ardent cyclists of this country".[1] The upshot for production techniques of continuous invention, innovation and the corresponding changes in designs, maintained The American Machinist, was that British cycle manufacturers were circumspect in investing heavily in highly-specialised plant and machine tools.[2]

Furthermore, and stemming from the preoccupation to devise annually a technically (or fashionably) superior product, there developed an entrepreneurial individualism, which militated against an inter-firm standardisation of cycle components (such as cycle chain pitches, screw threads and sizes, sizes of nuts and bolts, diameters of bearing-balls, chainwheel and sprocket designs, and crank lengths); plus a predilection for the manufacture of a"high-quality" good in terms of qualities of materials embodied, of the skill of the labour endowed, and in terms of finish and performance. The trade press began to make complaints on the former of these counts in 1888: "There can be no doubt about it that the diversity in the sizes of nuts and the diameter and pitch of thread used on the screws and bolts in cycle construction is the cause not only of great inconvenience to the rider, but of considerable inconvenience and additional expense to the repairer, and we are inclined to think also to the manufacturer".[3] Towards the end of that year differences in cycle makers' requirements meant that Hans Renold supplied his patent block cycle chain to Humber and Company, and double-bush cycle chains to the Coventry Machinists'

1. The Cyclist, vol. 7, No. 330, 10 Feb. 1886, p.395. The cycle trade press of the 1880's and 1890's does not record the existence of an extensive second-hand market for cycles which could provide an outlet for "old" stocks of cycle components. Auctions of complete machines were held occasionally in most of the main urban areas of the U.K., but it is not clear whether the cycles so disposed of were second-hand machines, the "old stocks" of large established manufacturers, or the products of cycle makers gone bankrupt.

2. The American Machinist, 10 June 1897, pp.17-18.

3. The Cyclist, vol. 9, No. 460, 8 Aug. 1888, p.1109.

Company (with a 1.02 inch pitch), to George Singer and Company (with a 1.19 inch pitch), and to Starley Brothers and the Rudge Cycle Company (with a 1.3 inch pitch).[1] Nine years later - in December 1897 - a private meeting of chainmakers in Birmingham resolved that Hans Renold's templates be adopted as the standard for the diameters of block seating chainwheels. Subsequent meetings were held by cycle chainmakers on the occasion of the National Cycle Show at the Crystal Palace, but at these Joseph Appleby (ill on the occasion of the Birmingham meeting) claimed that his design of chainwheel was superior, and Clements of B.S.A. additionally laid claim to a better design similar to Appleby's, with the result that nothing definite was decided upon the chainwheel standardisation issue.[2]

Among the notable cycle manufacturers of the 1880's and 1890's there was probably no greater individualist and "high quality" devotee than Harry James of Birmingham: "Mr. James is his own inventor-draughtsman, modeller, turner, fitter and, in fact, complete master of every department of his business. If Mr. James lights upon an idea, he disappears into his studio, works, worries, makes and re-makes, tries, fails and succeeds; he allows nothing to leave his hands that is not perfect. Maybe he does so at a serious loss, it doesn't matter; it has helpedto form the solid foundation upon which his present business, splendid works, and undoubted reputation rests".[3] James, apparently, preferred "a limited output of high-class machines to unlimited contracts taken at a price":

1. Ibid., vol. 10, No. 483, 16 Jan. 1889, adverts., p.11.
2. <u>Cycle Manufacturer</u>, 18 Dec. 1897, p.259.
3. <u>Cycling</u>, 26 Nov. 1892, p.314.

"There are many details in the construction of the James which are obviously more costly than the usual materials and methods; as an instance we may mention that steel stampings, instead of malleable castings, are used for all the lugs, whilst for the bearings an expensive iron is used, a material which is about three times more costly than the best steel usually used, this iron afterwards being treated with carbon by the old steel making process.....The construction of the frame of the James cycles differs in one important point from the usual pattern, and, in this, too, is additional expense incurred. Instead of the back stays being flattened and bolted to the seat pillar lug in the usual manner they are brazed into lugs on either side thereof, it being claimed that this produces a more rigid result than the other method..."[1]

An individualist pursuit of excellence marked another sizeable manufacturer of the 1890's - the Premier Cycle Company of Coventry, which developed a passion for its own helical steel tubing. Rejecting the use of frame members composed of seamless steel tubes, the firm introduced and adopted at the turn of 1894-5 a tube made of a thin strip of steel rolled or twisted helically in the same manner as a paper spill. Premier claimed that its invention was stronger and less subject to bend than ordinary steel tubing, and additionally, ordinary weldless steel tubing was deemed not always so exactly uniform in the thickness of the walls as the company desired. A margin of safety was considered desirable on this account whereas helical tubes could be constructed exactly to gauge. Reflecting upon this departure from common practice, Engineering was moved to comment: "Naturally, the great aim ofthe bicycle-maker is to achieve lightness, and it is

1. Ibid., and Cycle Manufacturer, 27 April 1895, p.166.

astonishing to what lengths some will go in order to save a couple of pounds or so".[1] A preoccupation with the "quality" of the product pervaded the entrepreneurial minds of the cycle trade, and the entrepreneurs themselves were proud of it. R. H. Lea and G. J. Francis, both drawn from the management of large Coventry cycle firms, formed their partnership in 1895 committed to the manufacture of "high class cycles". Their new machine shop in Day's Lane, Coventry, contained "good British and American machines" but Mr. Lea said "Quality, rather than quantity, was to be his firm's object".[2]

Regular invention and refinement, individualism and the pursuit of high quality had their implications for the level of and trends in cycle prices: "To those who have not carefully investigated the matter the price paid for machines seems high, but it must be remembered that before the cycle can be brought to the necessary pitch of excellence a vast amount of money has to be spent in experiments, and any small item of alteration or improvement may throw out of use machines or parts which lie ready to hand: thus the manufacturer is constantly finding himself burdened with obsolete patterns in castings and machines which, but a few weeks before, represented the 'latest improvements'. Moreover, the skill employed in the construction of a trustworthy machine has to be paid for, and paid for highly. Skill has much to do with it. It is perfectly well-known that two workmen may be working side by side with the same materials, and that one will make a wheel which may last ten years, whilst the other may make one which will not stay true for ten days. ......the services of a good workman

1. Engineering, 22 March 1895, pp.361-2.

2. Cycle Manufacturer, 28 Sept. 1895, p.116, and 5 Oct. 1895, p.123.

are not to be obtained for nothing, whilst a visit to any large cycle works will show that many machines and much skill and ingenuity have to be exercised before the modern machine can be placed satisfactorily on the market".[1] In the late 1860's the retail price of a "boneshaker" velocipede in England varied from £10 to £14 but during the following twenty years the quoted list prices of British cycles showed no marked tendency to fall, and, with successive increments in materials employed and changes in design, tended, if anything, to increase. The supercession of pneumatic tyres for cycles over the solid and cushion variety in the nineties, for instance, was probably one of the principal factors maintaining or uplifting cycle prices at that time. For certain, the Premier Company's "Koh-i-noor No. 2" cycle was listed in 1891 at £20 with solid tyres, £22.15. 0d with cushion tyres, and £25 with pneumatic tyres. The New Howe Machine Company's "Howe No. 12" was priced at £13 with solid, £16 with cushion, and at £18 with pneumatic tyres. Some makers were reluctant to publish their list prices in the press at all, or only occasionally did so, and no consecutive annual series for any one firm or group of firms can be obtained. The evidence on nineteenth century trends in cycle prices is correspondingly tatty:[2]

1. Earl of Albemarle and G. Lacy Hillier, op.cit., pp.63-4.

2. See Tables 6 and 7. Some information is available on the contract prices negotiated by the B.S.A. Company after its entry into the cycle industry in 1880. In July 1880 the company undertook to supply Messrs. Smith and Lamb of Ipswich with 210 of E.C.F. Otto's patent "safety" design of bicycle at £8.15s. each without rubber tyres and £10. 8. 9d with rubber tyres. A second contract for 200 "Otto" cycles was undertaken at a supply price of £13 each with tyres, and a third for 553 machines at £14 each with tyres. In 1881 the company contracted with Nahum Salaman of Holborn Viaduct, London to supply 200 "Omnicycle" tricycles at £13.10s. each, and a further 360 machines at £16 each plus 18 "Sociables" at £25 each. In January 1882, B.S.A. agreed to supply Maynard Harris and Company Limited of London with 200 "Devon" tricycles at £12 each, and also undertook to manufacture Martin D. Rucker's patent tricycle at £10.10s. each - 100 were ordered but only 65 made. History of the Birmingham Small Arms Company Limited 1861-1900, vol. 1, pp.4-10.

TABLE 6

The List prices of bicycles quoted by certain cycle manufacturers at various dates

Firm and date	brand of bicycle	list price
Sept. 1871		
Messrs. Starley and Hillman, Coventry	"Ariel" bicycle	£8
	"Ariel" bicycle with speed gear	£12.
1880		
Hillman, Herbert and Cooper, Coventry ..	"Number 0" Ordinary	£9.10s.
Centaur Cycle Company, Coventry	"Centaur" Ordinary	£15.10s.
1881		
Timms and Company, Coventry	"Number 3" bicycle	£7.10s.
	"H.F." bicycle with roller bearings	£10.
	"S.H.F." bicycle	£12.10s.
Howe Machine Company, Glasgow	"Interchangeable bicycle"	£15.15s.
1884		
Birmingham Small Arms Ltd.	"B.S.A. Safety"	£9.9s.
1886		
Kelsey and Company, Birmingham	Safety bicycle	£15.15s.
George Singer and Company Coventry	"Apollo" safety	£18.
1889		
F. W. Parkyn, Wolverhampton.	"Olympic" diamond safety	£15.10s.
J. Parr, Leicester.	diamond safety	£16.
Hillman, Herbert and Cooper, Coventry	"model F" safety	£12.12s.
	"model C" safety	£18.

TABLE 6 (continued)

Firm and date	brand of bicycle	list price
1891		
Starley Brothers, Coventry	"King of Diamonds" safety	£19
	"Bath Road"	£20
	"King of Solids"	£14.10s.
Triumph Cycle Company, Coventry.	"Popular"	£14.
	"Best Quality"	£16.
	"Rational"	£21.10s.
Ormonde Cycle Company, Birmingham.	"Semi-Racer"	£18.18s.
	"No. 1. Diamond Frame" safety	£12.12s.
Hillman, Herbert and Cooper, Coventry.	"Koh-i-noor No. 2" solid tyres	£20
	- ditto - cushion tyres	£22.15s.
	- ditto - pneumatic tyres	£25.
Marriott and Cooper, London.	"Model E" solid tyres	£10
	- ditto - pneumatic tyres	£12
	"Model C"	£18.10s.
Taylor, Cooper and Bednell Limited, Coventry	"Raglan Model B"	£18.
Jones Venn and Company Limited, Coventry	"Viking No. 6"	£11.10s.
	"Viking No. 3"	£12.10s.
Raleigh Cycle Company Limited, Nottingham.	"Type F" solid tyres	£13.13s.
	- ditto- cushion tyres	£16.16s.
Guest and Barrow, Birmingham.	"Model Z"	£9
	"Model Y"	£12
	"Model X"	£12.10s.
	"Model W"	£15.10s.
Ellis and Company London	"No. 2 Rhoda"	£16
	"Farringdon" safety	£18
Humber and Company Limited	"Popular"	£13
	"No. 12"	£14
	"No. 13"	£14.14s.
New Howe Machine Company Limited	"Howe No. 12" solid tyres	£13
	- ditto - cushion tyres	£16
	-ditto - pneumatic tyres	£18

TABLE 6 (continued)

Firm and date	brand of bicycle	list price
Roulette Cycle Company Limited, Coventry	"Roulette Safety"	£21
Hotchkiss, Mayo and Meek, Coventry	"Eagle Safety"	£17.10s.
1892		
John Marston, Wolverhampton.	"Sunbeam New Special Diamond" with cushion tyres	£13
	"Sunbeam New Special Diamond" with pneumatic tyres	£17
	"Design E" cushion tyres	£19.10s.
	- ditto - pneumatic tyres	£23
Premier Cycle Company Limited, Coventry	"F2 Safety" solid tyres	£14
	- ditto - cushion tyres	£16
	- ditto - pneumatic tyres	£19
	"Model A" solid tyres	£20
	- ditto - cushion tyres	£22.15s.
	- ditto - pneumatic tyres	£25
Triumph Cycle Company Coventry	"Rational"	£25
Humber and Company Limited	"Coventry Humber No. 11"	£15
Raleigh Cycle Company Limited, Nottingham.	"New Raleigh M" solid tyres	£16.16s.
	- ditto - cushion tyres	£18.18s.
Marriott and Cooper, London	"Safe Ordinary"	£23
	"Model D"	£16
1893		
New Howe Machine Company Limited Glasgow.	"No. 1 Road Racer"	£26
	"No. 1 Path Racer"	£25
	"No. 1 Path Racer Special Light Cycle"	£30

TABLE 6 (continued)

Firm and date	brand of cycle	list price
New Howe Machine Company Limited Glasgow.	"No. 9" Lady's safety	£28
	Front drive safety (Boothroyd tyres)	£24
	Front drive safety (Dunlop tyres)	£26
	"No. 10 Roadster" cushion tyres	£13
	"No. 10 Roadster" pneumatic tyres	£15
	"No. 2 Road Racer" cushion tyres	£22
	"No. 2 Road Racer" pneumatic tyres	£24
	"No. 14" cushion tyres	£11.11s.
	- ditto- pneumatic tyres	£13.13s.
Raleigh Cycle Company Limited, Nottingham	Model "M"	£15.10s.
J. Marston, Wolver-hampton	"Sunbeam" design H	£18.8s.
	"Sunbeam" design T	£21.
Marriott and Cooper, London	"Model C"	£15.12s.
Coventry Machinists' Company Ltd.	"New Model D"	£14.10s.
J. K. Starley and Company Limited, Coventry	"Popular Rover"	£15
Premier Cycle Company Limited, Coventry	"Light Roadster"	£26
1894		
New Howe Machine Company Limited, Glasgow	"Path Racer" safety	£28
	"No. 1 Road Racer"	£26
	"No. 2 Road Racer"	£22
	"No. 9 Lady's" safety cushion tyres	£24
	"No. 9 Lady's" safety pneumatic tyres	£26
	"New City" model	£14

TABLE 6 (continued)

Firm and date	brand of cycle	list price
J. K. Starley and Company Limited, Coventry	"Rover Roadster"	£26.10s.
	"Light Roadster"	£26.10s.
	"Rover Racer"	£25.10s.
	"High Rover"	£26.10s.
	"Lady's Rover"	£26.10s.
	"Lady's Popular Rover"	£16.
	"No. 2 Rover Racer"	£18
	"New Popular Rover"	£15
J. Marston, Wolver-hampton.	"Sunbeam 1894"	£17.13s.
	"Road Racer"	£22.13s.
Ormonde Cycle Company, Birmingham.	"Model E"	£17.10s.
Starley Brothers, Coventry	Lady's safety	£27.5s.
	Gent's Light Roadster	£26.15s.
Marriott and Cooper, London	"Popular" safety	£14.
1895		
Arab Cycle Company, Birmingham	Roadster safety	£20
Ormonde Cycle Company, Birmingham	"Model F" Roadster	£18.10s.
Referee Cycle Company, London	"Model A" road racer	£18
Marriott Cycle Company, Birmingham	Gents light roadster	£22
J. K. Starley and Company Limited, Coventry	"Royal Rover"	£20
Bonnick and Company Limited, Coventry	"R and S" road racer	£20
Premier Cycle Company Limited, Coventry	"Popular Premier"	£18
Quinton Cycle Company Limited, Coventry	"Popular Lady's"	£12.12s.
Metropolitan Machinists' Company Limited, London.	"No. 1 Juno" roadster	£18.9s.
	"Juno No. 12"	£12.12s.
	"Lady Juno No. 4"	£20
	"Lady Juno No. 6"	£14

TABLE 7

The List Prices of Tricycles and other types of cycle (except bicycles) quoted by certain cycle manufacturers at various dates.

Firm and date	brand of cycle	list price
1880:		
Hillman, Herbert and Cooper, Coventry	"Flying Dutchman" tricycle	£16.16s.
Centaur Cycle Company, Coventry	"Special Centaur" Tricycle	£16.10s.
Starley and Sutton, Coventry	"Meteor" tricycle	£16.
1881:		
Timms and Company, Coventry	"Favorite" tricycle	£14.14s.
	"No. 2 Perfection" tricycle	£16.
	"Perfection" Sociable	£21.
Howe Machine Company, Glasgow	"Interchangeable" tricycle	£16.16s.
National Arms and Ammunition Company Ltd., Birmingham	"National tricycle	£21.
1893:		
New Howe Machine Company Limited, Glasgow	"Cripper No. 20" tricycle cushion tyres	£30
	"Cripper No. 20" tricycle pneumatic tyres	£33

(Sources: G. Williamson, op.cit., pp.54-5; The Cyclist; Cycling; and Cycle Manufacturer)

The people who could afford to pay between £9 and £33 for the luxury of a new cycle, both at home and abroad, were mainly prosperous businessmen and professional persons (and their wives, sons and daughters) supplemented by an army of young office clerks. "The Frenchmen who go in for cycling", it was observed in 1888, "are all of the better class, the lower orders could not afford to do it. ....The French rider at present looks to England for his machine for he can afford to gratify his tastes and obtain the very best".[1] Cycling in Belgium during the early 1890's was increasing at a rapid rate but only with the custom of the nobility and the "best people", while the majority of cyclists in the U.S.A. were clerks or "men of the middle-class".[2] In British India, the Europeans were the largest buyers of cycles plus some Eurasians and better-off Indians able to afford the machines - the cool season, from November to February, being the favourite time of year for the cycling pastime.[3] In England the "working man" was not, as a rule, a cyclist: "The two sections of the community which form the majority of 'wheelmen' are.....the great clerk class and the great shop assistant class".[4]

1. The Cyclist, vol. 9, No. 464, 5 Sept. 1888, p.1270.
2. Cycle Trade Journal, Aug. 1893, p.591; and Feb. 1894, p.25.
3. Ibid., March 1894, p.38.
4. Cycling, 13 Aug. 1892, p.56.

For certain, the cycling clubs, which sprang-up during the late 1870's and early 1880's - there were some 230 clubs established in all parts of Britain by 1880 - and which organised bicycle tours and bicycle sports events for their members, were generally the domain of "young men of themiddle-class".[1] The Cambridge University Club was one of the largest at the beginning of the 1880's with a membership of 280.[2] And Cycling club membership involved expenditure on the part of the cyclist over and above that of the cost of a bicycle. A para-military style of uniform was invariably requisite, or, at least, a special jacket and ribbon or badge and a diminutive cap. The Liverpool Anfielders, for instance, wore black with a little "hussar" braiding on the jacket, and stripes of royal blue on a black scarf; the various officers had silver monograms, those of the captain being gold. A. W. Rumney, sometime honorary secretary of the Cambridge University Bicycle Club,recorded that in 1882 the uniform of the Bicyclists' Touring Club - green serge suit, Norfolk jacket, knee breeches, stockings and a stiff helmet - cost him £2.1s complete.[3] No late 19th century manual worker was likely to launch out on expenditure such as this, and, of course, there were the additional items of membership subscriptions and other fees. Membership of the Cyclists' Touring Club required an entrance fee of one shilling and an annual subscription of 2/6d (3/6d after 1893 and 5/0d after 1896). Twenty-one years after its foundation, the number of subscribers to the C.T.C. reached a high-point of 60,449 in 1899, but how many British manual workers could afford a week or a fortnights'

1. Frederick Alderson, Bicycling. A History (1972), p.42.
2. Ibid.
3. Ibid., pp.46-7; and pp.51-2.

holiday so as to utilise its facilities, e.g. special-term hotels and inns, and guide and information books on cycle touring throughout Britain and the Continent?[1] One historian of the cycling recreation has viewed the bicycle as becoming, by the 1890's, the status symbol of the black-coated workers of the lower middle-class. It was the means of personal transport for those "below the carriage class", but "For the proletariate....... the chance of a second-hand machine would be the only way to enjoy such a luxury".[2] Denmark, apparently was an exception: out of a

1. Ibid.,pp.100-1.

2. Ibid., p.109. H. G. Wells has conveyed an impression of the link between the bicycle and the social norms and aspirations of the lower-middle class, black-coated worker. In The History of Mr. Polly, the hero began his working life as an assistant in a drapers shop but had aspirations to be "independent" and acquire a higher social standing. His aspirations were partly fulfilled when a legacy from his lately deceased father enabled him to purchase a new bicycle, marry, and acquire a small shop of his own. The bicycle enabled Polly to perform "middle-class" visitations to friends and relatives who lived at some distance from his lodgings, and served as an aid to the courtship of girls who resided at otherwise inconvenient distances. He was a self-indulgent, self-pitying man with an extraordinarily affected style of speech (a betrayal of his yearnings for higher social status), but he found that the cycling recreation disposed of his indigestion, strengthened his leg muscles, afforded sporadic uplifts into euphoric states of mind, and a welcome mobility - a means of escapism; a counter-weight to the perceived endless drabness of his shop-keeping life, which, in the event, offered him insufficient social fulfillment. In Kipps, Arthur Kipps was reared by his status conscious, shop-keeping uncle and aunt. He was precluded from playing with the "low" in childhood, and was sent to a cheap, private school so that an education in a State board school was avoided. Like Mr. Polly he was apprenticed to a draper after completing his formal "education", and upon the completion of his apprenticeship he was paid £20 a year plus board and lodging. Not surprisingly, given his background, Kipps developed a status-consciousness as did all the shop assistants in the "Emporium" in which he worked. He shared a horror of "lowness" of any sort, and although he knew neither of his parents, he referred to his father as once a "gentleman farmer". With his feelings of the importance of social status, Kipps maintained as a young man incoherent feelings that the achievement of a higher social status was possible and desirable, and was clear about whatthis higher social status meant in terms of the trappings of consumer durables. An unexpected legacy from a deceased grandfather (£1,200 a year) afforded Kipps the social elevation he desired, and in a moment of ecstacy he reflected upon what this involved for him: "He might buy a motor-car, he might buy one of those here things that will play you a piano - that would make old Biggins sit up! He could pretend he had leant to play - he might buy a bicycle and a cyclist suit.." Kipps duly did buy a bicycle: he was not fond of it as a means of social recreation since he was never an accomplished rider, but he used it extensively as a means of personal transport when he felt that "visitations" were required.

population of $2\frac{1}{4}$ million it was reckoned to have between 60,000 and 70,000 cyclists by the mid-1890's, proportionately more than any other country on the Continent, and with the total number growing fast "because the peasantry and the working men are taking to the wheel to the same degree as the other classes". The country's flat topography and good roads facilitated the widespread use of cycles for utilitarian as well as for leisure purposes. "In the towns the working men combine in clubs of ten and twelve, and buy their wheels on contracts or mutual guarantee, and the agents say that there is not much risk in this kind of business.[1]

Even in the United Kingdom clerks and shop assistants did not usually command a high money income relative to the highest of cycle prices, though many cycle dealers and agents were prepared to sell cycles on the installment system - financed, incidentally, by themselves and not directly by the manufacturer or a finance company.[2] "Cycles of any make for Ladies, Gentlemen and Children may be purchased on the Gradual Payment system through any cycle agent in any part of the country: one twelfth part of the total required down, and one twelfth part each month until all is paid", declared a C.T.C. British Road Book of the 1890's. Such a facility was by the mid-1890's reckoned to be widely used by those whose occupation afforded the receipt of a regular weekly or monthly income, and little threat of unemployment, but the maximum prices which some consumers were prepared to pay acted as a constraint upon the potentially untramelled influence of the "high quality" entrepreneurial fetish.[3] Many of the most notable cycle makers

1. Cycle Manufacturer, 14 Dec. 1895, p.266.

2. Note that H. G. Wells' characters bought their bicycles from the proceeds of small legacies.

3. Ibid., 24 Aug. 1895, p.58.

produced "second grade", cheaper machines in order to satisfy the more price-conscious sectors of home and foreign markets, but such cycles were deemed an inferior relation, manufactured almost with reluctance, and at a time of high cycle demand such as that experienced during the "bicycle boom" of 1895-7 some firms reduced or abandoned their production altogether: "In addition to the high pressure of business which has, so far, prevailed everywhere this season, many of the manufacturers find real cause for jubilation in the fact that the demand for high-class machines has considerably increased whilst the sale of their second and third-grade wares has decreased correspondingly".[1] What is more, the middle-class cycle consumers of the late nineteenth century tended to assess their own and others' social status by reference to the ostensible quality of the cycles in their possession. There was a social force pressing the conditions of demand towards "high quality" bicycles, and, certainly, during the fashionable Society "boom" of the nineties, away from the cheaper types. Not surprisingly, given the ease of entry into the industry, many entrepreneurs established themselves with the

1. Ibid., 15 June 1895, p.242. The manufacture of the cheaper, "second grade" machines can be seen in the price data given in Table 6. See especially the lists given for the Premier Company for 1892, the New Howe Machine Company for 1893, J. K. Starley and Company for 1894, and the Metropolitan Machinists' Company for 1895. Unlike their major competitors, Humber and Company Limited, as formed and floated in 1887, operated this policy in a context of factory specialisation. The firm's original Beeston works concentrated upon the "top quality" products, while the Coventry and Wolverhampton works made a cheaper but reliable brand of cycle without the "excellent" finish and polish of the "best quality" machines. The Cyclist, vol. 9, No. 418, 19 Oct. 1887, p.45.

manufacture of relatively cheap machines as their principal policy, but the prevailing nature of the cycle market of the 1880's and 1890's (with its leanings towards "quality"), and the limited cost-reducing opportunities afforded by the utilised techniques of cycle production and the environment of continuous model change and improvement, meant that such firms were either short-lived or achieved no eminence in terms of size prior to the beginning of the twentieth century.[1]

During the late 1860's and 1870's cycles in the United Kingdom were made on a small scale. In Wolverhampton, at any rate, the town's first makers of the 1870's manufactured cycles in small workshops and depended on their own labour with the result that their output was limited.[2] But the cycle makers invented and innovated in their empiricist manner for growth, and in time growth came with the corollary that some sizeable enterprises developed, and, in addition, that makers had to concern themselves with the production of machines in quantity as well as of high quality. By 1887 the Rudge Cycle Company of Coventry was employing 600 hands, and Humber and Company were employing 350 at their Beeston works alone. In that year the Coventry Cycle Company employed 160 people and the Express Cycle Works at Wolverhampton 170. The Premier Company in Coventry was employing over 500 hands in 1891.[3] The growth of the industry and

1. A small firm - Lloyd and Sons of Birmingham, established in 1893 - found a growing market, during 1894 and 1895, for relatively low-priced cycles, its speciality, but ".....they are evidently content with a low rate of profit for their machines, fitted with good, hardened chains, Mason's saddles, and excellently finished, certainly seem worth more than the low price at which they are being sold". Cycle Manufacturer, 10 Aug. 1894, p.35.

2. W. H. Jones, Story of the Japan, Tin-Plate Working and Iron Braziers Trades, Bicycle and Galvanising Trades and Enamel Ware Manufacture in Wolverhampton and District (1900), p.148.

3. Times, 17 June 1887, p.13; 18 Oct. 1887, p.14; and 25 July 1891.

of some of the firms within it meant that cycle manufacturers had to come to terms with, and adopt, organisational structures and technologies that were possibly unfamiliar to them - and a number made some headway in doing so. The principal makers by the 1890's had grasped, for instance, the notion that there were advantages to be obtained from an interchangeability of parts in the production of any one design of cycle for any one season. As early as 1881, Settle and Company, the Coventry watch makers, who had launched-out into cycle manufacturing in the previous year, were making cycles on the interchangeable system.[1] An interchangeability of parts characterised the cycles of the Howe Machine Company of Glasgow, and of Palmer and Company of Birmingham, in the same year, as it did those of the National Arms and Ammunition Company Limited - Howe and National being already familiar with the concept in the context of their original trades.[2] But for those cycle entrepreneurs who sprang out of London and Birmingham's civilian gun-trades the step towards an interchangeability of parts may have been a big one. They had, after all, been used to an economic environment typified by outwork, component specialisation involving frequent transport of parts from one workshop to another, little reliance on machine tools and a great deal on handwork by independent, specialised craftsmen wedded to the individuality of each of their products.[3] Nevertheless,

1. The Cyclist, vol. 2, No. 82, 11 May 1881, p.304.

2. Ibid., vol. 2, No. 89, 29 June 1881, p.400; and Xmas Number, 1881, advert..

3. G. C. Allen, The Industrial Development of Birmingham and the Black Country 1860 - 1927 (1929), pp.56, 107-8, and 116-9.

there were some, like Charles Palmer, who took up the challenge, recognising, as did George Singer of Coventry in 1888, that the spread of the cycling taste enforced the issue: "Every part has to be interchangeable - we could not possibly make so large a number of machines except on the interchangeable principle", though he did add, "........we never bring out exactly the same machine two years in succession. It takes six months to bring out new machines and get the arrangements for their manufacture into full working order".[1] The same pressures of increasing demand and growth obliged cycle manufacturers (or they felt obliged) to rely less on outwork when specialised production processes, such as nickel plating, were involved; and to develop a sense of the importance of the integration of the various processes of production within the firm, and indeed, under the same roof. Chain-making for the new "safety" designs of 1885 moved readily enough into an integrated factory environment, especially since one of the first and largest of them, Perry's of Birmingham, had been established in the pen nib trade which had always been a factory trade with a few firms manufacturing on a large scale - factory organisation being found convenient for the co-ordination of unskilled presswork rather than as a consequence of the use of power machinery.[2] In

1. The Cyclist, vol. 9, No. 429, 4 Jan. 1888, p.303.
2. Victoria County History of Warwick, vol. Vll, (O.U.P. 1964), p.145.

1886, however, Messrs. Starley Brothers had to move into a new factory in Coventry, the firm's original St. John's Works, with its successive additions to it, having become "inconvenient" owing to the separation of the workshops from each other. The new premises were ".....built so as to have everything under cover, and is designed with a view to the continuity of progress of the parts from the forgings to the finished machines with as little moving about from one place to another as possible".[1] Vertical integration of production processes marked those "several of the larger cycle firms" who laid down their own gas generating plants in view of the large consumption of gas used in cycle frame brazing, while Bradbury's of Oldham, who entered the cycle trade in late 1893, was reported by the summer of 1896 to make every part of their cycles except for the seamless steel tubing and balls.[2] J. G. Accles of Grenfell and Accles Limited of Birmingham tried to go one further. In June 1896 Accles Limited was publicly floated with a £300,000 stock and share issue with the expressed intention of developing a cycle manufacturing business to produce everything, from the seamless steel tubing to the marketing of the finished machines.[3] By 1899, nevertheless, it became clear that the venture had proved to be abortive, and the firm's debenture holders moved-in to protect their financial interests.

The introduction of electro-plating activities into Coventry was intimately associated with the growth of the cycle industry there. During the late 1870's the town's nascent cycle manufacturers

1. The Cyclist, vol. 8, No. 369, 10 Nov. 1886, p.114.
2. Cycle Manufacturer, 8 Aug. 1896, p.26; and 6 March 1897, p.323.
3. Times, 4 June 1896, p.14.

looked to Birmingham or Wolverhampton for the performance of their plating work, but by 1887 their requirements were large enough to prompt the installation of their own plating shops - "......now it is the rule rather than the exception" whereas only a few years previously only two or three of the larger firms in the cycle trade had laid down a plating plant. Humber and Company's works in Wolverhampton ensured the economic viability of its own plating shop by also nickel-plating components made by the smaller cycle manufacturers in the district.[1] In February 1882 the B.S.A. Company installed its own nickel-plating plant for cycle work at a cost of £251 - previously, its plating was done by various Birmingham firms, occasioning delays in delivery and transport costs. But upon its second entry into the cycle industry in the 1890's, considerations of "quality" were an important factor in determining the direction of that firm's integration policy, although there were others. Initially B.S.A. relied upon supplies of German balls since their price, at an average of one shilling per gross, was 50 per cent below that of English-made steel balls of the same quality. In August 1896, however, the Company resolved to manufacture its own balls for its line of cycle hubs as "....the steel balls of German manufacture during the last month or two have been giving considerable trouble owing to a great falling off in the quality of manufacture" and as ".......English-made balls are quite insufficient to meet the demands of trade". During the subsequent November the firm decided to expend £5,279 on a foundry for the production of castings for cycles, it proving "....very difficult to obtain castings of sufficient quality and quantity": "The castings

1. <u>The Cyclist</u>, vol. 9, No. 422, 16 Nov. 1887, p.139.

could not be depended upon and there was very considerable loss in all the machine shops in which castings were used because of undue wear of milling cutters, drills etc.". In May 1897, with its weekly sales of cycle components still rising, B.S.A. began the manufacture of its own cotter pins for cranks since purchases from outside involved "insufficient deliveries and inferior quality".[1] Yet despite the integrative activities on the part of the larger manufacturers, the expansion of the cycle trade, and the net inflow of small cycle-making enterprises during the 1880's and 1890's, enabled the development and survival of specialist platers, enamellers, forged stampers and tube benders catering mainly for cycle producers. Henry Sills established his own cycle component plating business in 1882 after fifteen years spent working for the Coventry Machinists' Company, and although he died in November 1890 at the early age of 42 his firm endured well into the 1900's.[2] Thomas Smith, a Darlaston man who learned his trade as a forged stamper in a Darlaston firm, set himself up on his own account in Birmingham in the early 1880's, producing stampings for local engineers and coach-builders. An "avalanche of new orders" came with the growth of the cycle industry during the late 1880's and 1890's, and Smith devoted much of his plant to the manufacture of cycle cranks, chain and sprocket wheels, fork ends, brackets, hubs and tube joints - all by the forged stamping process. In 1896 the demand for his stampings was such that a large new factory was built at Red Lane, Coventry, just so as to be near the Coventry cycle manufactories.[3]

1. History of the Birmingham Small Arms Company Limited 1861 - 1900, vol. 1, pp.10-17; and vol. 2, pp.648,677 and 699.
2. Alfred Lowe, op.cit., 1890-91, p.486.
3. Augustus Muir, 75 Years. A Record of Progress (Smith's Stamping Works Limited. Coventry. 1958), pp. 9-17.

Even before the advent of the dramatic changes in demand conditions of 1895-99, the requirements of growth dictated to cycle-makers that they should adopt and use machine tools more specialised in purpose and design than those ordinarily to be found in the general machine shop. Moreover, they discovered that specialised machinery could enhance the quality of thefinal product: "The standard of mechanical perfection sought after, renders the adoption of specially-designed machinery an absolute necessity".[1] As early as 1881 a Coventry directory could describe George Singer's works as containing forging, stamping, turning, milling, drilling, wheel-making, tool-making, fitting, examining, brazing, nickel-plating, polishing, painting and packing departments, while ".....the manufacture is carried on by the extensive use of machinery and special appliances, and by division of labour upon a very complete scale". The same directory stated that the workshops of the Coventry Machinists' Company, employing between 300 and 400 men and boys during the season, were ".....replete with tools of the most elaborate and perfect kind."[2] Certainly by 1886 "automatic" machinery, "specially devised for the purpose", to drill and tap the flanges of cycle wheel hubs was in evidence at the Company's Cheylesmore works.[3] James Starley and Hillman in Coventry were said to be one of the first group of British engineers designing automatic screw machinery, and William Hillman at the Premier Company was one of a number of cycle manufacturers who devoted time to devising and modifying machine tools more in tune

1. Cycle Manufacturer, 23 May 1896, p.178.
2. Curtis and Beamish's Directory of Coventry, 1881, PPXXXVIII - XXXIX.
3. Engineering, 1 Oct. 1886, pp.338-40.

with specialised cycle-making requirements. In 1891 his firm boasted that its plant contained "labour-saving and automatic appliances", and in 1895 the machine tools used in the Premier works for drilling spoke-holes in hubs and wheel-rims were marked-out as "ingenious pieces of mechanism which have been devised especially for the work". The many machining operations involved in producing Hillman's cycle wheel hubs were "mostly performed by special tools designed and made by the Premier Company for the purpose", including a self-acting hub-turning lathe possessing "some novel features", and Hillman had also been busy in devising specialised machine tools for the manufacture of chain-wheels and for cycle wheel building.[1] Similar activity had been taking place at Humber's Beeston works: "A large number of small special lathes are employed for turning spindles, axles, hubs etc. .....They are only suited for a limited range of work, but for that work they are better adapted than much more expensive lathes, and, in fact, throughout the works there are evidences that the best tools are those which will only do one thing, provided they are so designed as to be the best for that one thing. A considerable number of these tools which have been designed by Messrs. Humber and Company is now made by two or three tool-makers. All these machines are worked by boys and youths, but all of them, as all the men, are on day work. There is no piece-work done in any part of the factory. All the milling-tools used in the Beeston

1. Charles Y. Hopkins, "Automatic Screw Machinery", in Proceedings of the Birmingham Association of Mechanical Engineers, 1901, p.6; Times, 25 July 1891, op.cit.; and Engineering, 22 March 1895, pp.361-2, and 5 April 1895, pp.429-32.

works - and they are very numerous in form and size - are made on the premises by their own tool-makers and with machines of their own design".[1] By the early 1890's John K. Starley had become an active designer of special new machine tools suitable for his cycle-making plant, these being made in his own works; and the Raglan works of Messrs. Taylor, Cooper and Bednell of Coventry were praised for similar reasons in 1894: "The machinery, the best and most unique of which is designed by Mr. Taylor, and constructed on the premises, is mostly automatic in action, which has two advantages, first the extreme of exactness is insured, and, secondly, cheap labour can be employed with absolute safety and confidence, meaning, of course, a cheapening of the price of the cycle to the public without a sacrifice of quality".[2] The short-lived Double Hollow Rim Company Limited, established in 1894 in Great Saffron Hill, London, used machinery specially designed for the Company's purposes with the major part of it constructed on the premises by the firm's employees; and in Birmingham, "As in all well-appointed large factories, the New Ormonde make their own special tools, and we found several men engaged in the slow laborious work in the shop devoted to this important department. The chief machine shop is ....crowded with machinery, much of it being of the best modern English make, including six of Herbert's capstan lathes, and others by Clark of Luton".[3]

1. The Engineer, 18 Jan.1895, p.56.

2. Cycling, 4 March 1893, p.136; and 21 July 1894, Supplement. In 1891 the ball-bearings, chainwheels and chains of the "Howe" cycles were reported to be made with "automatic machinery", and automatic tools were reckoned to be employed in the works of Buckingham and Adams of Birmingham. Ibid., 27 June 1891, p.373; and 15 Aug. 1891, p.53.

3. Cycle Manufacturer, 20 April 1895, p.150; and 22 June 1895, p.259.

The expansion of the cycle industry had, indeed, encouraged the development of British machine-tool makers who cared to manufacture tools especially suited for the fine and light requirements of cycle engineering. In 1885 William Astbury and Company of Salford were marketing light fine and six inch centre lathes for cycle-makers at £20 and £25 each, respectively.[1] By the close of 1886 a Coventry firm, Wildigg Brothers of the Vulcan Works, were supplying specialised machinery for cycle manufacturers - drilling, milling, hub-drilling and ball-turning lathes. They were joined by another Coventry firm of machine-tool builders, Messrs. Webster and Howarth who were prepared to supply metal polishing plant to cycle-makers in 1888. When the Triumph Cycle Company of Coventry equipped its new Priory Street factory in 1894, it purchased its new lathes from Webster and Howarth plus one automatic screw machine - a taste of things to come this - from the Cleveland Screw Machine Company of Ohio, U.S.A.[2] By the mid-1890's a number of indigenous enterprises were addressing themselves to the specific needs of cycle manufacturers, perpetrating technological inventions and innovation as well as providing actual machine-tool supplies. The firm of W. S. Lake of Braintree, Essex, introduced a spoke-screwing machine in 1895 and an improved version in early 1898, also bringing out in the latter year a special jig for clamping the front forks of cycles in

1. The Cyclist, vol. 6, No. 287, 15 April 1885, Supplement, PXii.

2. Ibid., vol. 8, No. 376, 29 Dec. 1886, p.279; and vol. 10, No. 480, 26 Dec. 1888, p.254. Cycle Trade Journal, Feb. 1894, p.26.

preparation for brazing. Alfred Herbert of Coventry completed, by the summer of 1895, a newly designed tool for producing cycle hubs from bar steel (at the then "rapid speed" of six to eight hubs, four inches long, per hour); and another for boring simultaneously the four tube holes in bottom brackets. The introduction of an improved machine for rolling cycle wheel rims and mudguards followed in 1896 plus a new type of two-spindle hub-drilling machine. An automatic bracket-boring machine came in 1897.[1] In fact Alfred Herbert was reported to be making specialised machinery for the cycle trade in 1892 though none of it was deemed "automatic".[2] Buyers of Herbert's No. 4. capstan lathe (introduced in 1895) included Bayliss, Thomas and Company, Raleigh Cycle, Rudge-Whitworth, Warman and Hazlewood, J. K. Starley and Company, Triumph Cycle, the Coventry Machinists' Company, and Centaur Cycle. Herbert's No. 1. Sensitive drill (introduced in 1897) captured the custom of Humber and Company (45 spindles at their Beeston, Coventry and Wolverhampton works), the Premier Cycle Company at Nuremberg (27 spindles) and Raleigh Cycle (24 spindles).[3] Webster and Howarth made their mark as inventors when they introduced a special spindle and cone-grinding machine in 1895, and a double-geared, self-acting milling machine that could be fitted with a semi-automatic dividing apparatus for chainwheel cutting. In 1896 they marketed a new design of wheel-rim

1. Cycle Manufacturer, 16 March 1895, p.88; 24 Aug. 1895, p.59; 21 Sept. 1895, p.98; 1 Aug. 1896, p.11; 29 Aug. 1896, p.50; 24 July 1897, p.3; 5 Feb. 1898, p.31; and 2 April 1898, p.144.

2. Cycling, 30 April 1892, p.237.

3. The Alfred Herbert News, vol. 1, No. 5, April 1927, pp.97-8.

and mudguard bending and sectioning machine, and had partially equipped in the previous year the machine shop of the recently formed Arab Cycle Company of Birmingham.[1] The older-established firm of Taylor and Hattersley of Brighouse, Yorkshire, turned their attention to cycle-making machinery in 1895, commencing with two new types of tool for the manufacture of cycle spokes, and, more generally, with capstan lathes, sensitive drills, milling machines and hub-forming machines suitable for cycle work. They added a type of capstan lathe for cutting bicycle hub blanks out of a solid bar in 1897.[2] The well-respected Birmingham engineering firm of Taylor and Challen Limited - originally established by Joseph Taylor in 1849 and joined by S. W. Challen in 1875 - devised an "improved" swaging machine for cycle spoke production in 1897.[3] During the first half of the 1890's, Messrs. Buck and Hickman in London, and John Holroyd and Company in Manchester had clearly established themselves as producers of cycle-making machine-tools, while Bradbury's of Oldham had been supplying cycle manufacturers with small machine-tools since 1886 - the Cycle Components Manufacturing Company of Bournbrook installed a bank of Bradbury's capstan lathes in their new machine shop completed in 1895.[4]

1. Cycle Manufacturer, 12 Oct. 1895, p.135; 19 Oct. 1895, p.139; and 4 July 1896, p.232.

2. Ibid., 26 Oct. 1895, p.155; 16 Nov. 1895, p.183; and 29 May 1897, p.443.

3. Ibid., 5 June 1897, p.454. Lord Aberconway, The Basic Industries of Great Britain (1927), pp.312-3.

4. Cycle Manufacturer, 12 Dec. 1896, p.196; and 20 Feb. 1897, p.300. The Journal of Domestic Appliances and Sewing Machine Gazette, vol. xxii, No. 281, 1 Jan. 1894, p.24.

The expansion of the cycle industry, it appears, had a qualitative impact upon British machine-tool technology, and no doubt quantitatively, in terms of the numbers of tools purchased, upon the machine-tool industry generally. But there is reason to suspect that the seasonal nature of the cycle trade, the diversity and constant change in types of output, the feeling for "high quality", the acceptance of orders for one-off jobs, and the readiness to manufacture one's own tools, tended to militate in the years prior to the late nineties against a full realisation of the potentialities of relatively low-priced, mass-produced cycles - and against the quick development of an associated indigenous machine tool industry fully capable of servicing and supplying a mass-production process. In Perry and Company's cycle chain-making plant in 1895 most of the machine tools had been designed specially for their various purposes and operated by female labour. All the tools had a self-checking system to ensure accuracy, though some were "remarkably rapid" in their work: side plates, for instance, were stamped out of sheet steel at a rate of no less than 90 per minute. The drilling of the chain blocks, however, upon which the accuracy of the pitch chiefly depended, was performed by hand on all the "better class" chains, "the most skilful workers being employed on this operation". The rivetting of the chains was done by hand using <u>hand hammers</u>, and each length of chain was subjected to a torsion of no less than 1,200 pounds: "This is of course a far greater strain than a chain is ever called upon to bear in real use, yet it is but rarely that a link proves wanting under this test. Each length is also carefully gauged for pitch, and if a variation of so much as one-sixteenth of an inch is detected in a length of four feet, the chain is returned to the shops, as a waster".[1] Prior to the "bicycle boom" years of 1895-97 American commentators noted the cautious attitude that English mechanics took towards the American type of automatic machine-tools designed to form part of a mass-production, metal-working process. The Cleveland Machine Screw Company of Ohio sent automatic screw machines to U.K. cycle manufacturers among others but "....the trade consisted mostly of orders for single machines or at most a very few machines in any one shop". Charles Churchill dealt exclusively in England in American machinery and tools, but saw the British engineers' attitudes to the adoption of advanced American machine tools governed by conservatism and circumspection. He crossed the Atlantic to the United Kingdom in 1894 with John Grant of the Cleveland Screw Machine Company to try to obtain an order for at least one sample automatic screw machine: "They could not at that time secure a single order, people seeming to be inclined to doubt the performance of the machine, and skeptical as to its successful working. Finally, however, after some months had elapsed, two sample machines were ordered, with the statement that at the same time two sample machines made in Germany were to be tried in the same establishment and future orders would depend upon the results of the trials".[2] It was in the following year, 1895, that one (unnamed) British cycle manufacturer complained of the considerable variety that customers desired and obtained in the types of fittings and accessories attached to cycles.

1. <u>Cycle Manufacturer</u>, 26 Jan. 1895, p.11.
2. <u>American Machinist</u>, 22 Oct. 1896, p.15.

These variations, he said, were "....a source of continual trouble and vexation", and deemed the cycle agents as largely culpable: "....instead of using all their powers to persuade their customers off their little fads, they are usually ready to make any concession or departure from standard patterns, in order to obtain their customers' order.....the consequence is that the machine ordered has to be specially made, specially watched through almost every department of the factory; this sort of thing is now so common that, in the season, we usually have a number of orders every week placed with us for machines that depart considerably from our standard pattern, causing untold worry and anxiety to the formen and managers of each department. A more serious side of the question becomes obvious, too, when one remembers that the prices, all round, have been consistently reduced on account of that very uniformity of pattern from which the agent so frequently departs, and these special orders, even if they do not bring about a loss to the maker, at least reduce profits to an uncommercial margin".[1] But for his times, a progressively-minded man was this : certainly in 1892, and still by 1895, the Premier Cycle Company, despite Hillman's advanced machine tool technology, was prepared to manufacture machines to individual customers' special requirements, and in 1893 Starley Brothers of Coventry were making specially designed tricycles to individual order and taste.[2]

1. Cycle Manufacturer, 27 July 1895, p.1.
2. Cycling, 23 July 1892, p.14; and 8 April 1893, p.214.

The predilection for "high quality" production affected wage-payment systems in some cycle factories. At Humbers' Beeston works, and in the Raleigh Cycle Company, turners and other machinists, and filers, were paid by time and not by piece during the mid-1890's, although this practice was not widespread in the industry: in Coventry in 1895 it was noted, "There is not much time work in the cycle trade, nearly all the men going in for piece work... ...A lathe hand paid by the standard of 6d an hour.....can and does on an average earn from 1s.2d to 1s.6d. an hour.....All branches of the trade are exceptionally well paid, and men think nothing of earning 1s.6d. an hour".[1] Messrs. Hearl and Tonks, a sizeable manufacturer in Birmingham, employed most of their workers on piece-rates by 1897.[2] It was becoming recognised, indeed, by 1895 that the general design of the "safety" bicycle was settling down to a standard form - "The cycle today has reached a pitch of perfection that does not allow of any considerable alteration of design"[3] -

1. Alfred Lowe op.cit., 1896-97, p.68.

2. Cycle Manufacturer, 3 April 1897, p.362; and 4 Sept. 1897, p.76.

3. Ibid., 27 July 1895, p.1. "The general designs of all '96 pattern cycles, good, bad and indifferent, will be practically identical: the almost entire absence of variation in the sizes and angles of the tubes is most remarkable. As a striking instance of this, we may mention that the Cycle Components Company, when approaching the makers to endeavour to obtain a uniform length of chain stays, and a general adoption of a standard pattern gear case, found that the measurement adopted by most so nearly identical that the trifling alteration in some cases required was readily agreed to". The principal mavericks on the question of cycle design in the late 1895 were, apparently, some Nottingham makers who intended to fit abnormal 28 inch steering wheels and adopt D-shaped or oval tubing in the construction of back-stays. Ibid., 28 Sept. 1895, p.107.

and there emerged cycle entrepreneurs and engineers, and particularly component makers, who began to advocate, experiment with, and adopt more economical organisational and productive methods. G. J. Francis, then manager of the Auto-Machinery Company of Coventry (but later a "quality before quantity" man), and W. Ivy Rogers, manager of the Unique and Unity Cycle Works Limited of Birmingham, were pressing for an industry - wide standardisation of small component parts - Francis, in fact, developed a "thing" about it to which he long held: "It is a question that deserves the attention of cycle engineers" wrote Percy A. Biggar, a cycle trade journalist, "for it seems to appeal to all mechanical minds as a sensible and long-needed departure, and as a matter which cannot be entirely ignored by those in the Trade".[1] According to this authority, three practical sizes of nuts were all that were needed on a cycle of the 1890's, and an agitation for this "mechanical departure" had long been supported by the St. George's Engineering Company who first introduced three standard sizes of nuts on their cycles "some years ago". Cycle threads could also be standardised, said Biggar, to help the cyclist obtain accurate replacements (and not guess the type and size of thread) and to avoid confusion in the workshops: "Co-operation leads to method, and method obviates confusion. Let the trade co-operate in this matter, and there will be greater economy and less confusion in the workshop!"[2] The mass-production of standard lines of cycle components in the 1890's

1. Ibid., 31 Aug. 1895, p.64.

2. Ibid.

by such new concerns to the cycle trade as B.S.A., Cycle Components, Accles, and Kynoch led the Cycle Manufacturer to comment: "To the older cycle making concerns in the trade, whose leaders have gained their knowledge ofcycle construction by actual experience over a long period of years, although probably not, in many cases, with, in the first instance, a full knowledge of mechanical principles and engineering construction, this modern tendency means that they will have to study closer than ever the scientific and technical side of their work".[1] This journal was of the opinion that "The price of raw material is, comparatively speaking, of less importance than the reduction of the cost of labour in the various processes of manufacture. This latter point is one of extreme importance to the cycle parts maker", and considered the utilisation of automatic machinery as the most effective way of reducing labour costs. In the Spring of 1896 it had nothing but praise for the production techniques of the Cycle Components Manufacturing Company. In this firm's new Bournbrook factory, it noted that "The milling and profiling machines are of the latest American type, while the boring and chain block cutting-off machines are of special design". Three long rows of capstan lathes were engaged in making the various parts of tyre valves: "It is a most interesting study to watch the extraordinary rapidity with which each component part is turned out complete. It is only necessary to stand a few seconds, and one may see the double milled nut on the air plug turned out complete from the rod; drilling, milling, shaping, planishing,

1. Ibid., 11 Dec. 1897, pp.243-4.

counter-boring and cutting-off - the whole thing done in a few seconds".[1] In November 1893, in addition to reconstructing its shell-making plant for cycle hub production, the B.S.A. Company placed on order with Charles Churchill and Company for twelve American "Brainard" milling machines for the same purpose, followed by an order for four sensitive drilling machines from Messrs. Grenfell and Accles. By February 1894 - three months after its entry into the cycle trade - 250 pairs of hubs, made on the repetition system, were coming off the machines weekly, and 650 pairs per week by 21 March 1894. By July 1894 bottom brackets for cycles, complete with axles, chainwheels and cranks, were being produced at the rate of 80 per week - ".....these goods were giving great satisfaction everywhere, the most important feature about them being that the bracket lugs were machined so truly, as regards position, that ......frames could beput together 'like shelling peas'". It was on 16th July 1895 that Driver, B.S.A.'s chief engineer, got his board to order American automatic machine tools "....having advised the Directors that it was desirable to instal a small plant of automatic machines of various kinds, for screw making and other purposes, in order to ascertain whether it would be good policy to adopt similar machines for use in the factory generally.....". They were "....always on the look-out for improvements in machinery that would either economise production or assist in fully maintaining and, if possible, raising the standard of the quality of the work they produced," and, interestingly enough, many of the first big orders for B.S.A's new lines of standard cycle components came from firms already well-established in the cycle trade. In December 1893 Thomas Smith

1. Ibid., 23 May 1896, p.178.

and Sons of Saltley ordered 5,000 pairs of hubs (at 12/6d per pair less five per cent for cash), and in January 1895 the Humber Company and the Coventry Machinists' Company ordered 500 pairs of pedals and 1,500 pedal frames, respectively. During the following February Messrs. Alldays and Onions ordered 550 pairs of pedals (at 6/- per pair) and in the March Humber ordered 10,000 pairs of hubs (but without spindles, cones and balls). The surge in cycle demand which hit British makers in the season of 1895 may have been the precipitating factor in some cases, but there was possibly also a tacit recognition that B.S.A. had set a new technological lead.[1]

An economy of labour-time spent in cycle construction, and a continuing search for economy in the materials embodied, were also engendered by the prevailing dictates of the cycling fraternity and the manufacturers' desire to expand the cycling recreation during the late nineteenth century. In this connection, especially in the earlier days, the racing men again had their part to play in innovation. "Once having discovered the advantages derivable from a saving in the

1. History of the Birmingham Small Arms Company Limited 1861-1900, vol. 2, pp.556-774. The strange thing is that B.S.A. went about the manufacture of complete cycles in the early 1880's in a very casual and inefficient manner. "There was no Works Engineer in the factory in 1884, no Tool Room Foreman, no Draughtsman, no Tool-Smith; just a few men putting tricycles together and that was all. The result was that the 'B.S.A.' Safety Bicycle (under design and construction in that year) had to be designed without properly prepared drawings. Any forgings required had to be made by one of the men engaged on Tricycle Assembling.....The drawings absolutely necessary to express any idea or instruction were made by John Parker (who had charge of the Tricycle Assembling), or by A. Ledbrook on bits of paper, pencillings on the whitewash of the workshop wall or in chalk on the floor....". But then again between 1885 and 1893 Driver and Clements had been recruited into the firm and climbed to the top of the managerial ladder - an example of how heavily the "gentlemen" on the board relied upon the expertise of the "players" in the works. Ibid., vol. 1, pp.15-17.

weight of a machine, the racing men incessantly clamoured for further reduction and obtained it. ....The manufacturers, thus constrained to cut down the weight of the racing machines, were enabled, by the practical experiments they made, to arrive at some rather startling discoveries as to the amount of unnecessary metal hitherto introduced into the frame and fittings of their roadsters, and ere long the experience thus gained enabled them notably to reduce the weight of that very much larger class of machine represented by the roadster cycles. Heavy joints, clumsy tubes, and preposterous solids were eliminated from the standard patterns, and tube frames of light gauge replaced the haphazard constructions of the dark ages of cycling; thus the road-riding contingent, on whatever style of vehicle they disported themselves, were actually benefitted by the practical and sometimes painful experiences of their racing confreres. ....We venture to credit the comparatively small section of racing men with being the 'original cause' of the rapid improvement which has been made in all classes of velocipedes. Possibly the manufacturers would tell us that the racing men gave them more trouble, and were more difficult to please, than any other section of their customers, and doubtless this would be quite true; but it is particularly this fact which has brought about a desire on the part of the manufacturers to meet these particular gentlemen, and in that endeavour they have vastly improved the machines they manufacture, not only for the small class of racing men, but also for the much larger body of general riders".[1]

Indicative of how far some cycle engineers had moved away, by the mid-1890's, from

1. Earl of Albemarle and G. Lacy Hillier, op.cit., pp.143-4.

some of the "factor-of-safety" attitudes traditionally associated with British engineering, were the recollections of W. H. Nelson (who eventually became assistant works manager of Rudge-Whitworth): "Mr. J. Davidson was works manager for a short time immediately after the amalgamation with the Whitworth Company in 1894. This gentlemen's chief qualifications were that he knew a good deal about guns, arsenals and bridges, and had travelled in China and Japan, about which he could tell the tale very well. His ideal bicycle was something like the Menai Suspension Bridge, and weighed about 100 pounds". Davidson, however, died in 1896 and was succeeded by V. A. Holroyd who described him as a "Scotch engineer of the most conservative type".[1] The question of cycle weights was still, nevertheless, in many manufacturers minds during the nineties, and no small amount of inventive effort was spent in quest of finding materials strong enough for cycle frames and parts and yet lighter than iron and mild steel. Aluminum frames were tried but found wanting, and many brands of white metals and alloys appeared on the market - "Kronand", "Acolite", "Sivadi", "Hecnum" and "Capstan" - though none at the time gained much trade popularity.[2] Bamboo for cycle frames was even tried and a joint-stock company was floated in 1895 - headed by Pickering Phipps, the Northampton brewer, and with a nominal capital

1. The Rudge Record, vol. 1, No. 4, Sept. 1908, p.51; and vol. 1, No. 7, Dec. 1908, p.101. But compare the statement of J. Batey: "It has been said that the cycle industry would never have attained its present position if it had been in the hands of Engineers, because the lightness of its construction was opposed to large factors of safety. ....but it is a harmless fiction to say that Engineers had no hand in the inception, because we can call to mind, and could name many men who, before starting on their cycle career, had been engaged in well-known Engineering works, and, strange enough, these firms have even had the reputation of turning out the best machines." J. Batey, Today and After (1904), pp.7-8.

2. Cycle Manufacturer, 27 Feb. 1897, p.312.

of £80,000 - to acquire the Bamboo Cycle Company of the Zoar Works, Wolverhampton plus certain patents covering the substitution of bamboo and aluminium into the steel frames of cycles to make them much lighter and resilient: "The combination of extreme lightness and strength should appeal to ladies".[1] The firm, however, was wound-up "by reason of its liabilities" in December 1897.[2] Frank Bowden of the Raleigh Cycle Company associated himself financially with the Fairbanks Wood Rim Company of Draycott, Derbyshire, an enterprise established in 1894 and destined to exploit an American invention (widely adopted in the States) of using wooden rims on cycle wheels in order to save weight. Bowden believed that with the Company's patent water-proof covering, the wooden rim would in time force all steel rims out of the market, but in the long-run he was proved wrong.[3]

The use of celluloid, however, (a material much lighter than most metals), for mudguards, chainguards and gearcases made a successful long-term debut in the 1890's; the principal pioneers in this section of the cycle trade being C. W. Bluemel and Brothers of the Globe Works, London, and Horace W. Dover who began to manufacture his patent celluloid detachable gearcase in Northampton

1. Times, 11 March 1895, p.14.

2. P.R.O., B.T.31, 6040/42688.

3. Cycling, 24 Feb. 1894, p.85.

in 1892.[1] Towards the end of the decade came another successful weight - (and time -) saving invention, namely the butt-ended cycle tube patented jointly in 1897 by Alfred Reynolds jun. and J. T. Hewitt of J. Reynolds and Sons Limited, nailmakers of Birmingham. The tube obviated the use of "liners" - one tube inserted inside another at the frame joints - hitherto used by cycle manufacturers to overcome the problem that thin gauge cycle tubes tended to fracture under the brazing process. Butt-ended tube production involved thickening the end of each straight frame member, and on the basis of the invention the durable Patent Butted Tube Company Limited was formed in December 1898.[2] The

1. Horace Dover was born in 1859 in Princes Risborough, Bucks., and at the age of sixteen was articled to Messrs. Chipperfield and Company, model makers of London. He stayed with this firm for thirteen years, constructing models for engineers, inventors, exhibitors and litigants. He was educated initially at the National and British School at Princes Risborough, but once in London attended evening classes for four years on machine construction and drawing at the Birkbeck Institute. When aged 29, Dover was asked to work out the details of a new lock-stitch sewing machine, and the entrepreneurs financially interested in the venture suggested eventually that he should start the works for the manufacture of the machine. While negotiations were in progress, he made the acquaintance of Thomas P. Dorman of Northampton, and with Dorman's advice and help, opened in 1888 a Northampton factory, the business later becoming known as the Dorman Engineering Company Limited. The factory duly began the manufacture of sewing-machines, but home and foreign competition proved too keen and three years later the firm began making bicycles under the trade-name "Whirlwind". Shortly afterwards, Dover left to form a partnership with Pickering Phipps, the local brewer, for the manufacture of his gearcases; the new firm being floated as Dover Limited in April 1897 with Horace Dover as managing director. Northampton Daily Chronicle, 4 Oct. 1924; Daily Echo (Northampton), 4 Oct. 1924; and Chronicle and Echo (Northampton), 3 April 1933.

2. Eric C. Tyler, Reynolds in Retrospect (Reynolds Tube Company Limited. Tyseley, Birmingham. 1948), pp.4-5.

issue of cycle weights apart, there were cycle entrepreneurs in the late 1890's, possibly prompted by the relatively high money wages paid during the course of the "bicycle boom", who were attempting to by-pass whole labour intensive processes incurred in the general run of complete cycle construction. The Arrow Fittings Company of Birmingham and other cycle makers were reported to be flirting with the idea of a brazeless joint for frame members, particularly the so-called Kirk-Jeffs system which used cone-headed screws and lugs - the ultimate objective being to cut costs by dispensing with brazing and filing shops and to prevent a weakening of frame members liable to occur when they were heated.[1] In early 1898 the British Tube Company of Birmingham introduced a type of cycle tubing possessing a bright silvery finish when drawn. Produced by a new system of cold-drawing, it removed the necessity for "pickling" and annealing: "Pickling is deadly to steel, more particularly when in such thin gauges as the present day cycle tubes", and allegedly saved cycle manufacturers the requirement of polishing the frame before enamelling. Five firms quickly took-out licences, but in the context of the cycle trade, bright-drawn tubing, as with the process of brazeless frame jointing, secured no long-term future.[2]

With regard to productive processes, however, it is not always manifestly obvious that the issues of scale economies, or of synergism, occupied the minds of cycle entrepreneurs to any great extent, despite the fact that some of the major British manufactories had developed partly through merger activity. Occasionally, cycle makers seemed to become aware of the possibilities of economies of scale only after

1. Cycle Manufacturer, 15 Jan. 1898, p.317.

2. Ibid., 2 April 1898, p.143.

hitherto separate concerns were linked-up. One purpose of the Humber amalgamation of 1887 was simply to expand the size of the firm and the types of cycle produced by adding two Coventry plants and one Wolverhampton works to the original Humber enterprise, employing 350 workmen, located in Beeston, Nottingham. Each geographically separate plant manufactured its own cycles and requisite components and maintained its own managerial structure, although each plant manager was subject to the authority of a single general manager - initially Thomas Humber - and a board of directors based at Beeston. Nevertheless, marketing arrangements came to be shared, and the fact of having two separate plants in Coventry was found unsatisfactory and a completely new Coventry factory was constructed during the following year with the original premises relegated to the status of warehouses or stores. But there was an air of speculative company promotion also surrounding the venture. Humber and Company of Beeston was purchased outright in 1887 by a William Horton, partner in the business of Joshua and William Horton, boiler-makers of Smethwick. His brother, Joseph, had also been busy in acquiring the cycle-making business of Joseph Devey and Company of the Ashes Works, Wolverhampton, and prior to the final Humber public flotation it was anticipated that the two would join forces with the new Humber amalgamation taking-over the Devey concern.[1] The formation of the Cycle Components Company Limited in March 1894 was justified in the flotation prospectus mainly in terms of a harmonisation of patent interests and productive capacities, and of economies in the expenses of managerial direction. The wheel rim manufacturing business of

1. The Cyclist, vol. 8, No. 395, 11 May 1887, p.743; and vol. 9, No. 459, 1 Aug. 1888, pp.1103-4. Times, 17 June 1887, p.13.

Thomas Warwick and Sons Limited of Birmingham was joined to the seamless tube business of Hudson and Company Limited on the grounds that "Hitherto, Messrs. Warwick and Sons have not been in a position to meet the demands made upon them. Their inability has been principally due to the difficulty of obtaining adequate supplies of rim tubing, and of certain essentials covered by patents controlled by Hudson and Co. While these firms worked apart it was found impossible to establish that harmony between the supply and the demand which was necessary to develop Messrs. Warwick and Sons' output to its fullest capacity. Under control, this harmony is established, and the output will no longer be hampered by divided interests, or by the grave difficulty which must arise when independent patents are worked from separate standpoints". The Westwood Wheel Company Limited was brought in chiefly for the purpose of acquiring certain patents granted to Frederick Westwood relating to improvements in cycle wheel rims: "The 'Westwood Rim' possesses special features, and has become widely known. It is in large and increasing demand. In addition to the patents acquired by the Westwood Wheel Company, a further series of patents have been recently taken out by Mr. Westwood personally. These patents produce a combination which the Directors believe to be exceptionally valuable, and they all became the property of the Cycle Components Company. ......The manufacture of this Rim will, in future, be merged in the works already specified herein, and the profits of this manufacture will, therefore, be freed from all those expenses of direction which it has hitherto borne. The plant employed in the production of these Rims becomes, of course, the property of the Cycle Components Company, and will be transferred to the commodious factories of the Company". The inclusion of the

R. F. Hall Manufacturing Company Limited of Birmingham and of the gearcase business of James Harrison Carter was to establish a strong and growing foothold in the cycle component trade, while the whole combination, it was proclaimed, was marked by a "....great affinity between the various articles which have hitherto been manufactured by each of the above firms, and that, therefore, the amalgamation of these large manufacturing plants, so varied in their character, with unlimited scope for development, and yet concentrated on one trade, cannot fail to produce economic results of great importance, while an interchangeable and co-operative system of unrivalled magnitude is established. It will also be understood that the conduct of these various businesses has hitherto been distributed over no less than five different executive managements, engaging the attention in the aggregate of a very large number of directors, and consequently entailing the expenditure of very considerable sums in fees. These businesses, in their unified form, are now......... controlled by a small, but representative, Board with limited fees for direction. The Articles of Association specially leave the question of more substantial remuneration in the hands of the shareholders, and, therefore, dependent upon the success of the undertaking".[1] Despite an assertion that "The united concerns are fully found in plant, machinery, furniture, buildings and all accessories - no outlay is demanded", the directorate soon realised that, with some four separate Birmingham plants, they had formed a ramshackle organisation, and future economic operations dictated that by 1895

1. The Birmingham Daily Post, 19 March 1894, p.1.

Cycle Components be rehoused in a single new factory built especially in Bournbrook. The Westwood patents and plant were sold to the Dunlop Pneumatic Tyre Company in early 1896, and, in addition, the Hudson tube business turned-out to be something of a pig-in-a-poke, and this was separated and publicly floated-off as the Components Tube Company Limited in January 1897. In any case, behind the initial formation of Cycle Components and its subsequent property transactions lay the financially acquisitive hands and tactical business brains of the du Cros family, and in spite of the announcement that no intermediary or any person was to benefit immediately from the establishment of the new firm, the du Cros' never seemed to lose out. After all, the firm soon came to manufacture the Warwick pneumatic tyre, the patent rights to which they possessed, and the Westwood patents were transferred to their Dunlop Company in order to consolidate the latter's technical and commercial domination of the pneumatic cycle tyre trade.

The criteria of rapid capacity expansion, and more economic operations from the effects of extra scale, were more explicitly stated - at least from the Whitworth side - upon the formation of Rudge-Whitworth Limited in November 1894. The new company's publicly issued flotation prospectus gave no reason as to why a merger in itself was deemed essential but Charles Vernon Pugh of the Whitworth Cycle Company was prescient and clear enough: ".........the Cycle Trade will before long be entirely in the hands of large concerns...... Successful as the Whitworth Company has been, I felt that its capacity was quite inadequate, and that in spite of the enormous additions constantly being made to the works......we have never been able to touch any other than a high-grade machine, owing to our being quite unable to even meet the demand for that class alone. For months past this matter has received my serious consideration, and the Rudge people made such extremely favourable proposals, that after the fullest consideration we arrived at the conclusion that such a combination would be exceedingly advantageous and quite unassailable".[1] The Rudge interest, on the other hand, was possibly more concerned in placing its currently sickly affairs in more capable entrepreneurial hands. Certainly, after a short period of joint managing directorship with John F. Wright (who gracefully retired in 1896), Vernon Pugh, in conjunction with his brother, took command of the concern and so organised its operations that the former Whitworth works in Birmingham specialised in cycle component production while the Rudge plant at Coventry concentrated upon the assembly of complete cycles.

Protestations that amalgamation would lead to more economic unit production accompanied the formation in 1896 of Bransom, Kent and Company Limited of Birmingham - a merger between the gearcase-making firm of W. Bransom and Company, and the St. George Cycle Company owned by S. Jordan Kent, "......in order to secure greater efficiency and economy in the management of the trade hitherto enjoyed by them".[2] A multifariety of criteria, however, appeared to constitute the basis of Middlemore and Lamplugh Limited - an amalgamation of 1896 of the saddle-making businesses of William Middlemore of Birmingham and Coventry (founded as long ago as 1795),

1. Cycling, 1 Dec. 1894, p.347.

2. Cycle Manufacturer, 14 Nov. 1896, p.148.

and of J. A. Lamplugh and Company of Birmingham. Promoters' profits were garnered: a William Gordon Hannay had bought both businesses and resold to the investing public at a profit to himself; and Thomas Middlemore, who owned the concern of his surname, wished to retire from commercial life, which he did, leaving his chief manager, Walter B. Holt, to act as joint managing director of the combination. But there was an alleged need for a vertical integration of productive processes and for immediate expansion to cope with cycle saddle demand: the ".....amalgamation with Lamplugh and Co., has been arranged for the purpose of providing additional strength to the management, and of consolidating the cycle saddle and accessory business of the two firms. The combination provides facilities for an immensely increased output of leather, which can be curried and prepared at the Holloway Head works. A large additional profit should be earned in this direction, as the company ought to be independent of the supply of leather from outside sources. The cycle saddle industry is a most important feature in the future of the company, and it is hoped that by this amalgamation not only will the means of output be greatly enhanced, but the ratio of profits will be increased".[1]

1. The Midland Daily Telegraph, 12 Oct. 1896. Middlemores was still carrying on its long-established trade in horse saddlery, general leather goods and military accoutrements. Henry A. Lamplugh became the other joint managing director, and Sydney Lamplugh remained as general works manager of the Birmingham factories. Ibid..

In merger activities the motivations of cycle entrepreneurs were plural - rarely single - and not always fully encapsulated under the three headings "technical, commercial and also financial".[1] For although the factors, such as company promoters' profiteering, and the quick satisfaction of growing consumer demands by relatively quick capacity expansion, were important in a good many cases, mergers also offered the opportunity for entrepreneurs to leave the cycle trade and hand-over the task of business leadership to the younger and provenly more capable men in command of other firms. This plurality of motivations paralleled the admixture of economic and social determinants which characterised generally the other technological developments within the cycle industry of the 1870's, 1880's and 1890's. Innovative activity in the cycle trade during these three decades was the product of entrepreneurial minds, operating along the line of mainly "trial and error", and which perceived that, in the U.K., there was a generic demand on the part of an urbanised people, leading physically confined and sedentary lives, for a leisure good yielding competitive sport, exercise, country-fresh air, and a relatively rapid change of scene.[2] It was found that cycles appeased such a demand by providing a readily accessible means of personal transport for those

1. The headings of Leslie Hannah, The Rise of the Corporate Economy (1976), pp.21-3.

2. The link between cycle demand and a felt-need for exercise was demonstrated in the 1860's when the early velocipedes were much used in gentlemens' gymnasiums.

whose incomes could permit horse-riding or horse-drawn carriage travel but who wanted a novel, fashionable, and less troublesome alternative. Moreover, the cycle had the potential of yielding a relatively cheap means of personal transport for those whose incomes could not stretch to regular horse-drawn carriage travel, but who wished to demarcate for themselves an enhanced social status that a greater personal mobility provided. Entrepreneurs in the cycle industry, therefore, were guided in their innovative efforts partly by pressures emanating from the conditions of demand, viz. the dictates of "fashion", of the aspirations for a distinct social status, and of tourist and sporting requirements. "Fashion" in cycling spelled annual changes in cycle designs, usually oriented towards the technical improvement of the final product (even if of a minor nature), so that the purchaser of a new machine during a given season could demonstrate that he had something "better" than in the one before. The pressure of "fashion" also dictated that cycle entrepreneurs should pander to individual requirements; produce one-off jobs and a wide range of standard models to accommodate as much as possible the particular and several cycling requirements of all devotees. From the standpoint of the overall growth of the industry, the element of "fashion" in demand had a positive property since it acted as a force for final product improvement that, in turn, widened the market; but it also sponsored a negative backlash in that annual changes in cycle designs, a penchant for individuality which involved one-off job production, and a wide-range of standard models, militated against bulk manufacture for stock, against mass production on repitition systems, and against an inter-firm standardisation of component parts even as basic as screw sizes and screw threads. Moreover, as cycle touring along Britain's pitted and rutted roads came increasingly into vogue, the cyclist's demand gravitated towards the "top quality" machine which offered the countervailing properties of unfailing strength and reliability, super-smooth running of moving parts, and a maximum of protective accessories. The emphasis on "quality" was also promoted by the bourgeois aspirations and notions of the cycle industry's middle-class clientele, which equated the quality of one's bicycle (and its corresponding high price) with one's ostensible social status. But for certain, from the supply side, there was a pervasive "high quality" fetish among Britain's cycle engineers too - a fetish by no means unique to this branch of mechanical engineering, and doubtless rooted in the craftsman-cum-skilled artisan social background of many of the men concerned, and/or in a nationally widespread cultural climate which favoured the manufacture of the perfect product. Even the Birmingham Small Arms Company, perhaps the paragon of mass cycle component production in the mid-1890's, had a ".....consistent policy which the Company has followed, from its early days, of making every part of every article it manufactures a little better than it need be".[1]

The cycle-racing fraternity - so closely linked with the manufacturing interest - additionally sought the best possible machine, in a qualitative sense, for their competitive, sporting purposes. But their dictates had a progressive technological and innovative aspect in that they demanded lightweight as well as

1. History of the Birmingham Small Arms Company Limited, pp.30-1.

strength in their mounts, and correspondingly encouraged the makers of their cycles to reassess, for all cycle designs, notions of large "factors of safety", inherent in many of the U.K.'s metal-fabricating practices; and to search for material inputs which offered an enhanced lightness with requisite strength. The cycle chain-makers, such as Perry's, nonetheless, exceptionally had a penchant for large "factors of safety" in that they maintained a pride in their production of virtually unstretchable and unbreakable chains. Yet looking at the process of technological advance from the supply-side - and despite their intrinsic affection for the "high quality" cycle - the principal cycle makers were technologically adventurous thinkers in many respects. For instance, some complete cycle makers and component manufacturers, in an endeavour to promote the fortunes of their products and enterprises, were willing to experiment with materials and manufacture products with which they had no previous technical experience. Notable were the advances of William Starley, F. Warwick and Sons, and I. W. Boothroyd into pneumatic tyre making in the early 1890's, and F. Brampton and Company, brassfounders, into steel chain manufacture during the 1880's. The growth of the consumer demands for their outputs eventually led cycle entrepreneurs with a craftsman's workshop background to devise and adopt factory production processes characterised by a vertical integration of manufacturing operations, primitive steps towards flow production systems, and the use of self-designed and self-made automatic machine tools for the rapid manufacture of parts - as well as purchasing the light but more conventional machine-tool equipment of a new generation of machine-tool builders viz. Alfred Herberts', Buck and Hickman, and Webster and Howarth.[1] In conjunction with these went the principle of producing standard designs of cycle embodying an inter-changeability of component parts. But these steps, taken in coming to terms with quantity production, were also often taken with caution. On the grounds of maintaining "high quality" Perry's preferred hand-methods of chain assembly in 1895 despite the availability of machinery that could perform the operation automatically. Before 1895, automatic machine-tools, as designed and built in the U.S.A. and introduced into Britain by Charles Churchill and similar agency firms, were treated with circumspection. However, such a circumspection with regard to the ideas of the foreigner did not extend to weldless steel tube production and cycle tyre designs. The Credenda Company was quick to take-up and develop in 1885 the new ideas of the German Mannesmann brothers concerning the rolling and drawing-down of hollow cylindrical steel billets. William Starley of Starley Brothers brought over from the United States in 1888 the innovation of cushion bicycle tyres; Palmer's single-tube pneumatic tyre of 1893 was devised by an American national in the U.S.A., but developed and exploited by British cycle and rubber manufacturing interests; and the Patent Self-Sealing Air Chamber Syndicate of

1. S. B. Saul has maintained that right until 1914 even the new British machine tool builders were markedly tardy in emulating the automatic machine tool designs as demonstrated in the cycle and sewing-machine shops of the 1890's. See his article "The Machine Tool Industry in Britain to 1914", Business History, vol. X, No. 1, January 1968. The fact that British cycle manufacturers initially turned to their own resources of talent with regard to automatics may have contributedto the development of this lag.

British cycle manufacturers set out in the 1890's to make the most of an American invention of a non-puncturable cycle tyre. Here the paradigm of British inventions being neglected at home and exploited abroad was reversed.

That other paradigm of British "new industry" development in the late nineteenth century, namely the lack of technical interest and technical support from longer established industrial enterprises, did not appear to be a heavy drag within the cycle industry. C. K. Welch had a disconcerting experience when he took his pneumatic tyre innovation to William Warne and Company, rubber goods producers, but on the whole rubber goods manufacturers and chain-makers were willing to devote time and thought to the technical problems that British cycle makers brought to their attention, and to participate even in the cycle industry directly. Indeed there were firms that diversified into the cycle and related trades and immediately contributed to the cycle's technical advancement, utilising their accumulated stocks of mechanical, chemical and metallurgical knowledge. Thus, Perry's of Birmingham brought their knowledge of hard pen-steels and rapid steel punching and pressing operations into use when they began the manufacture of cycle chains, and W. E. Bates of Leicester used their inherited know-how concerning rubber vulcanisation and cementation when they invented circular endless covers for pneumatic tyres and subsequently entered the tyre trade. In the quest for the manufacture of a better machine, nonetheless, the British cycle-making fraternity not only benefitted from technological "spin-ins", but made its mark as the centre of technological "spin-offs". The science of precision chain transmission was much boosted by the experiments and experiences with different designs of cycle chain. Hans Renold, Brampton Brothers Limited and the Coventry Chain Company eventually developed the bush-roller chain into larger sizes to serve the power transmission requirements of motor-cycles, the early rear-drive motor cars (before the advent of Cardon shaft-drives in 1910) and of heavy commercial vehicles. Renold by 1910 was making roller chains for printing machinery - each chain pin being hollow and into which stay bars or spigot pins could be inserted for attachments for conveyance. In 1906 the firm used the design of the block chain as the basis of its new mortise block chain - a moving, flexible, cutting chain developed for the purpose of producing a rectangular hole or mortise in wood or soft non-ferous metals.[1] Ball-bearings and pneumatic tyres also found their first non-pedal cycle homes in the motor-cycles and motor-cars of the early 1900's, although in the case of pneumatic tyres, the Grappler Company, for one, by the late 1890's, found a market among the builders of horse-drawn carriages.

1. Basil H. Tripp, <u>Renold Chains</u>, pp.61-2.

CHAPTER 3

The Rise of Foreign competitors

The Early Developments.

The British cycle makers of the 1890's had collectively created a "new industry" based upon new finished products, novel engineering techniques, and their own inventive and innovative talents. At the very beginning of that decade, this "new industry" of the United Kingdom could, more-or-less, be described as a quasi-monopoly supplier to the world's cycle markets. "A priori" the situation was curious since the initial impetus to the development of a cycle industry, at least in terms of the design of the final product, was French in origin, though there is some dispute as to who the principal originators were. There is the view, widely endorsed in France, that the idea of a man-propelled machine, incorporating a frame, a saddle, two wheels and rotating cranks with pedals - previous designs of cycle had to be propelled by the feet touching the ground or moving reciprocating cranks - was the brain-child of Pierre and Ernest Michaux, father and son and carriage manufacturers of Paris. They had been experimenting with hobby-horses in 1861 and derived the notion of utilising rotating cranks from the crank handle of a grindstone.[1] An alternative version is that Pierre Lallement, one of Michaux's workmen, was chiefly responsible for the design of the new velocipede by converting a pedal-propelled tricycle into a pedal-propelled bicycle, and by proving, in a practical fashion, that a bicycle could be ridden utilising the rider's sense of balance - a belief not commonly accepted at the time.[2] In 1861 the Michaux family enterprise produced two velocipedes; in 1862 - 142, and by 1865 they were manufacturing 400 bicycles a year.

1. This is the account of a descendent, Henry Michaux.

2. Axel Josephsson, "Bicycles and Tricycles", in Twelfth Census of the United States, 1900, vol. X, Part 1V, Manufactures. Special Reports on Selected Industries, p.330.

The Michaux concern had placed France in the forefront of bicycle development and new French companies for their manufacture sprang-up rapidly; one - Messrs. Tribout and Meyer - allegedly produced a chain-driven bicycle as early as 1869. It was in 1869 that the world's first cycle show was held (in Paris), and the first cycle road race (from Paris to Rouen) took place - the 83 mile-long event being won by an Englishman, James Moore.[1] France during the late 1860's had its "velocipede craze" but it was abruptly ended, both in terms of the demand for and the supply of bicycles, by the outbreak of the Franco-Prussian War, and the hostilities had a long-term effect of stifling a continued development of a French cycle industry, an Adolphe Clément being the only Frenchman to take-up the entrepreneurial challenge again in 1878. What happened to and within the Michaux business during the Franco-Prussian War and immediately afterwards is not clear, although the concern appeared to have continued in existence at St. Cloud, Paris, and by 1897 was calling itself the Société des Cycles "Michaux".[2] In France, as in other Continental countries , the taste for cycle-riding by athletic and prosperous people did not revive - or begin - until the latter half of the 1880's, and it is noteworthy that it was not until the late 1880's that French, Belgian, Austrian and German entrepreneurs began to set-up shop as bicycle manufacturers.[3]

1. Encyclopaedia Britannica, vol. 3, 1971, p.594.

2. Cycle Manufacturer, 6 March 1897, p.320. It was reported that an extension of its newly developed trade in motor-carriages dictated in 1897 a move to larger premises at Reuilly-sur-Seine. Ibid.,

3. In 1891 cycle-making was described as "...a branch of manufacture practically new to France". Cycling, 18 April 1891, p.212.

For France, at least, this lack of demand during the 1870's and 1880's could not be ascribed to the state of the roads, for the nation, by contemporary European standards, had very good roads even outside the cities - attributable "....to the fine leadership supplied by the governments' corps of civil engineers turned out by the Ecole des Ponts et Chaussées since the eighteenth century, and to the highway law of 1836 which required local governments to maintain local roads and authorised local taxes to finance them".[1]

As in France and the United Kingdom, the American people, too, were affected by the "velocipede craze" of the 1860's. Thoroughly disgruntled by the lack of Michaux's appreciation of his efforts, Pierre Lallement emigrated to the U.S.A. in 1866, constructed a velocipede, and rode it on the streets of New Haven, Connecticut while looking for work. His machine was noticed by James Carrol of Ansonia, Conn., who foresaw the development of a profitable new industry, and he persuaded Lallement to patent his bicycle jointly with him on 20 November 1866. By 1869 an American velocipede-riding fetish was at its height but two years later it had died out: the bicycles were too heavy, cumbersome and expensive to sustain even a continued American demand.[2] Lallement's U.S. patent eventually passed into the hands of a Colonel Albert A. Pope, and during the early 1870's the product and process developments requisite for the growth of a cycle industry emanated from the hands and minds of British inventors and entrepreneurs.

1. James M. Laux, In First Gear. The French Automobile Industry to 1914 (1976), pp.7-8.

2. Axel Josephsson, p.330, op.cit.; and Enclopaedia Britannica, vol. 3, 1971, pp.594-5.

Once these developments had got underway, however, the Americans, more so than the Continentals, were second to the British in the adoption of the cycling taste. The relatively high per capita incomes of people in the U.S.A. have been held out as an explanation for an early resumption of cycling in that country, but even at a basic price of between 100 and 150 dollars, an "ordinary" bicycle represented about four month's pay for the "average" American factory hand.[1] In the first instance, the resumed American demand for cycles that commenced during the second half of the 1870's was satisfied by imported British machines, the principal importing houses being Cunningham and Company and Albert A. Pope's Pope Manufacturing Company.[2] The former confined itself to an importing role, but Colonel Pope was an entrepreneur with great ambitions; very much a man-on-the-make, and he departed from the cycle import trading function in two main respects, ultimately to earn for himself the designation of "father" of the American bicycle industry.

Albert Augustus Pope started his working-life as a clerk in a shoe-shop, with his education at the Brooklyn Secondary School cut-short, because of the financial reverses of his father's merchanting business. At the age of 19, upon the outbreak of the American Civil War, he joined the volunteer forces of the Union Army and rose to the rank of Lieutenant Colonel. Upon the conclusion of hostilities and demobilisation, Pope established his Pope Manufacturing Company in Boston, making shoes and small mechanical

1. Robert A. Smith, A Social History of the Bicycle. Its Early Life and Times in America (1972), p.13.

2. The Cyclist, vol. 1, No. 18, 18 Feb. 1880, p.206.

parts for the shoe-making trade, but turned his business entirely over to the importation of "ordinary" bicycles from England after viewing such contrivances at the American Centennial Exposition in Philadelphia in 1876. During the course of 1876-1877 he made two visits to England in order to observe cycle manufacturing methods there and to purchase various patents. Thereupon he decided in 1877 to supplement his importing activities in Boston by retailing his own brands of "ordinary" cycles - named the "Columbias" and as manufactured for him by the Weed Sewing Machine Company of Hartford - and by acquiring and maintaining a monopoly position in the American cycle market through the acquisition of Lallement's patent of 1866 and various others as they appeared. In fact, he took Pierre Lallement into his employ. 50 of Pope's "Columbias" were manufactured in 1878 and the Weed Sewing Machine Company at Hartford continued to perform the manufacturing function well into the 1880's. By 1880 Pope had relinquished his importing activities and was exploiting his monopoly power in the market by the imposition of a ten dollar royalty on each and every cycle made in, or imported into, the U.S.A.: even Cunningham and Company paid the royalty rather than resort to the expense of fighting Pope's patent rights in court.[1] Nevertheless, British cycle makers throughout the 1880's found the American market

1. Ibid.; and Cycle Manufacturer, 25 July 1896, p.7; Axel Josephsson, op.cit., p.330; Arthur Judson Palmer, Riding High: The Story of the Bicycle (1958), p.77; and Robert A. Smith, op.cit., p.8. The Weed Sewing Machine Company of Hartford was founded principally by a Marcena Hitchcock in 1865. Born near Utica, New York, in 1832, Hitchcock early in his life became an expert machinist especially in regard to fine work. During the Civil War his skills were in demand by the Remington Arms Company at Ilion, New York, and later by Sharps' Pistol Company in Philadelphia. In 1886 he decided to devote much of his time and finance (until his death) to his Hitchcock and Curtis Knitting Company. In acquiring the manufacturing services of the Weed Sewing Machine Company, Pope was replicating a characteristic of early cycle manufacturing that typified the corresponding industries in the U.K., Germany and Austria. American Machinist, 1 Feb. 1900, p.22.

a substantial one, despite tariffs, transport and dock charges and Pope's ten dollar royalty which together ".....practically double the price of an English machine by the time it arrives in the U.S.A.", and this was attributed to the poorer quality of the American productions.[1] In addition, Pope did not manage to squash an important rival in the American cycle manufacturing trade, namely, the firm of Gormully and Jeffery of Chicago, that also began to make "ordinary" bicycles in 1878. Thomas B. Jeffery was an Englishman who had been trained as a maker of scientific instruments, and who had emigrated to the U.S.A. in 1863 at the age of 18 to practice his trade in Chicago. He and R. Philip Gormully went into partnership in 1878 to manufacture their "Rambler" bicycles, Jeffery constituting the "mechanical brains" of the enterprise having several patents to his credit.[2] No other firm arose to challenge seriously the Pope Manufacturing Company until Albert Pope's patent rights began to expire in the 1880's and until "safety" designs of bicycle began to cross the Atlantic after J. K. Starley's inventions of 1884-5, adding a further stimulus to American bicycle demand. The major blow to Pope's monopoly power was reckoned to be the expiration of Pierre Lallement's U.S. patent in 1883. Certainly, it led T. B. Jeffery of Chicago to examine the contents of the remaining patents held by Pope, and to declare publicly: "The days of monopoly are over....... The expiration of the "Lallement" patent this month gives to those who are not licensees, and who know the facts relative to the minor patents still in force, the right to make the ordinary bicycle of any grade or quality".[3] But Pope did not give-in so easily or readily.

1. The Cyclist, vol. 1, No. 29, 5 May 1880, p.289.

2. John B. Rae, American Automobile Manufacturers (1959), p.14.

3. The Cyclist, vol. 5, No. 217, 12 Dec. 1883, pp.121-122.

Although he was prepared to license other cycle manufacturers - Messrs. Gormully and Jeffery was one - he was also prepared to use his "minor patents" to control the American cycle market as much as possible. As late as 1888, in five separate suits, the Pope Manufacturing Company sued Gormully and Jeffery for patent infringements even though a license granted to the Chicago enterprise expired in 1886, therefore technically obliterating the latter's need to pay royalties. The Pope concern, on the other hand, maintained that the expired license did not apply to other patent rights in its possession, and that these patent rights were relevant to Gormully and Jeffery's cycle-making activities. In the corresponding legal jousting Pope lost heavily. The courts ruled that the expired license covered all of Pope's patent rights and not just one; the cases against the defendants were all dismissed; and Pope was more-or-less left with a useless port-folio of patent specifications.[1] Entry into the American cycle industry was thenceforward freely open to allcomers.

It was during the late 1880's - 1886 to 1887 in fact - that British cycle trade journalists began to make some assessment of the state of indigenous bicycle manufacturing activity within Continental Europe, especially in France and Germany. What they saw did not unduly worry them. There were a number of blacksmiths and locksmiths who did repairs and sometimes made an occasional machine of the "boneshaker" type. In addition, there were "several engineers and others" who had learned to master cycle manufacture with a certain amount of success and had established small workshops to produce a few machines to order and perform repairs and maintenance. This type of activity was "....met with in a great many of the principal towns on the Continent, more especially where cycling is on the steady increase."[2] "In France,

1. Ibid., vol. 9, No. 448, 16 May 1888, p.768.

2. Ibid., vol. 7, No. 328, 27 Jan. 1886, pp.347-8.

there are about half-a-dozen manufacturers making a fair class machine, but the material and workmanship is very inferior to English imported cycles. Workmen are very dear compared to English workmen, neither do foreigners work with much skill and quickness, nor nearly so laboriously as the latter. This makes a tricycle or bicycle equally as expensive as an imported one, after customs duty and carriage is paid".[1] Conversely, "Germany is making great and rapid strides in cycle manufacturing, and is turning out good substantial machines at a low price; and in the course of time, this country may become very conspicuous as a great opponent to English trade in foreign markets".[2] H. O. Duncan, a cycle trade journalist of the 1880's and 1890's, and a man who spent much time travelling about Continental Europe, noted in 1887 that most of the Berlin cycle makers operated on a small scale, combining cycle selling agencies (for English cycles) with their own cycle manufacturing activities. He was appalled by the typical cellar-cum-workshop of Messrs. Hasse and Stamm of Berlin, characterised by its darkness, scarcely enabling the twelve workmen in it to see their work properly. However, a visit to Herr Kleyer of Frankfurt-on-Main drew a different impression, viz. one of spaciousness and the employment of brand new machine tools, "many being of English make", but Kleyer was only in the preparatory stages of cycle manufacture and was not yet in full production of his "Adler" machines.[3] Duncan, in the main, deemed the

1. Ibid.

2. Ibid.

3. Ibid., vol. 8, No. 406, 27 July 1887, pp.1043-4.

German cycle industry of 1887 as primitively organised and to support his contention quoted Der Radmarkt, a German trade circular, which calculated that 64 firms employing 1,150 workmen were assembling bicycles in Germany. 19 of the establishments gave out work to workmen outside the firm, 37 purchased semi-finished parts from other German factories, and 36 bought components from English enterprises. 33 German cycle-making concerns employed less than 10 men; 12 employed 10 to 18; a further 12 had 19 to 40; and 7 firms employed more than 40 men. Total German output was estimated at about 7,000 cycles annually, with 10,000 machines being imported from England.[1] Six years later, a British trade journalist took a look at Belgian attempts to manufacture cycles and was again singularly unimpressed. He reckoned in 1893 that there were 6 or 7 cycle makers in Belgium, but that only one, Joseph Delin at Louvain, was really making complete machines entirely in his own premises. Belgian cycle-making enterprise was not helped, according to this authority, by the "abominable state" of the country's roads, which dictated the manufacture of exceptionally strong machines fitted with pneumatic tyres that had to be easy to mend.[2]

The emergence of competitive strength

From being the dominant, quasi-monopolistic supplier to its home and world markets in 1890, the U.K. cycle industry by 1897 had been pushed into a markedly different competitive position. In that latter year, and for a good many subsequently it had to contend with

1. Ibid., No. 407, 3 Aug. 1887, p.1068. Duncan, of course, may well have been comparing the German enterprises with the best and largest of the integrated concerns in Coventry. Certainly, in Birmingham and Wolverhampton, small-scale workshop production of cycles, with out-work as part of the manufacturing system, was widespread during the 1880's.

2. Cycle Trade Journal, Aug. 1893, p.591.

virile Continental and American competitors. It was true that during 1892 - 1896 the domestic exports of cycles and parts from the United Kingdom expanded sharply (Table 8) and that qualitative evidence points to the conclusion that the cycle industry's exports grew very rapidly in 1890 and 1891.[1] It was also true that until 1897 the retained imports of cycles and parts into the United Kingdom were deemed too small for the Government to take special statistical account of them. On the export side, over 1892-1896, the itemised countries which more-or-less consecutively absorbed increasing quantities of U.K. cycles and parts were Denmark, Holland, New Zealand and the Australian States of South Australia, Victoria, New South Wales and Queensland (see Table 9). Over 1895-1896 there were leaps in exports to British South Africa, British India, and the states of Western Australia and Tasmania. The export expansion of U.K. cycles and parts in the early 1890's had an increasing Empire market orientation, for the exports to Continental European countries and North American showed either no growth trend, or erratic growth, or actual decline. Cycle exports to Germany rose from £57,285 in 1892, to £104,301 in 1894 and then fell away to £93,387 in 1896. Exports to Belgium amounted to £81,769 in 1892, grew to £167,351 in 1894 and dropped to £100,519 in 1896; while exports to the French rose from £238,806 in 1892 to £308,091 in 1895 and fell precipitately to £233,221 in 1896. The Canadian market declined sharply in 1895 from absorbing £50,805 of U.K. cycles and parts in 1894 to £27,750, and recovering slightly to take £36,085 of exports in 1896. The United States' market collapsed:

1. Cycling, 28 Nov. 1891, p.296. 1892 was the first year in which exported cycles and parts were separately itemised in the U.K. foreign trade accounts.

TABLE 8

The Domestic Exports of Cycles and Parts from the U.K. 1892 - 1896

Year	value (£)	percentage change
1892	915,856	
1893	1,039,591	+ 12.8
1894	1,248,762	+ 16.3
1895	1,386,420	+ 15.4
1896	1,855,614	+ 33.9

(Source: U.K. Trade and Navigation Accounts)

TABLE 9

The Domestic Exports of Cycles and Parts from the U.K. according to Country of Destination, 1892 - 1896

(£)

Country	1892	1893	1894	1895	1896
Russia	25,018	50,531	93,845	117,558	84,168
Sweden and Norway	10,662	22,901	36,642	37,011	30,161
Denmark	63,708	64,888	60,724	70,343	73,438
Germany	57,285	68,943	104,301	90,319	93,387
Holland	39,416	66,635	100,554	112,492	154,921
Belgium	81,769	131,610	167,351	145,455	100,519
France	238,806	230,958	306,696	308,091	233,221
Portugal	*	4,994	3,292	1,996	4,728
Spain	*	8,815	13,104	30,769	16,726
Italy	12,662	24,035	34,952	42,089	35,325
Austrian territories	*	*	3,603	4,808	11,200
Egypt	*	*	2,815	2,802	4,280
U.S.A.	255,466	200,225	70,744	162,702	187,399
Chile	*	*	*	*	2,671
Channel Islands	**	**	1,996	8,430	7,252
British South Africa	15,680	19,295	26,980	41,466	105,055
British East Indies	8,815	17,487	17,040	18,606	70,717
West Australia	***	***	***	13,569	46,317
South Australia	4,383	7,995	8,910	14,306	33,524
Victoria	8,168	15,002	37,278	58,200	273,398
New South Wales	9,341	9,187	12,084	21,097	112,489
Queensland	3,242	2,846	4,058	8,303	30,277
Tasmania	***	***	***	2,493	12,328
New Zealand	10,346	16,222	16,197	24,241	70,493
British North America	48,975	44,553	50,805	27,750	36,085
British West Indies	**	**	2,226	1,738	4,032
Other foreign countries	45,286	17,248	20,369	23,525	17,077
Other British possessions	5,223	5,512	1,174	1,385	4,416

(Sources: U.K. Trade and Navigation Accounts and Annual Statements of Trade

* = not available and included in "other foreign countries".
** = not available and included in "other British possessions".
*** = not available and included in "Australasia - other colonies" which amounted to 1892 - £4,952; 1893 - £6,238; 1894 - £3,164; 1895 - £36; 1896 - zero.

it accepted £255,466 of U.K. exports in 1892 but only £70,744 in 1894. The U.K. statistics record that exports recovered to £162.702 in 1895 and to £187,399 in 1896, but American data on U.S. retained imports from Britain maintain that the U.S.A. absorbed $353,720 of cycles and parts during 1894/5, $56,960 in 1895/6, and $21,122 in 1896/7.[1] In 1895 Russia, Sweden and Norway, Spain and Italy were important overseas markets for the U.K. cycle and component makers but all contracted their demands from Britain during 1896. One reason for this was that Continental cycle customers were shifting their preferences towards Continentally-produced machines, and were not reducing their demands for cycles in aggregate. Germany found France a receptive market for its cycle products during 1892-1896, the latter importing 31,458 net kilogrammes from the former in 1892, the imports increasing consecutively, excepting 1894, to 59,289 in 1896. Conversely, the Germans constituted by 1896 an important, if erratically grown, market for French cycle and component manufacturers, delivering in that year 59,263 net kilos. of cycles and parts compared to 27,505 during the previous year, and 18,429 in 1892. While British cycle exports to Belgium declined during 1894-1896, French exports increased (from 34,552 net kilos to 84,987), and while exports from the U.K. to Spain decreased in 1896,

1. Axel Josephsson, op.cit., p.355. American trade figures related to "fiscal years" i.e. 1 July to 30 June of calendar years. There appears to be no qualitative information to bear out the British picture of events in this respect. Possibly, however, some of the large American purchases of weldless steel tubing, that occurred in Britain during parts of 1895 and 1896, might have been counted as cycle parts.

those from France increased (51,121 net kilos. in 1895 to 69,617 in 1896). French imports of cycles and parts, in terms of weight, declined trend-wise during 1892-1896 from a total of 672,879 net kilogrammes to a total of 550,194 net kilos, and it was England that bore the brunt of the decline: sending 622,771 net kilos of cycles and parts (92.5 per cent of the total) in 1892 and 394,802 (71.8 per cent of the total) in 1896.[1]

France, like the United Kingdom, was one of the earliest to record its exports of cycles and parts beginning in 1892. Over the succeeding four years they moved as follows (Table 10). In 1896 Belgium had become the French industry's largest overseas market absorbing 16.2 per cent of French exports (in terms of weight) after a very rapid growth over 1893-1896. Next ranked Switzerland (13.9 per cent), Italy (13.8 per cent), Spain (13.3 per cent) and England; England, in fact, with the exception of 1893, received greater quantities of French cycles and parts than did Germany during 1892-1896 (taking 65,850 net kilogs. in 1896 compared to Germany's 59,263). For other non-indigenous, cycle industries France constituted a declining market in aggregate in the five years prior to 1897 (with the singular exception of the year 1894) and ceased to be a net importer in value terms in 1897. In the early 1890's Austria-Hungary began to record its trade in complete cycles (Table 11), the Empire during the first six months of 1896 ceasing to be a net importer of cycles and with the bulk of its imports coming from, and its exports going to, Germany.[2]

1. Source of the French foreign trade statistics: Direction Générale des Douanes. Tableau Général du Commerce et de la Navigation (Paris). In 1896 the U.S.A. figures, for the first time in the French accounts, as a supplier of cycles and parts, with American imports recorded at 41,004 net kilogs.

2. During January to June 1896 1,541 Austro-Hungarian cycles went to Germany and most of the remainder to Italy and Russia. Cycle Manufacturer, 29 Aug. 1896, p.52; and 5 Sept. 1896, p.60.

TABLE 10

The Exports of Cycles and Parts from France ("commerce général") 1892 - 1896[1].

Year	net kilogrammes	value (francs)
1892	197,021	2,955,315
1893	315,243	5,674,374
1894	444,988	8,899,760
1895	391,452	7,829,040
1896	523,201	8,371,216

1. Ibid.. The data given for "commerce général", rather than that for "commerce special", has been adopted since the former gives a breakdown of total exports according to country of destination (if only by weight). The data relating to the latter does not. The differences between the values of total exports ("commerce général") and the values ("commerce special") are not usually great. Using an exchange-rate of 25 francs to £1, French exports of cycles and parts in 1892 approximated to £118,213 compared to the U.K.'s £915,856.

TABLE 11

Austria-Hungary : The Exports and Imports of Complete cycles. 1894 - 1896.[1]

Year	Exports		Imports	
	Volume	Value (florins)	Volume	Value (florins)
1894	658	-	3,646	-
1895	1,811	136,850	2,309	339,735
1896 (Jan to June)	3,007	-	1,361	-
1896	-	343,490	-	302,760

1. Sources: Ibid., and 5 Sept. 1896, p.60, op.cit., and 18 Sept. 1897, p.97.

On the import side, contracting though it was during the mid-1890's, the U.K. was being pushed off the stage: in 1895 1,043 of imported cycles came from England, 1,030 from Germany, and the rest mainly from France. During the first half of 1896 relative positions in the Austro-Hungarian imports had changed to 727 from Germany, 393 from England, 101 from the U.S.A., and 56 from France.[1]

The United States did not begin to classify separately its exports of cycles and parts until the fiscal year 1895/6. In that year its domestic exports amounted to $1,898,012 and it was already a net exporter of cycle products. During the following fiscal year, the U.S. exports leapt by 269.1 per cent to a figure of $7,005,323, dropping slightly to $6,846,529 for 1897/8.[2] Belgium began to account separately for its exports and imports of cycles and parts in 1896, and during that year exported cycle manufactures to a value of 1,674,000 francs, increasing it to 2,420,979 in 1897.[3] Germany did not begin to itemise its foreign trade in cycles and parts until 1897, and then isolated its exports at a value of 7,924,000 marks and its imports at a value of 6,546,000 marks - it had achieved the position of a net exporter.[4] Austria-Hungary increased the exports

1. Ibid., 13 June 1896, p.205; and 29 Aug. 1896, p.52.

2. Axel Josephsson, op.cit., p.335.

3. Le Ministre des Finances, Tableau Général du Commerce avec les Pays Etrangers (Brussells). The Belgian data used here refers to "commerce special" which roughly corresponds to Belgian retained imports and Belgian domestic exports. The data given for "commerce général" explicitly embraces visible goods simply in transit through Belgian territory.

4. The German data was supplied by the Statistiches Bundesamt Wiesbaden.

of its comparatively tiny cycle industry in 1897, and France expanded the exports of cycles and parts from 8,371,216 francs in 1896 to 12,890,820 in 1897. The exports of cycles and parts from the U.K., however, fell from a value of £1,855,614 for 1896 to a figure of £1,430,320 for 1897. Furthermore, in 1897, the retained imports of cycles and parts into the U.K. were now itemised at the relatively high value of £527,413 (£459,124 - worth coming from the U.S.A), and in 1898 such imports rose to £612,644, (£543,625 - worth from the U.S.A.) On the export side, the Empire tended to cushion the fall: cycle exports to the British Possessions fell by only 8 per cent, comparing 1897 with 1896 - with regard to New Zealand and British India they actually increased - but exports to foreign countries in aggregate fell in 1897 by 34.4 per cent.

There was a multifariety of factors operating in the late 1880's and 1890's which so substantially changed the home and world market position of the U.K. cycle industry by 1897. One such factor was, unquestionably, the development of the taste for cycling, by peoples of western European stock the world over, in the final two decades of the nineteenth century, which culminated in the "bicycle boom" of 1895 - 1897. This provided a demand stimulus to potential cycle-making entrepreneurs, in Continental European countries and in North America, who could visualise the opportunity of turning the expanding demand to their own profit. The "bicycle boom" itself reinforced the situation by placing any established cycle-making enterprise into a set of market relationships characterised by excess demand or limited supply. In the long-term, the rising demand for cycles was the function of an urban, sedentary, "middle-class" group of people that grew in numbers in industrialising and industrialised societies, and who, because of the style of their daily working lives, were attracted by the cycle- this affording exercise, recreation in the fresh air, and opportunities for short or long-distance travel as well as sport.[1] In the U.S.A., in particular, two further developments enhanced this long-term factor (apart from design improvements in the finished product, of course) during the early 1890's: the first being the onset of road improvement programmes in suburban towns, and the second was the decision of the reputable Warwick Company to bring "safety" cycle prices to a new low by reducing the retail price of its machines from $150 to $85 in the summer of 1893.[2] A good deal of the pressure-group activity to secure an improvement in the quality of American road surfaces was organised by the American cycling clubs and similar organisations, most notably the League of American Wheelmen, and was aided and abetted by the personalities - and finance - of two large-scale cycle manufacturers, Albert A. Pope and A. H. Overman.[3] In 1894 a correspondent to a British cycle periodical could write, "The pavements are improving in New York City, while the suburbs and nearby towns are spending large sums in road improvements. I rode last Sunday 107 miles over perfect macadam surface, a marvellous transformation when it is but little more than two years ago that fifty miles would have tired one out grinding through the sand".[4]

The demand leverage exercised by the "bicycle boom" was shortlived in the U.K., and even shorter in the U.S.A., but it had a number of interesting characteristics. The "boom" was, in part,

1. For a panegyric on cycling that emphasises these aspects, see R. J. Mecredy, "Cycling", Fortnightly Review, 1891, pp.75-88.

2. Robert A. Smith, op.cit., pp.26-27.

3. Ibid., pp.206-225.

4. Cycle Trade Journal, May 1894, p.89.

generated in the United Kingdom when it was observed in 1895 that "Royalty" was taking to the wheel. Early in that year, the Premier Company, by special warrant, were appointed bicycle makers to the Prince of Wales, and correspondingly despatched two "helical" bicycles to Marlborough House. This firm alone captured the custom of the Princesses Maud and Victoria, who both bought and rode tricycles, the Empress of Russia, ".....and more than half-a-dozen other Royal and Imperial Highnesses". The Viceroy of India, the Governor-General of Canada, three dukes, four marquises, six earls and seven lady members of the "titled class" also patronised the Premier organisation.[1] With new devotees to cycling such as these, a fashionable cycling fetish quickly ran down the British social ladder: "Follow the Fashion, set by Royalty, the Aristocracy and Society and ride Rudge-Whitworth cycles, which are unrivalled for Speed, Comfort, Safety and Strength" ran an advertisement on the back-page of the Cyclists' Touring Club's British Road Book.[2] " 'Society' riders.........now seem to be the backbone of the Trade", reported the trade press in 1897; and since "Society" demanded the best quality of bicycle available, so did those in lower social orders in Britain who flocked to join the cycling notables riding on the pavement or in the park, and justified the policy adopted by some U.K. manufacturers of concentrating upon the assembly of the highest quality product.[3] There was no Royal household in the U.S.A.

1. Engineering, 22 March 1895, pp.361-2.
2. Frederick Alderson, Bicycling. A History (1972), p.91.
3. Cycle Manufacturer, 13 March 1897, p.329.

nor a titled aristocracy, but there was a female emancipation movement, and in both the New World and the Old, "ladies" adopted the bicycling taste and perambulated about town and park to an unprecedented extent during the mid-1890's, as a symbolic assertion of new thoughts and feelings of freedom - some reinforcing the symbolism of freedom by wearing the trousered "bloomer" and riding conventional men's cycles constructed with a normal top cross-bar in the frame. The Cycle Manufacturer reckoned that whereas the percentage of ladies' machines to the whole U.K. output was about five in 1894, in 1896 it had reached $33\frac{1}{3}$.[1] The sudden onslaught of new, particularly female, aspirant cyclists in 1895 - 1897 led Goys', the Singer Company and Rudge-Whitworth to establish cycling schools in London in order to instruct the novices the art of the recreation. They were mostly patronised by women - "gentlemen are comparatively rare at these institutions" - and were themselves remunerative, and formed a method of advertising, "...for the schools invariably recommend the machines of the parent firm to their clients".[2] Another consequence of the burst in home cycle demand was the holding of numerous cycle shows up and down the country. In 1896 London had the usual two cycle shows - the National and the Stanley - but there was one in Manchester, Birmingham, Leeds, Liverpool, Dublin, Glasgow, Bolton, Brighton, Bournemouth, Hull, Nottingham and Lincoln in addition, and all, reportedly, were very successful despite the absence of any significant developments in cycle designs produced by the manufacturing exhibitors. No great wholesale trade was apparently

1. Ibid., 2 May 1896, p.145.
2. Ibid., 23 Jan. 1897, p.259.

conducted at them, though a large amount of retailing was done to private buyers.[1] Economically, within the United Kingdom, the "bicycle boom" obliterated in 1895-6 the usual annual phenomenon of the autumn and winter "off-season"; established cycle manufacturers struggled to meet the large home and overseas orders flowing to them; and gentlemen in the capital markets offered their services to enable the makers to expand quickly the capacities of their plants and factories.[2] In the U.K. all was busy but well with the cycle manufacturers, in their own eyes, during the mid-1890's, but then the "boom" died-out in June 1897 and the British manufacturers began to feel the force of their changed international market situation very acutely.

In addition to establishing depots and agencies in those overseas markets which experienced an increased demand for cycles and parts in the 1880's and the first half of the 1890's, a few of the large British cycle manufacturers set up branch factories. Messrs. Hillman, Herbert and Cooper constructed a plant in Nuremberg in 1887, and not long after another works at Eger in Austria. During the early 1890's the Coventry Machinists' Company agreed with the Austrian Small Arms factory at Steyr that the latter should manufacture the "Swift" cycles and

1. Ibid., 30 Jan, 1897, p.269. Many of the features of the "bicycle boom" - outlandish as many of them were and the subject of many a comical anecdote - were common to Britain, the U.S.A., France, and, to a muted extent, Germany. The German Emperor, conspicuously, did not take to cycling. The social aspects of the "boom" have been best portrayed with regard to the American scene. See Robert A. Smith, op.cit.; and Sidney H. Aronson, "The Sociology of the Bicycle", Social Forces, vol. 30, No. 3, March 1952, pp.305-12. For an account of the social aspects in Britain, see Frederick Alderson, op.cit., pp.77-106.

2. Cycle Manufacturer, 10 Aug. 1895, p.33.

promote the retailing of them throughout the Austro-Hungarian Empire, Italy and South-Eastern Europe. In 1895 La Campagnie Française des Cycles Raleigh was established at Rouen with a capital of £40,000 and with the sole rights to manufacture Raleigh cycles and Fairbanks wood rims in France and the French colonies.[1] The Humber Company of Nottingham and Coventry promoted two offshoots on the London capital market to lay down plants in Russia and the U.S.A. Humber and Company (America) Limited was inaugurated in December 1894 to acquire and run a cycle manufacturing plant inWestborough, Mass.; and Humber and Company (Russia) Limited was promoted in September 1895 to establish a Humber cycle manufactory in the former St. Petersburg premises of W. and T. Fletcher, lace-makers of Nottingham, and to acquire the cycle importing business of George and Feder Zemliczks of Moscow.[2] Triumph Cycle of Coventry set-up a subsidiary factory in Nuremberg in 1896 to supply the German, Swiss and Balkan markets.[3]

Initially, the branch factory method of market penetration and sales expansion met with criticism from other British cycle manufacturers. It was feared in 1887, for example, that Hillman, Herbert and Cooper's plant at Nuremberg would effectively establish a technical school "......to teach the Germans the English methods of manufacture and all the other technicalities of our cycle trade, and which it has taken us 20 years to develop........I in return would advise that an eye be kept upon the foreign pupils - the German workmen. When they have graduated at the manufactory which is being set up at Nuremberg they will be at a premium, and their services will be sought after by

1. Ibid., 23 Feb. 1895, p.53. The French company was to pay its English parent £6,000 plus a royalty of 5 francs per machine and 2 pence per rim. Ibid., It lasted until 1898.

2. Economist, 15 Dec. 1894, pp.1547 and 1566; and Times, 30 Sept, 1895, p.15.

3. Times, 13 Feb. 1897, p.3.

the German makers, who will pay high wages to secure them....... I hear that the German cycle manufacturers are already chuckling over the advantages that are likely to accrue to them from the establishment of an English cycle factory there".[1] It was also alleged that leading German cycle agents, dealing principally in imported British machines, were offended by Hillman, Herbert and Cooper's move. "They consider it unfair to them that, after they have invested their capital in working-up an English trade, and have established depots throughout the Empire for the sale of our machines, that we should come and take the trade out of their hands. This may be selfish, but it is sound reasoning from their point of view".[2] Thomas Humber, nearing the end of his cycle manufacturing life, saw the Nuremberg factory issue in a vague moral light tinged with complacency: "....no German or German firm can compete with us, but it was not right for an Englishman to take our accumulated knowledge over to Germany, still they would never work on the Continent as we did here".[3]

1. The Cyclist, vol. 9, No. 430, 11 Jan 1888, pp.327-8. The words are those of an unnamed Coventry cycle manufacturer.

2. Ibid.,

3. Ibid., No. 434, 8 Feb. 1888, p.419.

The criticism died away, however, in face of the realities of American and Continental duties on imported cycles and parts, and of transport and handling costs.[1] The move by Messrs. Hillman, Herbert and Cooper was justified, from the standpoint of hindsight, when a round of new trading agreements perpetrated by the German Government raised the import duty on English-made bicycles to 24 marks per 100 kilogrammes in the early 1890's.[2] At around the same time, it was observed that differences in the costs of transport was helping the penetration by the nascent German cycle industry into the Austro-Hungarian market, and militating against the British. The tariff of £2.10s. per cycle levied by the Austro-Hungarian authorities was the same for German makers as for the British, but the freight charges per machine were reckoned at 16 to 18 shillings for British suppliers, and only one to two shillings from Dresden.[3]

1. The unnamed cycle manufacturing critic of Coventry, cited above, thought that in the German case of 1887-88, import duties and transport costs were of little account. The import duty levied by Germany was 20 marks per 100 kilos., and accordingly a safety bicycle weighing 45 lbs. (about 20 kilos.) would have to pay a duty of about four shillings. He gave the through-rate from Coventry to Flushing, Antwerp or Rotterdam at about 12 shillings per two hundredweight, and the rate from any of these ports to the Rhenish provinces at about two to three shillings per 100 kilos., "....which (together) upon a safety bicycle would not exceed five shillings. So the total charges of carriage and duty combined (about 9 shillings), in sending a machine into the centre of Germany, would not greatly exceed the cost of carriage alone for the same article to Ireland, Scotland, or remote parts of England". Ibid., No. 430, 11 Jan. 1888, pp.327-8.
   However, part of the rationale behind Hillman, Herbert and Cooper's establishment of their Nuremberg branch factory was to be nearer the growing cycle markets of Austria, Eastern Europe, Italy and Russia - not just simply to supply the German market from within. See Times, 25 July 1891.

2. Cycle Trade Journal, August 1893, p.592.

3. Ibid., March 1892, p.115.

The French legislature awarded the recently-established indigenous cycle makers the chance of a greater share of their home market in 1891 when, as from the 1st February 1892 the duty on imported cycles was doubled from 1 franc 10c. per kilo., to 2 francs. 20c.[1] Even the allegedly revenue-raising duty of ten per cent ad. val. upon imported vehicles, levied by the Belgian government, was raised to 12 per cent as from 24 July 1895.[2] And again, in the same year of 1895, the French Chamber of Deputies felt obliged to assist an insignificant French weldless steel tubing industry by doubling the import duty on tubes from the level of 40 francs per 100 kilogrammes.[3] The issue of the opportunity to make profits out of company promotion apart, Humber and Company (Russia) Limited was formed in 1895 so that Humber cycles could appear on the Russian market without incurring heavy shipping-freight charges and a Russian import duty on cycles of approximately £2 per machine.[4] The case for the formation of a Humber off-shoot in the U.S.A. in 1894 seemed unimpeachable given the recent prior developments in British exports of cycles to North America. The prospectus announcing the formation of the Humber subsidiary stated the freight charge per machine to be ten shillings from England to New York, but, more significantly, that the duty payable upon entry

1. Cycling, 22 Aug. 1891, p.68.

2. Cycle Manufacturer, 3 Aug. 1895, p.22.

3. Ibid., 28 Sept. 1895, p.114.

4. According to the company's prospectus. See Times, 30 Sept. 1895, p.15.

on a cycle invoiced at £20 was about £7.[1] This latter charge was a product of the imposition of the U.S.A's pervasive 45 per cent protective tariff inaugurated by the McKinley Act of 1890, and which allegedly ".......make it almost impossible to compete with the home manufacturers".[2] Yet pre-McKinley import duties on cycles and parts, levied by the U.S.A., amounted to 35 per cent ad. val., which was unquestionably a protective rate. More to the point was the development of the American cycle industry itself, not only in terms of its size, but also in terms ofits use of a relatively sophisticated productive technology and its manufacture of distinctive designs of cycle products at prices within the pockets of wide sectors of the American public.

Until the appearance of the "safety" design of bicycle and the depletion of Pope's monopoly power, the cycle manufacturing activity of the U.S.A. was, in the main, confined to the Pope Manufacturing Company (in conjunction with the Weed Sewing Machine Company) and Messrs. Gormully and Jeffery. In France, too, indigenous entrepreneurial interest in cycle manufacture was limited during the 1870's and early 1880's to very few men, and most notably to one, namely, Gustave-Adolphe Clément. Clément was born at Pierrefonds, Oise, in 1855, but lost his parents early in life and which ended his secondary education. He was sent to Paris and was apprenticed to a lock-smith, but managed to develop his mechanical inclinations in a more formal manner there, by attending some courses at the Conservatoire des Arts et Metiers. On a bicycle that he had made

1. Economist, 15 Dec. 1894, p.1566.

2. Ibid., p.1547.

for himself he ".....knocked about the provinces in the 1870's, learning the art of metalworking and the bicycle trade", and in 1878 returned to Paris and opened a small workshop in the Rue Brunel, with the assistance of three partners, to make complete bicycles. Also for the purpose, he utilised patents brought out by a M. Truffault who during 1875-78, devised designs of cycles with hollow steel forks and rims which lightened cycle weights considerably; and until the second-half of the 1880's, imported Rudge cycles and Clément's machines pretty well shared what French demand there was.[1] When the indigenous taste for cycling began to develop and blossom, Clément's business grew apace and he maintained his position as France's largest producer of cycles and parts. He learned about the Dunlop pneumatic tyre soon after its introduction in 1889, and in return for buying £2,000 of Dunlop shares Clément quickly obtained the sole French manufacturing rights (he later sold these shares for five million francs: £200,000). In 1894 Clément incorporated his bicycle firm into the Société Anonyme des Vélocipèdes Clément with a capital of four million francs, and this was followed in the next year by the construction of a new factory to make bicycle parts in Mézières. This town, in the Ardennes region near the Belgian frontier, was a traditional and important centre for fine iron foundry work.[2]

An interesting characteristic of both the American and French cycle industries, once their growth got underway, was that ostensibly, and unlike the British pattern of development, there was little or no

1. Dictionnaire de Biographie Française, vol. 8, p.1431; James M. Laux, op.cit., p.41; and The Cyclist, vol. 7, No. 360, 8 Sept. 1886, p.1239.

2. Dictionnaire de Biographie Française, vol. 8, p.1431; and James M. Laux, op.cit., pp.41-2.

entrepreneurial 'spin-off' from the pioneering, forerunning, firms to form the basis of additional sizeable enterprises. A good many of the French and American new and individual cycle entrepreneurs of the 1880's and 1890's had, in personal terms, some background in general engineering, foundry work, tool or toy making, but no prolonged and direct experience of bicycle manufacturing gained in the workshops of an established cycle-making firm. By the mid-1890's the concern of J. Aucoc and Darracq was France's second largest producer of cycles. Alexandre Darracq, the principal active partner, was born in Bordeaux in 1855 and moved through several manufacturing enterprises before teaming-up with Jean Aucoc to make "Gladiator" bicycles in 1891. They located their factory in Pré Saint Gervais (a suburb north-east of Paris), and hired Thomas C. Pullinger, an English bicycle engineer, to manage the workshops. From the outset Aucoc and Darracq was an integrated concern manufacturing most of its own components, and by successive rounds of price-cuts competed very successfully with the other French bicycles and the English imports on the market. In 1894 it was incorporated as the Société Anonyme des Cycles Gladiator with a capital of 3.4 million francs, and it was about this time that it took into its employ another English cycle engineer, Charles R. Garrard.[1] A smaller French cycle manufacturing organisation was Cycles Georges Richard, located on the rue d'Angoulême

1. James M. Laux, op.cit., p.40; and Cycling, 13 Feb. 1892, p.51. Garrard was something of a rover as a cycle engineer both in Britain and in France, but he had been "for a considerable time" chief designer and superintendent of the Howe Machine Company's cycle making department at Glasgow; and ".....thanks to him principally, there was very soon a marked improvement in the quality and design of their machines". The Cyclist, vol. 10, No. 471, 24 Oct. 1888, p.85.

in north-eastern Paris, and incorporated in December 1895 as the Société de Construction de Cycles et d'Automobiles "La Marque Georges Richard" with a capital of 500,000 francs. A sales agency was opened on the rue Theophile Gautier in the Auteuil section of western Paris, the well-to-do area where most of the firm's clients lived, and in July 1897 its capital was raised to one million francs by a new issue of shares. Georges Richard himself was born to a middle-class Parisian family in 1863, and in the 1880's he and his brothers, Felix Maxime and Jules, ran a shop making measuring instruments for meteorology and electric currents, and called Richard Frères. In 1893 Georges and his brother, Max, left this concern to enter the bicycle business, ultimately to gain a reputation as makers of motor-cars.[1] A new entrant into the French cycle industry in the late 1880's, drawn by the expanding indigenous demand, was Edouard Rochet who graduated from the Martinière technical school in Lyons in 1881 at the age of fourteen, and began work in his father's machine shop. In 1894 Rochet was joined by Théodore Schneider, whose family was engaged in the Lyons silk trade, and, obtaining additional funds in 1896, the partnership was reorganised as a "société anonyme" under the style of Société Lyonnaise de Vélocipèdes et Automobiles Rochet-Schneider with a capital of 300,000 francs supplied by local financiers and silk magnates.[2] Across the Atlantic Ocean in the late 1880's, but in the same vein of recruitment, was George N. Pierce who started his business career in Buffalo, New York, in 1872 as a member of a firm constructing bird cages and refrigerators. But these he abandoned when he struck-out on his own as a maker of bicycles.[3]

1. James M. Laux, op.cit., p.45.
2. Ibid., p.63.
3. John B. Rae, op.cit., p.15.

In order to meet English cycle competition, supply a rapidly growing indigenous and even overseas or foreign demand, and to take advantage of protective tariffs and the factors of location, the American, French, German and Belgian entrants into the bicycle manufacturing field of the 1880's and 1890's found (judging by the way things turned-out) that a successful start, and quick growth to be a significant supplier, depended much upon a sizeable endowment of capital and technological resources, and business experience and connection from the beginning. The most notable Continental and American cycle-making firms, which began to bother British manufacturers, had diversified from other manufacturing industries, though, to an extent, less so in the case of France than in the cases of Germany, Belgium and the U.S.A. The reason for the greater scope in France for an entrepreneur to set-out and develop into a major cycle market supplier, from the initial status of sole-proprietorship or small partnership, was the near-absence in that country of a sewing-machine industry and a comparatively under-developed arms and ammunition industry. In Germany the new indigenous cycle producers of the 1880's to achieve prominence were nearly all large-scale sewing machine manufacturers, and, in the U.S.A., sewing machine makers, sizeable gun and rifle producers, and small metal or wooden component manufacturing firms producing "en masse". In Belgium one firm arose to dominate the native industry, the Fabrique Nationale d'Armes de Guerre of Herstal, near Liége, which made arms and ammunition on a repetition system.

By 1886 the German sewing-machine industry had developed such that it contained large-scale producers, making machines on the mass-production interchangeable principle and of recognised good quality at that. The German sewing-machine firms were also sufficiently advanced to conduct an overseas trade through depots, agencies, and merchant-house representatives located abroad, though they were often accused of being mere copyists of the American Singer Company's designs. The factor that pushed many of them into diversification into the cycle industry was a protracted depression in the sewing-machine trade in Europe which began in 1886 and continued, to a greater or lesser extent, well into the 1890's.[1] The first German maker to move into the cycle industry was Messrs. Seidel and Naumann of Dresden, in 1886, the quality of whose sewing machine products was highly praised by the British trade press, and which marketed them in the U.K. through the house of Gustave Herzfeld of Cheapside, London, E.C.[2] In November 1886 the sewing-machine sales of the firm were reportedly well-down on those of the previous year, and its principals were "being invited to sanction the introduction of other and different industrial branches".[3] In choosing bicycles the enterprise launched itself upon an astonishing growth path, and was reputed to be the largest cycle manufacturer on the Continent in 1891, employing a total of 1,300 workpeople.[4] In 1892, Seidel and Naumann manufactured 80,000 sewing-machines and 10,000 cycles, and employed 1,600 workers.[5] In 1893 the firm's sales of cycles -

1. Journal of Domestic Appliances and Sewing Machine Gazette, vol. XIV, No. 190, 1 May 1886, p.17; and No. 195, 1 Nov. 1886, pp.21-22. The demand for sewing machines in Belgium and Holland, two of the German industry's largest markets, was reported in September 1886 to be "now very dull". Overall, the state of trade for the German sewing-machine manufacturers was little better, if at all, in 1892. Ibid., No. 194, 1 Sept. 1886, p.27; and vol. XX, No. 260, 1 April 1892, p.17.

2. The Sewing Machine Gazette and Journal of Domestic Appliances, vol. VI, No. 86, 15 Sept. 1878, p.39; and Journal of Domestic Appliances, op.cit., vol. XI, No. 159, 1 Oct. 1883, p.23.

3. Journal of Domestic Appliances, op.cit., vol. XIV, No. 195, 1 Nov. 1886, pp.21-22.

4. Cycling, 9 May 1891, p.253.

5. Journal of Domestic Appliances, op.cit., vol. XXI, No. 273, 1 May 1893, p.16.

numbering 13,000 - and sewing-machines together amounted to 4,722,000 marks compared to 4,309,000 marks during the previous year, and plans were being implemented to enlarge the factory so that an extra 1,000 men could be employed.[1]

Seidel and Naumann were followed immediately by Adam Opel of Russelsheim, near Frankfurt, and the Bielefeld Maschinenfabrik of Bielefeld (Dürkopp and Company). Bernhard Stöwer, a sewing machine manufacturer at Stettin in East Prussia, joined the cycle industry in 1894; Koch and Company of Bielefeld, the Gritzner Maschinenfabrik of Durlach, and Haid and Nen of the Carlsruhe Sewing Machine Company at Carlsruhe in 1896; and Baer and Rempel of Bielefeld in early 1898. Most of these were well-established enterprises in their original manufacturing field. Adam Opel had been making sewing-machines since 1862 and had agencies in Britain under the supervision of Weingart, Fraig and Company of Moorfields, London, E.C.[2] Baer and Rempel were going strong in the 1870's,

1. Ibid., vol. XXII, No. 282, 1 Feb. 1894, p.18. In reaction to the sewing-machine trade depression of the late 1880's and early 1890's, another notable German sewing-machine manufacturer, Messrs. Frister and Rossmann, attempted to adopt the manufacture of automatic scales in 1887, washing machines in 1888, and cartridges in 1889 - and became seriously unstuck. For the years 1886-1888 inclusive Frister and Rossmann made a total net loss of 3,360,000 marks and in 1889 generated a further loss of 438,280 marks. It continued to labour under trading losses, making one of 485,300 marks in 1893. Ibid., vol. XX, No. 260, 1 April 1892, p.17; and vol. xxii, No. 291, 1 Nov. 1894, pp.13 and 15.

2. Ibid., vol. XlV, No. 189, 1 April 1886, p.8.

being represented in London by Gustave Herzfeld, and so was the Gritzner Maschinenfabrik of Durlach, notable at that time for the interchangeability of its sewing-machine parts.[1] The Dürkopp Company employed about 700 hands in 1882 and manufactured four types of sewing machine on the "Singer system", viz. a family, a shoemakers', a tailors' and a hand machine. The quality of the firm's products was considered good even by the hyper-critical British trade journal.[2] By 1895 this concern had given over almost all its plant to the production of cycles and cycle parts, and did a particularly good export business in cycle parts in 1894.[3] Entry into the cycle industry put Bernhard Stöwer at Stettin upon a resumed growth path. The firm employed 691 workpeople in 1894, 910 at the close of 1895 and 1,200 by the end of 1896; and enjoyed a boost in the demand for its cycle products in 1896 upon the completion of a commercial treaty between Germany and Russia - Stöwer being well-located to serve the then booming Russian market.[4]

The German sewing-machine manufacturers found themselves, in a technological sense, suited to the production and commercial requirements of growing cycle markets. Likewise, the German arms and ammunition producers, some of whom moved into the cycle industry in 1897 and 1898 when the arms trade was in the doldrums; for instance, Weyersburg, Kerschbaum and Company of Solingen who established a new cycle works at Hilden in 1897; Herr. C. Schilling,

1. Ibid., vol. XI, No. 160, 1 Nov. 1883, p.5; The Sewing Machine Gazette, vol. VI, No. 86, 15 Sept. 1878, p.39; and Cycle Manufacturer, 6 June 1896, p.193, and 26 March 1898, p.126.

2. "The working portions of the machine are of fine steel, and all parts are carefully finished. We have examined specimens of work performed by these machines which we find to be excellent". Journal of Domestic Appliances, vol. X, No. 148, 1 Nov. 1882, p.18.

3. Cycle Manufacturer, 13 April 1895, p.137.

4. Diplomatic and Consular Reports on Trade and Finance (Foreign Office), No. 1652, 1896, p.5; No. 1808, 1896, p.28; and No. 1896, 1897, p.9.

small-arms makers of Suhl in Thuringia in the same year; and the Dreyseschen Small Arms Works at Sommeida, Thuringia that took-up cycle manufacture in 1898.[1] This is not to say that technological linkages between productive systems was the only determinant of successful entry into the German cycle industry: Heinrich Kleyer of Frankfurt became a cycle manufacturer after gaining experience, first of all, as a cycle agent. Starting in 1886, in fact, he built something of a cycle emporium, his agency consisting of an eight-storied building that contained warehouses, showrooms, stock-rooms with lifts, a riding school on the top floor adjoined by dressing rooms and lavatories, repair workshops, and offices.[2] A firm in heavy industry joined the German trade in the boom year of 1896, namely, Hugo Hartung's Cast Steel and Iron Foundry of Berlin.[3] Nevertheless, it was observed more than once that new entrants from the sewing-machine and arms trades began life in the cycle manufacturing industry with a manifest expertise. A cycle trade journalist noted in 1888 that the cycles built by the German sewing-machine manufacturers were far better in quality than those built by German makers who constructed nothing but cycles on a small scale.[4] The critical H. O. Duncan wrote an account of his visit in 1888 to Seidel and Naumann's factory at Dresden: "Messrs. Naumann and Seidel manufacture six or seven different styles, bicycles, bicyclettes, tricycles and tandems, all more or less exact copies of the Coventry

1. Cycle Manufacturer, 3 April 1897, p.361; 13 Nov. 1897, p.205; and 21 May 1898, p.226.
2. The Cyclist, vol. 7, No. 358, 25 Aug. 1886, p.1187.
3. Cycle Manufacturer, 31 Oct. 1896, p.137.
4. The Cyclist, vol. 10, No. 474, 10 Nov. 1888, p.128.

Machinists' Company cycles; they employ about 200 workmen on cycles, and the men earn from 20 to 36 marks (£1 to 36 shillings) weekly, and the majority are working piecework......There were three or four large workshops utilised for the manufacture of cycles, and we passed through a nickel-plating room, polishing shop, painting and enamelling shop, well fitted up, indeed, with many enamel ovens, but the system of enamelling was very inferior to our Coventry process. Then we visited the fitting and other machine shops, all exceptionally well-organised. Amongst the machinery which appeared to us very practical was the drilling machines, on very exact and excellent principles, the machine for specially turning heads and necks, and six small machines for cutting cog and chain wheels were perfection. There were machines for rim and backbone rolling, and machinery to finish all steel parts on the premises that to our idea could not possibly be excelled, if equalled. All tools and many parts were made and really beautifully finished on the premises, but a great maby parts in the rough and other portions of the machines were got over from England."[1] Seven years later, and newly-returned from a business trip to the Continent, Alexander Davidson, a British cycle engineer with the Fairbanks Wood Rim Company, reported: "......the various makers of sewing machines etc. have, in the last few years, been rapidly getting more and more at home in the production of cycles of the very best quality, not, as many English makers wilfully persist in trying to believe, of an inferior class. In fact, such makers as Clément, Peugeot, Kleyer, Opel, Naumann, Dürkopp etc., not only produce machines as good as the best English makes, but..... have bought the very best of modern labour-saving tools of American,

1. Ibid., vol. 9, No. 440, 21 March 1888, pp.566-8.

English, French and German makes."[1] Firms with a previous history of sewing machine and small arms production, he stated, "......have been enabled to start with very clear notions as to the absolute necessity of perfect accuracy and interchangeability, and in no point is this more noticeable, than in the attention which is paid to the retaining of standard sizes of nuts, screws, hubs, etc., and the dispatch with which such parts are replaced should such be required by a customer. It is, however, a noticeable fact that the makers keep to standard patterns, except as regards special racing machines, and do not give way to the fads and whims of individual customers, as is so often the case in England, thus, as English makers will at once admit, simplifying the work in the shops, lowering the cost of production, and facilitating the output".[2]

The French had nothing to match the Germans in the way of a sewing-machine industry with the capacity to diversify quickly into large-scale cycle production. Perhaps, the reduction of the French import duty on sewing machines in 1881 from a level of 72 to 84 francs per 100 kilogrammes to six francs per 100 kilos. may have been an important factor.[3] France was a substantial importer of sewing machines from Germany and the United Kingdom, but only a very minor exporter:- 7,190 kilos. of machines in 1881 and 9,190 in 1882, (mostly to Belgium, Italy and Algeria), compared to aggregate imports of 2,178,343 kilos. and of 2,136,840 kilos., respectively.[4] Indeed,

1. Cycle Manufacturer, 16 Feb. 1895, p.38.
2. Ibid..
3. Sewing Machine Gazette, vol. IX, No. 130, 1 Sept. 1881, p.25.
4. Journal of Domestic Appliances, vol. xiii, No. 185, 1 Dec. 1885, pp.21-2.

at the very time that French cycle demand began to grow rapidly, in 1885, France, with Russia, constituted the German sewing machine industry's largest markets taking 687,900 and 627,900 kilos, respectively.[1] And, again during the previous year, France and Russia were the largest overseas markets for U.K. manufactured sewing-machines, France receiving 31,173 machines to a value of £59,638 and Russia 23,832 to a value of £51,032, with total U.K. exports valued at £356,215.[2] The French industrial structure appeared to yield only one sewing machine manufacturer to the nation's cycle industry viz. the firm of Hurtu, Houtin et Deligeon, established in the town of Albert, twenty miles east of Amiens, in 1880. Not long after, however, it was producing machine tools, grinders and bicycles, and in 1895 E. Diligeon bought out his partners and the firm's official name became the Société Deligeon et Cie, although it maintained the "Hurtu" trade-name. At that time it employed 500 workers - not all that large for a multi-product firm even by contemporary standards, though it has been described as one of the largest metalworking enterprises in France.[3] A number of French arms

1. Ibid., vol. XIV, No. 192, 1 July 1886, p.16. Total German exports of sewing-machines in 1885 were recorded at 6,557,500 kilogrammes but 1,623,300 were credited to Hamburg and 31,000 to Bremen. Ibid.

2. Annual Statement of Trade for the United Kingdom for the Year 1884. The French were not devoid of inventive talent in the industrial field of sewing-machines. In 1830 Barthelemy Thimmonier, a tailor of St. Etienne, patented in France a sewing machine, and about 80 were in use in 1841 sewing uniforms in Paris until a mob, in a Luddite frame of mind, destroyed them all. Thimmonier constructed fresh machines which he claimed could make 200 stitches per minute, and this device was patented in England in 1848. Despite one of his machines being demonstrated at the Great Exhibition of 1851, the inventor died in poverty and obscurity in 1857. L. Lyons, T. W. Allen and W. D. F. Vincent, The Sewing Machine (1924), p.3.

3. James M. Laux, op.cit., p.61.

and ammunition makers turned to the cycle industry when spasms of excess capacity affected the notoriously volatile small arms trade in the 1890's. The city of St. Etienne, about 30 miles south-west of Lyons, was the chief centre of French small arms manufacture, and small arms makers there diversified into complete cycle production from the late 1880's till 1897, when 3,000 people in the town found employment in the new industry. Thereafter most St. Etienne bicycle firms came to specialise in bicycle components rather than the completed article, but both before and after the change no St. Etienne small arms maker began cycle production on lines similar to that of B.S.A. in England, Remington in the U.S.A. or the Fabrique Nationale in Belgium, for the ancient trade was organised on a domestic-workshop basis with firearms manufactured in and between many small shops.[1] Machine tools were increasingly being used and the labour was experienced in making small metal parts (for firearms) but that was about as far as the level of technological expertise, relevant to cycle manufacture, went. Messrs. Dombret et Tussey of Lyons, who entered the cycle trade in 1891, and Hoster of Dieppe were two of the few comparatively integrated small arms makers to contribute to the French bicycle industry's development.[2]

Within the French cycle market, therefore, there was time and scope for firms with a not very specific engineering background to

1. Ibid., p.66. Relative to the British, German, Belgian and American small-arms industries, the St. Etienne arms trade in quantitative terms was and remained a small trade. See "Artifex" and "Opifex", The Causes of Decay in a British Industry (1907), passim.

2. Cycling, 28 March 1891, p.165. Hoster was English in origin. Ibid.,

became sizeable bicycle manufacturers and simultaneously learn - through experience and observation of the products and techniques of foreign enterprises - the arts of interchangeability and quantity production; and the handling of the requisite machine-tool technology. This they seemed to do very well: the epitome being the firm of the Société Peugeot Frères. The Peugeot family had been entrepreneurs for generations, beginning with a corn-milling enterprise established by Jean-Jacques Peugeot in 1725 at Hérimoncourt in the Pays de Montbéliard. In 1759 his son Jean-Pierre, diversified the concern into cotton spinning and weaving, and in 1805, two of his sons, Charles and Jacques, launched a machine-building works at La Chapotte to manufacture designs of "Spinning Jennys" smuggled into France from England. In 1810 another two of Jean Pierre's sons, viz. Jean Pierre II and Jean Fréderic converted a family-owned corn-mill at Sous-Cratet into a steel foundry, making saws, saw-blades, and steel springs as well as whalebone stays for corsets. The offspring of Charles and Jacques Peugeot sold their inherited cotton spinning enterprise to their cousins, the children of Jean Pierre II and Jean Fréderic, who continued cotton yarn production until 1840, when the premises were converted for the production of tools. It was Jules and Emile Peugeot - sons of Jean Pierre II - who founded the Société Peugeot Frères in the 1850's, and acted as steel founders, and makers of steel wire cages for crinoline dresses (while the fashion lasted during the years of the Second Empire), springs, saw blades, corset-stays and steel planes. In 1871 Armand Peugeot, son of Emile Peugeot, took a business trip to England in order to study the techniques of Leeds engineers. Simultaneously, he witnessed the development of the velocipede into the "ordinary" bicycle and of a British taste for cycling, and upon his return to Hérimoncourt advocated that Peugeot Frères should undertake cycle manufacture. It was not until the advent of the "safety" design of bicycle in 1885, however, that any significant decisions were taken positively upon Armand's advice. In 1885 the firm adopted the "safety" design of bicycle and in 1887 converted premises it maintained at Beaulieu to cycle production which commenced in 1888. In 1892 the Beaulieu works turned out 8,000 cycles and employed 650 workers, working ten hours a day. In 1894 a new floor was added to the Société's Valentigney factory where chain, tube and wheel-rim manufacture was begun. This major diversification move they performed without relinquishing their former, traditional lines of manufacturing activity.[1]

As the British cycle engineer, Alexander Davidson, inferred, the technological status of Continental cycle producers could be assessed from the types and origins of the machine-tools they used. In 1892 it was noted that the relatively advanced English machine-tool manufacturer and agent, Alfred Herbert, had supplied machinery to such French cycle manufacturers as Clément et Cie, Hoster of Dieppe, Aucoc and Darracq, and Rochet and Schneider.[2] By 1896 the Cleveland Machine Screw Company of Cleveland, Ohio, America's dominant producer of ball-bearings and a world leader in screw machine tool technology, had supplied one complete ball-making plant to Clément's firm in Paris.[3]

1. René Sedillot, Peugeot de la Crinoline à la 404 (1960), passim.
2. Cycling, 22 Oct. 1892, p.221.
3. American Machinist, 1 Oct. 1896, pp.18 - 24.

Parisian cycle manufacturers were buying bicycle machinery from The Garvin Machine Company of the U.S.A. during 1896 and 1897, and in the former year the Garvin Company received a $60,000 order from one German cycle manufacturer alone.[1] By 1897 <u>The American Machinist</u> could assert: "The manufacture of bicycles has done much to advance French shop practice...... M. Clément, who is the largest cycle manufacturer in France (employing 475 workmen), has a good deal of American machinery in his factory, and is now building, on the bank of the Seine, what will be the finest factory in France, if not in all Europe. It will have all the latest and newest features of factory equipment, and considerable additional American machinery will be installed, M. Clément, apparently, being a firm believer in our system of manufacturing and in our tools for doing it".[2]

Qualitative accounts tended to indicate that German interest in American (and advanced) machine tool technology was particularly strong, the country containing an exceptionally progressive machine-tool maker, Ludwig Loewe and Company - a firm which had grown on the basis of supplying tools to mass-producing arms and ammunition manufacturers. The expansion of the German cycle industry and the "bicycle boom" of 1896-97 seemed to develop the American-style of machine tool technology in Germany further. Prior to 1893 the house of Schuchardt and Schutte of Berlin dealt only in steel and machinists' supplies, but subsequently in the 1890's the sale of American machine tools had become their main business. In 1897 German machine-tool

1. <u>Ibid</u>., 24 June 1897, p.35.

2. Ibid., 15 July 1897, pp.17-18. Just as there were agencies in the U.K. specialising in the import of technologically advanced American machine tools, so there was one notable merchant house devoted to this field in Paris. In the 1890's <u>Fenwick, Frères et Cie</u> of Rue Martel, Paris, acted as representatives for France for the Browne and Sharpe and Pratt and Whitney companies. Early in 1896, M. Francis Fenwick of the firm had sailed to the U.S.A. ".....for the purpose of more fully investigating American machine tools, especially those adapted to bicycle manufacturing". Ibid., 27 Feb. 1896, p.19.

builders, Ludwig Loewe among them, were reportedly over-run with orders, Loewe having to decline three-quarters of the orders offered, and deciding, in light of this, to concentrate on a small variety of machine tools, made in large lots with systematic (and American) methods of manufacture.[1] It was in 1897 that a German ammunition and small arms factory at Berlin gave an order to the Cleveland Machine Screw Company of Ohio for $120,000 worth of machinery for making steel balls for bicycles.[2] In the Spring of the following year the Garvin Machine Company of New York thought it worth its while to open a depot in Berlin for the sale of cycle machine tools in the German Empire.[3] Almost at the same time, Stöwer's firm at Stettin - now called the Nach-Maschinen und Fahrad Fabrik (V. M. Stöwer) awarded a large order for bicycle-making machinery, including screw machines, hub machines, pedal machines and milling machines, to the Davis and Egan Machine Tool Company of Cincinnati, through the latter company's Berlin branch office.[4]

Although it did not seriously enter the cycle trade until the turn of 1896-97 - driven by a downturn in mass-produced military small-arms demand - Belgium's Fabrique Nationale had, from its establishment in 1886, a leaning towards the machine-tool technology of Ludwig Loewe and the American makers.[5] In 1893 it employed about

1. Ibid., 22 July 1897, pp.18-20. This was the sort of machine-tool producing practice characteristic of the large American makers such as Pratt and Whitney.

2. Ibid., 17 June 1897, p.37.

3. Cycle Manufacturer, 21 May 1898, p.226.

4. Ibid., 7 May 1898, p.199.

5. The Fabrique Nationale had B.S.A. type origins. It was founded by the leading small arms producers of Liége, under the style of Les Fabricants d'Armes de Guerre réunis with the object of rapidly executing large orders. Arms and Explosives, vol. 1, No. 10, July 1893, pp.220-222.

2,000 people, half of them women, and as early as this, its machinery was driven by electric power, utilising electric motors, belting, shafting or countershafting, and the machine tools themselves were of the "self-acting" type, emanating either from Germany or from America, and tended by women who were supervised by skilled male mechanics.[1] At the beginning of 1896, a third of its stock of American machine tools had reportedly come from Pratt and Whitney of New York, and during the course of the year it added $140,000 worth of tools from the same firm and from Brown and Sharpe.[2] Thereupon, at the start of 1897, the _Fabrique Nationale_ began manufacturing, initially, cycle components and fittings under licence for Albert Pope's "Columbias", and, at that time, Ludwig Loewe of Berlin had a substantial financial stake in the enterprise, represented in physical terms by rows of his machine-tools, but the management was led by Hart. O. Berg, an American formerly employed by Colt's Armoury.[3] A dependance upon imported capital, entrepreneurial talent and advanced machine tool technology was important in the early development of the Belgian cycle industry. The move by the _Fabrique Nationale_ was soon followed by the entry of a H. Pieper of Liége into the cycle industry with the establishment of a bicycle-making plant under the supervision of E. B. Hotchkiss. Hotchkiss was formerly assistant superintendent and mechanical engineer of the

1. Ibid.
2. _American Machinist_, 10 Dec. 1896, p.36.
3. Ibid., 8 July 1897, pp.17-18; and _Cycle Manufacturer_, 16 Jan 1897, p.251.

Duquesne Manufacturing Company of Pittsburgh, and equipped his new charge with Pratt and Whitney machinery.[1] The structure of the Belgian industry was filled-out when R. C. Stiefel, the weldless steel tube technologist now in American employment, decided to advance Belgian tube production by the erection of a plant at Lembecq, near Hal, in late 1896. The financial capital was mainly British in origin, since Stiefel operated through his Stiefel's Weldless Tube Patents (Foreign) Limited, that had been floated on the London capital market, though in February 1897 the new weldless tube producing mill was transferred to a Belgian registered company, called Usines de Lembecq Tubes, san soudure, Société Anonyme with a capital of 1,875,000 francs.[2]

British reactions.

The reaction of the British cycle trade, in the broad - manufacturers, agents, merchants, trade journalists - to the rise of Continental competitors during 1886-1897 ranged from feelings of complacency to alarm; and in the cases of some aggrieved overseas agents, dependent hitherto upon purely British cycle supplies, to sentiments of glee. H. O. Duncan and others noted in the 1880's that the new German cycle manufacturers were copyists, and therein lay a protective mechanism for the continued prosperity of the British cycle trade. Just as in 1868 Seidel and Naumann at Dresden began manufacturing sewing-machines after the American "Wheeler and Wilson" system, and in 1873, and thereafter, copied the Singer sewing-machine designs, so

1. American Machinist, 25 Nov. 1897, p.33.
2. Cycle Manufacturer, 7 May 1898, p.208.

in 1886 the firm was copying British designs of cycle product. But so long as this firm and its compatriots remained as copyists, the British firms, in terms of the designs of the finished articles, would be paramount, it was argued, since the designs were in a continuous state of change and improvement from year-to-year, and the British were in the van of improvement. Correspondingly, George Singer, the Coventry manufacturer, opined in early 1888: "What about German competition? Well, I do not fear it. I expect that the Germans will be able to successfully compete with us in the supply of a medium priced cycle in their own country - they won't be able to compete with us in England.......The Germans are trying to make cheap goods which Coventry has not found it to its interest to make, but it is no use their copying our better makes, because we are constantly introducing something fresh, and keep a year ahead of them. None of the German manufacturers have done much good in Germany yet. The establishment of works in Germany by Coventry firms is no doubt an endeavour to hold the German trade, which is a large one. The policy is a doubtful one, and anyhow must be a loss to Coventry. ....I place reliance on Coventry maintaining its position as the seat of the cycling trade, on the quality and style of its machines being maintained at a high standard, and on the efforts which are made by manufacturers to more nearly approach perfection by the introduction of real improvements".[2] A few weeks later, another Coventry cycle manufacturer combined this type of argument with the assertion that

1. The Cyclist, vol. 9, No. 440, 21 March 1888, pp.562-3.
2. Ibid., No. 429, 4 Jan. 1888, p.303.

Coventry's cycle workmen and techniques of production could not be equalled or surpassed in quality. In foreign markets, he said, "We hold the field and shall continue to do so. In the first place, we have got twenty years' start, which, to say the least, is no mean advantage in a race of this kind.....(the foreigner) can purchase the machines, it is true, but not the experience, and it is in that alone where Coventry will be able to uphold its supremacy".[1] The cheaper labour available to the German cycle producers was to no avail, he maintained: ".......Up to the present they have not succeeded in turning out anything but second and third-rate articles, and these, in spite of their cheap labour, at a cost greatly in excess of what a Coventry Manufacturer could produce first-class machines for. ....The Germans may be deep thinkers and great scientists, but their forte is not in practical mechanics. In this department at the best they are only copyists.....In cycles it is not a fact the Germans prefer buying goods made in their own country".[2] Cheap German labour was answerable in Coventry by dint of ".....a diminution in the cost of production. It has been effected to a great extent by the introduction of labour-saving appliances, the result of long experience, and a judicious division of labour, by which each section of hands has become very expert in their particular department, so much so that many workmen are earning higher wages today at half the price they were paid ten years ago. I speak advisedly when I say that with our experience and other facilities we can at the present time produce more cheaply than the Germans. I have been through two or three German manufactories, and have been struck with the slowness of their workmen and with their clumsy methods, and withal, the poor results obtained".[3]

1. Ibid., No. 430, 11 Jan. 1888, pp.327-8.
2. Ibid.
3. Ibid.

It was through the superior quality of the British cycle product that many commentators, manufacturers and trade journalists alike, counted upon to keep severe Continental competition at bay. Reports spanning 1892-1893 noted that three or four indigenous cycle manufacturers had established themselves in Austria-Hungary, paramount among them being the firm of Job Puch at Gratz in Styria. Puch could produce cycles at prices one-third less than the prices charged by English exporters and English-run factories within the Hapsburg Empire, but the English products were preferred by the majority of Austrian consumers because of their quality. "The machines made by them are bad, and in spite of the high duty (£2.10s. per machine) imposed on foreign cycles, local makes are not cheap. The patterns are heavy and awkward copies of the English".[1] Of the English and German machines imported, "The German makes are cheap, but have not the elegance of the English machines, and are always a year behind the leading fashions in patterns etc. The Germans cannot build a light roadster, or a fine racing mount. The racing men in Germany and Austria have English machines".[2] Writing from Holland in 1892, Philip Stokvis, "a leading Dutch cyclist" and Humber Limited's central agent in that country, claimed: "English cycles are chiefly in demand. Cycles are manufactured in Holland only in a small way, and the less said about them, the better. The Germans have tried to introduce their goods here, but German machines are clumsy, heavy, and their finish cannot come up to the English. In design they are years behind the English, and with one or two exceptions, a long wheel-base and a ball-head, is something yet unheard of amongst the German makers".[3] This view was

1. Cycle Trade Journal, Feb. 1892, p.93; and Diplomatic and Consular Reports on Trade and Finance (Foreign Office), No. 1387, 1893, p.10.

2. Cycle Trade Journal, Feb. 1892, p.93.

3. Cycling, 2 April 1892, p.169.

supported a month later by a trade journalist in Holland: "The German manufacturers have introduced up to the present a few machines, but they do not present a taking appearance. Siedel and Naumann had last year an agent in Amsterdam, but we hear that that gentleman has sold off their machines at almost net cost prices. In general, German machines are too heavily built, not being as strong or as speedy as English ones."[1]

Nevertheless, if some British cycle makers, agents and journalists looked upon the efforts of nascent Continental competitors with complacency, there were others who saw, or foresaw, trends of a dire nature. One commentator observed as early as 1886 that if such firms as Dürkopp and Siedel and Naumann could produce "good work" in the field of sewing machines "....they should in time be able to supply first-class cycles".[2] A couple of years later, H. O. Duncan noted with chagrin that the Stanley cycle shows of recent years had been marked by the visits of American, German and French cycle manufacturers to examine the British machines in their latest designs: "It goes almost without explanation that these visitors obtain their new ideas, fresh models and improvements at the Show......and then return quietly to their different works to give all instructions and teach their workmen all the English practical cycling mechanical ideas and improvements, year by year, in as many hours as it has perhaps taken the English mechanic

1. Cycle Trade Journal, May 1892, p.164.

2. The Cyclist, vol. 8, No. 376, 29 Dec. 1886, p.278.

years to complete to virtual perfection".[1] By the mid-1890's, it was becoming to be recognised that the Continental producers of cycles had learned a lot concerning the technical arts of cycle manufacture, and that their capacity to learn and technically catch-up was undiminished as yet. Towards the end of 1894, for instance, Cycling maintained that the French cycle-making firms had made "....enormous progress over the past few years" with respect to the techniques of production and the quality of the finished product, though it still held-out that as regards "finish" the English machines were superior to the French cycles.[2] Despite this process of technical improvement by Continental makers and the implied threat of serious competition, nonetheless, there was a feeling, widespread among overseas agents, trade journalists and others, that, with regard to selling efforts and attention to the detailed requirements of potential overseas customers, the British cycle makers were slothful and tended to rest on their old quasi-monopoly laurels. A German importer of cycle goods was moved to write in 1892 that German cycle manufacturers ".....give a very long credit, and in many cases places machines in depots for sale on commission, to be paid for when sold.....Your makers add a good deal to the popularity of the German maker by the manner in which they treat their agents over here. As for small things in the shape of repairs which must be sent to England, we have to wait from two to three months, and our letters are ignored in a very unbusinesslike

1. Ibid., vol. 10, No. 471, 24 Oct. 1888, p.58.
2. Cycling, 22 Dec. 1894, p.427.

manner ....A German maker, on the contrary, looks well to what his agent wants, and he is gradually improving in details of manufacturing. I think his enamelling and nickel plating are superior to the English. He always delivers up to time, pays the greatest attention to small things, and is gradually putting in the thin end of the wedge everywhere he possibly can, to the detriment of the English maker".[1] In the same year, a Russian cycle agent complained in the trade press that the English manufacturers ".....pay very little attention to our continuous complaints and advice given regarding improvements in detail, which, if carried out, would render English-made cycles all the more popular amongst cyclists over here. ....German makers are more energetic, more careful and attentive, and, in short, seem to be better businessmen. I fear that if English makers do not soon wake up from the lethargic state into which they seem to have fallen, they will not alone lose their trade in Russia, but everywhere else on the Continent, very rapidly".[2] F. Möller, a cycle agent in South Australia, was acutely bitter in 1893: "Judging from the general opinion Australians have of English (cycle) manufacturers, they are divided into two classes. Those who have a large trade, and treat their small foreign clients with contempt, or the smaller fry, who offer cheap, but wretched material, who are anxious to secure custom at any sacrifice: the latter generally end in insolvency etc., and are looked upon with suspicion by our traders. When the large concerns are busy, we, or our orders can go to the D—— for all they care; later on, when business is dull, a courteously worded epistle requests our further orders <u>which will meet with prompt attention</u>".[3] The inflow

1. <u>Cycle Trade Journal</u>, March 1892, p.117.
2. Ibid., June 1892, p.188.
3. Ibid., No. 1893, pp.691-2.

of overseas agents' complaints, concerning the marketing efforts of British cycle makers during the early 1890's, was sufficient to draw an admonishing editorial from the Cycle Trade Journal: "One great and grave error has been made by such of our manufacturers as were in a position to cater largely for the foreign trade. They had for years the sole monopoly without opposition, and having this sole monopoly they treated their customers with the greatest contempt, compelling agents to wait months and months before their orders were executed, and when executed something was wanted to complete the transaction. The foreign agent, if far away, could not get even the courtesy of reply to his complaint......The treatment makers extended to their agents when they had the monopoly has now come back to them with a certain amount of retribution, as foreign manufacturers have so perfected their resources as to machinery, that they now turn out cycles that bear a very favourable comparison with English made ones, and so we find agents who previously placed their faith entirely on English makers, taking on the sale of machines of local manufacturers, who at least attend to their reasonable requests, and place them in a position to supply such orders as they may receive from their customers".[1]

The onset of the "bicycle boom" in 1895, that served to put established British cycle manufacturers in a chronic excess demand market environment - at least, with respect to the domestic market - also served to expand the real complaints and suspicions of overseas agents and cycle export merchant houses. The agents, more than ever, grumbled over the long delays in obtaining delivery, blaming the British makers for not adequately stocking during the autumn and winter off-seasons.[2] The merchant houses handling

1. Ibid., Aug. 1892, p.238.

2. Cycle Manufacturer, 25 April 1896, p.131.

cycle exports alleged that "fair rotation" in the execution of orders was not adhered to, and that under the prevailing conditions of excess demand, the home trade was being given preference over the foreign. Moreover, they developed grievances against the list-price system used by the British makers, whereby large discounts were given on list prices, irrespective, they said, of the amount ordered and the customer. Continental manufacturers, on the other hand, used a net cash pricing system (instigated by Albert Pope in the U.S.A.) not subject to discounts - resale price maintenance, with uniform cycle prices irrespective of locality, in fact.[1]

To some unquantifiable extent, therefore, the Continental cycle industries of the first half of the 1890's grew upon the back of an established English industry that had allegedly developed bad selling habits in overseas markets, and showed no sign as yet of changing its ways. Yet over 1892-96 U.K. exports of cycles and parts to Continental countries in aggregate, expanded rapidly, indicating that in Europe as a whole there was sufficient and growing demand to accommodate both an expanding British industry and the development of other indigenous cycle producers. This demand, however, was not a homogeneous economic variable and was beginning to be satisfied in different ways by British producers, on the one hand, and Continental cycle-makers on the other. Early in 1893 the market for the "second-grade" British cycle on the European Continent was observed to be deteriorating with the competition of the French and German industries, and the

1. Ibid., 2 March 1895, p.66; 20 July 1895, p.310; and 8 May 1897, p.410.

advent of the new French tariff, while the British manufacturers were being increasingly confined to supplying their high-grade mounts, which Continental competitors could not yet match, though the work turned-out by them was "constantly improving".[1] In Bulgaria in 1895 the British supplied the limited demand for top quality cycles, but the Germans satisfied the greater demands for lower-grade machines at cheaper prices.[2] In 1896 reports from British Consuls at Venice and Ancona, and in Naples, attested to the fact that the Italians deemed British cycles to be of the highest quality but at relatively high prices, such that the demand for them was not so virile as that for lower-grade Austrian and German machines marketed at lower prices - "The majority of the people prefer, for economy's sake, to buy the cheaper ones".[3]

There is no evidence that the British cycle manufacturing community was much exercised by this trend which emerged in the first few years of the nineties. So long as world aggregate demands for their high-quality, relatively high-priced, commodities expanded, as the relatively wealthy took to the wheel, there appeared to be no desperate problem of Continental competition. In so far as the rise of Continental cycle industries bothered anybody connected with the operations of the British industry, it was the company promoting fraternity of E. T. Hooley, the du Cros family, and Martin D. Rucker of Humber Limited, who took the most notice. They were in business principally to anticipate future trends and make large sums of money from doing so. In recognition of the growing size of the French cycle industry and

1. Cycling, 11 Feb. 1893, p.84.
2. Cycle Manufacturer, 7 Sept. 1895, p.79.
3. Diplomatic and Consular Reports on Trade and Finance, No. 1665, 1896, p.14; and No. 1703, 1896, p.14.

its native market, the du Cros' took the manufacture of Dunlop tyres in France out of Adolphe Clément's hands in 1893 and formed the independent concern of La Cie Française des Pneumatiques Dunlop. Foreseeing further growth in the French cycle industry and cycle market in 1896, they floated the Dunlop Pneumatic Tyre Company (France) Limited on the London capital market in the August.[1] In the following October, the du Cros', Hooley, H. J. Lawson and M. D. Rucker formally stated through a company prospectus that they anticipated that the French import duty would again be raised substantially, permitting even fewer British cycles a place in the French market; and, correspondingly, Clément, Gladiator and Humber (France) Limited was promoted on the London capital market with a nominal capital of £900,o00. The new company bought-out the Clément bicycle name and its operations at Rue Brunel, Paris, and at Tulle in Corrèze, plus its branches in Madrid and Geneva, but not the factory at Mézières. Also acquired was Aucoc andDarracq's "Gladiator" works in Pré-Saint Gervais, and in Nantes; and the French depot of the British Humber Company. Additionally, the new company contracted to purchase all its tyres from the Dunlop Pneumatic Tyre Company (France) Limited.[2] As a combine to exploit monopoly powers in the French market, the arrangements of the new company appeared strong enough indeed - but that was not the explicitly formulated objective. Just how the French sales of Humber and Company Limited were to be enhanced was never made clear - unless French cycle prices were to be lifted to English "high quality" levels. At first both Clément and Darracq joined the board of the French combine, but the latter soon

1. Times, 10 Aug. 1896, p.4.

2. Ibid., 12 Oct. 1896, p.13; and James M. Laux, op.cit., p.42.

departed. In February 1897 he formed A. Darracq et Cie with a capital of two million francs, and built a new factory, the Perfecta Works, in Suresne, on the other side of Paris from Pré Saint Gervais. Darracq's new plant began operations in early January 1898, making bicycle parts, motor-cycles, tricycles and quadricycles, achieving resounding success from the start and paying regular dividends.[1] Possibly, Darracq foresaw the shaky financial fortunes of Clément, Gladiator and Humber (France) Limited. In the event the combine was extravagantly overcapitalised and had to be reorganised in April 1901, under a new name, Société Française des Cycles Clément et Gladiator Limited, with £600,000 of its original capital (two-thirds of it) written-off, and with its production concentrated at Darracq's former works in Pré Saint Gervais. Adolphe Clément stayed with the firm throughout all this, but ultimately severed his ties with it in October 1903, although the concern continued to use his name.[2]

The development of American prowess

During the 1890's it was the American cycle industry which, above all, made the British manufacturers sit-up and take notice that radical changes in their world market situation were afoot. In the first place, there was the spectacular growth of the U.S. cycle industry itself, which began once the "safety" cycle design gripped the American public's enthusiasm, and when the bottlenecks of Pope's patent rights were finally cleared away. In 1889 there were 27 cycle making firms in the U.S.A., and the whole industry

1. James M. Laux, p.42, op.cit.

2. Ibid., pp.42-4.

had an aggregate output to the value of $2,568,326.[1] For 1895 it was estimated that there were 500 factories producing cycles in the United States, and 700 for 1897.[2] The Twelfth Census of Manufactures reported 312 bicycle-making establishments in 1899 - despite the industry being then on the downgrade - having an aggregate value product of $31,915,908, plus 16 establishments producing bicycles as a by-product to an aggregate value of $1,553,177.[3] Many of the largest of these enterprises, as in Continental Europe, had diversified from the technologically-linked manufacturing activities of arms and ammunition production and sewing machines. The Lozier Company of Toledo, Ohio, led by its principal entrepreneur and stockholder, Colonel H. A. Lozier of Cleveland, was originally engaged in making sewing-machines.[4] America's "Dayton" bicycle was made by the Davis Sewing Machine Company.[5] The White Sewing Machine Company of Cleveland, Ohio, entered the cycle trade - a once dynamic concern, founded in 1876 by its principals, Thomas H. White, R. C. White, George W. Baker and D'Arcy Porter, and which from 1881 "......in the short space of two years, accomplished the unprecedented feat of establishing an enormous business in England and thoughout the entire Continent, without the establishment of a single branch house for retail trade".[6] Nonetheless, it

1. Axel Josephsson, op.cit., p.331.
2. The Engineer, 16 April 1897, p.403.
3. Axel Josephsson, op.cit., pp.325 and 328.
4. American Machinist, 27 Feb. 1896, pp.7-9.
5. Robert A. Smith, op.cit., p.34.
6. Sewing Machine Gazette, vol. XI, No. 156, 1 July 1883, p.11. In 1883 it was a sizeable enterprise employing 1,200 men. Ibid.

consolidated this achievement in subsequent years by the establishment of depots and agencies in major European capitals and cities; facilities that it eventually used in its cycle trading activities.[1] The Remington Company at Ilion, New York, moved into the U.S. cycle industry having had a long history of the mass-production and engineering of small metal parts. The Company began its life under Eliphalet Remington sen. in 1846, who commenced the manufacture of rifle barrels by hand at a small forge, but who developed his enterprise into a substantial firearm manufactory. In 1871 his two sons acquired the American Empire Sewing Machine Company, aided by John Thomas Jones, who became head of the mechanical department of the Remington Works and who designed a distinctive sewing machine for production and sale by the Company.[2] The sewing machine branch of the business grew rapidly, especially with regard to an export trade, and a few years later the concern began the manufacture and sale of typewriters.[3]

The factor of technological linkage, as a force propelling firms into the cycle industry, was more wide-ranging in the U.S.A. than in Germany and France. This was partly a function of the general structure of American industry, and partly a function of the American factor endowment that reflected itself in a distinctive design of American "safety" bicycle - wheel-rims, handlebars, and even mudguards and chainguards were often fashioned out of wood. The Indiana Novelty Manufacturing Company of Plymouth, Indiana, was originally engaged in the manufacture of a general line

1. Ibid. Rowley B. Turner, now esconced in Brussells, was one of the Company's agents. Ibid.

2. Ibid., vol. XI, No. 150, 1 Jan. 1883, p.31; and Journal of Domestic Appliances, vol. XXI, No. 273, 1 May 1893, pp.15-16. Jones came from the American Singer Sewing Machine Company, a firm to which he eventually returned.

3. Sewing Machine Gazette, vol. XI, No. 150, 1 Jan. 1883, p.31.

of small wooden specialities, for instance, folding tables and tennis racquets, and then became cycle wooden-wheel rim makers in 1893 when the firm's superintendent, George W. Marble, invented a new form of cycle wheel rim joint, afterwards used by the concern. By 1895 the enterprise was making complete bicycles and also wooden mudguards and chainguards.[1] Also by 1895 there were three sizeable cycle manufacturing concerns in Chicago that were originally engaged in producing toy wagons constructed mostly from wooden components: the St. Nicholas, the Western Wheel and the Featherstone companies.[2] The techniques of watch-making in the U.S.A. were allied to those of cycle manufacture since both involved the arts of quantity production and mass marketing, and the machining and assembly of small metal parts. A recession in the American watch trade during the mid-1890's induced many watch manufacturers to begin the manufacture of cyclometers with the technical consequence that the design and manufacture of these items improved substantially and their prices fell. The Trenton Watch Company of Trenton, New Jersey, gained a good reputation for its cyclometers which it commenced producing in 1895, and the New York Standard Watch Company became noted for the quality and cheapness of its "Standard" cyclometers.[3] The forces of technological linkage and trade depression in alliance, however, propelled some watch makers in the U.S.A. into a greater committment to the cycle trade. The Illinois Watch Case Company of Elgin, Illinois, and the Keystone Watch and Machine Company, of Lebanon, Pa., entered into complete bicycle production and extensive

1. American Machinist, 17 Oct. 1895, pp.821-22.
2. Ibid., 10 Oct. 1895, p.801.
3. Cycle Manufacturer, 27 July 1895, p.5; and 13 Feb. 1897, p.290.

cycle component manufacture during 1895-96, as did the New York Standard Watch Company in 1897.[1]

The phenomenon of technological linkage apart, the factor of phases of recession and depression in other American industries was no minor dynamic in accounting for the behaviour of established firms diversifying into cycle manufacture. Over 1891-1898 the American cycle industry often assumed the appearance of an island of prosperity in a sea of agricultural and industrial depression, and this helps to explain the "odd" industrial backgrounds of some of the firms that entered the cycle trade, and the tremendous attention that American machine-tool builders gave to the rapidly expanding and specialised requirements of U.S. cycle makers: "Our trade.....has been, to a very large extent, from bicycle manufacturers", said Hill, Clarke and Company, iron and brass working machinery makers of Boston in 1895, "while general business has been rather quiet".[2] The

1. Ibid., 14 Sept. 1895, p.91; 19 Dec. 1896, p.211; and 13 Feb. 1897, p.290.

2. R. A. Smith, op.cit., p.14.; and American Machinist, 2 Jan 1896, p.19. "One of the largest New England makers of small machine tools recently said that his concern would not be paying taxes if it were not for the cycle factory orders. It will thus be seen that the cycle has carried the machine trade over a period which would, apparently, have been extremely dull for all the metal-working trades, had not cycle sales redeemed the paucity of work in other lines". Ibid., 27 Feb. 1896, pp.7-9. In 1895 the Fox Machine Company of Grand Rapids, Michigan, makers of wood and iron working machinery, reported a rush on machine tools for bicycle manufacturing which exceeded by far the demands for its other machinery products. The firm had only decided to construct machine tools, especially for the cycle trade, in 1894, but now ".....this year we shall not only place upon the market the same model that we sold last year, with some improvements, but shall have five other new models that we shall add to our line". Ibid., 2 Jan. 1896, p.19.

"oddities" (i.e. in terms of technological affinities to cycle manufacturing) tended to appear during the years of 1896 and 1897, attracted by the potentially high rates of profit to be garnered from the "bicycle boom", but some entered the cycle industry before then. There was the Peerless Manufacturing Company of Cleveland, Ohio, which was originally established in Cincinnati in 1869 for the manufacture of clothes-wringers, and which moved to Cleveland during the late 1880's andadopted bicycle production in 1891.[1] A foundry, the Gendron Iron Company of Toledo, joined the cycle industry in 1892 with a "high class" cycle selling at $115 with pneumatic tyres.[2] In 1896, however, The Scott Paper Company, paper manufacturers of Philadelphia, put down a plant for the production of complete cycles; and also in that year the Thomas Manufacturing Company, agricultural machinery makers of Springfield, Ohio was tempted to diversify into the cycle trade, as was Roberts' Architectural and Ornamental Iron Company of St. Paul, Minnesotta.[3]

Nevertheless, just as in France, where no diversifying firm approached the size of Adolphe Clément's cycle enterprise in the 1890's, so in the U.S.A. the "father" firm of the Pope Manufacturing Company remained by far the largest single organisation in the American cycle trade. In January 1896 the Pope Company employed a total of 3,043 men: 1,437 men, 163 managers and clerks, and 29 travelling salesmen in its cycle factory; 159 workmen and 25 managers in its tube works; 316 workmen and 17 managers and clerks in its adjunct, the Hartford Cycle Company; 368 men and 20 managers and clerks plus nine salesmen in its Hartford Rubber works;

1. John B. Rae, p.15, op.cit.
2. Cycle Trade Journal, June 1892, p.189.
3. Cycle Manufacturer, 6 June 1896, p.193; 4 July 1896, p.232; and 1 Aug. 1896, p.10.

and 500 workmen in the stamping shops and in other factories.[1] More than any other cycle manufactory, either within the U.S.A. or without, it was a vertically integrated concern, producing the seamless steel tubing, the tyres, and practically all the other components that went into the assembly of its complete machines. It also constructed a proportion of the machine-tools that went into its works. All this was not the outcome of simple empire-building, but the product of successful attempts to overcome some of the supply constraints afflicting the American cycle industry in general, and to exploit the technological advances the firm had itself engendered.

Faced with a clamorous demand for bicycles on the part of the American public in the 1890's, U.S. cycle manufacturers found that their customary production techniques were unsatisfactory. "In the earlier days of the industry", stated the Scientific American, "the bicycle was frequently manufactured in the machine shops of establishments where it formed only a small part of the output, and the bicycle parts were manufactured by the use of such tools as the shop possessed. But as soon as the industry began to assume its present proportions, manufacturers realised that special efforts must be made to keep pace with the demand and meet a competition which was evidently going to be fierce and sustained. They bent their energies to the construction of special tools and machinery for the more rapid, accurate and cheaper execution of the new class of work".[2] There is no question that the machine-tool building enterprises, such as Pratt and Whitney of New York, the Lodge and Davis Machine Tool Company of

1. Ibid., 1 Feb. 1896, p.12. Towards the end of 1895 Gormully and Jeffery of Chicago employed about 600 hands. American Machinist, 28 Nov. 1895, p.942.

2. Scientific American, 6 Nov. 1897, pp.292-3. Soon after entering the cycle industry from the realm of sewing-machine manufacture, the Lozier Company established a separate workshop at Thompsonville, Connecticutt, and filled it with the latest types of auto-screw-machines for the better and quicker production of cycle components. American Machinist, 27 Feb. 1896, pp.7-9.

Cincinnati, Messrs. Rudolphe and Krummel of Chicago, Browne and Sharpe of New York, the Hartford Screw Machine Company, and the Cleveland Machine Screw Company of Ohio, strained every nerve and employed every talent to supply the American cycle industry with the most sophisticated and specialised machine-tool technology in the world, and yet American cycle-makers still found it necessary to improve their productive systems a step further by dint of "home productions". The St. Nicholas cycle making firm of Chicago, for example, made its own rim-turning lathes and rim-sanding machines; The Indiana Novelty Manufacturing Company designed and built its own wooden-rim making machinery; and Messrs. Gormully and Jeffery constructed their own steel wheel-rim rolling machines.[1] The last of these, and the Pope Manufacturing Company made and designed their own spoke threading machines, and when it came to the drilling of cycle wheel hubs, the St. Nicholas Company used self-made, single-spindle drillers, incorporating the technically advanced features of automatic feeds and automatic indexing for the fixture to be held.[2] The Lozier Company made their own cup and cone grinding machines, and their designs were developments from a grinding machine used for sewing-machine work, which was the firm's original line of

1. American Machinist, 10 Oct. 1895, p.801; 17 Oct. 1895, pp.821-2; and 21 Nov. 1895, pp.924-5.

2. Ibid., 6 Feb. 1896, p.4; and 15 May 1896, pp.5-7.

manufacture.[1] Such was the emphasis put upon advanced machine tool technology by this firm, that two of its three top executives were recruited specifically for their machine-shop experience: one, a Mr. Moore, came from the machine-tool departments of the Ames Iron Works of Chicopee, Massachussetts, while the other, W. L. Gleason, the assistant superintendent, had "for many years" the charge of the Elyria Machine Screw Works in Ohio.[2] There was good reason for the "topping-up" by "home productions" of an already-available, advanced, cycle-making technology supplied by the independent U.S. machine-tool firms. Labour, especially skilled engineering labour, was, even in the mid-Western states, expensive by national and on international standards. Machinists in Toledo, Ohio, for instance, were reckoned to be unusually well-paid:

1. Ibid., 21 May 1896, pp.7-9. A very specific example of "technological linkage" in the machine-tool field. A machine which Browne and Sharpe - originally and still a sewing machine producer - had designed for grinding sewing-machine needle bars, was adopted by some firms to bicycle cup and cone production. Robert S. Woodbury, Studies in the History of Machine Tools (1972), p.111. In the case of the Pope Manufacturing Company, "home productions" of machine-tools were in part the outcome of the decision to manufacture chainless, bevel-geared driven, cycles, in which the gearing had to be mechanically accurate if they were to work with perfect silence and smoothness. "The difficulty in cutting bevel gears in a machine arises from the fact that the teeth for their full depth have to be evenly tapered throughout their length. The old machine-cut teeth were tapered at the point but not at the root, and it was only after a certain amount of wear that really good results were obtained in a new set of bevel gears". The Pope Company had specifically designed for them "......an ingeneous machine with various compound motions by which it is possible to cut gears whose teeth shall have at every point a mathematically exact taper. So perfect is the result that when two such gears are run in contact, the friction is practically as small as after several months of wear"; and it was completely automatic - "After the gear has been inserted the cutting of the teeth goes on automatically until the whole set has been completed". Scientific American, 30 Oct. 1897, p.277.

2. Ibid., 27 Feb. 1896, pp.7-9.

"Mr. Heartley, maker of the cycle-shop tools (at the Lozier Company's works) said that the great demand for machinists caused by the development of the cycle industry in Toledo had raised machinists' wages from $2.50 to $3.25 or $3.50 a day, and that help had to be 'handled with silk gloves' even when paid top prices, as they had only to choose where they would work".[1] Yet rates of payment such as these were not seriously out-of-line with those paid by Messrs. Gormully and Jeffery in Chicago, who, despite the employment of boys and youths, had to pay an average weekly wage of $15 in 1895.[2]

Labour was one potential supply constraint, overcome by labour - saving machine-tools and more systematic production layouts; pneumatic tyres were another. The American cycling public, like the British, found that even the invention of "cushion" tyres in the late 1880's did not satisfactorily mitigate the vibrations induced by the relatively small diameter wheels of the "safety" bicycle, and that J. B. Dunlop's original design of pneumatic tyre was often more trouble than it was worth. The problem facing American cycle manufacturers was to obtain access to trouble-free supplies of pneumatic tyres, sturdy in construction and relatively easy to fit, and at not too-excessive a market price. The "Clincher" design of pneumatic tyre was one which technically fitted the bill, but it was protected by a patent held by Bartlett of the British North British Rubber Company but with a licence granted only to the du Cros'

1. Ibid.

2. Ibid., 28 Nov. 1895, p.942. This was equivalent to £3 per week given an exchange-rate of £1 = $5. An American cycle trade publication <u>The Wheel</u> recorded a complete dearth of skilled workmen in the U.S. industry in 1895, and also a shortage of suitably qualified men to place in the design and production-management departments: "Of the mediocre, or unskilled, the Wheel Trade will continue to have its due quota, even if a much greater condition of activity should be favoured in the Trade. The highest grade of workman cannot be recruited from the hordes of emigration dumps upon our shores". <u>Cycle Manufacturer</u>, 12 Oct. 1895, p.131.

Dunlop organisation and the U.K.'s Palmer Tyre Company Limited. The du Cros' were willing to supply non-"Clincher" designs of pneumatic tyre to American buyers, but were careful to preserve a near-monopoly position, with respect to these products, by acquiring the American patent rights, in May 1891, relating to Welch's wired-on detachable tyre. In 1891, therefore, American cycle manufacturers could either import "Clincher" pneumatic tyres from the U.K. at prices dictated by the North British Rubber Company (and also pay the corresponding McKinley-level import duty), or purchase Dunlop pneumatic tyres on du Cros' terms from Alfred Featherston of Chicago who ran the Dunlop Company's American offshoot.[1] In order to be rid of the threats of high tyre prices and restrictive trading conditions for good pneumatic tyres, the Americans resorted to persuasion, vertical integration and innovation. As with the du Cros' in the United Kingdom, Bartlett of North British Rubber was flexible enough in 1891 to grant Messrs. Gormully and Jeffery a licence to manufacture "Clincher"-type pneumatic tyres for fitment to wooden cycle wheel rims, and for sale in the U.S.A. On this basis the Gormully and Jeffery Tyre Company of Indianapolis was established, and developed during the course of the nineties as the largest tyre-making concern on the American continent.[2] The Pope Manufacturing Company took a slightly different tack. Basing the design on a tyre invention, originally perpetrated by J. W. Boothroyd in the U.K., the Company devised its own tubeless pneumatic tyre - it had no inner-tube unlike the "Clincher" - called it the "Hartford", and marketed it

1. Sir Arthur du Cros, Wheels of Fortune (1938), pp.105-6.
2. Times, 28 March 1899, p.14; and John B. Rae, op.cit., p.14.

freely from manufacturing works built for the purpose in Hartford itself. The absence of an inner-tube and the manner of its attachment to the cycle wheel rim kept Pope's "Hartford" tyre free from any predatory legal action either from Messrs. Gormully and Jeffery or from U.K. pneumatic tyre interests.

Likewise, it was innovation within the firm and the desire to avoid difficult or troublesome supply problems that led Pope's into the manufacture of seamless steel tubing for cycle frames, and for such components as handlebars and seat pillars. By 1895, in fact, Pope had built invention and innovation into his firm's structure by the establishment of a Scientific Testing Department, initially under the direction of Henry Souther, a graduate of the Massachussetts Institute of Technology, and this began systematic tests on all raw materials in order to find the most suitable inputs for cycle manufacture. From the beginning the new department addressed itself to the properties of seamless steel cycle tubing and found that the adoption of high carbon (and, later, nickel) steels for certain parts of the cycle frame, yielded both increased strength and lightness.[1] This discovery was duly incorporated into the 1896 and 1897 "Columbias" and enhanced the importance the Pope Company attached to having control over the conditions of its tube supply. For certain, acquisition of adequate quantities of seamless steel tubing to satisfy an insatiable cycling public was a running sore in the American cycle industry of the nineties until 1897. Throughout the 1880's and early 1890's American cycle makers imported practically all their seamless tubing from England, despite high, protective import duties - in any case, for a start, there was no indigenous seamless steel tubing industry to protect; rumours which circulated in 1884 that two firms in the U.S.A. were preparing to manufacture weldless steel tubes, and

1. Cycle Manufacturer, 3 Aug. 1895, p.16. Souther later became director of research for the Mechanical Branch of the Association of Licensed Automobile Manufacturers. John B. Rae, op.cit., p.10. The adoption of nickel steel for seamless tubing was in the first stage a spin-off from Pope's experiments with chainless cycles. Pope had kept note of the good technical performance of a chainless cycle which appeared in Hartford in circa 1893. The failure of this cycle as a commercial venture was not due to the driving mechanism but to the secondary features of weight, the large width of tyre tread, and ungainly appearance, and the Pope Company was sufficiently attracted to secure possession of the relevant patents. It was found that a requisite for good performance, on the part of a bevel geared, chainless cycle, was a frame rigid enough to prevent the dislocation of the gearing. The original "League" chainless cycle had, accordingly, a heavy frame weighing 38lbs. It was also found by the Pope Company that nickel steel tubing for parts of the frame overcame the weight and rigidity problem. Its possible use was suggested to the Company by a naval engineer, who had met the metal in its use for armour plate, but at that time there was no firm in existence making or capable of making nickel steel tubing - it was not even known that such a tubing could be satisfactorily produced. After experimentation and testing in the Scientific Testing Department, Popes came out with nickel steel seamless tubing, and invested nearly a million dollars in the construction and equipment of a nickel steel tube-making plant - the new tubing not only being incorporated in the frames of Pope's chainless cycles (which went on the market at the turn of 1897-98) but also in the 1897 "Columbias". Scientific American, 30 Oct. 1897, p.277; McClures' Magazine, vol. X, Nov. 1897 to April 1898, pp.iii-viii; and Cycle Manufacturer, 7 Aug. 1897, p.30.

threaten the English imports, remained rumours.[1] "Tube famines" not surprisingly raged, especially in the summer of 1891 and again in 1894-95, when American cycle demands took exceptionally high upswings, and there were always reports that American industrialists were about to do something about it. In 1891, for instance, it was stated that "The exorbitant customs tariff, and the difficulty of procuring the tubing from England, are combining to make American cycle manufacturers seriously think of laying down plant in the States for its manufacture".[2] In fact, in July 1892, the first move was made but the initiative came from without the American cycle-making community. During that month the Shelby Steel Tube Company of Ohio began to produce cold-drawn, seamless steel tubing; and over the following four years other and new tube-producing companies were established, namely the Elwood Company of Pennsylvannia, Elwood-Ives of Philadelphia, the Columbia Tube Company of Boston, Mass., the New Brewer Seamless Tube Company of Toledo, Michigan, the New Castle Tube Company and the Manfield Machine Company of Ohio.[3] In the Spring of 1896 these had a total plant of 220 draw benches with an aggregate potential output of 82 million feet of seamless

1. The Cyclist, vol. 6, No. 263, 29 Oct. 1884, p.51.
2. Cycling, 13 June 1891, p.341.
3. Victor S. Clark, History of Manufactures in the United States 1860-1914 (1928), vol. 2, p.347; and Cycle Manufacturer, 19 Oct. 1895, p.140. Victor S. Clark maintains that American engineers, disguised as workmen, learned enough, clandestinely, about seamless tube production in the U.K. to induce the makers there to disclose their methods and to co-operate in their introduction to the United States. However, there is no other corroborative evidence for this. No British seamless steel producer established an American branch factory, and the technology of drawing seamless tubes on draw benches and in a cold state was no top secret in the Black Country. It appears more likely that the American interests introduced and improved their methods by recruiting British experts in this industrial field e.g. R. C. Stiefel, and Edward Warwick of Components Limited.

steel tubing per annum, but the Shelby Company, being the first, remained the largest American producer with a plant of 65 draw benches and an output of 18 million feet per annum. The second largest was the Elwood Company of Pennsylvannia which had 50 draw benches and a potential annual output of 12 million feet of tubing.[1] Yet despite growth as quick as this, a "tube famine" gripped the American cycle industry in 1895, and British cycle manufacturers were forced to sit up and take notice as American tube-buyers, chief among them a Samuel Snell, cycle fittings manufacturer of Toledo, arrived in Birmingham with multi-million feet orders for seamless steel tubing. In consequence ".....every tube works is bunged with orders, discount has fallen to sixty, and we are told, on good authority, it would be difficult to get orders accepted.....Very few English makers have yet placed contracts, and another tube famine seems impending".[2]

1. Cycle Manufacturer, 11 April 1896, p.118.

2. Ibid., 7 Sept. 1895, p.74. In England it duly materialised and was reckoned to have reached its height in the month of January 1896 when "tube discounts" dropped to 30 to 40 per cent. It was also reckoned to be "....of no small embarassment to the smaller makers", and even some larger enterprises were reportedly sending away to Germany for seamless steel tube suplies. Ibid., 1 Feb. 1896, p.11. It was partly the fact that American steel tube drawers faced a shortage in 1895 of the special steel billets from which they made their tubes that prompted Snell's visitation. Ibid., 12 Oct. 1895, p.128.

The United States Consul for the Birmingham district reported in the summer of 1896 that American buyers, to secure supplies of tubing for some time ahead, had made long contracts for taking nearly the whole steel tube product of many English factories: the value of Black Country seamless steel tube exports to the U.S.A. he gave as $85,899 for 1894; $507,041 for 1895; and $231,200 for the first quarter of 1896.[1] The fiscal year 1896/7 was the first in which imports of bicycle tubing were given separately in the United States Treasury Reports, the value imported for consumption in that year being $185,259, falling to $33,798 in 1897/8, $26,413 in 1898/9 and to $16,573 in 1899/1900.[2]

The "tube famine" of 1895 had given the new American industry a very prosperous time, to which they responded - as did seamless steel tube drawers in the U.K. - with substantial extensions of their output capacities, and with improvements in their productive methods, such that the requirement to import had, by and large, died away by 1897.[3] The "famine" also ushered-in a phase of inventiveness among some American entrepreneurs, for example, a R. W. Smith in conjunction with Colonel I. D. Smead of the Smead Heating and Ventillating Works of Toledo were quick to devise machinery capable of manufacturing steel tubing of a new type. The machines took, apparently, a cold-rolled sheet of steel and by means of a set of

1. Ibid., 20 June 1896, p.219. At one stage rumours began to circulate among British cycle makers that Snell had cornered the supply of tubing for the English cycle industry and was intending to profit thereby, although this was virulently denied by Snell himself at the same time as admitting that he had purchased large quantities of English seamless tubing. Ibid., 19 Oct. 1895, p.140.

2. Axel Josephsson, op.cit., p.333.

3. Ibid.

mandrels and rollers, converted it into a tube with a seam formed by the edges locking together. In late 1895 plans were afoot to manufacture this tubing at Smead's factory, but how the project fared is an unknown story.[1]

Like seamless steel tube production, the manufacture of balls and ball-bearings was a semi-separate industrial activity and technology in the U.S.A., and the growth of the American cycle industry made heavy demands upon the suppliers of these commodities. In the 1890's, however, the American cycle assemblers found that they had no need to import for the enterprise and expertise of John J. Grant of Cleveland, Ohio, matched up to their requirements. Grant bestrode America as one of the nation's leading auto-screw machine technologists, and he made steel ball and ball-bearing manufacture an adjunct of screw-machine operations. Three concerns made steel balls for ball-bearings in the U.S. during the 1890's viz. "Simonds" of Fitchburg, Massachussetts, "Excelsior" of Buffalo, New York, and the Cleveland Machine Screw Company of Ohio.[2] Grant's Cleveland Machine Screw Company, however, dominated the ball and ball-bearing market. The methods and machinery which he developed in the firm he confined to the U.S.A., apart from supplying a ball-making plant to Clément in Paris, but the American Machinist had no doubts about the level of sophistication of his ball-making technology: his ball-blank screw machines were "......very rapid in operation, and require very little attention; they were especially designed for this work, are incredibly quick in their rod moving and chucking actions; are, of course,

1. Cycle Manufacturer, 16 Nov. 1895, p.182.

2. American Machinist, 25 June 1896, pp.5-7.

swimming in lard oil, and eat up rods of steel with bewildering avidity ....A careful study of the Cleveland Machine Screw Company's ball-making plant shows plenty of reasons for the fewness of the ball-making establishments in the world.......

.....Although at this writing there is such a demand for cycle-bearing balls that customers are treated as suppliants by the manufacturers, there is no inducement to go into ball-making without machinery in sight which is at least equal to this, and capital enough to fight a long, hard battle for the market, which can hardly be expected to forever buy anything that looks like a ball at the manufacturers' own prices."[1] To convey an impression of its output, the Cleveland Company was reckoned to have manufactured 14 million balls of varying sizes in the month of January 1896, and 16 million in the February.[2]

Only the most unperceptive amidst the British cycle-making community could ignore the virile growth of the American industry during the first half of the 1890's for, in the second place, British cycle exports to the U.S.A., after a couple of years of steady decline, underwent a severe depletion in 1894. The John Griffiths Cycle Corporation Limited - the cycle marketing organisation created by the du Cros family - having purchased the New York agencies for imported Premier and Raleigh cycles, found that, for the eighteen months ending 31 March 1895, these agencies made losses on trading and on the depreciation of stock amounting to £53,926, and correspondingly decided to close them as quickly as possible.[3] The Coventry Machinists'

1. Ibid., 1 Oct. 1896, pp.18-24.

2. Ibid.

3. Cycle Manufacturer, 29 June 1895, p.275. The Canadian depots also made losses totalling £11,622. Ibid.

Company made total losses two years running (£20,000 in the trading year 1893/4 and £27,000 in 1894/5), attributed to a depreciation of stock values, but heavy losses by its American depot played no small part in this, and the depot was closed in 1895 and the whole capital of the Company was written-down by 55 per cent.[1] Yet while this commercial suffering was taking place, the American cycle industry was evidently preparing for an assault upon European markets despite the clamour for cycles at home. The vision of world trading conquest, which tended to pervade the American entrepreneurial community from the mid-1890's, had already appeared before the U.S. cycle makers. Symptomatic of the belief in the desirability of expanding foreign trade, especially in the face of overseas competition, was an advocacy of the liberalisation of the McKinley tariff, and both Albert Pope of the Pope Manufacturing Company, and A. H. Overman, maker of the American "Victor" cycles, argued in favour of such a course. Their claim was that American manufacturers would not suffer undue competition thereby, but that the existing high duty encouraged other countries to follow suit and endangered potential export expansion.[2] Probably

1. Ibid., 31 Aug. 1895, p.66. In the trading year 1893/4 the losses incurred by the Company's American depots amounted to £15,975, while losses incurred through stock depreciation amounted to £3,377. The company also made a small loss through its Paris depot. <u>Cycle Trade Journal</u>, Jan. 1894, p.14.

2. David E. Novack and Matthew Simon, "Commercial Responses to the American Export Invasion, 1871-1914. An Essay in Attitudinal History", <u>Explorations in Entrepreneurial History</u>, 2nd. Ser., vol. 3, No. 2, 1966, pp.134 and 142; and <u>Cycle Manufacturer</u>, 7 Aug. 1897, p.30.

the first tangible sign of the American cycle makers' desire to export was the establishment of a branch in Coventry by the Gormully and Jeffery Tyre Company in 1893.[1] In the Spring of 1894, the Pope Manufacturing Company opened up an agency in Paris, and later in the year its "Columbias" were said to be there gaining a wide popularity.[2] Hard on Pope's heels were the "Frost" cycles made in Chicago when in late 1894 M. L. Barthes of Paris was appointed European agent for them.[3] In 1895 the French market received more American attention when a Franco-American Company was formed in Paris with a capital of 144,500 francs to market the American "Falcon" and "Strongest" cycles and the Yost tyre.[4] Then in August and September 1895, two American cycle firms set up agencies in London, viz. the Yost Manufacturing Company of Toledo and the Western Wheel Works of Chicago. "The thin end of the wedge is already in" commented The Cycle Manufacturer.[5] And it got thicker: during the last quarter of 1895 and the first half of 1896, E. C. Stearns and Company of Syracuse, U.S.A.,

1. Cycling, 11 March 1893, p.152.
2. Cycle Trade Journal, May 1894, p. 86; and Oct. 1894, p.170.
3. Ibid., Oct. 1894, p. 169.
4. Cycle Manufacturer, 31 Aug. 1895, p. 66.
5. Ibid., 7 Sept. 1895, p. 77.

appointed John Tourunen's North European Cycle Export Company of London, E.C., as English agents; the Pope Manufacturing Company, the Yost Manufacturing Company, and the Western Wheel Works of Chicago exhibited at the 1895 Stanley Show; the Lozier Company opened a London depot; the Pope Manufacturing Company appointed Vigor and Company of Baker Street, London, W, as principal retail agents for the metropolis; the Hartford Rubber Works Company got Oestheimer Frères of Paris to introduce Pope's "Hartford" single tube tyres into France; the Lozier and Pope companies opened-up agencies in Ireland under the aegis of well-known and popular cycle racers and cyclists; and at the January 1896 Salon du Cycle exhibition in Paris, seven American firms put in an appearance, notably the Cleveland Cycle Manufacturing Company, Samuel Snell's Snell Cycle Fittings Company of Toledo, Ohio, the Pope Manufacturing Company of Boston, the Frost Company of Chicago, the Black Manufacturing Company of Erie, Pennsylvannia, and the Falcon Bicycle Company and the Monarch Cycle Company both of Chicago. "Somehow", it was reported, "American machines seem more in the French style than those produced by our own makers, and they are catching-on".[1] U.S. exports of cycles and parts, not separately itemised until 1 July 1895, amounted to $243,721 for the second half of 1895, and to $1,654,291 for the first six months of 1896, and for the whole of the fiscal year 1895/96 the U.K. absorbed $613,300, or 32.3 per cent of them.

1. Ibid., 30 Nov. 1895, pp.204 and 211-221; 21 Dec. 1895, pp.274 and 275; 4 Jan. 1896, p.296; 8 Feb. 1896, p.23; and 2 May 1896, p.146.

The development of the American and Continental European cycle industries revealed that in spite of their (the British) relatively recent arrival on the U.K.'s industrial scene, the older, pioneering English cycle and component makers had already absorbed some traditionally Victorian notions of innate British superiority when it came to the manufacturing arts. They believed their position in the cycling world to be essentially impregnable with respect to the techniques of cycle production, and the quality and refinement of design of the finished product. Correspondingly, at home and abroad the British-made cycle would "sell itself"; and the arrival of foreign competition demonstrated that the British makers had a lax attitude in their dealings with independent retail outlets abroad, especially when enjoying phases of overall prosperity - an oft-asserted British entrepreneurial failing. This did not mean, however, that the developmental path of the foreign competitor was, without supports of various kinds, an easy one. In order to challenge, seriously, established British market positions, Continental cycle manufacturers often needed strong economic and technological bases from which to start; and aid and protective devices of various kinds to continue their growth and development successfully. Albert Pope in the U.S.A. found them in the possession of an established Boston business enterprise, in an initial monopoly-holding of certain important patents, and in a liason with a sewing machine manufacturer inherently accustomed to machining small metal parts. Most of the sizeable American cycle manufacturers, who were prominent during the 1890's, had diversified from initial manufacturing activities in which they were well-established and which were often technologically linked.

The small-scale, sole-proprietor, cycle maker who grew big was an exceptional phenomenon. In addition, American cycle manufacturers, as a whole, received the protection of a 35 per cent import duty until 1890 when the tariff was lifted to 45 per cent. In Germany, Siedel and Naumann of Dresden found a strength in its initial role as a successful and sizeable firm with the close technological affinities of making sewing machines. Kleyer of Frankfurt in the trade connections, financial strength and large premises of his thriving cycle agency business. German cycle manufacturers, generally, also enjoyed a geographically, land-based, central position that afforded comparatively low transportation costs when it came to supplying emergent eastern and southern European cycle markets. But, by all accounts, the Germans did not benefit significantly from a highly protected home market, as did the French, Austrians and Americans. The French, especially, probably required a high degree of tariff protection given the virtual absence in that country of technologically well-advanced and sizeable sewing-machine and small arms manufacturers attuned to mass-production activity. They also imported British cycle engineering expertise, while the only notable Belgian firm, the Fabrique Nationale, depended upon the initial support of American and German machine-tool technologists and management, and a licence to manufacture Pope's "Columbia" cycle components.

Even after a successful commercial start - helped by rising indigeneous cycle demands during the late 1880's and 1890's - Continental manufacturers nevertheless had to undergo a "learning process" with respect to types of final cycle design and producing techniques : a technical gap which they bridged by copying English cycle designs and importing semi-manufactured cycle components from the United Kingdom ready for finishing-off. But the Americans eventually showed that they had the potential to establish an absolute trading advantage in cycle and cycle component production, based upon an advanced and superior machine-tool technology. This, in turn, being partly the product of that country's endowment of machine-tool makers and engineer-managers, with the experience of supplying and supervising mass-production manufacturing systems; and partly due to a feature of the American cycle market of the first half of the 1890's viz. its rapid expansion when the industrial and agricultural sections of the economy were recessed generally. This concentrated the minds and efforts of American tool-builders towards the cycle trade wonderfully.

CHAPTER 4

The "American Invasion" and After 1895-1914

The prospect of an"American Invasion" of the Continental, and especially the British, cycle markets during 1895 and early 1896 induced two reactions among U.K. pedal cycle entrepreneurs and engineers. On the one hand, there were those who took a complacent stance. Bale, general manager of the Coventry Machinists' Company, declared in November 1895 that there was no need to fear American competition in the home market for a long time yet: "No doubt some time will come when they will be looking out for outside fields; in fact, they are now supplying, to a certain extent, places on the Continent. I don't think the American cycle is equal to our English machine of the highest grade; at any rate, I feel sure that it does not meet the taste of the English cycling public".[1] This was two months _after_ the Yost Manufacturing Company of Toledo, and the Western Wheel Works of Chicago - by no means small American makers - had established retail depots in London. E. Mushing of the Centaur Company of Coventry was of the opinion that in order to get a foothold in the U.K. market, the Americans would have to alter their cycle designs, because their machines were not constructed, in main details, according to British ideas. He also maintained that the American manufacturers were handicapped by reason of the higher rate of wages that they had to pay, and because they had to obtain their seamless tubing almost exclusively from England. It would take a long-time, argued Mushing, for American or German producers to draw tubing that would be as satisfactory and as reliable as that made by the older makers in the Birmingham district "....for they haven't the experience".[2]

1. _Cycle Manufacturer_, 30 Nov. 1895, pp.203-4.
2. Ibid.

Mushing was wrong with respect to the sources of American cycle tubing supply, no doubt being over-influenced by Snell's buying-spree in the seamless steel tube market of 1895, and the <u>Cycle Manufacturer</u> was quite convinced that American methods of drawing tubes were not inferior to Britain's despite the lack of experience.[1] But it was on the issues of cycle design and the "quality" of the output that British manufacturers harped-on the most as their best defence against any large-scale American attack. The American cycle was a comparatively light machine, and in the view of some too light for British cyclists, who used their machines all the year round, and for British road conditions. "There can be little doubt", it was said in 1895, "that American makers will have to 'climb down' on the weight question, and admit that the nineteen-pound roadsters are of benefit only to the repairers.....most of their methods of weight reducing have been tried and abandoned here, and others have not been considered even worth the trying".[2] J. C. Stringer of George Singer and Company of Coventry, after a business trip to the United States, declared in October 1895: "......In America riders are satisfied with having not more than half a machine to ride on. The American so-called roadster is really what we should call a scorcher; that is to say, it is not what we consider a fit machine for the average tourist. When they say they build a light machine they mean a machine which consists of a frame, a pair of wheels with single hose-pipe tyres - always especially liable to puncture, by the bye - stripped of all accessories in the way of brake, footrests, mudguards, and other

1. Ibid. The British cycle engineer, P. L. Renouf, after a visit to Pope's tube works in the autumn of 1895, reported that "....in several processes - especially that of annealing - the American method appears to be in advance of any that we have yet seen in tube mills at home". Ibid., 23 Nov. 1895, p.201.

2. Ibid., 19 Oct. 1895, p.137.

articles considered necessary on this side of the Atlantic, and with saddle fit only for the racing path, and a pair of rat-trap pedals. That is what the Americans call a roadster. There is also a notable absence of gearcases or other forms of chain covers in the United States. Over here a machine is hardly considered complete unless the chain is protected in some way from the dust and mud; but in America hardly one machine in fifty is so fitted..... Then, again, advertising is indulged in to an enormous extent in America, and, apparently, the value of the machines has to suffer in consequence. It is certain, any way, that we need fear nothing from American competition with machines constructed on their present lines".[1] Additionally, the British cycle manufacturing community noted that American cycles often comprised features about which even their own makers entertained doubts. In 1895 wooden cycle wheel rims were pervasive in the American trade, but it was found that in continuously moist weather conditions they were prone to warp, and towards the end of that calendar year firms, such as Messrs. Gormully and Jeffery, turned to metal rims, which the American Machinist for one considered stronger and more durable.[2] Also in 1895 the "reckless competition" in the U.S.A. for the production of lightweight machines led tyre manufacturers to produce lightweight tyres which would not tolerate even good road surfaces; with a corresponding reaction towards heavier tyre designs in 1896.[3]

1. Ibid., 26 Oct. 1895, p.148. George Singer and Company Limited was toying with the idea of establishing a branch factory at South Framingham, Mass., in the U.S.A. It purchased a factory and then (for reasons unknown) abandoned the project. Ibid., 15 Feb. 1896, p.32; and 18 April 1896, p.125.

2. Ibid., 7 Dec. 1895, p.230.

3. Ibid., 16 Nov. 1895, p.186.

Of course, the British manufacturers and their propagandists were not averse to making much of the instances where, quality-wise, the American cycles were found wanting, and some American manufacturers did not aid their public image by utilising "mixed dealers", e.g. ironmongers and drapers, as their English retail outlets - interested in cycle-selling only as a sideline and unable to offer technical guidance and adequate after-sales service facilities.[1] To an extent, American cycles did contract a bad public image in Britain, as witness an opinion given by the Pall Mall Gazette which asserted ".....with the exception of one or two makes American cycles are very bad. They are badly designed and finished, and their lightness is obtained by the sacrifice of strength. They are usually fitted with single tube tyres. They are all very well for butterfly cyclists, who wish to ride round and round the park, but they have not been, nor never will be, adopted by the general cycling population in England".[2] Yet unquestionably, the American cycle producers did increasingly penetrate the U.K. and Continental cycle markets during 1895-97, and technical experts and the trade press pointed out that, the issues of numbers of accessories and fittings apart, the machines were not generally qualitatively inferior, and in some respects had much to commend them. It was widely acknowledged that American pedals were lighter and superior to British ones because the central pin was shorter and the pedal frame was made in one piece; "over here the Trade has hammered away on old models with but little variety".[3]

1. Ibid., 3 July 1897, p.491.

2. Reproduced in Ibid., 28 Aug. 1897, p.67.

3. Ibid., 19 Oct. 1895, p.137; and 30 Nov. 1895, p. 222.

P. L. Renouf at the Pope Manufacturing Company's cycle works was ".....particularly struck with their system of brazing..... the method seems much cleaner than that adopted in most English factories; and, no doubt, the tubes are less weakened in the operation than they are by the ordinary English method". Cross-examined upon his return to Birmingham, it was put to him that the English market would never tolerate American designs: "No, that is a matter of taste purely; but America could easily make machines in accordance with English ideas, if necessary", and went on to say that American cycles were "....perfect in design, and quite as strong in all points as those of English make; though they may, in some cases, give one the idea of being out of date in appearance, merely because they differ in some respects to what fashion has here decreed to be the 'correct thing'". ".....from eighteen to twenty-one pounds are ordinary weights for road machines - I weighed several", said Renouf, "Moreover, they ride over roads that we should never attempt to pass in England".[1]
The Cycle Manufacturer, upon the occasion of the 1895 Stanley Show, opined that "The American machines are a decided advance on anything yet sent over the water", and pointed-out that they were lighter and cheaper, "....the prices £12, £15 to £21, are a bit

1. Ibid., 23 Nov. 1895, p.201. "There are few British designers" stated the Cycle Manufacturer, "whose opinions would be equal in value, in this connection, to those of Mr. Renouf". Ibid. Renouf, having recently left the works-managership of J. and H. Brookes of Birmingham, was then supervising the laying-out of a cycle-making plant for the Holford Engineering Works, also of Birmingham and of "gatling gun" fame. Ibid., 5 Oct. 1895, p.123.

lower than the list terms of our own first-class stuff".[1] In sum, this trade journal deemed the "continual bickering" between American and English cycle manufacturers and cyclists, over the quality of the product of the opposite number, as "puerile" because the English and American makers served different types of market. In the U.S.A., it reckoned, people only cycled when and where the roads were well-made, hence the American public desired and required only a light and relatively cheap machine; whereas in England people cycled all the year round on roads of varying surface quality, and such conditions of use required a sturdier and heavier machine.[2] Nonetheless, the Bar-Lock Typewriter Company Limited of London, who acted as general central agent for the American "Waverley" cycles in England, in early 1897 shipped back ten cases of parts for imported 1896 "Waverleys", because breakages, even in English riding conditions, were so few and hence repairs so few that so many spare parts were not needed. On the question of cycle quality, emulation may be taken as a form of flattery: in late 1895 it was reported that many British makers were introducing pedals based on the better American designs; and the Raleigh Cycle Company apparently deemed the American design of cycle sufficiently meritorious and marketable in England as to introduce at the 1895 National Cycle Show in London its own brands of American-type machine with American produced and designed fittings - a lady's weighing 26 pounds and a gents' roadster weighing 21½ pounds, both fitted with Fairbanks wood

1. Ibid., 30 Nov. 1895, p.222.
2. Ibid., 18 Jan. 1896, p.318.

rims and light saddle, and American Morgan and Wright tyres.[1]

What surprised the more perceptive British cycle manufacturers and engineers was the fact that a number of American cycle makers should entertain the policy of opening and cultivating an export trade in 1895 and early 1896, when the pressure of demand upon their products in their home market was tremendous: "The demand for bicycles at the present time in the United States is enormous, taxing to the utmost the combined capacity of the manufacturers".[2] This demand pressure evinced itself in terms of both American cycle prices and the inflow of firms into the industry.

1. Ibid., 15 Dec. 1895, pp.245-63; 28 Dec. 1895, p.292; and 13 March 1897, p.330. It may, at this juncture, be interesting to take a look at what American journalists thought of American cycle products and of British machines. Describing the works of the Eclipse Bicycle Company of Elmira, New York, the Scientific American was impressed by "....the close work, rigid inspection of all parts, the vast number of labour saving machines... the great skill and care, and the elaborate plant, required in the construction of the modern bicycle", and "...the distinguishing characteristics of the finished wheel at which the makers have aimed during the past few years are strength and durability". An American cycle trade journalist, E. D. Warner, viewed British machines as follows: "Weight in general is several pounds greater than in the States. A machine of 24lbs or under is the exception, and then is recommended for racing purposes only.....Occasionally one will see a net price of £12 or thereabouts, but such are offered mainly for competitive purposes. As a rule, such low-priced machines, in design, material and workmanship, will not equal an American machine retailing at 60 dollars (£12) cash. English cycles for the most part are well made, have fine bearings, and are durable. They are indeed good machines, and can be relied upon, but are heavy and higher in price when compared to the American machine in the essentials of graceful design and unnecessary weight". An American, writing from Melbourne in Australia, maintained that imported British cycles for ladies were "unsatisfactory", as they were too heavy and clumsy for the average lady cyclist. Their weight averaged about 36lbs. whereas American-made ladies' safeties weighed between 20 and 25lbs. Scientific American, 6 Nov. 1897, pp.292-3; and Cycle Manufacturer, 7 Sept. 1895, p.78; and 14 Sept. 1895, p.89.

2. Cycle Manufacturer, 8 June 1895, p.230.

It was noted on more than one occasion that American cycle retailers in 1895 were depleting the amount of covert price-cuts from catalogue list prices, and of discounts, given to customers to ensure purchases. ".....'list prices' this season represent something real and tangible, and are being adhered to by a vast majority of retailers with a strictness as new as it is pleasing".[1] The American manufacturers, it was observed, were, all-the-more, publishing net prices in their retail catalogues, and making sure that the associated system of resale price maintenance was being rigidly adhered to.[2] Ten large cycle producers, in fact, under the wing of the American Cycle Board of Trade - the main trade association - arranged an "ironclad" agreement during the winter of 1895/96 to maintain cycle prices at about $100 (far from a low level) at least for the 1896 season.[3] The all-time high demand of 1895, which "firmed-up" American cycle prices, also led to optimistic expectations of an even higher demand in the following season: the anticipation in the U.S. industry was that 1896 was going to be a "bonanza", and this attracted firms and entrepreneurs outside the industry to move in, and tempted existing cycle-making firms into expanding their capacities as fast as they could. "The maker, who is not to increase his capital and enlarge his factory, in anticipation of another season of phenomenal prosperity in '96, is a decided rarity".[4]

1. Ibid., 15 June 1895, p.247.
2. Ibid., 20 July 1895, p.310.
3. American Machinist, 18 June 1896, p.14.
4. Cycle Manufacturer, 27 July 1895, p.6. The American publication Wheelman estimated the output of American cycles at 400,000 in 1895 and made a forecast of 650,000 cycles for 1896. This latter figure was obtained by estimating the recently introduced extra capacity of firms already established in the cycle industry, and the capacities of firms newly entering the trade. Quoted in Cycle Manufacturer, 24 Aug. 1895, p.50.

The confidence that the American entrepreneurs evidently displayed as to their capacity to satisfy both actual and anticipated home orders, and a new line in overseas orders, contrasted with the feelings of British cycle makers that they were unable to meet the demands that the "bicycle boom" was putting upon them. To some extent there were problems of obtaining adequate supplies of the right kinds of labour at the right time. In 1895 Birmingham cycle makers found more difficulty than usual in getting their men back to work after the August weekly holiday. "There has been such an unusual amount of overtime work in the Birmingham factories of late that, perhaps, the men are hardly to be blamed for taking matters into their own hands, and insisting on a little extra holiday, though the makers, who have lately received good foreign orders, find no little inconvenience arising from their enforced idleness".[1] There were about 200 tin-plate workers making gear-cases in the Birmingham district in late February 1896, but the supply to the City's cycle trade was not readily expandable since, according to the Birmingham Society of Tinplate Workers, not one man employed in that craft - about 800 in total in Birmingham - was unemployed.[2] During the Spring of 1896, Bayliss, Thomas and Company Limited of Coventry found that it was not short of cycle tubing, but that labour was very difficult to obtain to the required extent.[3] Among the London cycle manufacturers, a shortage of skilled labour reached "famine" proportions.[4]

1. Ibid., 17 Aug. 1895, p.38.
2. Ibid., 7 March 1896, p.62.
3. Ibid., 25 April 1896, p.138.
4. Ibid., 9 May 1896, p.194.

Undoubtedly, craft labour did flow into the British cycle industry during the months of the "bicycle boom", but cycle-makers found that they had to compete with other industries for it by offering the payment of relatively high wages. The wages paid for foundry-men in the Midlands cycle industry drew brass-founding workers away from brass-founding, with the consequence that some brass founders experienced, in turn, a shortage of labour that disabled their capacity to fulfill all their contracts. In addition, the higher wages offered by the major cycle companies in Beeston and Coventry even managed to attract cutlers from Sheffield.[1] Despite the higher wages, nevertheless, there were mutterings that cycle trade workers were not satisfied with their lot during 1895-96, and that there was a nascent spirit of cycle trade-unionism developing among them.[2]

Problems of labour supply apart, the ultimate test of the inability of the U.K. cycle industry of 1895-96 to meet the demands made upon it, so readily and elastically as the Americans, was revealed when delivery dates were lengthened to unprecedented time - intervals and when the production of certain cycle models was suspended. In March 1896 the Trent Cycle Company Limited of Long Eaton - not, nationally speaking, the best-known of cycle enterprises - gave notice that due to the pressure of orders it was unable to despatch machines under three weeks of their receipt.[3] Not much more than a month later, J. K. Starley and Company Limited of Coventry ceased the manufacture of the "New Popular Rovers" and the "Royal Rovers"

1. Ibid., 16 May 1896, p.164; and 23 May 1896, p.172.

2. Ibid., 28 Sept. 1895, p.108. This implies that trade-unionism was hitherto weak in the industry, which, generally speaking, it was, although particular groups of workers were sometimes well-organised in local societies, since the techniques of production of cycles in the U.K. embraced many crafts.

3. Ibid., 4 April 1896, p.102.

because the demand for the firm's "best" machines was so great.[1] Soon after the Marriott Cycle Company announced it could not undertake to make delivery under six weeks; and the Premier Company of Coventry withdrew from making price quotations to agents, discontinued the manufacture of its "second-grade" "R" and "S" models, and declared that it could not deliver for certain all of its orders-on-hand under three months.[2] In Glasgow, the Victoria Manufacturing Company stated in May 1896 that it was unable to accept bicycle orders for delivery in under six weeks.[3]

The Impact Upon British Production Techniques.

It was in the 1895 and 1896 seasons, therefore, that hard-pressed British cycle engineers and entrepreneurs began to listen more attentively to the sales-talk of the representatives of those import houses that dealt in American machine-tools and American equipment, such as brazing hearths, jigs and swaging apparatus. Charles Churchill and Company was paramount in the 1890's among these import houses but there were others: in London, Burton, Griffiths and Company, Selig Sonnenthal, and Buck and Hickman; in Coventry, Alfred Herbert manufactured his own machine-tools but also served as agent for the Lodge and Davis Machine Tool Company of Cincinnatti; and in Birmingham, Schischkar and Company was established in December 1895 - a partnership between a former employee of Alfred Herbert's and a Mr. Tinsley Waterhouse, late of the Stockport Engine Company - to specialise in the import of

1. Ibid., 9 May 1896, p.152.
2. Ibid., 16 May 1896, p.162.
3. Ibid., 30 May 1896, p.188.

machine tools designed for the cycle trade.[1] It was also during the same "boom" years that British cycle engineers crossed the Atlantic to probe into the production systems of the American cycle manufacturers. P. L. Renouf, J. C. Stringer of Singer Cycle, G. P. Mills of Raleigh, Rucker of Humber, and Charles Sangster of Cycle Components, for certain, made the trip, and in so far as they commented upon the American production methods they were agreed on three aspects: that wherever possible the American manufacturers employed labour-saving, semi-automatic or automatic machinery; that the Americans geared their machine-tools, their manning arrangements, plant lay-outs and their small tool construction to high-speed operation; and that every mechanical operation, every physical movement by an operative and every small tool design was examined and assessed in detail with a view to more accurate and more economic production. Thus Charles Sangster could write: "In a visit to the United States, undertaken last autumn in the interests of the company I represent, my eyes were opened not only to the great benefit derived by the Americans who have invented and adopted labour-saving machinery, but to the advantages obtained by the general arrangements of their plants and study of detail in small tool construction. Their thorough system tends to increase production at the smallest cost, notwithstanding the fact that their wages per man are higher...."[2] P. L. Renouf also noticed the American emphasis

1. Ibid., 28 Dec. 1895, p. 293.
2. Ibid., 9 April 1898, p.156. The American detailed attention to every physical and mechanical motion was illustrated by reference to cycle wheel building in the Lozier Company's workshops. There, wheel assembling was done by quick boys standing at benches, and "extreme attention to detail-aids in quick handling prevails in the Lozier, as is evidenced by the nipple rack and spoke trays, so constructed and placed that a single nipple may be picked up with one motion from the rack, while a spoke tray stands on both the right and left sides of the workman, who assembles a wheel in an incredibly short space of time..." American Machinist, 9 July 1896, pp.7-10.

on high speed, large-scale production. He visited the Pratt and Whitney machine tool works and examined their hub-making machines, which he deemed "...ingenious and practical enough, but probably of little advantage except for the production of enormous quantities. A striking fact in connection with this firm, however, is that they make the special tools used by almost everyone of the larger American makers. They keep patterns of all tools used by their customers, and are always able to immediately execute orders for any particular tool. Thus the worry of tool-making is lifted from the shoulders of the cycle-maker, who can depend on obtaining any shape of tool as soon as it is required."[1]

Despite the recognition on the part of some that it was as much the productive system, as the specialised and advanced machine-tool technology, that accounted for the American vigour of 1895-96, British cycle manufacturers, on the whole, thought in terms of relaxing their conservative approach to American automatic machine tools in order to overcome the acute demand pressures facing them in 1895 and 1896. A major American cycle producer, A. H. Overman, employed assembly-line and "systematic production" techniques to turn-out his "Victor" cycles in 1895, but the British cycle manufacturers of 1895 took more notice of the American machine-tools partly because of the intense competition between American machine tool producers to devise as rapidly as possible improvements in specialised cycle-making machinery (and which were dutifully reported in the British cycle trade press as well as being fulsomely announced by the machine-tool agents and

1. Cycle Manufacturer, 23 Nov. 1895, p.201.

salesmen) - partly because the American machine-tool agents in the U.K. viewed their job, initially at any rate, as simply selling tools and not an accompanying productive system.[1] Unquestionably, during the years of the "bicycle boom", British cycle manufacturers bought - were indeed anxious to buy - American machine tools of advanced design and performance. There was some groaning in late 1895 when the British importers of American machinery were finding it difficult to obtain cycle-making plant from the U.S.A.: "The home demand for this class of stuff is so great just now in America", it was reported, "that the machine-tool makers there have perforce to let their foreign trade stand down".[2] But the difficulty was temporary. Humber Limited equipped its Moscow subsidiary in 1895 with machinery mostly purchased from the Garvin Machine Company of New York.[3] The machine shop of Messrs. Hand and Cake of Birmingham - makers of the "Bard" cycles - was in 1896 ".....lined each side with some of the best tools for the production of cycle parts which it has ever been our good fortune to inspect. Most of it is American, made by Messrs. Warner and Swaysey, Cleveland, Ohio, U.S.A., and, being automatic, one workman is able to attend to two or three machines instead of being confined just to one tool as in days gone by ..... The firm has spent over £3,000 on these tools, and we believe they will find in the long-run their money has been well spent".[4] Thirty chain-making machines from New York

1. R. A. Smith, op.cit., p.18; and Cycle Manufacturer, 5 June 1897, p.454; and 12 June 1897, p.463.

2. Cycle Manufacturer, 30 Nov. 1895, p. 205.

3. Ibid., 17 Aug. 1895, p. 40.

4. Ibid., 10 Oct. 1896, p.105.

equipped the new firm of the Simpson Lever Chain Company of Draycott, Derbyshire - one of E. T. Hooley's creations of 1896 - and Hans Renold's chain-making manufactory at Salford was reckoned to be largely comprised of American machine tools by 1897.[1] The Billings and Spencer Company of Hartford, Connecticutt, supplied the Cycle Components Company of Bournbrook with all the machinery for the latter's new drop-forging plant, installed in 1897; the new cycle firm of Accles Limited of Birmingham was equipped "almost exclusively" with American machine tools; and "The new shop of John Roper at Wolverhampton is a model of its kind, at least to American eyes. He makes bicycle parts and with rare exceptions his equipment is entirely American".[2] The trading year ending 30 September 1896 was the best ever for Charles Churchill and Company, whose business was "exclusively in American machinery and tools", turnover reaching £110,000 and largely attributable to the British cycle trade: "..... whereas in former years the trade consisted mostly of orders for single machines or at most a very few machines in any one shop, it now often takes the form of complete equipments for the production of a certain machine or article". In one case, for example, 50 automatic screw machines made by the Cleveland Machine Screw Company were ordered in one lot and destined for a single plant.[3] In December 1896 the Davis and Egan Machine Tool Company of Cincinnatti (formerly the Lodge and Davis Machine Tool Company), Pratt and Whitney, the Garvin Machine Company and other American tool builders exhibited

1. Ibid., 21 March 1896, p.85; and <u>American Machinist</u>, 17 June 1897, p.19.
2. <u>American Machinist</u>, 3 June 1897, pp.18-19; and 16 Sept. 1897, p.34.
3. Ibid., 22 Oct. 1896, p.15.

cycle-making machinery at the Crystal Palace Cycle Show in London. Upon his return to the U.S.A., Charles Davis reported the Show a "great success" for the American interests, large orders apparently being secured by all the American exhibitors; "The English makers were represented, but their orders were largely confined to tools that could not be quickly delivered by the American builders".[1] By the summer of 1897, it was reported that "very much American machinery" had been installed in Coventry's cycle factories.[2]

The British cycle manufacturing community looked to American cycle-making, machine-tool technology during the "bicycle boom" for its labour-saving element (both in terms of labour-time and labour-skills employed), and its high-output, accurate replication of standardised cycle components. But the process of absorbing the important elements in the new American technology was not always performed simply and straightforwardly and unquestioningly by relatively large-scale purchases of U.S.-made machine-tools. Many a British cycle manufacturer, while accepting the economic value of the American achievements, had his own ideas, his own special requirements and even, on occasion, his own doubts. Thus, for example, established British cycle-makers often purchased American-made tools but modified them in certain respects, or took certain design features of U.S. cycle-making machinery and built their own tools which incorporated such characteristics, or, thirdly, they

1. Ibid., 31 Dec. 1896, p.36.

2. Ibid., 10 June 1897, pp.17-18.

purchased cycle-making machinery from British machine-tool manufacturers who were emulating American machine-tool designs. Correspondingly, in written accounts of the contents of the machine-shops of a number of British makers, the machine-tool equipment was not entirely "American-made", but described as of "American type". When Charles R. Garrard departed from his management position in the Simpson Lever Chain Company Limited to set up his own cycle-chain and cycle component manufacturing enterprise in 1896 in Birmingham, the plant he installed consisted of American "Reed" lathes, Cincinnati Universal milling and grinding machines, hub-forming machines of "American type" but of Garrard's own design, and power presses which "....are of American make, modified to this Company's designs".[1] The machine-shop of Bradbury's of Oldham had in 1895 "Automatic lathes, with self-stopping gear, slide lathes on the American system, turret lathes, capstans, punching and pressing machines....."[2] At the Tower Works, Birmingham, of the Osmond Cycle Company: "In one shop are six long rows of automatic machinery, amongst which we noticed the most modern manufacture of the best English and American machine-tool firms. Automatic hub-forming machines, chain-wheel millers, and profiling machines are all to be seen here......"[3] And the automatic machine-tools possessed by the Coventry Cross Cycle Company Limited (lately Messrs. Warman and Hazlewood) were especially constructed to the firm's own designs.[4] Eventually nudged out of his original Raleigh

1. Cycle Manufacturer, 29 Aug. 1896, pp.53 and 56.
2. Ibid., 15 June 1895, p.250.
3. Cycling, 18 June 1898, p.542a.
4. Ibid., 27 Aug. 1898, p.131.

enterprise by Frank Bowden in 1894, R. M. Woodhead was in the following year appointed to the managing directorship of a new cycle-making firm located in Sandiacre, near Nottingham, and named the Springfield Cycle Company Limited. This he equipped almost entirely with machinery manufactured by Alfred Herbert, despite a recent return from a visit to the United States.[1]

The engineers of the Birmingham Small Arms Company were the epitome of those British cycle manufacturers who took note of the American successes in machine-tool automation, specialisation and in accurate performance; but nevertheless shopped-around among indigeneous and Continental machine-tool builders as well, or relied upon their own ingenuity, in expanding their cycle-making capacities and advancing the technical features embodied therein. As a producer of military rifles and shells, the Company for long had kept faith with the British machine-tool building firms of Archdale, Muir and John Holroyd, only beginning to look abroad - to Ludwig Loewe of Berlin - in 1893 when it wanted an expanded barrel-making plant.[2] During the course of 1895-97 B.S.A., now a major cycle component producer, extended its cycle plants very

1. Cycle Manufacturer, 9 Nov. 1895, p.172; and 16 Nov. 1895, p.184.

2. Loewe had on offer barrel-drilling and barrel-reamering machines, designed by Pratt and Whitney of New York in 1889, but now incorporating Loewe's own improvements. The Company bought ten of Loewe's drillers plus one reamering machine, but though the machines seemed to work well in Berlin, considerable difficulty with them was experienced at Small Heath. Some of the machines were practically remade by B.S.A. and a number of improvements were made to the drills. History of the Birmingham Small Arms Company Limited 1861-1900 (privately printed), vol. II, pp.545-7, and 554-7; and MSS.19A/7/TE/1, B.S.A. Limited. Machine Book (Modern Records Centre of the University of Warwick).

substantially, spending £56,000 on cycle-making machinery in the trading year 1896/97 alone.[1] The bulk of its orders, however, in terms of physical units of machinery, went to the British tool builders of John Holroyd of Manchester, Taylor and Challen of Birmingham, Archdale, Ward and Muir. B. S. A.'s cycle engineers turned to Holroyd when they demanded vertical milling machines, universal milling machines, facing machines, cross milling machines, automatic circular milling machines, small six-inch screw-cutting lathes, lapping machines and bench drilling machines - their largest order to Holroyd's was for 124 milling machines (valued at £4,419) on 7 July 1896.[2] Taylor and Challen during 1895-97 supplied automatic or semi-automatic cycle chain-making equipment in the form of self-feeding presses for chain link blanks, chain rivett holes and for chain central holes; otherwise this firm was relied upon for standard cutting-out power presses and double-action power presses, and for drawing presses for cycle head lugs. B.S.A.'s requirements in the way of hand-operated single-sided and double-sided presses, and fly presses were fulfilled by the firm of Sweeney and Blocksidge. Archdale remained very much in favour for a variety of machine-tools viz. cross milling machines, single and double-spindle profiling machines, centering machines, fly presses, slitting machines, circular milling machines, small screw-cutting lathes, copy milling machines, small capstan lathes, six inch automatic slide lathes, specialised bolt turning lathes, small seven-inch general purpose lathes, and mortice milling machines. To B.S.A., however, Archdale was a big

1. History of the Birmingham Small Arms Company Limited, op.cit., p.724.
2. Ibid., p.642.

supplier of cross and circular milling machines: 65 cross millers were delivered during the course of 1895 and 1896, and 42 circular millers. Like Archdale, Ward rendered to the Company a wide variety of machine tool equipment: polishing heads, facing machines, multi-spindle sensitive drilling machines, double-spindle nut tapping machines, headstocks and tail rests for lathes, cross milling machines, slotting machines, six inch centre lathes, lathe beds and columns fitted with slide rests or drilling heads, tapping machines, small capstan lathes, six inch screw-cutting lathes, and upright milling machines. But Ward's "forte", so far as B.S.A. was concerned, was in the area of sensitive drilling machines and attachments to lathes. Ward supplied 15 sensitive drilling machines, bearing from one to four spindles, in 1895; 34 in 1896; and 20 in 1897.[1] Muir, as in the cases of Archdale and Ward, was looked to by B.S.A. for a fairly wide range of standard equipment. Muir supplied the Company's cycle component plant with trimming presses, two-spindle profiling machines, five-and six-inch screw cutting lathes,

1. The firm of H. W. Ward and Company of Birmingham was a comparatively new concern and composed of men drawn mainly from Archdale and Company. In the view of F. J. Miller, who wrote for the American Machinist, "They have advanced ideas, a new shop and new tools, among them some of American origin, which, generally speaking, they do not think very highly of......It is evident from an inspection of what they are doing that they do not hesitate to adopt such American ideas as commend themselves to them; not in the sense of being mere copyists only, however, for they modify and adopt to suit their own market; especially making everything heavier", American Machinist, 3 June 1897, pp.18-19.

small capstan lathes, universal milling machines, and forging machinery.[1] When, in 1895, the B.S.A. Company began to entertain the utilisation of the very specialised, automatic machine-tools for cycle-parts production that characterised the American cycle industry, it turned not only to the American machine-tool builders- and their principal agent in the U.K., Charles Churchill - but also to Ludwig Loewe of Berlin, to the not-long established but progressive firm of Webster, Howarth and Bennett of Coventry, and to its own designing engineers. Through Churchill came light Barnes drilling machines, 65 Brainard Cross Milling machines, Cleveland Automatic Screw machines, Springfield Shaping machines, 18 Mossberg drilling machines, Ferracute power presses, Warner and Swasey "Monitor" lathes, Reed six-inch screw cutting lathes, 23

1. MSS 19A/7/TE/1, B.S.A. Limited. Machine Book op.cit.. The machine book is detailed enough in its contents to indicate when the Company stipulated special design requirements, or special attachments, with regard to the machinery it purchased from Archdale, Holroyd, Ward and Muir. Significantly such stipulations were very few in number: confined, more or less to Archdale when B.S.A. ordered in 1896 four special pattern milling machines, three of which equipped with universal headstocks and one with a special dividing apparatus. Otherwise, departures from the standard patterns of complete tools, as marketed by these firms, took the form of lathe beds and columns supplied to B.S.A. and upon which the company fitted assortments of headstocks, drilling heads, compound slides and longitudinal slides produced by the same concerns. Ward, in particular, received several of such orders in 1896 and 1897; but the point is that the "spin-offs", in terms of new designs and techniques, from B.S.A. to these machine-tool manufacturers cannot have been great. This runs counter to the proposition that the demands of the British cycle manufacturers during the 1890's directly lifted the level of technical sophistication espoused by the U.K.'s indigenous machine-tool industry. Generally speaking, that level may well have been lifted more through agency activities (Churchill for the Cleveland Screw Machine Company; Alfred Herbert for Lodge and Davis; Buck and Hickman for Pratt and Whitney etc.,), and through an entrepreneurial recognition that a substantial demand for automatic and semi-automatic machine tools had arisen - not through an inter-active process, i.e. the typical "British" approach to designing, between cycle manufacturing customers and British machine-tool suppliers. For an account of the "British" system of machine-tool designing and of its economic aspects, see R. Floud, The British Machine Tool Industry 1850-1914 (1976), p.57.

automatic ball-making machines, Hendry shaping machines, and Diamond grinders - all from the U.S.A. Just as American cycle manufacturers depended much upon automatic screw machines and Barnes drillers in their techniques of cycle component production, so much of what Churchill delivered to B.S.A. consisted of these two items: during 1895-97 the Company took receipt of 39 automatic screw machines and 39 light Barnes drillers. Some pieces of American machine-tool equipment were purchased directly, without Churchills' intermediation. An automatic chain rivetting machine was bought from the Waterburg Company in 1896 and another in 1897. Pratt and Whitney provided an automatic tapping machine for nuts in 1896, and two more came through their London agents, Messrs. Buck and Hickman, in 1897. Ludwig Loewe in Germany was sufficiently advanced in machine-tool technology and sufficiently aware of the specialised requirements of the cycle trade as to be able to supply B.S.A. in 1895-96 a fully-automatic machine for the production of nuts, two automatic machines for the manufacture of chain-rivetts, and automatic machinery for the production of screws, of cups for the bearings of bottom brackets, and of cones. By the August of 1896, unable to obtain sufficient quantities of steel balls from English manufacturers and detecting a falling-off in the quality of its imported German balls, B.S.A. turned to Ludwig Loewe for the provision of automatic machinery to build-up part of its own ball-making plant.[1] During the remaining months of the year, 18 of Loewe's Number 1 automatic machines for steel ball production went into B.S.A.'s

1. History of the Birmingham Small Arms Co. Ltd., op.cit., pp.648-50.

machine-shops, plus 12 of Loewe's Number 2 autos for steel balls. Substantial orders to Loewe ended in 1897 with one of 20 automatic nut-making machines. Machine-tools from Webster, Howarth and Bennett filled-out B.S.A.'s new ball-making plant when the Coventry firm supplied eight "Duplex" ball-grinding machines in 1896. B.S.A.'s engineers did not initially entertain the American "Cleveland" techniques of steel ball production because they reckoned that the construction of the small American auto-machines for ball making were "unsuitable to the B.S.A. methods of manufacture", and, in any case, were more expensive than the Berlin machines. In planning to extend its ball-making plant in May 1897, the Company correspondingly thought of ordering 24 autos from Ludwig Loewe once more, but a timely intervention by Charles Churchill in the following month led to a trial of another type of American auto-ball-making machine with the consequence that the order for 24 automatics went to the U.S.A.[1] It was in the manufacture of cycle chains, begun in March 1896, that B.S.A. utilised its own special "home produced" machine-tools. Taylor and Challen power presses were used to stamp out the side links and rivett holes, Loewe automatics produced the chain rivetts, American Waterburg machines automatically performed the rivetting, but the machining of the chain blocks was done by milling machines from Ward and Holroyd, converted and modified by B.S.A.'s engineers.[2] In 1897, in expanding its chain-making capacity, B.S.A. looked much more to its own design-

1. Ibid., pp.699-703. Lightness, small-size and fragility constituted objections that some British engineers held concerning American machine-tools during the 1890's.

2. Ibid., pp.629-632.

resources (even in the previous year it modified a Taylor and Challen chain side-link press, and then brought into use its own automatic pressing machine): 20 self-built, automatic drilling machines for chain blocks were installed, plus 25 auto-circular milling machines for chain blocks, 14 auto-circular milling machines for chain side links, three automatic assembling presses for chain blocks, and three automatic "drifting" presses for chain side link production - all constructed in B.S.A.'s own workshops.[1]

The tendency, among British cycle engineers during the years of the "bicycle boom", to be drawn to the automatic, specialised features of American cycle production techniques, but, nevertheless, to operate American tools according to the "British way of doing things" and to depend, still, much upon indigenous builders of machine tools, attracted criticism from American commentators. These discerned that the British practices of machine-tool operation led to output losses through a failure to achieve the maximum possible productivity gains. In so far as British cycle-makers, like B.S.A., bought lathes and lathe attachments from H. W. Ward and Company, they got something ".....generally more in accordance with the prevailing idea that a machine tool ought to work 30 to 50 years and still be good, to secure which they do in some cases I am convinced sacrifice something of these qualities of handiness and convenience which we pay so much attention to and generally consider of commanding importance".[2] "When it comes to automatic screw-machines, turret lathes etc., such as are used in bicycle manufacturing and to some extent in other lines here, it is quite certain they are far behind our own practice. Their toolmaking for such work is not generally good, there is a general lack of appreciation of such machinery, and it is usually not tuned up to anything like its proper pitch. An American friend of mine, who manufactures such machinery and whom I

1. This data is itemised in MSS 19A/7/TE/1, <u>B.S.A. Ltd. Machine Book</u>, op.cit..
2. F. J. Miller in <u>American Machinist</u>, 3 June 1897, pp.18-19.

accompanied on an expedition to see some of it working in bicycle factories, gave vent to his feelings when he remarked 'You see how it is, Miller; it's like putting a grand piano into a dwelling of a Hottentot'. I agreed with him, but, of course, there are exceptions to this, i.e. factories where they are doing very well.

"They very generally hesitate to use lard-oil for cutting steel, and depend upon soap suds or soda water, with the result that not nearly so much work can be gotten out of the tools. Lard oil costs more here than with us, but still it is demonstrated that its use here pays when proper means are taken to recover it from chips and work". In two Midland cycle factories visited, American machinery, it was reported, "....was found to be doing fairly well, but in both the speeds were slower than normal. And it is here certainly not a matter of harder stock, because American stock was being used".[1] But cautious and wayward with regard to machine-tool automation and operation as British cycle engineers perhaps were, there was little sign of outright labour and entrepreneurial opposition in the cycle trade to the American machine-tool technology that was reckoned to bedevil older sections of the British engineering industry. Given the American example

1. Ibid. The American cycle manufacturers' practice of running their machine tools at the highest possible speeds threw into high relief the question of cutting tool lubrication. The American cycle-makers gave it much thought, and in 1896 the American Machinist could report: "Nothing is more noticeable than the changes in ideas regarding lubrication, which have been brought about lately by the necessity of heavy cuts, fast feeds, and high speeds in metal working, entailed by the fierce competition for the lowest cost-price production". Instead of rudimentary and inaccurate methods of lubrication, ".....we now see elaborate and costly and highly ingenius oil-forcing and conveying appliances in use, which deliver heavy jets of oil as nearly as possible at the cutting edge of the tool". In order to facilitate production at a maximum speed, C. P. Ball, superintendent of the Lozier Company's Thompsonville screw-machine shops, introduced a system of central distribution of lubricating oil that pumped oil to every machine-tool in sufficient quantity. Ibid., 12 March 1896, p.4; and 2 April 1896, pp.4-6.

and the supply problems facing the British cycle industry in the 1890's, there was also the factor of the industry's comparative youth. American or "American-type" labour-saving machinery "......has been largely put into the bicycle factories here, and has worked well, because that is a new industry, and mostly new men have been put to work in it - men who have few or no preconceived ideas of what amount of work a machine ought to do nor how it ought to do it, but simply operated the machines as they were instructed. Hans Renold, the transmission chain manufacturer of Manchester, operates his factory on the American system almost completely, and uses American machinery largely. He has studied this problem deeply, and has experimented conscientiously. His conclusion is that either you must accept things as you find them and run your establishment in the old way, and as the others are run, or that you must discard it entirely, and train your own men in your own way. He has chosen the latter alternative, and has an admirably conducted establishment...."[1] It was none other than Herbert Austin of the Wolseley Sheep-Shearing Machine Company - a firm that had a brief tenure in the British cycle trade beginning in May 1897 - who chose to serve as a conservative spokesman with regard to automatic American machinery. He claimed to have a knowledge of the operation of Pratt and Whitney and Spencer automatics, and wrote: "There seems to be an idea among a section of the trade that you have only to get an automatic, push in the rod, and get a labourer or boy to wheel away the product of about a dozen machines; whereas, you require a good tool room at the back of them and good tool makers to keep them in order, and then at the finish you must be content with a much inferior article than that made on hand-operated turrets.....Again,

1. Ibid., 17 June 1897, p.19.

it is well known that hand-operated turrets can be, and usually are, worked quicker than automatic ones, although, of course, the latter can be kept more constantly at work".[1] There were many who disagreed, though. Good quality cycle components could be produced from automatics so long as the various parts of the machines, governing the automatic operations, were properly adjusted, and if the feeds were not too slow or too fast. Furthermore, more and better work could be made on automatic machines because the feeds were always regular with no jerks.[2] The principal requirement for the successful use of automatics was regularity in the shape and quality of the bars of steel stock.[3]

British Pre-eminence Lost In The World's Markets.

Despite the complacent anticipations of some U.K. manufacturers, based on the qualitative differences in American and British cycle designs; and despite the efforts of most to expand Britain's cycle-making capacity during the years of the "bicycle boom", through capital investment and the adoption of more rapid and labour-saving techniques of production, the "American Invasion" developed and continued in the latter half of the 1890's. Whereas U.S. domestic exports of cycles and parts amounted to $1,898,012 during 1895/6, in the following fiscal year, 1896/7, they increased by 269.1 per cent to $7,005,323, falling slightly to $6,846,529 in 1897/8. The U.K. was the main customer, taking 33.9 per cent of American cycle exports in 1896/7 and 27 per cent in 1897/8. Next came Germany with 14.6 and 25.2 per cent, respectively; then Canada (10.5 and 9.0 per cent),

1. Ibid., 3 March 1898, p.30.

2. Ibid., 31 March 1898, p.19.

3. Ibid., 23 Feb. 1899, p.29.

Australasia (9.9 and 4.5), and then France (3.7 and 7.0 per cent, respectively).[1] The British overseas trading accounts record imports of cycles and parts from the U.S.A. at £459,124 for 1897 and £543,625 for 1898, with imports from all countries totalling £527,413 in 1897 and £612,644 in 1898.[2] The American cycle industry had obviously become Britain's main competitor in its home market, though, on a much smaller scale, cycle imports from Germany, Holland and Belgium also increased over 1897-1898.[3] But this was not all. In 1896 the exports of cycles and parts from the U.K. stood at £1,855,604, but in 1897 fell back to £1,430,320 and in 1898 still more to £960,939: exports were falling but imports were rising. The German, French and Belgian cycle industries, moreover, were able to increase their cycle exports during 1896-1898 as Britain's were falling: German exports of cycles and parts rose from 7,924,000 marks (£396,200) in 1897 - when they were first separately itemised - to 15,177,000 marks (£758,850) in 1898. The French exported 8,371,216 francs (£334,849)

1. Calculated from The Foreign Commerce and Navigation of the United States, 1902/3 (Bureau of Statistics. Washington), vol. II, p.359.

2. Working from monthly U.S. foreign trade data, the Cycle Manufacturer calculated that imports into the U.K. of cycles and components from the U.S.A. amounted to £261,280 for the calendar year 1896. Cycle Manufacturer, 13 March 1897, p.331.

3. Annual Statements of Trade for the United Kingdom. Since Holland had no cycle manufacturing industry to speak of, the imports attributed to that country were probably German in origin. The German and Dutch contributions totalled £15,526 in 1897 and £25,718 in 1898. Imports from Belgium rose from £8,667 to £13,387 in 1898. During 1897 and 1898, however, France remained second to the U.S.A. in Britain's total cycle import bill, though her contribution fell in absolute terms from £39,531 in 1897 to £27,212 in 1898. Ibid.

of cycles and parts in 1896; 12,290,820 francs worth (£491,633) in 1897; and 12,483,760 francs (£499,350) in 1898. Belgium exported cycles and parts to a value of 1,674,000 francs (£66,960) in 1896 - the first year of separate itemisation - rising to 2,421,000 francs (£96,840) in 1897 and to 2,639,000 francs (£105,560) in 1898. The expansion of the U.K.'s cycle-making capacity and the adoption of labour-saving machinery not only failed to arrest an "American Invasion" of the British and overseas markets, but also failed to prevent a sharp downturn in the U.K.'s overall degree of international competitiveness. There were several factors contributing to this situation, not least of all the wilting of the American craze for bicycles during the summer of 1896 and beyond, while the "boom" in Britain and Continental European countries continued for approximately a year longer.

In mid-1896 it was noted that America's "high society", viz. the families of the New York based business elite, ever fickle, had turned to other sports and diversions and was depriving cycling of the attraction that came from being able to emulate the wealthy. One of these other fashionable diversions was the motor-car and, in the short-run, some American cycle manufacturers did the demand for their staple product a disservice by their interest in, and development of, the nascent automobile industry. Since 1893 the Pope Manufacturing Company had been experimenting with motor-vehicles, and in 1895 engaged Hiram Maxim to perfect a vehicle suitable for putting on the market.[1] Work on prototypes was begun in premises formerly used for Pope's seamless steel tube production -

1. Cycle Manufacturer, 26 Oct. 1895, pp.147-8.

this being moved to more spacious quarters - and the first Pope motor-cars for public consumption were introduced in June 1897.[1] Likewise, A. H. Overman, president of the Overman Wheel Company of Chicopee Falls, Mass., stimulated a public excitement for automobilism in November 1895, when he announced that his enterprise was intending to manufacture motor-carriages of his own invention "on a large scale".[2] Economic problems in the agricultural Western states re-emerged to affect cycle demand in the 1896 season. American cycle-makers complained that Western farmers were obliged to hold-on to the previous year's crops, rendering themselves short of cash for luxury purchases, and generating a financial stringency that affected those cycle-makers in the West who desired banking accommodations. The bankers would not lend money to entrepreneurs engaged in an almost new industry - whose stability had not been tested - when they were faced with familiar and urgent demands elsewhere.[3] From February and during the rest of 1896 the cycle trade in San Francisco was reckoned to be at a standstill.[4] Certainly, American cycle demand during the spring and summer of 1896 did not come up to the American makers' anticipations, as formulated towards the end of 1895, and some were bedevilled by excess capacity and stocks of complete cycles on their hands.[5] Those makers who desired to avoid, or escape from, this

1. Ibid., 9 Nov. 1895, p.168; and 19 June 1897, p.476.
2. Ibid., 30 Nov. 1895, p.205.
3. Ibid., 15 Aug. 1896, p.36.
4. Ibid., 29 Aug. 1896, p.52.
5. The Cycle Manufacturer maintained that, overall, the demand for cycles in the U.S.A. in 1896 was greater than that for 1895, but that the level of demand had not met potential supply to its fullest extent; particularly so with regard to "high-grade" machines as the demand principally had been for "medium-grade" cycles. Ibid., 18 July 1896, p.254.

unexpected situation emulated their brethren who, in the previous season, had established export agencies abroad, and those already in the cycle export trade redoubled their efforts to penetrate substantially markets overseas. Correspondingly, during the course of the latter half of 1896 and in 1897, some U.S. cycle entrepreneurs were either forced into leaving the industry or closed down their works temporarily, while others actually decided to expand their capacities to cater for overseas demands. Some American makers either slashed their retail prices or sent their cycles to the auction rooms, while others made more tactical price reductions, bearing in mind the still bouyant demand conditions prevailing in Britain and other cycle-consuming countries abroad. At the individual firm level, therefore, there was a variety of experience and pricing and output policy. In July 1896 there were reckoned to be 25 failures in the cycle trade in the U.S.A.; the Revere Wheel Company of Boston, the Greyhound Bicycle Manufacturing Company of Boston, and the Thistle Manufacturing Company of Chicago (makers of the "Thistle" cycles) went under during the following month; but simultaneously the Pope Manufacturing Company carried out extensions to its Hartford, Conn., works, and the Carnegie Steel Company of Pittsburgh decided to construct a plant for the manufacture of cycles on a large scale.[1] In September 1896, the Indiana Bicycle Company of Indianopolis (makers of the well-reputed "Waverley" cycles) decided to close its works for an indefinite period, blaming the uncertainty as to the course of future events caused by the "currency question", and putting 1,500 men out

1. Ibid., 29 Aug. 1896, pp.50-52. What became of Carnegie's decision in practical terms remains unclear.

of work. The works of the Ellwood Weldless Tube Company were temporarily closed down owing to a scarcity of orders and large stocks of tubing on hand. The Globe Cycle Works of Buffalo, New York; the firm of Messrs. O. J. Faxon and Company of Boston (whose "Puritan" cycles were handled in the U.K. by a Liverpool merchant house); the Oswego Tool Company of Oswego, New York (makers of the "Ontario" cycles); and the Elgin Sewing Machine and Bicycle Company of Elgin, Illinois, all failed.[1] In the following October, however, the Scott Paper Company of Philadelphia completed its first plant for the manufacture of cycles, the Shelby Steel Tube Company extended its capacity for the production of cold-drawn cycle tubes, and the works of the Waltham Cycle Manufacturing Company of Waltham, Mass., were expanded. Nevertheless, the Marion Cycle Company of Marion, Indiana, failed.[2]

Prices for American cycles tended to come down as the American makers began to worry about the prospect of under-capacity working in late 1896 and during the 1897 season. In June 1896 the Pope Manufacturing Company led the way by reducing the retail prices of its "Hartford" cycles (patterns 1 and 2) by \$20 per machine.[3] The Yost Company responded in the following month by cutting its cycle prices from \$100 to \$75 per machine.[4] For 1897 the retail prices of "Waverleys", as manufactured by the Indiana Bicycle Company were declared in October 1896 to be \$75 compared to the hitherto prevailing \$100.[5] Messrs. Gormully and

1. Ibid., 19 Sept. 1896, pp.76-7; and 26 Sept. 1896, p.90.
2. Ibid., 10 Oct. 1896, p.102.
3. Ibid., 20 June 1896, p.214.
4. Ibid., 11 July 1896, p.244.
5. Ibid., 31 Oct. 1896, p.127.

Jeffery waited until December 1896 before reducing the prices for their "Rambler" cycles from $100 to $80, and the home market prices for their "G and J" tyres by $3.[1] As to the type of cycle produced, there were reports that many American manufacturers were catering more extensively for the tastes of customers in British and some other European markets by fitting gearcases and mudguards - the Pope Manufacturing Company, for one, altered the pattern and construction of its "Columbias", prepared for the 1897 season, so as to appear more on British lines.[2]

The switch of a substantial portion of American cycle-making capacity to the supply of overseas markets was accompanied by a more rapid sprouting of American cycle agencies abroad during and after the summer of 1896. And the success of American entrepreneurs in combatting a sagging home demand, by turning to export sales, was noted very early-on in 1897, when reports reached England that many of the U.S. cycle works that had been standing idle over the previous few months were once more back in full operation - and despite an estimated carry-over of some 200,000 machines from the 1896 to the 1897 seasons.[3] The American vigour in establishing new overseas agencies was felt in London when the Monarch Cycle Manufacturing Company of Chicago opened-up a London office, simultaneously, in July 1896, with Messrs. Wolff and Company of New York (makers of the "Wolff-American" wheels) who established a London agency. Additionally, in that month, began a strident

1. Ibid., 12 Dec. 1896, pp.203 and 207.

2. Ibid.

3. Ibid., 2 Jan. 1897, p.232; and 6 Feb. 1897, p.281.

advertising campaign, conducted through the trade and national press, by the Fowler Cycle Manufacturing Company of Chicago: "The Fowler Facts" edited by "Uncle Thomas" warned the British cycling public against the danger of British manufacturers unfairly denouncing American-made machines as of poor quality.[1] Throughout the rest of 1896 and during the spring of 1897, Messrs. Wolff and Company were followed by the Ellwood Weldless Tube Company ("This seems to confirm suspicions that American tube capacity is greater than home demand"); by the Iver Johnson Arms and Cycle Works of Fitchburg, Mass.; by the Royal Cycle Works of Marshall, Michigan; by the Syracuse Cycle Company of Syracuse, New York; by the Overman Wheel Company of Chicopee Falls; and by George N. Pierce and Company of Buffalo, New York.[2] A similar vigour in establishing retail outlets, on the part of American cycle manufacturers, was also experienced in Australia, South Africa, Germany and France. By October 1896 Messrs. E. C. Stearns and Company of Syracuse, New York, for example, had fixed-up agencies for their "Yellow Fellow" cycles in Sydney, Melbourne and Adelaide.[3] At the start of 1897 the Pope Manufacturing Company had just established agencies in Durban and Port Elizabeth, South Africa.[4] Less than two months later, the New York Standard Watch Company appointed Arnd and Filuis of Frankfurt-am-Main as agents for its

1. Ibid., 18 July 1896, p.252.
2. Ibid., 8 Aug. 1896, p.30; 15 Aug. 1896, p.32; 10 Oct. 1896, p.101; and 21 Nov. 1896, p.158.
3. Ibid., 3 Oct. 1896, p.92.
4. Ibid., 26 Dec. 1896, p.227.

"Standard" cyclometers for Germany, Switzerland and Russia.[1]

So long as excess demand conditions prevailed in the home and in Empire markets, the reaction of British cycle-making entrepreneurs to the "American Invasion" was unremarkable, though the journalists of the trade press pointed to factors that made the "Invasion" all the more a possibility and a success. The larger of the British manufacturers continued to wallow indulgently in the production of their best-quality and highest-priced machines, given the strength of the home demand for them, and neglect or suspend the production of the cheaper "second-grade" article.[2] Arthur du Cros, who had so much influence in the British cycle trade, roundly declared in 1897: "Speaking as an old and expert bicycle rider, I do not think that our high class makers need fear the American machines. My experience is that people are particularly anxious to be up to date in the matters of their cycles. They insist upon having the very best article there is in the market. Their machines must be as good as anybody else's, and better than most. What else is it that makes tens of thousands buy new machines at the commencement of every season.....It is like the fashions. You may take it from me that people will buy the very latest and best".[3]

1. Ibid., 13 Feb. 1897, p.290.

2. Ibid., 15 June 1895, p.242; and 24 April 1897, p.392. Perhaps the most extraordinary instance of the British entrepreneur's predilection for "top quality" at this time was the product-policy of Humber (America) Limited. The Company's objective was to supply a traditionally-made, British-type cycle to the American market at a price of at least $110. At the beginning of 1896 300 men were employed at its Westborough, Mass. factory: "Not an automatic machine is in use in the factory; every part is made by hand so as to get exact gauge, and the workmen are all employed by the day, and not by the piece, so as to get good work, rather than much work". Ibid., 18 Jan. 1896, p.321.

3. Alfred Lowe, History and Antiquities of the City of Coventry, 1897-98, p.84.

Likewise, Edward Mushing of the Centaur Cycle Company - whose views were said to be a "fair sample" of Coventry makers' opinions - stated that the boom of 1896-7 had thrown "....something in the foreigners' way because people would take machines from wherever they could get them. But the Society demand has been for first-class bicycles, and wealthy persons would not look at German or American, or indeed English machines, which were not of excellent quality".[1] There were signs, even, that some of the leading entrepreneurs in the British industry were taking a more relaxed attitude towards their roles in their businesses - under the impression that the British cycle industry was now clearly a well-established and thoroughly profitable industry that required little more than simple managerial guidance. J. K. Starley of Rover took time-off to involve himself in the movement of General Booth and his Salvation Army. The substantial grounds of his Kenilworth home became occasional garrisons for the troops, and Starley himself wrote evangelical literature and even produced a special Bible. His cousin, William Starley of the Starley and Westwood Manufacturing Company, and Martin D. Rucker, managing director of the Humber Company, turned to stock market speculation - Rucker in conjunction with E. T. Hooley - and the

1. Ibid., 1896-8, p.85. The concentration upon the production of "high quality" cycles during the "bicycle boom" does not infer that the British entrepreneurs were, economically, behaving "irrationally". On the criterion laid down by D. N. McCloskey and L. C. Sandberg, with regard to the measurement of "entrepreneurial efficiency", the pursuit of any other policy may have involved a diminution of profits, and hence Mushing and his compatriots were, in the short-run, performing efficiently. Where, on the grounds of "inefficiency", the British cycle manufacturers can be criticised is their widespread failure to recognise that the fashionable demand for "high quality" cycles might suddenly evaporate and leave them high-and-dry without clearly thought out alternative policies. The exception being Rudge-Whitworth, which maintained the production of "high quality" cycles during the "boom", but realised its emphemeral nature and prepared alternative production and pricing policies accordingly. For McCloskey and Sandberg's criterion see their article "From Dammation to Redemption: Judgements on the late Victorian Entrepreneur", Explorations in Economic History, vol. 9, Fall, 1971.

acquisition of the perquisites of wealthy gentlemen.[1] In 1895 local politics began to claim the attention of Walter Phillips of Humber, Arthur du Cros, and Thomas Bayliss of Bayliss, Thomas and Company Limited. Coventry's municipal elections in the November of that year returned Phillips and du Cros as Conservative councillors for the Gosford Street ward, and T. Bayliss as unopposed Liberal for the Whitefrairs ward.[2] It was also in 1895 that Frank Bowden of Raleigh, out of an alleged concern for the state of his health, consigned the day-to-day leadership of his company to D. W. Bassett who was drawn from the Beeston works of Humber Limited.[3] Rucker, in order to make time for his other concerns, similarly delegated his daily managerial duties to H. Belcher, who in 1896 had the task of directing the fortunes of Humber Limited's Wolverhampton and Beeston works, while the Company's Coventry works were left under the control of Walter Phillips.[4] Whereas some British cycle manufacturers had a proclivity to rest on their laurels in 1896 and 1897, the Americans were selling hard. Within the context of his own home market, Albert Pope of the Pope Manufacturing

1. The bankruptcy of M. D. Rucker in 1905 revealed that he received a total fortune of £458,641 in his transactions with E. T. Hooley. In 1896 he purchased The Woodlands in Surrey for £45,000 and spent £50,356 on buildings for the property. Whereupon he became an owner, breeder and dealer in racehorses, and Master of the West Surrey Staghounds. To supplement his racehorse interest, he also purchased Slyfield Farm and Sefton Lodge near Newmarket. Times, 9 Aug. 1905, p.13.

2. Cycle Manufacturer, 9 Nov. 1895, p. 174.

3. Bassett was designated as "general manager". Ibid., 15 Feb. 1896, p.39.

4. Ibid., 7 March 1896, p.68. In 1897 George Singer, also now active in local politics, consigned the "general managership" of his firm to an employee of long-standing, Walter Hewitt.

Company had early in his cycle manufacturing career realised the effectiveness of well-organised, brash and colourful marketing techniques. He was also the first American maker to sell his cycles through a national network of independent agencies at a fixed net cash price regardless of freight costs.[1] P. L. Renouf, on his visit to Pope's in 1895, observed that, in contrast to British organisations, "Here, as in all American cycle factories of any importance, there is a separate advertising department, where all papers, in which the Company advertises, are kept, and whence the matter for each new advertisement is issued by a special clerk, retained for the purpose".[2] The emphasis on effective marketing, which involved novel gimmickry, colourful presentation of the product, a discernment of where new consumer demand was to be found, a splash of gaudy wall-posters, and repetitive doggerel, had become a characteristic of the American cycle industry in the 1890's; and this manner of arousing public interest accompanied the "American Invasion".

While the "boom" lasted, the British approach to cycle marketing was, by comparison,

1. R. A. Smith, op.cit., pp.9-10. Interestingly enough, from 1887 Pope's head salesman was not a man of unique social background or training. He was Herbert W. Gaskell, an Englishman, a noted cycle-racer, and a graduate of Liverpool College. For the previous six years, Gaskell had been employed by the Coventry Machinists' Company, and for the last three of them as manager of the Company's American depot. He was given the responsibility of Pope's selling department at the young age of 27. <u>The Cyclist</u>, vol. 8, No. 391, 13 April 1887, p.635.

2. <u>Cycle Manufacturer</u>, 23 Nov. 1895, p.201.

flaccid. "When we take-up the average English (price) list, and compare it with the average American production, we almost feel ashamed for our country, seeing what a very poor show she makes beside America, both in the artistic properties of her cycle manufacturers' catalogues and in their descriptive properties".[1] American price lists had a "....chatty, business-like style.... going fully into the excellencies and special points of his wares, and yet does it in such a nice, unconventional style as to make the reading of his list a perfect pleasure". British catalogues, on the other hand, had "....the tersest possible details in a little paragraph, crowded, as often as not, under a more-or-less badly-executed block of a bicycle that would do duty (and for that matter frequently does) for any grade or make of machine". The British produced cycle illustrations using wooden-blocks, whereas American reproductions came from "process-blocks" made directly from photographs of machines or parts, and correspondingly giving an accurate portrayal of the commodity being sold - "The wood block is as defunct as the Dodo in America".[2] It was noted, too, that compared to the American cycles, dull presentation characterised the actual British machine. American labelling and colouring were certainly eye-catching: "In one point the American machines differ from ours, the makers take good care to label them in so striking a manner that there is no mistaking them.... With the small, and almost obscure transfers on most English machines it is hard, save in cases like the Referee head, where there is a

1. Ibid., 13 Feb. 1897, p.289.

2. Ibid.

distinctive feature, to know what the machine is without close scrutiny. In America cycle and tyre makers have something to catch the eye in either label or colour of rim, or even valve, so that one easily identifies a passing machine".[1] The American makers also attracted the attention of the passer-by through stunt-riding by clowning cyclists; and through the construction of "cycle monstrosities", gaudily decorated with slogans and the manufacturer's name, and capable of bearing up to six cyclists pedalling furiously and noisily.[2] They also realised that in Britain, as in the U.S.A., the average cyclist was not a technocratic enthusiast but a person who rode for health and pleasure. The Pope Manufacturing Company's policy was to try to expand the number of cyclists by an appeal to those who had never cycled before - "All out-doors is yours" was its advertising slogan - while the British jammed their advertisements with technical jargon unintelligible to the layman or learner.[3] Once the "American Invasion" (and the development of the Continental cycle industries) provided a basis for comparisons, British marketing techniques came under criticism in other respects. Despite the employment of home and foreign travelling staffs by the larger of the British firms - the personnel often being drawn from the cycle-racing fraternity, for instance, Frank Shorland of Humber and then Raleigh - overseas customers were treated with some lack of concern and even truculence.

1. Ibid., 30 Nov. 1895, p.222.
2. Ibid., 6 Feb. 1897, p.279.
3. Ibid., 27 July 1895, p.4.

The Americans, in their efforts to sell in the U.K., were willing to adjust their cycle designs and add fittings to suit the British public's taste; but when the Canadians demanded cycles free of gearcases and other weighty accessories, the British makers were unresponsive. They conceived a cycle as incomplete without a gearcase, mudguards and a tool bag, and would not market them without. Despite tariff arrangements in their favour the British consequently lost the Canadian market almost entirely to the Americans. In the fiscal year ending June 30, 1892, Canada imported £31,804 of cycles and parts from Great Britain and £5,538 from the U.S.A., but in 1896/7 £5,226 of British cycles entered the Dominion compared to £146,562 from the U.S.A.[1] A report, especially commissioned by the <u>Cycle Manufacturer</u>, on the Japanese market noted that the American cycle makers practically had a monopoly foothold in that country, due partly to the much greater speed with which American cycles were delivered to customers - located mainly in the treaty ports - compared with English machines. "American manufacturers, moreover, seem to lay themselves out to cater for the trade in Japan in a way that our makers do not seem to care to do. Reliable agents are appointed, and machines are sent to them on consignment, and as the agents are able to gauge the trade there almost to a nicety, these machines are very seldom returned".[2] British selling organisation was reckoned to be faulty in Europe, too. When German cycle agents attempted business with the British, wrote the British Consul at Stettin, they were referred to a central agency in

1. Canadian importers of cycles claimed that import duties fell more heavily on U.S. than on British cycles, because in the former case the duties were levied, percentagewise, on the list prices, and in the latter on the (lower) invoice prices. Ibid., 27 July, 1895, p.2; 19 Dec. 1896, p.209; and 28 May 1898, p.239.

2. Ibid., 19 Sept. 1896, p.75.

Berlin which demanded a high commission on an already high-priced machine, and, furthermore, the British makers objected to making trifling alterations in their cycles to suit the tastes of German customers.[1]

Distinctive marketing techniques apart, there was another aspect to British cycle production which contemporary commentators found wanting during the mid-1890's, namely, the construction of cycles for juveniles. Trade journalists noted that, in the years of the "bicycle boom", not only did the adult members of "Society" take to the wheel, but their children did also, yet no sizeable British manufacturer recognised this juvenile market unless in receipt of a special order. And then the attitude adopted was that this was a one-off job to be highly-priced accordingly. A number of American cycle manufacturers, in contrast, were organised to produce juvenile bicycles in quantity and in anticipation of demand, which they found to be surprisingly bouyant both at home and abroad. The sizeable Monarch Cycle Manufacturing Company of Chicago produced about 10,000 24 and 26 inch framed bicycles in 1896 which satisfied only about 35 per cent of the orders received for that class of machine. The Western Wheel Works, another substantial U.S. manufacturer, had "....a fine line for the children, with diamond frame, 20 inch wheels and weighing 16lbs".[2] But the causal role played by American juvenile cycles in the success of the "American Invasion" remains an imponderable since neither British nor foreign accountants of overseas trade distinguished them from adult-sized machines. Equally, because of its essentially non-quantitative

1. Ibid., 7 May 1898, pp.197-8.
2. Ibid., 23 Nov. 1895, p. 191.

nature, the contribution of the panache of American selling techniques to the quantities of American cycles exported, in the second-half of the nineties, can be assessed only in the terms of a probable positive factor. The weight of journalistic evidence, on the other hand, points to two principal factors which made the large-scale American penetration of British cycle markets possible in 1896-1898. Contrary to what most British cycle manufacturers believed as being the most important and sometimes the overriding demand conditions among their actual and potential customers, there was a sizeable sector of cycle demand that was as much price as "top quality" conscious. Secondly, until the demise of the British "bicycle boom" in mid-1897, the British cycle-making industry had not the capacity to fulfil home and overseas demands without delay, whereas, since the summer of 1896, the American industry had the requisite capacity and could supply without delay.

The Retreat Of The "American Invasion".

A decline in the demand for pedal cycles began and continued almost unabated in the U.S.A. throughout the last three years of the 1890's and well into the 1900's. "By 1900 the bicycle was maribund......The expanding interurban railway system delivered people to rural areas with less effort than cycling and required no special costume for participation. Also, high society, ever fickle, had turned to other sports and thus deprived cycling of the attraction that comes from being able to emulate the wealthy".[1] What was more, the motor-car had arrived as a practical vehicle for the utilitarian and recreation activities of the American adult.[2] Only after 1904 were there indications that domestic American consumption of cycles and parts was on the increase once more; "There no longer seems room for reasonable doubt but that the year 1905 is to mark the long-prophesised turn of the tide", remarked a British cycle trade journal, but consumption values never achieved the levels of the 1890's. (see Table 12).[3] At the turn of the century the principal reactions of the American makers were to sustain the policy of export drives to overseas markets, to attempt to diversify into motor-vehicle manufacturing, to cultivate a market for a chainless bicycle, and - for 44 member-firms of the American cycle industry - to do these things in the form of a combination, the so-called American Bicycle Trust. The 44 producers combined in May 1899 to form the American

1. Robert A. Smith, A Social History of the Bicycle. Its Early Life and Times in America, pp.242-3.
2. Ibid.
3. The Cycle and Motor Trade's Review, 11 May 1905, p.449.

TABLE 12

Estimates of the Domestic Consumption of Bicycles and Parts in the U.S.A.[1]

Year	value of Consumption ($)
1898	26,350,000
1899	28,615,000
1904	4,107,000
1909	5,559,000
1914	9,159,000

(Sources: see footnote)

1. Total Value Product as given in the U.S. Census of Manufactures plus imports minus exports. Shaw's calendar year figures were used for the export data except for 1914, for which the official fiscal year figure for 1913/14 was used. For Shaw's calendar year estimates see William H. Shaw, Value of Commodity Output Since 1869 (1947), p.283.

Bicycle Company with a capital of 40 million dollars; and included the Pope Manufacturing Company, the Acme Company of Reading Pa., Gormully and Jeffery, the Lozier Company, the Columbus Cycle Company of Ohio, and the Syracuse Company of New York. "It is the intention of the combination to pay special attention to foreign markets, it being frankly acknowledged that the productive capacity of the country is more than equal to all the demands of the American people".[1] Albert Pope elaborated upon this principal policy while in Philadelphia at a commercial congress in connection with the 1899 National Export Exposition. "Until 1896 we handled our export business incidentally in connection with domestic trade; now we have a department with full paraphernalia for export business and facilities for translating or transcribing in several languages, and our product has been described in handsome catalogues printed in French, Spanish, German, Danish and Dutch, with smaller catalogues and price lists in other languages. ...... The formation of the American Bicycle Company will, we believe, be a material benefit in both our domestic and foreign trade. We own, or control the use of about a thousand patents, and we have for the management of this industry the combined capital and ability of the forty-four leading concerns which united to form it. .... The price of material has greatly advanced during the past year, but still, with the saving in running expenses and otherwise, which our combination will probably effect (if not this year, at least in following years) we expect to be able to do our business successfully without increasing the price of bicycles. Of course, during the first year of the American Bicycle Company's career the full benefit of the union will not be available, but when we get the new

1. John B. Rae, American Automobile Manufacturers (1959), p.11; and Engineering, 26 May 1899, p.685, and 13 Oct. 1899, p.464.

organisation so perfected in detail that our various plants can be assigned fewer models, the smaller ones making probably only one, we can bring out a product cheaper and better. .... The combined output of the concerns forming the American Bicycle Company, for the past year, was over 800,000 machines. With everything in running order, and each plant running in conjunction with the whole, instead of in opposition to others, our production can be increased materially and, we believe, marketed. We feel sure, therefore, that we can meet the open competition of the world, so that it will be for the advantage of foreign buyers to purchase bicycles".[1]

But the "special attention" to exporting, while it seemed to pay-off during 1896/7 and possibly 1897/8, failed to sustain full-capacity working in the American cycle industry during the subsequent fiscal year and into the early 1900's. In addition, it raised a clamour for increased tariff protection on the part of Continental European cycle manufacturing interests. A French Parliamentary Committee examined the issue of American cycle imports in 1898; and a German cycle manufacturers' association petitioned the Imperial Parliament and the Federal Council, pleading for increased import duties as a help against the sale of cheap imported American machines, in early 1899.[2] Both the French and German makers were unsuccessful - a commission of the German Parliament arguing that the German trade was as prosperous as most and in need of no further support - but the

1. The Cycle Trader, 10 Nov. 1899, extra supplement, p.2.

2. Ibid., 8 March 1899, p.432; and 7 June 1899, p.450. Cycle Manufacturer, 12 March 1898, p.98.

U.S. domestic exports of cycles and parts fell from $6,846,529 for 1897/8 to $2,515,804 in 1900/1, rose slightly in 1901/2, and then dropped annually to a low point of $620,760 in 1909/10 (see Table 13). One of the main elements in this failure to maintain a successful export performance was the collapse of the "bicycle boom" in European markets in the second-half of 1897, obliterating the excess cycle demand abroad that the Americans could easily fill. Some American makers turned to willy-nilly "dumping" to off-load their cycle stocks. "Nearly all the (American) machines that have been sold at very low prices came from concerns in financial difficulties" claimed the Cycle Manufacturer in 1898, "or the machines are composed of parts made up in the cheapest possible manner for the express purpose of catering for the low-priced trade".[1] And this served to tarnish the cycling public's image of American-made machines whether good, qualitatively, or bad.[2] Furthermore, the advanced technology surrounding American cycle production was more fully transferred - instead of being partly transferred as in the mid-1890's - by the early 1900's,

1. Cycle Manufacturer, 23 April 1898, p.171.
2. Birmingham Daily Post, 23 Dec. 1898, p.5.

TABLE 13

The Exports of Pedal Cycles, parts and accessories by the United Kingdom, the U.S.A., France, Belgium and Germany
1897 - 1913

Year	United Kingdom £	U.S.A. £ (= $5)	France £ (=25 fr)	Belgium £ (≡ 25 fr)	Germany £(= 20 RM)
1897	1,430,320	1,401,065	491.633	96,840	396,200
1898	960,939	1,369,306	499,350	105,560	758,850
1899	665,366	1,150,776	475,991	128,680	585,500
1900	530,590	710,630	307,708	89,000	564,300
1901	577,412	503,161	236,081	58,010	604,100
1902	717,123	525,514	182,286	57,028	785,050
1903	849,281	426,526	237,522	44,087	927,850
1904	739,971	393,005	264,209	44,020	1,005,600
1905	945,490	275,286	294,062	48,654	1,389,650
1906	1,140,235	274,153	296,596	43,374	2,479,250
1907	1,288,044	236,583	265,351	24,133	3,388,550
1908	1,418,999	159,255	261,844	23,860	2,825,150
1909	1,637,870	144,779	365,562	21,168	3,004,350
1910	1,957,287	124,152	318,024	22,488	3;628,500
1911	2,024,199	176,660	286,052	25,655	4,075,050
1912	2,058,817	225,345	292,096	18,496	1,282,250
1913	2,087,198	141,887	333,536	15,862	1,189,450

(Sources: U.K. Trade and Navigation Accounts; U.S. Bureau of Statistics, The Foreign Commerce and Navigation of the United States, 1896/7 - 1912/13; Statistches Bundesamt of Wiesbaden, Federal Republic of Germany; U.K. Statistical Abstract for the Principal and Other Foreign Countries 1901-12 (Cd. 7525), 1914, p.134; Statistik des Deutschen Reichs - Band 317, Der Auswartige Handel Deutschlands in den Jahren 1923 und 1924 verglichen mit den Jahren 1913 und 1922 (Berlin 1925); Direction Générale des Douanes, Tableau Général du Commerce et de la Navigation (Paris), 1897-1913; and Le Ministre des Finances, Tableau Général du Commerce avec les Pays Etrangers (Brussels), 1897-1913. The French statistics include motor-cycle exports during 1898-1900, as do the Belgian figures for 1897-1900, and the American figures prior to 1912/13. The last, of course, refer to fiscal years. The German data for 1906-1911 has to be regarded with great circumspection, since classification changes made in 1906 led to the inclusion of parts of land vehicles other than those relating to pedal cycles. These were separated out beginning in 1912).

to the British and Continental European manufacturers. The American manufacturers were hence gradually deprived of the absolute trading advantages they once possessed. This factor adversely affected the extent to which American producers of cycles could adjust their unit prices to meet competitively the lower unit prices as charged by the European manufacturers; and as part-and-parcel of the depletion of their absolute trading advantages, the Americans were affected increasingly, in their pricing policies, by the higher rates of wages they were obliged to pay.[1] Additionally, the Americans were not helped during 1899-1904, in this respect, by the rapidly declining home demand for cycles, for this led to a decline in average firm and plant size with a corresponding loss in the available economies of scale.[2] It was true that during 1904-1914, the average size of cycle firms in the U.S.A. increased beyond the 1899 figure, and that by 1914 the six largest firms produced 69 per cent of the industry's total value product, and two of these employed over 1,000 wage-earners and 40 per cent of the total labour force. Before the outbreak of the First World War, a conjuncture of economic circumstances had been building-up within the American cycle industry, since 1904,

1. Assuming that 52 weeks were worked in a year and that £1 ≡ $5, male American cycle workers, aged 16 and over, earned an average of 45.8 shillings per week in 1904; female workers aged 16 and over earned 38.2 shillings; and juveniles under 16 earned 16.4 shillings. In the last week of September 1906 British cycle workers earned:- men aged 20 years and over, 34/8d; women 18 years and over, 13/8d; boys, 10/9d; and girls, 9/6d. In 1904 the American trade employed only 7 women and 14 juveniles. U.S. Census of Manufactures, 1905; and Board of Trade, Earnings and Hours of Labour of Workpeople of the United Kingdom, vol. V1, (Cmd.5814) 1911, p.X1V.

2. That economies of scale existed in the American cycle industry may be inferred from the following table (based on data in the 1914 Census of Manufactures):

Size of motor-cycle and cycle making establishments according to value of product (dollars)	average value added by manufacture per wage-earner (dollars)
less than 20,000	1,500
20,000 - 100,000	1,301
100,000 - 1 million	1,324
1 million and over	1,890

which should have placed it in an improved internationally competitive position once more. There was increased concentration leading to larger plant size. There were economies of scale to be exploited, and home consumption of cycles and parts began to increase. Throughout the 1899-1914 period unit costs of production maintained a falling trend, and gross output per man in the American motor-cycle and cycle trade probably stood higher than the British: it was £310 in 1904 and £482 in 1909, compared to £229 per capita in the U.K. motor and cycle trades of 1907, and to £198 for F. Hopper and Company Limited of Barton-on-Humber, Lincs. in 1912.[1] But the U.S. exports of cycles and parts only increased from their nadir of $620,760 in 1909/10 (probably including a small proportion of motor-cycle exports) to $709,436 in 1912/13 (excluding motor-cycle exports), and falling away again to $608,031 in 1913/14.[2]

The failure of the period of minor structural and home market recovery in the U.S. cycle industry to rebound on the level of U.S. pedal cycle exports lay partly in the types of cycle design which the American makers were increasingly adopting. By the 1910's a large proportion of American cycle demand came from juveniles and correspondingly American cycles were constructed as semi-toys: the pseudo-motor cycle design was popular, the pedal cycle incorporating a dummy petrol tank, long-horn-type handlebars,

1. Hopper's employed 800 workpeople in that year and exported approximately half of its total output of complete pedal cycles and cycle frames plus a small quantity of motor-cycles. The data for the calculation of gross outputs has been derived from U.S. Census of Manufactures, 1905 and 1910; the U.K. Census of Production 1907; and the business records of the Elswick-Hopper Cycle and Motor Company Limited.

2. The Foreign Commerce and Navigation of the United States op.cit.

supplementary curved tubes, a big saddle and fat tyres.[1] This was alright for the youthful consumers in the American suburbs but not for the utilitarian, touring and racing adult cyclists in Britain and its Empire, and in Continental Europe. The design of the chainless bicycle, incorporating bevel gearing and shaft drive, and from 1899 produced within the combination of the American Bicycle Company, manifestly failed to revive domestic U.S. cycle consumption or promote a successful long-term upswing in American cycle exports - as smart a piece of engineering as it was. The chainless bicycle was fundamentally a novelty (it offered no remarkable advantages over the usual type of chain-driven cycle) and a relatively expensive one at that.

Also expensive in the event were the experiments with motor-cars and motor-car production, which the entrepreneurs within the combination turned towards to utilise the massive amounts of spare capacity steadily being yielded by the declines in cycle demand. Albert Pope essentially visualised the American Bicycle trust as a rationalisation measure to promote greater export <u>and</u> home sales of pedal cycles through the lower prices stemming from economies in production costs. Correspondingly, cycle production was concentrated in the largest and best-equipped plants, such as those of the Pope Manufacturing Company, the Lozier Manufacturing Company, the Indianopolis Chain and Stamping Company, (for chains), the Western Wheel Works, the Gormully and Jeffery Manufacturing Company, A. Featherstone and Company and the Monarch Cycle Manufacturing Company. The smaller plants of the Stearns, Tribune, Imperial, Barnes, Stormer, Phoenix and Envoy companies

1. The Motor Cycle and Cycle Trader, vol. LXXIV, No. 1011, 22 May 1914, pp.475-6.

were closed down. But the failure of the trust to secure increased domestic sales undermined Pope's ambition to exploit the best sales techniques possible and to cater for the special requirements of particular export markets. The emphasis within the Bicycle Company swung away from effective marketing policies towards a desperate attempt to secure the full-capacity working of at least some plants with the intention of minimising unit costs of production.[1] Already overloaded from the beginning with capital liabilities, the heavy development and production expenditure caused by diversification into motor-cars, led the combination to default on its gold bonds, and the American Bicycle Company went into liquidation in September 1902 with only six of the original 35 plants in operation.[2] The number of factories producing bicycles fell from an estimated 700 in 1897, to 328 in 1899 (counting the plants of the American Bicycle Company separately). 101 cycle and component makers remained operating in the U.S.A. in 1904, and 78 in 1914.

1. The Cycle Trader, 7 Sept. 1900, p.456; and Robert A. Smith, pp.242-3, op.cit.

2. Times, 22 Sept. 1902, p.3.

The Demise Of The "Boom" And Its Effects.

Within the United Kingdom cycle agents detected that "Society" and its emulators were rapidly losing their interest in cycling during the season of 1897, and in the month of June of that year it was being said that the "bicycle boom" was drawing to an end. The British manufacturers soon felt the impact; for instance, on July 20, 1897 the manager of B.S.A's cycle component department cancelled the night-shift in all sections, except pedals and cranks, in consequence of "a great falling off in demand", and a week or so later the pedal and crank sections were, in turn, similarly affected.[1] Rudge-Whitworth was the first leading British cycle enterprise to react to the changed market situation: it abandoned the list-price system still pervasive among British cycle manufacturers and adopted the net cash pricing policy as pioneered in the U.S.A. by Pope. The list-price of its "Special" cycle went from £30 to a net cash price of 16 guineas, and its "Standard" cycle from a listed £20 to a net cash price of 12 guineas.[2] Rudge-Whitworth's reaction was quick, occurring as it did in July 1897, because Charles and John Vernon Pugh, the brothers who ran the firm, had for long recognised the transient nature of the "bicycle boom" in contrast to most of their British cycle-making compatriots, who saw it as the start of everlasting prosperity.[3] Furthermore, the Vernon Pugh's recognised that the profits

1. History of the Birmingham Small Arms Co. Ltd. 1861-1900, vol. 2, p.709.
2. Rudge Record, vol. III, No. 17, June 1916, p.75.
3. and which explains the heavily inflated capital liabilities of the new joint-stock cycle companies floated in 1896-97.

history of Rudge-Whitworth had been comparatively poor since the formation of the firm in November 1894 - consequent upon difficulties that arose with attempts to obtain a unity in working from two plants, one in Birmingham and the other in Coventry. They were anxious, therefore, to embark upon a price and output policy as soon as possible, which they conceived as being the most profitable in the long-run, given the changed demand conditions. Such an anxiety was all the more understandable in the light of Pope's announcement of price-cuts during the week ending 3 July. The Pope Manufacturing Company reduced the net cash prices of its 1897 pattern "Columbias" from $100 to $75 (£20 to £15); its 1896 pattern "Columbias" from $75 to $60 (£15 to £12); its 1897 "Hartfords" from $60 to $50 (£12 to £10); its "Hartford Pattern One's" from $50 to $40 (£10 to £8); and its "Hartford Patterns 5 and 6's" from $45 to $30 (£9 to £6).[1]

Despite the quick reaction of Rudge-Whitworth to the demise of the "boom" - a reaction which was decidedly unpopular in the trade - no other leading British complete cycle maker followed suit until ten months later when the Rover Company put its "popular-priced" 12 guinea "Meteor" on the market.[2] B.S.A., however, was in advance of Rover when it made a general reduction in the prices of its components and fittings on 1 March 1898 - an aid to the "small" assembler in the changed conditions.[3] During the remainder of 1898

1. Economist, 3 July 1897, pp.952-3; and Scientific American, 22 May 1897, p.336, and 7 Aug. 1897, p.96.

2. Cycle Manufacturer, 21 May 1898, p.227.

3. History of the Birmingham Small Arms Co. Ltd. 1861-1900, vol. 2, p.743.

many of the other major companies introduced their special cheap machines, though some were disinclined to acknowledge their parentage of the new cheap cycles by not placing upon them their conventional, but individually distinctive, brand names and transfers.[1] Then, in November, Rudge-Whitworth cut its prices again, taking its "Standard" cycle from 12 to 10 guineas, and its "Special" from 16 to 15 guineas, and initiated another spasm of price-cutting.[2] In May 1904 Swift Cycle introduced an 8 guinea machine, and Rudge-Whitworth a £6.15s. cycle in 1905 and a £5.15s. machine in 1908.[3] After some initial hesitation on the part of many manufacturers, the trend of British complete cycle prices during 1898-1914 was firmly set in decline (see Table 14).

The production of "popular-priced" cycles, however, did not open up opportunities for greater exporting by the British makers in order to compensate for downward movements in home demand - not, at any rate, until after 1900. In the depressed aftermath of the "bicycle boom", the German, the French and the Belgian cycle industries (as well as the American) looked to exporting to relieve declines in home demand, with some partial success. The values of German and French exports of cycles and parts increased in 1897 and 1898, though fell away in the years following. The values of

1. This practice died out in 1900. Coventry Herald, 7 July, 1900.
2. Cycle Manufacturer, 26 November 1898, p.233.
3. Coventry Herald, 13 May 1904; The Cyclist's Trade Review, 17 Nov. 1904; and Rudge Record, vol. 1, No. 4, Sept. 1908, p.50.

TABLE 14

The Average F.O.B. price of completed cycles exported from the United Kingdom, 1905-1914.

Year	av. price (£)
1905	6.45
1906	5.46
1907	4.97
1908	4.65
1909	4.40
1910	4.20
1911	4.10
1912	4.25
1913	4.13
1914	4.10

(Source: U.K. Trade and Navigation Accounts. Calculated from the export volumes and values, the former not being itemised prior to 1905).

Belgian exports increased from 1896 to reach 3,217,000 francs in 1899 and then declined thereafter. The British cycle industry experienced sharp declines in total export values in 1897 and which continued until 1901.[1] On the assumption that the U.K., the U.S.A., Germany, France and Belgium contained the totality of the world's cycle producing capacity, and that all cycle industries were eager to export after the demise of the boom, it appeared that Britain's share of the value of total world exports - already down to 37.7 per cent in 1897 - fell to 23.6 per cent in 1899, while the German, French and Belgian industries experienced increasing shares over 1897-1899 of 10.4 to 20.8 per cent, 12.9 to 16.9 per cent, and 2.5 to 4.6 per cent, respectively. The American share of world exports stood at 36.4 per cent in 1897 (very close to the British), 37.9 per cent in 1898 (exceeding the British), and 34.2 per cent in 1899 (again exceeding the British). The second-half of 1897 and the years of 1898 and 1899 and 1900 were hence grim years for the British cycle industry in terms of product price levels, the level of home demand, net profits earned, and the ability to export. Some cycle-makers and trade observers saw gloom all-round. One manager of an (unnamed) large Coventry firm declared in 1900:

"At present competition is to see who shall sell the most machines at a loss, not who shall sell the most at a profit. The mistake has been in the old firms, which had a good reputation for high class machines, being so unwise as to lose that reputation by making cheap machines......... I would rather sell 10,000 cycles and get

1. See supra. pp.129-30.

£25,000 profit on them, than sell 20,000 and get the same profit....... the loss of the foreign trade is altogether uncalled for. Not even the angels from Heaven could have averted what has happened. The foreign trade - at least the Continental trade - has gone, never to come back in any quantity. At the present time it is not worth a consideration".[1] At the Leipzig Cycle Show of 1899 it was observed that "Some-thing startling in complete cycles was not to be seen, but the progress made (in Germany) in finishing a machine smartly is remarkable. The fittings and little odds and ends on all machines showed that no effort was spared by the manufacturers to bring their goods up to the highest standard of perfection and equalling all English and American competitors. In former years the complaint was often heard that German cycles could not be compared with English makes on account of the latter's exacter workmanship and superior technical details, but this illusion now falls to the ground, as the German makers supply an equal quantity, and, perhaps, at a slightly cheaper price. The machines, and everything belonging thereto, proved that American tools and automatic machines are extensively used in German factories, and with the best results with regard to quality and sale price. ....Of the English makers only Garrard and Co., were directly represented. They had a very smart show, quite in accordance with their excellent goods and world-wide reputation. Many other English and American goods were to be seen, but they were all in the hands of agents, who sometimes sold them as German makes. It is a pity that English manufacturers do not show more enterprise and regain a market they once possessed, and which they only lost through neglect and ignorance".[2] A local newspaper took

1. Coventry Herald, 24 Aug. 1900.

2. The Cycle Trader, 3 Nov. 1899, p.232.

note that the quantity of rail despatches of complete cycles from Coventry was much lower, during the final two years of the nineties, compared with 1896. The number of such cycles passing through the Midland Company station it recorded at 22,800 for 1895, 40,000 for 1896, 21,000 for 1897, and 22,000 for 1899. The London and North-Western station at Coventry was reckoned to have despatched 28,800 cycles in 1895, 63,000 in 1896, 56,000 in 1897, 35,000 in 1898, and 38,960 in 1899.[1] And all the "reputable" financial journalists wagged knowing fingers at the profits declarations of most of the sizeable cycle companies (Table 15). With few exceptions, profits were under a downward pressure and dividend declarations were low or zero. By 1899 both the important firms of Humber Limited and Raleigh Cycle were under extensive financial reconstruction, and ...."the vast majority, judged by the ordinary business standard", opined The Economist "have nothing before them but reconstruction or bankruptcy".[2]

Matters were not helped, especially with reference to the capacity to export, by outbreaks of labour troubles and strikes, which afflicted Dunlop's Coventry works and the Nottinghamshire cycle-makers - especially Raleigh and Humber - during the autumn of 1897; nor by the clamour for tariff protection against American imports raised by the German and French cycle-makers in 1898-1900. Attempts to find quick-yielding, profitable avenues of escape through collusive arrangements and diversification into motor-car and motor-

1. Coventry Herald, 29 Dec. 1899.

2. Economist, 10 Dec. 1898, pp.1760-1.

TABLE 15

The Profits declared by certain cycle companies during the trading years ending in 1898, 1899 and 1900 (dividends on ordinary shares given in brackets)

Company	1898 £	1899 £	1900 £
New Premier Cycle, (after depreciation and debenture interest)	49,752 (5%)	15,131 (0%)	- 3,264 (0%)
Raglan Cycle, (after depreciation and debenture interest)	15,521 (6%)	3,020 (5%)	4,703 (3%)
Enfield Cycle, (after depreciation)	9,490 (10%)	8,657 (10%)	7,583 (5%)
Rudge-Whitworth (after depreciation and debenture interest)	21,223 (10%)	20,673 (10%)	17,614 (10%)
New Hudson Cycle (after depreciation)	4,190 -	- 660 -	6,012 -
Triumph Cycle (after depreciation)	3,522 (0%)	343 (0%)	7,502 (0%)
Brampton Brothers (after depreciation)	14,027 (5%)	- 366 (0%)	2,274 (0%)
Birmingham Small Arms (after depreciation and debenture interest)	60,192 (20%)	56,431 (20%)	58,158 (20%)
Perry (after depreciation and debenture Interest)	41,415 (5%)	39,665 (5%)	36,266 (5%)
Abingdon Works (after depreciation)	10,400 (15%)	5,029 (10%)	3,634 (6%)
Swift Cycle	33,946 (4%)	24,999 (2½%)	17,894 (0%)
Centaur Cycle	18,259 (7½%)	2,440 (0%)	- 2,767 (0%)
Humber Limited (after depreciation)	20,126 (0%)	-12,504 (0%)	8,337 (0%)
Dunlop Pneumatic Tyre	433,916 (5%)**	289,987* (0%)**	279,451 (0%)**

* annual figure based on 18 month's trading

** dividends on deferred ordinary shares

(Sources: various newspaper and trade press reports) cycle manufacture proved abortive, or not deemed, upon reflection, worthwhile. Rudge-Whitworth refused to co-operate in the first overt more towards collusion of February 1900, by which manufacturers hoped to increase prices to compensate for higher raw material costs.[1] In the following October, upon the initiative of Joseph Lucas and Sons Limited, an Association of Cycle Accessory Manufacturers was formed, and at a meeting held in Birmingham, the new Association organised a three-man committee to consult with the leading manufacturers of proprietory articles about a scheme to eliminate the price-cutting trend. A conference in Birmingham of 18 leading component and accessory manufacturers soon followed - convened by the committee of three - at which it was found that all manufacturers were in favour of a price-limiting policy, but when it came to the point of organising combined action, to prevent retailers from cutting from makers' list prices, "The prevalent feeling was that on such an important question of business policy it would be better to encourage individual action".[2] Many a cycle, and cycle component and accessory manufacturer, was a member of the Cycle Trade Association - an almost dormant organisation, hardly active apart from the settlement of bankrupt cycle traders' and manufacturers' estates - but in the autumn of 1900, H. Wallis of the Birmingham Small Arms Company (and a committee member of the C.T.A), for one, was quoted as saying: "I am not prepared to take a leading part in trying to galvanise the Association into life".[3] It was in the British seamless steel tube trade that individualism was less rampant and a quasi-monopolistic organisation was formed; aided, no

1. The Engineer, 26 Jan. 1900, p.94; and Coventry Herald, 23 Feb. 1900.
2. The Cycle Trader, 5 Oct. 1900, pp.633-4; and 19 Oct. 1900, p.88.
3. Ibid., 5 Oct. 1900, p. 650.

doubt, by a homogeneity in the types of standard product, and, initially, by a different policy objective. In March 1897, while conditions in the tube markets were comparatively calm, the New Credenda Tube Company, the Star Tube Company, the Climax Weldless Tube Company, and the St. Helens' Tube and Metal Company Limited announced an intention to merge themselves into a market-dominating combine called Weldless Tubes Limited with a nominal capital of £1 million. Its stance was that of an amalgamation determined to draw monopoly profits from a thriving cycle trade, but the termination of the "bicycle boom", the threat of large-scale imports of American seamless steel tubes, and the failure of Weldless Tubes Limited (later renamed Tubes Limited) to embrace <u>all</u> British tube producers inevitably led to market conditions and entrepreneurial postures similar to those pervading the complete cycle trade. By July 1897 Black Country tube drawers, under pressure from strong American competition, had raised their discounts from 50 to 72½ per cent, and in the September a meeting was held in Birmingham attended by "almost 90 per cent of the English traders" to consider the formulation of a scheme to amalgamate all the cycle tube manufacturers in the world, and "improve the state of the Trade" by a regulation of output. Another meeting of cycle tube drawers in September established an agency to fix uniform discounts from list prices: buyers who signed an agreement with the central agency obtaining better discounts than those who did not. Fifteen British tube manufacturers agreed to market their products under the terms of the Cycle Tube Agency, and negotiations were set in progress with American and German manufacturers to obtain their support, but, significantly, Tubes Limited, the Perfecta Seamless Steel Tube Company, the Mannesmann Company, the Cycle Components Tube Company and nine other smaller enterprises refused to co-operate. The firms involved with the Agency, although a majority in number "....aggregate considerably less than half the producing capacity of the firms remaining outside, and the latter, therefore, are perhaps not unjustified in regarding the action of the Cycle Tube Agency as akin to the effort of the tail to wag the dog". There was some feeling among the well-established tube drawers that their freedom of commercial action would be restricted to the benefit of unstable and newly-arrived "promoters' companies"; and the larger of the companies had businesses in other descriptions of tube than that employed for cycle-making, prices in this department being correspondingly less important to them than to those whose productions pertained almost wholly to the cycle branch. In 1898 the Cycle Tube Agency scheme of price regulation collapsed through the failure to secure full co-operation; and an attempt in the summer of 1899 by a group of tube producers to form an agreed scheme of pricing, which would eliminate "ruinous" price competition and fix trade discounts at 75 per cent, came to naught when Tubes Limited refused to participate.[1] The

1. Cycle Manufacturer, 20 March 1897, p.346; 17 July, 1897, p.513; 4 Sept. 1897, pp.69-70; 18 Sept. 1897, p.94; 16 Oct. 1897, p.151; 30 Oct. 1897, p.167; and 6 Nov. 1897, pp.177-8. The Cycle Trader, 1 Sept. 1899, p.408. Attempts to regulate the seamless steel tube trade internationally resolved themselves in the formation of Tubes (America) Limited, promoted in 1897 by William T. Smedley, a Birmingham accountant. His scheme was to purchase the Ellwood Tube Works of Pennsylvania, the Granville Tube Company in the same State, and the American Weldless Steel Tube works of Toledo, and to associate their commercial operations with those of Tubes Limited. In 1898 his plans fell through on two counts: firstly, his £205,163 flotation of Tubes (America) Limited was a failure with insufficient moneys subscribed; and, secondly, American seamless steel tube manufacturers arranged their own monopolistic combination, comprising three-quarters of the American industry's capacity and named the Shelby Tube Company. It embraced the Shelby Steel Tube Company of Ohio, the Ellwood Weldless Tube Company and the Granville Tube Company of Pennsylvania, and the American Weldless Tube Company and the Brewer Tube Company, both of Toledo. Later, in June 1898, the new American combination bought out the tube-drawing department of the Mansfield Machine Works of Mansfield, Ohio. Cycle Manufacturer, 26 June 1897, p.489; 24 July 1897, p.7; 18 Dec. 1897, p.262; 5 March 1898, p.9; and 25 June 1898, p.295.

high development expenditures and the comparatively rapid rate of design change in the field of motor-cars and motor-cycles either bankrupted or repelled the entrepreneurs of cycle firms already in a parlous financial position. The Progress Cycle Company Limited of Coventry began motor-car manufacture with $3\frac{1}{2}$ h.p. De Dion engines in 1899 and ended-up bankrupt in 1903.[1] Allard and Company, at their Earlsdon, Coventry, works began experiments with internal combustion engines in 1899, produced 4 h.p. and $2\frac{3}{4}$ h.p. cars and motor-cycles in 1900, but abandoned their "Allard" motor-car production in 1906.[2] During 1899-1900, in fact, there was something of a rush on the part of pedal cycle and component makers to join the nascent British motor-trade. And the French De Dion type of engine unit was popular. Edward Lisle of the Star Cycle Company Limited introduced a motor-car with a Benz engine and motor-tricycles with De Dion engines in the Spring of 1899.[3] He was followed by the Singer Cycle Company of Coventry with its motor-tricycle; by the Bard Cycle Company of Birmingham, in the September, with its De Dion-engined motor-tricycle; by the Eadie Manufacturing Company of Redditch, in the October (prepared to supply to the trade motor axles, balance gears and bridges - "the most costly and important components necessary to the construction of a motor vehicle"); by the Riley Cycle Company; by the Birmingham Small Arms Company with its "R and V Petro-Car", built according

1. K. Richardson, <u>Twentieth-Century Coventry</u> (1972), pp.346-9.
2. Ibid.
3. <u>The Cycle Trader</u>, 26 April 1899, p.180.

to the designs of Messrs. Roots and Venables of London, S.E.; by the Swift Company's motor-cycles, introduced in the November; and by the De Dion powered motor-bicycles, motor-tricycles and motor-quadricycles of the Enfield and Cycle Components companies. In 1900 John Marston Limited of Wolverhampton brought out its first own design 4h.p. "Sunbeam" motor-car; and in the same year Alldays and Onions Pneumatic Engineering Company Limited of Birmingham moved into motor-car production.[1] However, whenever cycle firms entertained motor-vehicle manufacture in the late nineties and early 1900's, production and marketing conditions were found to be difficult - and invariably expensive and often unprofitable. As early as December 1900, Fred Warwick, chairman of Cycle Components, asserted that in the motor-car field the firm had produced "....some very satisfactory articles, but unfortunately there was not much money in them at present".[2] The New Centaur Cycle Company in Coventry found that attempts to enter motor-car manufacturing during 1900-1 were productive of losses; the manufacture of motor-tricycles did not save the Bard Cycle Manufacturing Company from a winding-up in 1902; and during 1901-2 Bayliss, Thomas and Company made a poor profit despite a "successful" cycle selling season, because of the development and advertising expenditures

1. Ibid., 22 Sept. 1899, p.542; 13 Oct. 1899, pp.60, 64 and 74-6; 3 Nov. 1899, p.256; 17 Nov. 1899, pp.386 and 392; 21 Sept. 1900, p.572; 9 Nov. 1900, p.220; and 23 Nov. 1900, p.388.

2. Ibid., 7 Dec. 1900, p.512. It finally abandoned motor manufacture in 1906 because of the losses it incurred. Coventry Standard, 4 May 1906, p.8.

incurred in moving over to motor-cycle manufacture.[1] In 1903 Edward Powell of Humber and Company attributed the poor profit performance of the enterprise "almost entirely to motor-car manufacturing losses"; and for 1904-5 the Singer Cycle Company reported a poor aggregate profitability due principally to the expenses incurred in developing its motor-car business. The disappointing returns experienced by the Enfield Cycle Company from its entry into motor-car production led the firm to hive-off its new department to a separate joint-stock company, the Enfield Autocar Company, floated in March 1906, and destined to eke out a desultory commercial existence until wound-up in 1908.[2] Rudge-Whitworth was careful not to involve itself with the motor-trade until much later-on in the 1900's beginning with motor-cycles in 1911; and J. K. Starley of the Rover Company, although following the developments in the motor-trade closely, regarded a direct entry into motor-car production too risky in 1900 while the technical development of the final vehicle was in such an early stage, precluding quantity production.[3] For most firms in the British cycle industry, therefore, the trading years spanning the late nineties and early 1900's were a commercial agony - with the notable exception of Rudge-Whitworth whose annual ten per cent ordinary share dividends became the talk of the trade - when export values fell, when overseas cycle producers were in a predatory competitive mood, when home and overseas demand

1. Coventry Standard, 22 Nov. 1901, p.2; 17 Oct. 1902, p.3; and 9 Jan. 1903, p.8.
2. Ibid., 6 Nov. 1903, p.5; and 23 Dec. 1905, p.3. B.S.A.'s first ambitions to enter the motor-vehicle manufacturing industry were brought to an end by the outbreak of the Boer War. From April 1899, "as a preliminary experiment", B.S.A. built the engines to fit into Roots and Venables' car bodies and planned to market the finished product. But in February 1900 further orders for motor engines from Roots and Venables were declined since both the fitting-shop and the tool room were "...so fully employed an important Government rifle work". Significantly, however, the Company did not restore its interest in internal combustion engines until August 1907 when, in some haste, it decided to manufacture "Itala"-pattern motor-cars ready for the 1908 season. History of the Birmingham Small Arms Company Limited 1861-1900, vol. 2, pp.792-3 and 826; and MSS. 19A/1/1/2, IV, Business Records of the B.S.A. Co. Ltd.
3. Coventry Standard, 11 Oct. 1901, p.6. Starley nevertheless sought the permission of his shareholders to set some capital by, year-by-year, so that his Rover Company could enter the motor-car trade when manufacturing and selling conditions were deemed more satisfactory. Ibid.

conditions were rapidly changing, and when ostensibly profitable escape routes were absent.

Technical And Commercial Thrusts Forward In The British Industry.

Yet such tribulations established a number of economic and social dynamics in the British industry which, in the long-term, acted much to its advantage. There was, first of all, a growing realisation that the change in demand conditions in 1897 was irreversible; that the "Society" demand for cycles and its corollary, "high price" and "high quality", had gone for good; and that cycle makers must henceforward seek for the demand of the masses by marketing reliable bicycles at lower prices and on attractive terms. The masses, by and large, were not avid long-distance cycle tourists who required everything in the way of cycling equipment, perfection in the running of their machines, and membership of the Cyclists' Touring Club that provided the facilities and aids for those who spent long holidays awheel. Membership of the Cyclists' Touring Club rose rapidly from 14,166 in 1894, to 16,343 in 1895, 34,655 in 1896, 44,491 in 1897, 54,332 in 1898 and to 60,449 in 1899. Thereafter, until after the First World War, the annual number of members went into decline (Table 16). The enthusiastic tourists of the 1880's and 1890's were drawn-off gradually by the attractions of motorised vehicles as the new century progressed. "Members who were at one time famous for their cycling exploits were gradually influenced by the ever-increasing desire for mechanical assistance and resultant speed. Motor-cycles and motor-cars both commanded special attention at the Shows and evidence was not wanting that amongst a certain class the love of the bicycle was being displaced

TABLE 16

Annual Membership of the Cyclists' Touring Club, 1900-1914.

Year	Number of members
1900	56,147
1901	51,339
1902	45,207
1903	42,141
1904	38,487
1905	35,786
1906	32,443
1907	27,617
1908	23,496
1909	19,642
1910	18,227
1911	17,688
1912	16,550
1913	15,474
1914	14,569

(Source: James T. Lightwood, The Cyclists' Touring Club. Being the Romance of Fifty Years' Cycling, p.274.)

by the attractions of the new mode of progress".[1] One (unnamed) manager of a Coventry factory seemed to have a prescient inkling of this in 1900: "It is the ten-guinea machine that will sell, and the large number of higher priced machines turned out at the present time by so many cycle firms will not have a good market...... There is scarcely room for more than one class of high-priced bicycle in it. Soon for many firms the eighteen and twenty guinea machine will be a vision of the past - it will have to be so, if they are to continue to pay their way. At the present time the sale of the high-price machines represents about 20 per cent of the whole turnover in the cycle trade. This is rapidly decreasing, and will continue to decrease".[2] A rather rosy report of 1899 maintained that "....English made machines are now for the first time able to compete more satisfactorily in the matter of price with those manufactured in other countries. Cycles, at once reliable and of finished workmanship, are now being turned out in large quantities at prices which place them within the reach of an increasing number of people, and while manufacturers pay the same attention to the public requirements as they have shown themselves anxious to do the last twelve months they need have little fear of foreign competition on their own ground though the rivalry among themselves may possibly become more acute".[3] On the issue of acute rivalry, the report had an important point: in a context in which it

1. James T. Lightwood, The Cyclists' Touring Club. Being the Romance of Fifty Years' Cycling (1928), p.84. The reaction of some of the Club members was to advocate the admission of motorised tourists. A proposal on these lines was defeated on a postal vote in 1903, and an attempt to change the Club's Memorandum of Association so as to permit the admission of motorists was quashed by the judiciary in 1906. Ibid., pp.85-88.
2. Coventry Herald, 24 Aug. 1900.
3. Ibid., 15 July 1899.

was perceived that lower cycle prices in general meant a larger overall demand in terms of the number of cycles sold, any single cycle manufacturer might seek a competitive edge by means of a price-cut. Not surprisingly, therefore, the British cycle industry became an intensely competitive industry during the 1900's and 1910's, whether there was a threat of foreign competition or not.[1] As part-and-parcel of this manufacturers were under pressure, whether stemming from the actions of others or self-generated, to cut profit-margins to a bare minimum, and so the enterprises in the U.K. industry were rarely outstandingly profitable for long. And collusive pricing arrangements remained impossible to implement successfully: in 1910 the company secretary of the Premier Cycle Company spent much time and effort organising a collective move to raise bicycle prices, but his arrangement, so carefully worked-out, was in the event broken by most manufacturers except Premier.[2] There were, nonetheless, "laggards" in the British cycle industry at the turn of the century; entrepreneurs in sizeable firms who tried to stand by a "high price", "high quality" policy. George Singer of Coventry's Singer Cycle Company was one. He approached the "slump" in the cycle trade with "extreme caution", refused to market a cheap machine for many years (until the poor profits and losses earned by his firm became finally untenable), and "firmly adhered to

1. A good example of a firm being dynamised into action by another firm in search of a "competitive edge"was provided in 1904. The appearance of Swift Cycle's 8 guinea machine at the height of the 1904 cycle season depressed Humber Limited's cycle sales from its Coventry and Beeston works so much that reorganisation of the company's various departments was deemed necessary. At the invitation of his director-colleagues, E. Powell, Humber's chairman, accepted the post of managing director to carry-out the reorganisation, and one of his first moves was to cut the prices of the cycles produced from the Beeston works in order to expand their output and take advantage of the lower prices for materials and labour then prevailing. <u>Times</u>, 11 Nov. 1904, p.12.

2. <u>Coventry Standard</u>, 9 Sept. 1910, p.2.

the belief that so long as they provided the best article, for which they had for so long made a name, the public would be ready to pay for it".[1] Premier Cycle resisted the trend until restive shareholders secured a change in policy in 1902/3. Bayliss-Thomas, Centaur Cycle, the Coventry Cross Company and Progress Cycle held-on to "high quality" to the bitter end of final liquidation.

The greater "attention to the public requirements", born out of the depressed post-1896 years, showed itself in three aspects of the final cycle product in its retail setting. In 1898 it was noted that the presentation and descriptive qualities of British catalogues had followed the American example and had markedly improved: ".....during the past year or so there has been a considerable improvement in the general get-up and contents of English cycle manufacturers' catalogues - many of those for the 1898 season being fully equal to any American production......"[2] And also in 1898 the majority of leading British cycle makers - at least those who decided to produce "popular-priced" machines - abandoned the list-price system and emulated Rudge-Whitworth in adopting net cash prices. This proved agreeable to both cycle agents and the public since it ensured that the purchase price for the same cycle-type did not vary widely from agent to agent. Furthermore, in the period 1898-1900 the public, for a lower cash outlay, was, in a sense, beginning to obtain a more serviceable bicycle, for in an attempt to revive the high level of demand that typified the "bicycle boom", entrepreneurs adopted the ideas of those cycle engineers, such as

1. Ibid., 14 Dec. 1900, p.6.

2. Cycle Manufacturer, 1 Oct. 1898, pp.118-9.

Charles A. Hyde of James Cycle and William Bowden, who devised free-wheel clutches and more effective braking systems to replace the former standard fitments of fixed wheels and single "spoon-brake" - the latter operating by means of a rubber or leather pad bearing down upon the top surface of the front-wheel tyre. As befitted a community of consumer-durable manufacturers, concerned to extend the "social depth" of demand, company-financed systems of hire-purchase were introduced in the 1900's instead of leaving such matters to the cycle agent. The lead once more was given by Rudge-Whitworth, it being noted that the 1904-5 season was ".....marked by the large extension of sales made on hire-purchase".[1] Sales on company-financed hire-purchase schemes became more widespread during a spasm of high cycle demand in the home market in the 1906 and 1907 seasons, and as more of the larger cycle makers adopted the practice. But the new consumer-credit schemes served as an extra burden on cycle companies' working capital resources, and some deplored the necessity, forced upon them by competition, for involving themselves with them.[2] Fielding Johnson, chairman of Centaur Cycle, declared in 1906: "He was sorry that the easy-payment system was so general in the cycle trade, for the board (of directors) did not regard the plan of payment with satisfaction, and would be pleased to join the other leading firms of the trade in an undertaking to discontinue it altogether".[3] Collective action to curtail hire-purchase was also mooted by a shareholder's committee

1. Rudge Record, vol. 1, No. 3, Aug. 1908, p.35; and Coventry Standard, 15 Sept. 1905, p.5.

2. Times, 19 Sept. 1906, p.10.

3. Ibid., 26 Oct. 1906, p.16.

investigating the affairs of Components Limited in 1908. The management of the Company was advised to "...do their utmost, in conjunction with other firms, to bring about the curtailment of this undesirable form of business".[1] Centaur Cycle and Components Limited were, however, just then in difficult financial straits, and those companies more adequately endowed with capital accepted the burden and refused to be drawn. The enhanced "attention to the public requirements" eventually spun-off from a direct concern with sales techniques in the home market to a concern with those abroad: in 1905 and again in 1910, American consuls in the Netherlands and in Denmark observed that the credit-terms of, and the speed of supply of spare parts by, the British cycle industry had become more favourable to customers than those of the American.[2]

The willingness and ability to abandon a "high price", "high quality" policy was not surprisingly intimately bound-up with changes in the techniques of cycle production, and, again, in several respects, the Americans set the example. The engineers and entrepreneurs of the U.S. industry, in their hey-day of cycle-production, were not over-fussed, in the interests of high-speed production, by standards of finish, nor did they lavish large quantities of care and skilled-fitters' labour on the cycle's running parts, namely, hubs and bearings. The American Machinist, for instance, noted that in some large American cycle works cups and cones from the case-hardening room passed straight

1. Ibid., 30 March 1908, p.14.

2. United States Monthly Consular and Trade Reports, No. 296, May 1905, p.76; and No. 357, June 1910, pp.33 and 34.

to the polishing room where they were simply brightened and handed-over for assembly. Such a procedure accepted the possibility that the case-hardening of a thin piece like the ball cup could result in distortion, and dispensed with the corrective finishing process of grinding.[1] The same journal also noted that the process of wheel-truing, as performed by some enterprises like the Monarch Cycle Company of Chicago, could be done utilising Pratt and Whitney or Schrader-Garvin bicycle wheel tables, and not by hand-and-eye methods. Speed of bicycle-wheel production was the chief advantage of truing-tables, combined with an accuracy in the initial location of the hub pin in relation to the wheel-rim; and they produced a wheel "very nearly true" if the spokes and nipples fitted each other well. Since this was not often the case, uneven spoke tension led to a lack of wheel truth when the wheel came off the machines.[2] The American techniques of cycle production demonstrated that short-cuts could be taken if high-speed of output or lower costs of production were essential objectives, and that, occasionally, there was a definite choice to be made between accuracy in finish and speed of manufacture when more capital intensive methods were in contemplation. It was a lack of superb, hand-produced finish and accuracy, quick assembly by semi-

1. American Machinist, 21 May 1896, pp.7-9. The protagonists of this method, apparently, maintained that the case-hardened cups were restored to shape by being forced into the truly-machined hubs, and that the cones and cups did not need to be absolutely true - they needed only to be smooth to make as good a bearing for wear and ease of running as could possibly be made. Accordingly, it was deemed a waste of time and money to do more than simply polish the ball track surfaces of the cone and cup. The Lozier and Gormully and Jeffery companies, nevertheless, preferred the finishing process to be performed by grinding. Ibid.

2. Ibid., 9 July 1896, pp.7-10.

skilled labour, and a less generous provision of fittings and accessories, which marked-off the British "popular-priced" bicycles of the late 1890's and 1900's from their predecessors. The American Machinist remarked upon the differences in 1899. The production of English high-grade cycles was characterised by: "Each machine is a special product, turned out with infinite care. No work is rushed wholesale through the shop. In each case, the bearings are tested and such careful attention given to details of finish as only a British or German workman can afford to give, for his time does not count for much"; whereas the new cheap cycles marketed by English manufacturers ".....stand inspection very well. They are lighter than the usual style English machine, and not so carefully finished, and the machine is not first-class; but they sell well. They are practically an imitation of the American wheel designed for quick market purposes".[1] The extent of imitation, however, did not go so far as the incorporation of wooden wheel-rims and single-tube tyres, and the fittings of mudguards and chain-covers, if not a gearcase, were retained.

The Americans continued to set the example, too, in terms of automation. The British "popular-priced" bicycles were manufactured increasingly by automatic machine-tools - the new ideas and devices proclaimed as the "American way of doing things" in 1895 spread in British cycle factories from one machining process to another. Hence,

1. Ibid., 7 Dec. 1899, p.42.

in December 1898 the New Hudson Cycle Company of Birmingham proclaimed that for 1899 it was marketing a new "popular roadster" machine at a net cash price of £10.10s. (but excluding a gearcase) because it had increased its plant of automatic machinery during the 1898 season.[1] Extra automation also characterised the chain-making processes employed by Joseph Appleby Limited, the chainmaker of Aston, Birmingham, in 1898; the new machines having been made especially to the firm's own designs and geared towards speedier production.[2] In November 1904 the Premier Company in Coventry declared that it had recently spent heavily in increasing the size of its plant "chiefly for purchases of automatic machinery"; and it was in that year that John Vernon Pugh, the engineering graduate in Rudge-Whitworth, invented his special automatic machine for the manufacture of cycle wheel rims.[3] The cycle and related trades, in fact, came to be regarded as the paragons of light machine-tool engineering techniques: "There is no English trade", said a Coventry manufacturer, "which has such up-to-date machinery and factory methods as the cycle trade".[4] In 1905 the workshops of the Triumph Cycle Company were observed to be filled by automatic machine tools, the majority of which were of American origin.[5] In

1. Catalogue of the New Hudson Cycle Co. Ltd. for the 1899 Season (1 Dec. 1898), pp.14 and 22-3.
2. Cycling, 4 June 1898, p.494.
3. Times, 4 Nov. 1904, p.12; and Proceedings of the Institution of Mechanical Engineers, vol. 132, (1936), p.591.
4. Coventry Standard, 16 Feb. 1906, p.3.
5. "The Cyclist" Trade Review, 2 March 1905, p.198.

1907 Perry and Company separated their cycle component departments from their original pen business with the construction of a new chain-making plant at Tyseley, near Birmingham. In its workshops "....the very latest of automatic tools have been installed, thus reducing the amount of hand labour to a minimum. No fewer than 300 machines are employed in the automatic manufacture of chain rollers, with a corresponding number of machines for the several processes of stamping blanks for side pieces, bevelling and naming, and for squaring up. An interesting section was that devoted to the four automatic stamps utilised in the pressing of side blanks from strip steel. Each operation of the stamp means the production of material for 2½ ins. of chain at 80 operations per minute. ...... Every operator works to a gauge so that the assembling of the various parts becomes practically automatic and no rejections are necessary".[1] Unlike 1895, no hand hammers and no meticulous inspection and testing!

In pursuit of the goal of greater automation during the 1900's, the British cycle-makers still maintained an own-design initiative. At Raleigh's Lenton works in 1911, cycle cups, cones, free wheel parts and ball races were produced on automatic machines chiefly of Alfred Herbert's manufacture, but the semi-automatic milling machines for forming the teeth on chain and sprocket wheels - they could operate on 396 chainwheels each at one time - were unique and especially made for, and designed by, the firm.[2] In 1914 it was noted that Raleigh manufactured their own machine-tools for certain special operations, for instance, the thread milling machines used for cutting the threads on free-wheel bodies and hub shells; and in the three-speed gear shop, the rows of "practically new" machinery were designed and made by the

1. <u>The Cycle Trader and Review</u>, vol. LXI, No. 847, 30 March 1911, pp.750-2.
2. Ibid., vol. LXIV, No. 874, 6 Oct. 1911, p.34.

Company and were highly specialised with regard to operation and/or component parts. One series of tools were used for milling the pegs in planet cages, another series for cutting the internal gear teeth used in both motor-cycle and cycle hubs, and another series were employed on tapping the coarse worm thread on tri-coaster brake ratchet rings.[1] Here, the unique features of the firm's finished product probably dictated the reliance on its own machine-tool designing resources. Another member of the cycle trade who embraced own-design machinery with the maximum of automation by 1914 was Hans Renold. Whereas American tools pervaded the chain-making Manchester works during the late 1890's, Renold's own automatic equipments proliferated in the premises in the 1910's: "Some of these are of special types not to be seen elsewhere, and they are characterised by marked ingenuity of design and rapidity combined with efficiency in the execution of the processes for which they are employed". Cycle chain rivets came off Renold's automatic machines at the rate of 1,100 per hour; rivets, rollers and bushes for cycle chains were all made

1. The Motor-Cycle and Cycle Trader, vol. LXXIII, No. 1000, 6 March 1914, pp.638-42.

on automatic machines; and the machines used for automatically recessing cycle chain studs (at a rate of 2,400 per hour) were all designed and made in the works. As well as typifying the chain component producing process, complete automation marked final chain assembly. And the process was continuous: automatic machines firstly and continuously assembled the inner links, the outer plates were then put on by pendulum presses, and the final stage of rivetting was performed on automatic machines which imparted a blow to the ends of each rivet simultaneously, the chain being fed forward continuously and automatically. Thus five feet of cycle chain was produced per minute.[1]

As the American cycle makers had realised, however, automation was not by itself necessarily a massive purveyor of cheaper costs of production and could bring its own problems. Automation, for its full potential to be realised, required a great deal of attention to be given to the surrounding productive apparatus and lay-out, and to the utilisation of labour and raw material inputs. The young Charles Sangster of Components Limited got an inkling of this in 1898: "Many of us, spurred on by this American competition, have bought their machinery, much of it automatic machinery, have remodelled our factories, and, I fear, are again sitting down to wait for developments. The possession of automatic machinery alone.......will not regain or retain our manufacturing supremacy unless we are prepared to expend blood and treasure in the way of brains and money in giving that strict

1. Ibid., vol. LXXIV, No. 1015, 19 June 1914, pp.748-58.

attention to minute details of tool construction which the Americans have given so much attention to and have so well paid for in the past".[1] But small tool construction was only one aspect. Shift working and the employment of relatively cheap female and juvenile labour was another, and increasingly throughout the 1900's the British cycle industry was typified by both. Strong or widespread trade unionism never obtained a firm grip on the cycle industry despite a certain amount of industrial-union development in the mid-1890's. Two cycle-workers, Isaac Ward and Wright Wain, had attempted to form a National Society of Cycle Workers during the prosperous weeks of early 1897, and at the end of 1897 had a paid-up membership of 1670. The demise of the "bicycle boom", unemployment amongst the unskilled workers in particular, and a downward pressure on wage-rates, exerted by cycle entrepreneurs anxious for their commercial survival, served to weaken the Union's appeal, such that it had a membership of 12 by the close of 1898 and was dissolved in 1899. In the absence of restrictive industrial trade unionism, the labour force of the cycle industry was usefully pliable: 25 per cent of the British industry's labour force consisted of females by 1911 compared to 9.3 per cent in 1901, and on average in 1907 16.9 per cent of the total wage-earning labour force in

1. Cycle Manufacturer, 9 April 1898, p.145.

the U.K. cycle and motor-trades was aged under 18.[1] Boy and girl machinists were dismissed by some cycle firms, it was said, once they attained an age which qualified them for higher wages; children fresh from school taking their place.[2] In a contest of automated plants, Rudge-Whitworth found that electrical driving from 23 motors yielded a bigger and better output over that yielded by the gas engines formerly used, since automatic machines tended to require more intricate forming tools, which responded well to the uniform drive of electric power, and the cooler and cleaner workshops. Electrical power provided its own economies, too, as there was a considerable saving in floor-space, and a substantial saving in labour-costs due to the comparatively small amount of attention electric motors required.[3] This innovation, pioneered by Rudge-Whitworth in the cycle trade, was soon adopted by other cycle manufacturing concerns. By 1914 all the machinery employed by the Enfield Cycle Company was driven by 41 Westinghouse electric motors, the current being generated by the Redditch Company's own power station. Hans Renold, too, saw the advantages of electric power, taking current from Manchester Corporation to drive all his machinery - and to light his workshops - via 65 motors of between 12 and 20 horse power, shafting and chains. By 1912 the rapidly expanding firm of J. A. Phillips and Company of the Credenda Works, Smethwick, was using electric power to drive the Acme auto-screw machines it employed for turning out components for its complete cycle and parts business.[4]

1. Anna Fox, An Investigation into the Cycle Trade in Birmingham (Birmingham University Thesis. 1913); Census of England and Wales 1901. Summary Tables (Cmd. 1523), pp.192-3; and First Census of Production 1907. Final Report, p.204.
2. Anna Fox, op.cit.
3. The Engineer, 11 Jan, 1907, p.32; and 18 Jan. 1907, pp.60-1.
4. The Cycle Trader and Review, vol. LXV, No. 892, 9 Feb. 1912, p.362; and The Motor-Cycle and Cycle Trader, vol. LXXIV, No. 1008, 1 May 1914, p.284; and No. 1015, 19 June 1914, p. 752.

Perhaps the most significant aspect to cost-reducing automation in the British cycle industry of the post-boom era was the extra knowledge demanded by cycle engineers of the chemical and physical properties of the metal stocks passing through the new types of machine. Optimal performance from many of the semi-automatic and automatic machine-tools could only be achieved from stocks of uniform quality and size, and of certain qualities and sizes. It was this type of consideration that led the Pope Manufacturing Company to establish its Scientific Testing Department under Henry Souther (Souther, significantly enough, being recruited from the Pittsburgh Steel Company), and initially to inaugurate quality checks upon the raw materials purchased by the firm. B.S.A. was one of the first British members of the cycle trade to follow this example when in May 1899 it retained the services of A. E. Tucker of Birmingham, consultant chemist and metallurgist, to perform not less than 86 analyses for an annual remuneration of £75; analyses beyond the number of 86 to be paid for at the rate of £1.11. 6d each.[1] The Rudge-Whitworth Company emulated Pope's example more exactly in 1901 when it drew H. L. Heathcote B.Sc. (Lond), M.Sc. (Birmingham), F.I.C. from his research post at the University of Leipzig, and placed him in charge of the firm's new research laboratory. Heathcote's laboratory, during the first few years of its long existence, ".....learned how to co-operate with other departments; with the drawing office by testing experimental designs and supplying exact data as to the strength of the materials employed and so enabling designs to be worked out on a trustworthy basis; with the Purchasing Department by

1. History of the Birmingham Small Arms Co. Ltd. 1861-1900, vol. 2, p.793. Tucker was formerly works manager of Bolckow, Vaughan and Company, and for the Lilleshall Steel Company. "The Cyclist" Trade Review, 29 June 1905, p.614.

drawing-up specifications embodying the firm's requirements, and by analysing samples and supplies to see whether up to specification, or to find the best for the purpose intended; and with the management by aiding in the effort to attain a uniform standard of excellence by testing and reporting upon the raw materials as delivered and partly finished and finished products - calling attention to any departure from the standard aimed at".[1] The new laboratory, however, quickly became more than a straightforward testing laboratory, since Heathcote was given the run of the works to make investigations into any process or operation that attracted his attention; and the result was a number of advances in the techniques of cycle production. Investigations into the electro-plating process during the early 1900's ".....led to a patented process giving much improved coatings in less time than usual"; and a probe into Rudge-Whitworth's enamelling ".....led to more enlightened choice of materials employed for producing the black coating on bicycle frames".[2] Heathcote's research into the firm's brazing process revealed that "......weak joints were associated with the use of a brazing brass containing a percentage of tin, and led to the establishment of a specification and regular testing of samples and supplies of all brazing brass"; and ".....in 1902 and 1903 I took micro-photographs of every screw thread on the Rudge-Whitworth bicycle, with the result that some of the tools for making screw threads were accorded very marked attention".[3] Rudge-Whitworth

1. Coventry Engineering Society Journal, vol. 4, No. 1, Jan. 1923, pp.8-9.
2. Ibid., p.5.
3. Ibid., pp.7-8.

demonstrated to the U.K. cycle-makers, as Pope did to the U.S. makers in the mid-1890's, that an on-sight scientific testing laboratory could yield significant technological advances in the means of cycle production in general, as well as optimising the performance of a given set of machine-tools. In the beginning in 1901, though, in Heathcote's recollection, "The new departure met with approval from the shareholders, but was the occasion of no small amount of hilarity, scoffing, and occasional caustic commentary from other cycle manufacturers. Now the commentators, for the most part, have laboratories of their own or have disappeared from the trade".[1] By 1910 Enfield Cycle had its own raw material testing laboratory headed by A. E. Tucker, and B.S.A. (somewhat tardy in this respect) finally established a metallurgical laboratory about 1913, previously relying upon Tucker, and the employment of a works chemist at £300 per annum from 1909.[2]

Apart from a general coming-to-terms with the implications of a proper and increasing use of automatic machinery, within Britain's cycle works during the late 1890's and 1900's, there were two major technological advances in cycle production that again emanated from the U.S.A. Liquid brazing and sheet-steel pressing both offered the opportunity of lower unit costs of production, although British cycle firms found that time and money for development work was necessary since both were innovations not universally accepted by American cycle manufacturers during the boom years of the 1890's, and, liquid-brazing in particular, were of quite recent origin. Liquid brazing,

1. Ibid., p.4. This new scientific-cum-technocratic approach to the problems of cycle manufacturing had its equivalent in the collective gatherings of cycle engineers (who were not always owner-entrepreneurs) during the late 1890's. These people managed to standardise chains and chainwheels at the turn of 1897/8, and cycle screw threads in 1901. They formed themselves into the Cycle Engineers' Institute in 1899, where they formally presented papers and discussed technical issues of common concern.

2. The Cycle and Motor Trade's Review, 12 Jan. 1911, p.27; and The Motor-Cycle and Cycle Trader, vol. LXXIV, No. 1012, 29 May 1914, pp.552-4. Tucker's reports on high speed steel tests became, apparently, "very erratic" in 1908 which led to his discharge. MSS. 19A/1/1/6, Business Records of the B.S.A. Co. Ltd.

when satisfactorily performed, economised on spelter, labour-time and weak joints, but the operation required the preparation of a good anti-flux to prevent the molten spelter in the brazing bath or crucible from sticking to parts of the frame not requiring any brazing. Although the subject of much research and experimentation in the U.S. cycle industry and its equipment suppliers in the mid-1890's, it was not until 1898 that the Joseph Dixon Crucible Company of Jersey City, New Jersey, declared that it had produced an adequate anti-flux.[1] During the following couple of years, both the Eadie Manufacturing and Raleigh companies spent "a great deal of time and money on perfecting the system", the Raleigh Company finally achieving a technically and commercially viable method in 1900, though it and many of its cycle manufacturing compatriots continued to use the old open-hearth method of frame brazing as well.[2] Rudge-Whitworth maintained the use of 50 open brazing hearths in 1911 and had no liquid brazing plant, because it had made a speciality of producing cycle frames with flush joints such that the brass spelter had to be placed inside the frame tube and lug.[3] The Raleigh Company and the British cycle industry in general had more ready success with the technique of sheet steel pressing during the 1900's. In the U.S.A. at least three firms in the 1890's had been developing the art for the benefit of cycle manufacturers - Hartley of Toledo, Rudolphe and Krummel of Chicago, and the H. A. Matthews Stamping Works of Seymour, Connecticutt. The Western Wheel Works of Chicago "which is one of the four largest American cycle-making concerns" was much given to the use of steel pressings in cycle construction though even it used malleable iron castings for cycle frame lugs.[4] Raleigh was the first British Company to become interested in sheet steel pressings for cycle frame lugs and crowns, and sent its works manager, G. P. Mills, to the U.S.A. in 1897 to investigate. Mills

1. Cycle Manufacturer, 22 Jan. 1898, p.5.
2. History of Raleigh Industries (privately printed), p.21; and The Cycle Trader, 23 Nov. 1900, p.348.
3. The Cycle Trader and Review, vol. LXIII, No. 864, 28 July, 1911, pp.214-22.
4. American Machinist, 6 Aug. 1896, pp.18-21; and 17 Dec. 1896, pp.14-23. The Ferracute Machine Tool Company of Toledo, and the E. W. Bliss Company of New York also became interested in the technique of sheet-steel pressing. The technique had its origins in Germany, and the Western Wheel Works before 1890 imported its pressed steel requisites from that country. Ibid.

eventually purchased new types of pressing machinery from the Ferracute Company of Toledo, but it was not until 1900 that Raleigh proclaimed the introduction of its "all steel" bicycle.[1] Steel pressings abolished the large amount of machining necessary with the use of malleable iron castings or forged stampings, and within the U.K. cycle industry of the 1900's (and following the precedent laid down by the Americans in the 1890's) they gradually spread from the manufacture of cycle frame lugs to bottom brackets, cones, chainwheels, sprockets and pedals. The U.S. Consul in Birmingham in 1898 was convinced that the British cycle manufacturers were ultra-conservative in their attitudes towards sheet-steel pressings, and even in 1900 C. T. Crowden of the Cycle Engineers' Institute thought that the British were well behind America and the Continent in the technique of steel pressing, though the specialist forged stampers of Coventry felt the acute competition from pressings soon after 1897.[2]

In the competitive drive to find lower unit costs of production and secure an ever-shifting competitive edge, the British complete cycle manufacturers were undoubtedly helped by the falling price trends which pervaded two of their important purchased materials, namely, pneumatic tyres and seamless steel tubing. The weldless tube industry, for a long time after 1897, suffered from chronic excess capacity - the product of the disappearance of American buyers after 1896, the expansion of capacity during the "bicycle boom", and of the formation

1. History of Raleigh Industries, op.cit., p.14.
2. Augustus Muir, 75 Years. A Record of Progress (Coventry. Smith's Stamping Works Limited. 1958), p.22; Birmingham Daily Post, 23 Dec. 1898, p.5; and J. T. Haddock, "Press Tools" in Proceedings of the Cycle Engineers' Institute, vol. II (1900), p.143.

of the semi-monopolistic grouping of manufacturers who had organised themselves into Tubes Limited in 1897, but who were reluctant to allow productive capacity to contract. The artificial maintenance of excess capacity combined with a less than 100 per cent hold on the seamless steel tube market by Tubes Limited could not fail to depress tube prices. In 1902, for instance, tube prices fell by 20 per cent; in 1903 by 10 per cent; in 1904 by 20 per cent; and in 1905 by 25 per cent.[1]

It was in 1905 that the master patents held by the Dunlop Pneumatic Tyre Company finally expired, and the pneumatic tyre trade was nominally thrown open to all-comers. But the Dunlop Company was careful to prepare for the end of its monopoly, and had been reducing the prices of its cycle tyres previously. In order to facilitate a profitable existence both before and after the expiration of its commanding patents, and retain a dominant position in the U.K. tyre market, the Dunlop organisation in 1901 consolidated its tyre-making business at Aston, Birmingham, in conjunction with its close associate, the Rubber Tyre Manufacturing Company - soon to be fully taken-over and renamed the Dunlop Rubber Company Limited. A large element in this policy was the adoption by the tyre company of the Doughty process of rubber tyre production which yielded substantial increments in labour productivity. With the Doughty process practically all the operations involved in tyre manufacture were performed solely by machinery, hand labour only being required to load the machines with canvass and rubber strips, and to cut a thread near the pattern of the tyre. 300 hands, it was asserted in 1901, could now perform the work that three years previously required some 700 operatives.[2] Like sheet-

1. Times, 20 Nov. 1905, p.16; and 2 Dec. 1905, p.3.
2. Coventry Standard, 14 June 1901, p.6.

steel pressing for the cycle-makers, the Doughty process, and the machinery embodied and associated with it, was capital intensive and the Dunlop concerns were obliged to invest heavily. But it proved to be capable of further technical improvement and refinement such that cycle tyre prices during the 1900's fell - helped by the du Cros' desire to keep competing pneumatic tyre manufacturers at bay and retain Dunlop's commanding market position.

The interest displayed in the cycle factories of the 1900's in the on-going development of automation, in scientific testing laboratories, and in new, more capital-intensive techniques of production - plus the growth, since the early 1890's, of a new group of cycle-engineer managers, as represented by A. Davidson, P. L. Renouf, Charles Sangster, G. P. Mills and Charles A. Hyde -was not the reflection of a social and/or economic revolution at board-room level. There was not a new breed of men at the top, who had entirely different backgrounds and perceptions from those who ruled during the early 1890's. Right-up to the outbreak of the First World War, Siegfried Bettmann and M. J. Schulte were joint-managing directors of Triumph Cycle, Edward Wilson was in command of New Hudson Cycle, R. W. Smith of Enfield Cycle, Edward Lisle of Star Cycle of Wolverhampton, John Marston of John Marston Limited, Charles and Arthur Brampton of Brampton Brothers Limited, Alick S. Hill of Coventry Chain, Charles Vernon Pugh of Rudge-Whitworth, Hans Renold of Hans Renold Limited, John Brooks of J. B. Brooks and Company, the Lucas brothers of Joseph Lucas and Sons, and the du Cros family was still paramount in the Dunlop group of companies. Certainly, the late 1890's and early 1900's did witness changes in the executive directorships of some cycle and cycle component-making concerns, if for no other reason than that scapegoats had to be found for the restive shareholders of companies annually reporting abysmal trading profits. The reconstruction of Humber and Company in 1899 involved the replacement of the now hedonistic M. D. Rucker by Edward Powell, a Montgomeryshire solicitor, conscientious but no technocrat. The financial disasters which overcame the Raleigh Company in late 1898 brought Frank Bowden scurrying out of retirement to retake the helm, and displacing the general manager he had appointed, R. W. Bassett. During 1899/1900 Walter Hewitt, aged fifty, formally took-over from George Singer the managing directorship of Singer Cycle in order to placate grumbling shareholders. But Hewitt failed to deliver the goods and in 1902 his appointment was supplemented by that of John Griffiths as general manager, who began the production of cheaper machines, though until his death the conservative George Singer continued to wield considerable influence over policy by virtue of his seat on the board. In any case, Hewitt and Griffiths were not new men to the cycle trade: they had been in the British industry for many years, and Hewitt at least shared in Singer's "high-price", "high quality" ideas. Whenever "founding fathers" died or retired in the cycle trade of the 1900's, they were usually replaced by sons or by men who had been closely associated with them for a long time. When John K. Starley of the Rover Company died in 1902, he was succeeded by his long-serving commercial aide, Harry Smith; and, similarly, the death of Edward Mushing in 1906 occasioned the advancement of two employees of many years standing, George Gilbert and Walter G. Jenks.[1]

1. Ibid., 9 March 1900, p.6; 14 Dec. 1900, p.6; 13 Dec. 1901, p.3; 26 Dec. 1902, p.8; 24 Aug. 1906, p.2; and 1 Nov. 1907, p.12.

The only main instance where "new blood" was brought from outside the firm to introduce specifically new pricing and product policies, and re-organise internal manufacturing techniques, was that of New Premier Cycle. A shareholders' committee investigating the affairs of the concern in 1901 found that ".....too much reliance has been placed on the past reputation of the Company's business and that there is a want of energy and managerial connection in maintaining the trade". The shareholders demanded the appointment of a general manager to take control, effectively, from Messrs. Hillman, Herbert and Cooper, and obtained one soon after in the form of E. H. Godbold, who immediately began the production of a new single line of 12 guinea machines.[1] In the broad, however, the type of men working at executive-director level in the 1900's was very much the type of the 1890's, but this did not prevent most of them from recognising - even if, at times, with lags - the changed marketing conditions facing them, and the requisite technological advances necessary to meet the problems such changed conditions posed.

The Revival Of International Competitiveness.

Thus British cycles became cheaper not only in relation to the passage of time but also in relation to the prices of their major foreign competitors. Between 1905 and 1914, for example, the average price of the American cycle fell by approximately ten shillings, while that of the British machine by over £2. Between 1907 and 1913 the average export price of British cycles fell by £0.84 while that of the German by £0.49. Belgian average cycle export prices did not show a clear falling trend at all during the 1900's, and were at a higher level towards 1913 than they had been during 1901 and 1902 (see Table 16).

1. Ibid., 6 Dec. 1901, p.6; and 19 Dec. 1902, p.8.

TABLE 16

Comparative Price levels of complete cycles.
The U.K., the U.S.A., Germany and Belgium.

Year	U.K. (av. factory price)	U.K. (av. export price)	U.S.A. (av. factory price)	Germany (av. export price)	Belgium (av. export price)
	£	£	£1 ≡ $5	£1 ≡ 20 marks	£1 ≡ 25 francs
1899			4.00		
1901					4.70
1902					4.79
1903					5.51
1904			2.99		4.99
1905		6.45			5.15
1906		5.46			5.40
1907	5.52	4.97		3.36	5.41
1908		4.65		3.26	6.33
1909		4.40	2.76	3.61	4.99
1910		4.20		3.41	5.77
1911		4.10		3.20	6.01
1912	4.54	4.25		3.15	5.14
1913		4.13		2.87	5.49
1914		4.10	2.51		

(Sources: as for Table 13 (for U.K. average export prices) and calculations from the volume and value data in the U.S. Census of Manufactures, 1905, 1910 and 1914, and the U.K. Census of Production, 1907 and 1912. The German prices came from data supplied by the Statistches Bundesamt, Wiesbaden, W. Germany. The German data does not permit the calculation of annual average export prices prior to 1907).

Furthermore, after 1906 Belgian cycle prices stood at higher absolute levels than the British, the American, and the German. The changes in absolute and relative cycle prices not surprisingly had an impact upon the export performances of the principal cycle manufacturing countries. By 1905 the situation in world markets was such that Germany was the principal cycle and parts exporter, contributing 47.1 per cent to total world exports of cycles and parts, her main geographical area of dominance being Continental Europe. In 1903 the bulk of her exports of cycles and parts went to the Netherlands and Denmark - taking about one-third of her total exports - Austria-Hungary, Switzerland, Italy, Belgium and Russia; the latter group accepting almost 40 per cent.[1] In 1902 £91,746 worth of cycles were imported into Russia, only £18,622 coming from the U.K. and the rest almost entirely from Germany; and over the five years 1900-1904, 74,500 cycles were imported into Switzerland, 49,500 from Germany, 12,500 from France, 6,000 from the U.S.A., and 1,700 came from the U.K., imports from the last, it was said, having been dwindling owing to their relatively high prices.[2] In 1904 of the 5,379 complete pedal cycles imported into Belgium, 3,781 were from Germany, 851 came from France and only 175 from the United Kingdom; and of the 1,068,175 francs of cycle parts imported, 521,684 francs-worth originated in Germany, 337,901 francs-worth came from the U.K., and 129,877 francs-worth from France.[3]

The United Kingdom by 1905 had

1. "The Cyclist" Trade Review, 2 Feb. 1905, p.110.
2. Ibid., 5 Jan. 1905, p.17; and 19 Jan. 1905, p.51.
3. Le Ministère des Finances, Tableau Annuel du Commerce de la Belgique avec les Pays Etrangers.

struggled back to claim 32 per cent of the total value of world exports of cycles and parts.[1] In 1901 the exports of cycles and parts from the U.K. resumed an increasing trend, rising from £530,590 in 1900 to £739,971 in 1904 - an increase of £209,381. But of that increase £89,789 or 42.9 per cent was attributable to extra exports to "foreign countries" (mostly to the Netherlands), whereas the bulk of the increase was comprised of additional exports to Empire and Dominion territories that afforded tariff preferences, and whose populations demanded sturdy, reliable machines to withstand rough road conditions. Over 1901 to 1904 the U.K. made negligible or negative headway in the value of its cycle exports to Russia, Sweden, Denmark, Germany, Belgium and France. In 1905 it was reported that British cycle exports to the Netherlands were mainly of "a high-class nature", the cheaper British products being unable to compete with the German makes of that class; and that the Humber agency was practically the only British cycle agency left in Paris - selling only high-grade "Beeston Humbers" to wealthy and quality-conscious Frenchmen. The majority of French cyclists, apparently, preferred much cheaper machines: "Only here and there does one see a brake, and rims, tyres and, indeed, all fittings, are of the cheapest possible character".[2] The American cycle industry by 1905, in order to retard the retreat in its international competitiveness, concentrated upon relatively cheap, flimsy, wooden-rim wheeled cycles, largely devoid of fittings like the French. And in 1905, like the French, it had a similar share in total world exports: 9.3 per cent (it was 29 per cent in 1900) as against France's ten per cent (which was 14.6 per cent in 1900). In 1903/4 the American cycle makers still found some of their largest markets in Europe: Europe absorbed $870,530 of cycles and parts in that year, the U.K. remaining the largest national market with $263,775, with Germany second with $131,217, and the Netherlands and Denmark absorbing $114,735 and $111,112 respectively. Additionally, however, America dominated the Canadian and Mexican cycle markets, and maintained a strong position in Japan. In 1904 the Japanese imported 724,248 yen of American cycles and parts, 125,255 yen of British, and 100,202 yen of German; and the Japanese market was one of the fastest growing cycle markets of the 1900's.[3]

1. These percentages of total world exports are derived from the figures presented in Table 13.

2. "The Cyclist" Trade Review, 16 March 1905, p.259; and The Cycle and Motor Trade's Review, 21 Sept. 1905, p.274.

3. Monthly Journal of the Coventry Chamber of Commerce, vol. III, No. 11, Dec. 1908, p.7.

TABLE 17

The value of the exports of complete cycles by the U.K., Germany and Belgium 1901-13.

Year	United Kingdom £	Germany £ ≡ 20 marks	Belgium £1 ≡ 25 francs
1901	n.a.	n.a.	28,600
1902	n.a.	n.a.	10,360
1903	n.a.	n.a.	8,840
1904	n.a.	n.a.	3,400
1905	307,189	n.a.	2,760
1906	431,122	346,450	2,880
1907	508,822	505,250	2,840
1908	461,913	467,150	3,360
1909	462,579	275,850	3,280
1910	542,511	311,100	2,400
1911	601,318	324,100	4,600
1912	582,386	347,200	4,320
1913	609,482	353,250	4,080

(Sources: as for Table 13. The German figures for 1906 cover the months March to December only).

There was little doubt that the type of pedal cycle produced by the British industry by the mid-1900's, in terms of design and quality, came to satisfy the majority of cycle consumers in the British domestic market. There were no tariff barriers imposed upon imported cycles and parts, and yet the number and value of imported machines tended to decline (Table 18): relatively cheap American, German and French cycles either found little place, or lost their place, in the British home market. In fact, the average prices of cycles imported into the U.K. (admittedly c.i.f) tended to be higher after 1905 than the prices of those exported f.o.b., (compare the figures in Tables 16 and 18). Imported cycles were really specialities, particularly for the cycle-racing man. On the other hand, as the price differentials between the British, and American, Belgian and German cycles, narrowed after 1904, the more expensive, reputedly better quality, U.K. cycles found an expanding overseas market - certainly during 1905-1913 - while the export values of complete machines from Germany and Belgium tended to sag, in the case of the former, or grow from a comparatively very low absolute base, in the case of the latter (see Table 17). What-is-more, after 1905 or thereabouts, British cycles and parts found an increasing place in Continental European and Japanese markets. Over 1906-1913 the value of exported U.K. cycles and parts rose by £946,963, and, of this, £715,861 (or 75.6 per cent) was attributable to extra exports to "foreign countries" compared to the increment

TABLE 18

The volume and value of complete pedal cycles imported into the United Kingdom 1902-1913.

Year	number	value (£)	average price per cycle (£)
1902	14,357	83,302	5.80
1903	4,777	29,120	6.10
1904	1,587	12,352	7.78
1905	2,345	13,617	5.81
1906	1,288	7,886	6.12
1907	698	5,259	7.53
1908	772	5,356	6.94
1909	521	3,710	7.12
1910	433	3,045	7.03
1911	351	2,567	7.31
1912	387	2,696	6.97
1913	422	2,945	6.97

(Source: Board of Trade, Trade and Navigation Accounts of the United Kingdom. Imported complete cycles were not separately itemised before 1902).

of 42.9 per cent of 1900-1904.[1] During 1906-13 the British cycle industry found rapid expansion in the Danish, German, Dutch, Belgian and Italian markets. So far as the cycle trade was concerned, the Danish and Dutch were free-trading nations, and in 1906 the U.K. exported £26,480 of cycles and parts to Denmark and £121,669 to the Netherlands. Unquestionably, the German makers overwhelmingly dominated both markets in 1906, yet U.K. cycle exports to Denmark rose to £88,138 in 1913, and to £254,589 to the Netherlands. In 1913 German exports of cycles and parts to Denmark amounted to £181,700, and to the Netherlands £220,850. In that same year, exports of cycles and parts from the United Kingdom to Italy were valued at £108,676, while the Germans recorded a value figure of £72,800. The Belgians, meanwhile, levied a 12 per cent ad valorem duty upon imported pedal cycles and parts, and in 1906 absorbed 483,880 francs-worth from the U.K.; 1,297,557 francs-worth from Germany; and 316,470 from France. In 1913, however, imports from the U.K. stood at 1,074,805 francs (a rise of 122.1 per cent), imports from Germany at 1,950,856 (a lower rise of 50.3 per cent), and imports from France at 740,537 francs (a rise of 134 per cent). The British cycle industry found a growing export outlet within Germany after 1905 despite the German authorities' decision to increase the import duty on cycles from 24 marks per 100 kilos to 100 marks in 1906, with accompanying tariff rises upon finished and unfinished cycle components - from between 10 to 24 marks per 100 kilos to 100 marks, in the case of the former, and from six

1. See supra, p.345.

to 25 marks per 100 kilos, in the case of the latter.[1] The value of complete U.K. cycles sent to Germany increased from £5,824 in 1906 to £8,622 in 1911, falling to £4,247 in 1913, but components increased from £12,516 in 1906 to £26,473 in 1913. Of the 580,000 marks of finished cycle components imported by Germany in 1913, 323,000 marks-worth came from the U.K. The French protective tariffs, however, appeared to serve the indigenous cycle industry fairly well in that British exports of cycles and parts to that country fell from £98,812 in 1906 to £80,592 in 1913, while <u>total</u> French imports fell from 9,197,413 francs (£367,896) to 8,844,800 francs (£353,792). During 1906-1913, nonetheless, Germany ceased to be the largest supplier of cycles and parts imported into France, losing that position to the United Kingdom.[2]

It was probably the degree of protection that Germany, France and the U.S.A. afforded to their own cycle industries that led the cycle entrepreneurs of these countries into taking a passive stance, more-or-less, to the growing incursion of British machines to the markets which they had come to dominate during the early 1900's. The collapse of the "bicycle boom" and the almost simultaneous appearance of severe foreign competition (actual and potential) <u>within</u> the home market had led badly-shocked British entrepreneurs, in their free-trading country, to make some fundamental re-appraisals

1. <u>Coventry Standard</u>, 2 March 1906, p.9.

2. This statement may seem odd given the presentation that the value of U.K. exports to France fell by a greater absolute amount than the value of French imports. The statement is based upon the data afforded by the French foreign trade statistics, but these itemised cycle imports at constant "official values", and individual country's contributions were assessed only in terms of weight.

of their types of cycle designs, of their cycle prices, and of their techniques of production. The feeling for good quality remained in an attenuated form and served to give the British cycle an international reputation for strength and reliability - a characteristic which even the new classes of domestic cycle consumers of the 1900's wanted. Since the British cycle entrepreneurs and domestic consumers, combined, were averse to a deterioration in the quality of material inputs entering into the production of pedal cycles (a thing which overseas competitors were willing to entertain), ever-cheaper British machines were manufactured during the 1900's accompanied by a continuous search for economies in productive processes, backed-up by a strong competitive market system. The sturdy, ever-cheaper British cycles found a growing market abroad as well as at home, but they did not constitute a "shock" to foreign cycle manufacturers of the 1900's in terms of a strong penetration of their home markets. Hence, the cycle makers of the U.S.A., for instance, sat back and watched their exports to Japan fall from 724,248 yen in 1904 to 477,071 yen in 1907, while the British exports rose from 125,255 to 1,639,495 yen, and the German effort changed little - German exports rising from 100,202 to 101,820 yen in 1907.[1] And there were no preferences of any kind in the Japanese tariff structure.

1. Monthly Journal of the Coventry Chamber of Commerce, vol. III, No. 11, Dec. 1908, p.7.

CHAPTER 5

Joint-Stock Company Flotation in the Cycle Motor-vehicle and Related Industries 1882-1914.

Despite their "newness" in terms of Britain's industrial history, spasms of public company flotation in the cycle, pneumatic tyre, seamless steel tubing, and motor-vehicle industries occurred during the period 1882-1914. By 1914 these "new industries" of the late nineteenth and early twentieth centuries were certainly closely related in terms of input-output relationships, technology and entrepreneurial personnel. Many firms originally in the cycle trade, for instance, had become important motor-car manufacturers particularly Rover, Humber and Singer. Triumph and Rudge-Whitworth were soundly ensconced in motor-cycle manufacture. Some pneumatic tyre producers, especially the Dunlop companies, supplied the requirements of both motor-car and cycle-making enterprises; while the seamless steel tube drawers provided the main components of pedal cycle and motor-cycle frames, although they eventually found important sales outlets as well in boiler-making, marine engineering, and heavy engineering in general. An admirable general survey of the determinants and techniques of public company flotation was written by J. B. Jefferys in 1938,[1] and it is partly the intention here to compare his general assessments of the development of joint-stock incorporation in the United Kingdom with the developments specific to the cycle, motor-vehicle and related industries. Moreover, was it the case - a question and issue posed by contemporaries and still posed among economic historians - that the more formally organised parts of Britain's capital market,

1. J. B. Jefferys, *Trends in Business Organisation in Great Britain since 1856, with special reference to the financial structure of companies, the mechanism of investment and the relations between the shareholder and the company*. (Ph.D. Thesis. University of London, 1938).

dealing in long-term securities, unsatisfactorily met the requirements of home industries, and the "new industries" in particular, during the 40-odd years preceding the outbreak of the First World War?[1] An examination of the company flotation activities of the cycle, motor and related trades might throw some light thereon.

The Time-Pattern Of The Company Flotations.

The nominal values of security issues made by public authorities and commercial enterprises, both domestic and foreign, upon the London capital market were itemised month-by-month, and weekly, by the Investor's Monthly Manual and the Economist, respectively. The data given includes new issues made upon the flotation of new public companies, and issues by joint-stock companies and public authorities already established, but usually excludes issues conducted by private negotiation. It is possible, however, to determine which category a particular new issue fell into, and consequently obtain a time-series for public flotation issues by enterprises in the cycle, motor-vehicle and related trades. Such a time-series appears in Table 19. Unfortunately, the data provided by the Investor's Monthly Manual and the Economist did not cover every public stock or share issue made in the United Kingdom, and, consequently, a search through trade journals and other financial newspapers revealed the existence of further flotation issues not itemised by the above two periodicals. Fortunately, the numbers of these were, apparently, relatively few and do not perform violent

1. See, for example, F. Lavington, The English Capital Market (1921), pp.218-9; A. K. Cairncross, Home and Foreign Investment, 1870-1913: studies in capital accumulation (1953), pp.101-2; A. K. Cairncross, "The English Capital Market before 1914", Economica, new series, 1958, vol. 25, No. 98; A. R. Hall, "A Note on the English Capital Market as a source of funds for home industry before 1914", Economica, new series, 1957, vol. 24, No. 93; and 1958, vol. 25, No. 100; J. Saville, "Some retarding factors in the British Economy before 1914", Yorkshire Bulletin of Economic and Social Research, 1961, vol. 13, No. 1; D. H. Aldcroft and H. W. Richardson, The British Economy 1870-1939 (1969), pp.119-20, 164 and 198-200; and M. Edelstein "Rigidity and Bias in the British Capital Market 1870-1913" in D. N. McCloskey (ed), Essays on a Mature Economy: Britain after 1840 (1971).

TABLE 19

Public flotation issues by Cycle and motor-cycle, Pneumatic Tyre, Seamless Steel Tubing, and Motor-Car Manufacturing Companies.[1]

Year	Cycles and Motor-cycles £	Tyres £	Tubes £	Motor-Cars £
1882	26,000	-	-	-
1883	40,000	-	-	-
1884-86		No issues made		
1887	315,000	21,000	-	-
1888-90		No issues made		
1891	250,000	-	-	-
1892	-	-	44,000	-
1893	340,000	635,000	66,670	-
1894	357,000	10,000	-	-
1895	454,000	107,000	-	-
1896	9,267,910	6,760,000	1,356,000	1,122,000
1897	3,823,417	1,818,334	1,720,163	380,000
1898	81,000	10,000	-	-
1899	20,000	-	60,000	21,250
1900	-	350,000	-	60,000
1901	-	-	-	-
1902	32,500	-	-	-
1903	-	-	-	70,000
1904	-	-	-	-
1905	37,493	150,000	-	849,837
1906	-	-	-	1,275,669
1907	25,000	-	-	588,667
1908	-	85,000	-	40,000
1909	-	-	-	-
1910	-	250,000	-	-
1911	-	40,000	-	337,000
1912	-	80,000	-	70,000
1913	265,000	255,000	-	871,421
1914	19,000	-	-	419,000

1. So far as is known, there were no issues in these trades prior to the year 1882. The figures for cycle manufacturing companies include issues made by those who manufactured components and accessories (excluding tyres and tubes), issues made by cycle agents, and those who produced cycles or components as well as other products. The figures for tyre and tubing producers exclude those who also made cycles and other components - these were put into the "cycles" category e.g. the "Grappler" Pneumatic Tyre and Cycle Company which made both complete cycles and tyres.

damage to the time-pattern of public flotation issues as given in Table 19. Their values and their distribution over time are summarised in Table 20, but given the nature of the method by which their details were collected, it cannot be claimed that the information in the table is comprehensive and complete.

Beginning in 1882 when E. C. F. Otto of London attempted to publicly float his Otto Cycle Company Limited,[1] a trickle of small cycle company promotions came on to the market during the 1880's - the Rudge Cycle Company's £190,000 issue of 1887 was the largest - building-up, both in number and in average value, in the early 1890's to the "boom" years of 1896 and 1897. Thereafter, the total annual value of cycle company promotions rapidly subsided - some years seeing no flotations at all - until three flotations brought a very minor peak in 1913. Commencing with another one of E. C. F. Otto's companies,[2] floated in 1887, tyre company flotations were negligible until a rush of promotions hit the market in 1893, subsiding during 1894 and 1895, after which more issues came extensively in 1896 and 1897. Apart from one big issue in 1900 - that of the Bell-Hall Unpuncturable Tyre and India-Rubber Company - and a smaller one in 1905, little was seen of tyre company flotations until 1910-13 when eight new companies appealed to the market. Public flotations by cycle tubing makers began in a small way during 1892-95, ending dramatically with a boom in 1896 and 1897, with

1. The company was formed to purchase 30 cycle patents from Otto plus the furniture, fittings and the lease of premises in Newgate Street, London. The Cyclist and Bicycling and Tricycling Trades Review, vol. 4, No. 162, 22 Nov. 1882.

2. This time to purchase two of Otto's patents relating to rubber tyres for cycles and carriages. The Cyclist, vol. 8, No. 387, 16 March 1887, p.528.

TABLE 20

Flotation Issues made by enterprises in the Cycle, motor-cycle, Motor-Car and related trades not mentioned by the *Investor's Monthly Manual* and the *Economist*.

Year	Cycles and Motor cycles £	Tyres £	Tubes £	Motor-Cars £
1886	50,000	-	-	-
1887	4,500	-	-	-
1888	35,365	-	-	-
1889	17,000	15,010	-	-
1890	-	-	-	-
1891	79,988	-	-	-
1892	-	55,000	-	-
1893	70,000	-	-	-
1894	45,000	-	-	-
1895	-	20,000	82,670	-
1896	160,000	75,000	395,000	-
1897	248,810	-	65,000	-
1898	29,650	-	24,000	-
1899-1900		No issues made		
1901	50,000	-	-	-
1902	-	-	-	-
1903	35,000	-	-	-
1904		No issues made		
1905	-	-	-	40,000
1906-11		No issues made		
1912	-	-	-	7,250
1913-14		No issues made		

only one promotion thereafter. Flotations by motor-car manufacturers, suddenly and with no precedents, hit the scene during 1896-97; a few companies were formed in the following years but trivial amounts were demanded from the market until 1905-7 when 24 motor-car companies tried public flotation. A relapse followed in 1908 till 1911-14 during which 16 new company promotions were made.

In general, the major fluctuations in the total value of flotation issues by the cycle, motor-car and related trades were positively correlated with the major developments, and with the profits earned, in these industries as a whole. The explosion of pneumatic tyre company promotions in 1893 was precipitated by the rapid shift from solid and cushion tyres to pneumatic tyres among cycle manufacturers and consumers during the early 1890's - a development which was reflected in the high profitability and quick growth of the Pneumatic Tyre and Booth's Cycle Agency Company Limited; the forerunner of the Dunlop tyre companies.[1] The burst of company promotion in the cycle, tyre, and cycle tubing industries in 1896-97 reflected the "bicycle boom" of these years, with the concomitant high profits and high dividend pay-outs. After the evaporation of the "bicycle boom" in mid-1897, and throughout the early 1900's, all three trades were in the doldrums so far as profits were concerned. The seamless steel tube drawers appeared to be in difficulties right up to the outbreak of war, and not one company involved in the cycle branch of this trade dared public flotation after 1899.

1. The company began its life in 1889 with an issued capital of £22,500. Subsequent share issues and a reconstruction meant that, by 1896, the shareholders of the company had paid-in £260,000, upon which they had received dividends totalling £658,123. Economist, 18 April 1896, p.486.

During 1905-7 the profits of most of the principal cycle manufacturers picked-up but elicited only two new company flotations. Depression followed during 1908-10 but demand, and profits, began to rise rapidly again thereafter, bringing four flotations in their wake. Changes in the structure of the cycle and tubing industries were, however, also important factors accounting for the time-pattern of company flotation. Among the cycle tubing producers a comprehensive amalgamation was undertaken in 1897, viz. the formation of Weldless Tubes Limited (its name changed later to Tubes Limited), designed partly to exploit the economies of scale, and partly to monopolise the industry's market. Economies of scale also began to affect the cycle trade's development during the 1900's, which meant that successful entry into the industry became increasingly difficult. In addition, nearly all the well-established cycle and tubing companies had been publicly floated by 1898.

The pneumatic tyre company flotations of 1910-13 were essentially related to the growth of the motor-car trade. They were mainly designed to exploit tyre designs specifically developed with motor-cars in mind, and hence appeared at a time when the level of demand for cars was relatively high and increasing. The profits of Dunlop Rubber and Palmer Tyre - established firms in this field - showed no marked tendency to increase during 1910-14, and so these flotations were not, in some way, related to these companies' performances. The spurt of motor-car promotions during 1905-7 and 1911-14 corresponded to the increased demand for cars by consumers, and the increased profits of the enterprises already in this field, though the motor-car flotations of 1896 and 1897 appealed entirely to the future possibilities of the internal combustion engine, potential investors, by the nature of events, having no profits record to assess, and hardly any indication as to the extent of current demand. The single flotation of 1908, and the absence of any promotions by motor-car companies during 1909-10, was a reflection of the depressed state of British motor-car demand during those years, and of some motor-car company profits. The flotation of 1908 was that of the Italian Spare Motor Wheel Company Limited, an off-shoot from the then very profitable Stepney Spare Motor Wheel Company, floated in 1906, and its sphere of operations was to be in Southern Europe and not the United Kingdom. Even when at their height, and adding the issues by established companies, the value of new issues by the cycle, motor-vehicle and related trades constituted only a small percentage of the total value of new issues made by public authorities and commercial enterprises upon the London capital market. For a number of years this percentage was of tiny dimension. During the peak year of 1896 the total value of all new issues made by the cycle, tyre, tubing and motor-car manufacturers reached 13.4 per cent of the total value of all the new issues listed by the Economist. For 1897 the percentage was 4.9; for 1906 it was 1.7; and for 1913 and 1914, 2.2 and 0.6 per cent respectively. These were the years of secondary peaks in cycle and motor-car new issues. With the possible exception of 1896, in no year before 1915 did the "new industries" of cycles and motors, and their closely associated trades, figure prominently (in quantitative terms) in the demands made upon the British investing classes interested in publicly issued stocks and shares.

The Sizes Of The Flotation Issues.

Since the Investor's Monthly Manual and the Economist itemised the values of each public flotation issue separately, it is possible to perform an analysis of the distribution of flotation issues by the cycle, motor-car and related industries according to their size. Such an analysis, presented as a frequency distribution, appears in Table21, and includes those flotation issues not mentioned by the above two journals. The striking feature that emerges is the relatively large number of cycle manufacturers entertaining what contemporaries considered to be "small" flotation issues of (say) £30,000 or less. One authority, H. Lowenfeld, for instance, even deemed issues of £50,000 to £100,000 to be "small".[1] About one-third of all cycle company flotations were of the order of £30,000 or less, most, but not all, occurring in the 1890's. Tyre and tubing producers were, apparently, less prone to this activity (28 and 18 per cent, respectively) and motor-car manufacturers, mostly floated in the 1900's, least of all, with 14 per cent making issues of £30,000 or less.

The feature of the "small" flotation issue among the cycle makers may be deemed significant in view of the general developments in company formation during the 1890's which drew adverse comment from the Economist in 1896, the company promoter bearing the brunt:-

"There has seldom been a period of greater activity in company - promoting than is now being enjoyed by the people who go in for that description of business.....There have been comparatively few very large issues; but there has been such a steady increase in the number of concerns which are obviously unfitted for the adoption of the joint-stock principle, by reason of their small, domestic, or family-party character, as to suggest, on the one hand, that the abiding faith which a certain class of promoters entertain in the credulity of investors throughout the country is more robust than ever, and, on the other hand, that some difficulty is being found in discovering likely business to

1. See F. Lavington, op.cit., p.219.

TABLE 21

The Size Distribution of Public Flotation Issues made by the Cycle, Motor-Cycle, Tyre, Cycle Tubing and Motor-Car Manufacturing Companies of 1882-1914.

Size of Issue (£)	Cycles and Motor Cycles	Tyres	Tubes	Motor-Cars
1 - 10,000	19	2	0	1
10,001 - 20,000	21	4	1	1
20,001 - 30,000	25	8	5	5
30,001 - 40,000	18	5	1	6
40,001 - 50,000	17	7	1	4
50,001 - 60,000	14	4	3	3
60,001 - 70,000	11	2	4	5
70,001 - 80,000	13	2	2	3
80,001 - 90,000	5	2	2	1
90,001 - 100,000	10	3	2	7
100,001 - 150,000	18	5	5	4
150,001 - 200,000	12	5	0	4
200,001 - 300,000	4	0	4	4
300,001 - 600,000	3	1	0	2
600,001 - 1 million	3	1	0	1
Over 1 million	0	2	1	0
TOTAL	193	53	31	51

offer to the public... In some cases it has been made clear that the would-be vendor had by his personal exertions built-up a decent business, and that, if left to his own devices he would be content to remain an honest trader for the rest of his days, but he has been shown how apparently easy it is to transform himself into a company, with benefit to himself and his go-between".[1] Again, in 1897, the same journal remarked that small businesses with small capitals "though perhaps satisfactory, and, in their degree, prosperous in private hands, are quite unsuited for conversion into joint-stock enterprises". It drew attention to the facts that small capitals of under £50,000 precluded either a stock exchange quotation or a free market for the shares; that the cost of incorporation was generally "out of all proportion" to the nominal capitalisation of the company; and that ".....a business which has been built up by the persistent energy of an individual, and has thus been rendered successful and lucrative, dwindles away and becomes unprofitable when the great incentives of self-interest and personal responsibility are replaced by the control of a body of directors, frequently possessing neither knowledge of the duties they are supposed to perform nor a pecuniary stake in the enterprise". Furthermore, it claimed that "the owners of carefully-managed progressive businesses needing accommodation have no difficulty in obtaining it upon reasonable terms from their bankers, who in these days are only too anxious to lend to customers of good credit

1. Economist, 25th July 1896, p.963.

and repute".[1] The alleged relatively higher costs of "small" flotation issues did not, apparently, act as a severe constraint or deterrent upon the financial operations of the cycle makers, given the number of such issues. Lavington maintained that in addition to their formation expenses, small industrial ventures had to pay relatively heavily for the advertisements by means of which they could present their prospects; for the borrowed reputations of brokers and other parties by which their prospects were supported; for underwriting commissions; and for the fees paid to the banks which received the applications. Quoting Lowenfeld, he reckoned that such expenses "....hardly ever amount to less than £2,000 even on a modest issue".[2]

Antipathy to the spread of the joint-stock principle, even during the late nineteenth century, was dying hard among some sections of the financial press, but in contrast to the opinion of the Economist the appearance of the "small" flotation issue at the time may have reflected the real financial needs of certain types of business that were not easily satisfied in any other way, given the structure and nature of the capital markets in which the businesses found themselves. An alternative which must have crossed entrepreneurial minds was whether the capital desired and raised by a public flotation issue could have been acquired "privately", and, given the absence of prospectus expenses, presumably more cheaply, though the medium of the "private" joint-stock company. Taking the main centres of the

1. Economist, 31 July 1897, p.1087.

2. F. Lavington, op.cit., pp.218-9.

British cycle and related industries together - Birmingham, Coventry, Wolverhampton, Nottingham and London - well over 100 "private" formations of joint-stock companies occurred among cycle and tyre makers alone during 1870-1914. From an examination of local trade directories, and taking into account the information on flotations contained in the Economist and Investor's Monthly Manual, it appears that at least 96 cycle and tyre producing joint-stock companies were formed "privately" in Birmingham before 1915, 58 in Coventry, 16 in Nottingham and 8 in Wolverhampton - mostly, in all four towns, during the 1880's and 1890's. There was no aversion to this form of organisation peculiar to these particular trades, and that led to a predisposition towards public issues. On the other hand, evidence drawn from a sample of 37 of these "private" company formations appears to show some limitations of this method of fund-raising.[1] In so far as any of them raised capital by share issues to people not hitherto directly connected with the financing and management of the business, it was on a relatively small-scale. J. K. Starley and Company - the forerunner of the Rover Company - raised £4,885 from its "private" incorporation in 1889; the Triumph Cycle Company obtained £1,099 in 1890 (plus £728 from George Sawyer and Philip Schloss, serving as depot managers to the Company); Centaur Cycle of Coventry £2,970 in 1892, but all subscribers had long managerial or financial connections with the new company; and Bonnick and

1. The sample includes all those cycle and tyre firms which achieved prominence (in terms of numbers employed) in their respective trades, and which resorted to "private" company formation. Given the esteem which the public bestowed upon their products and commercial performance, one would have expected a favourable accord allotted to their financial requirements by the holders of wealth. The evidence concerning them was drawn from the original company files now held in the Public Record Office.

Company - forerunner of the Riley Company - £950 from incorporation in 1890. The Palmer Tyre Company of Birmingham obtained £3,750 in 1893, and, in the same year, the Whitworth Cycle Company of Birmingham achieved £8,923. For some enterprises, the amounts raised by "private" company formation were trifling: George Price and Company of Wolverhampton acquired £240 in 1890; Humber, Synyer and Company of Nottingham £421 in 1892; B. S. Roberts and Company of Birmingham £300 in 1893, and Barton and Loudon of Coventry raised £200 in 1895. The Stafford Manufacturing Company of Coventry went to the trouble of incorporation in 1895 for £26 in cash. The £68,475 acquired from "private" allotments by George Woodcock's Rudge Cycle Company in 1886 was singularly exceptional. Its nearest rival was the £15,519 raised by Messrs. Hillman, Herbert and Cooper of Coventry, also in 1886.[1]

Additionally, the "private" company formation in the cycle and tyre trades relied heavily upon local, personal and business connections, and family ties, for the acquisition of finance. £15,414 of the £15,519 found by Messrs. Hillman, Herbert and Cooper came, in roughly equal shares, from Robert Dalton, Alexander Rotherham and George Twist, manufacturer, silk dyer and solicitor, respectively, and all of Coventry. All but £5 of the £7,505 raised by Townend Brothers of Coventry in 1891 was provided by Joshua Perkins, a local coach lace manufacturer. A Coventry silk merchant, ribbon manufacturer, surgeon, watch manufacturer and an estate agent together invested the

1. The sums mentioned refer to shares allotted for cash. The nominal paid-up value of shares allotted to vendors is excluded. Since debenture stocks were not registrable until after the Companies Act of 1900 was passed, amounts raised through debenture issues are not included.

bulk of the £2,010 put into S. and B. Gorton when incorporated in May 1890. The £3,750 raised for the Palmer Tyre Company in 1893 came from C. H. and C. V. Pugh of the Whitworth Cycle Company, James Gutteridge and John F. Wright of the Rudge Cycle Company, three Birmingham industrialists, one Birmingham architect, a Kent engineer and a London company secretary the last two representing the interest of the India-Rubber, Gutta-Percha and Telegraph Corporation. Not surprisingly shareholders tended to be few in number. In J. K. Starley and Company only three people held more than one share; in S. and B. Gorton there were nine shareholders; in Triumph Cycle - 18; in Centaur Cycle - 7; in Bonnick and Company - 7; in George Price and Company - 7; and there were only 7 shareholders also in Barton and Loudon. Seven shareholders was, in fact, the statutory minimum, and only a few "private" companies in the cycle and tyre trades seem to have exceeded the figure by any significant margin. The Rudge Cycle Company was notable with a total of 30 holders, although 22 of these were Birmingham businessmen. The Whitworth Cycle Company "privately" distributed 30,000 £1 shares among 58 holders in 1893, although again the majority of these - 34 in number - lived in Birmingham and district (mainly industrialists and members of the professions), and a further nine were actively involved in the cycle trade as either manufacturers or agents.[1] The Whitworth Company was, however, fortunately placed for capital-raising activities since its proprietor, Charles H. Pugh, was a well established Birmingham manufacturer of screws and nuts. For the Star Cycle Company (Sharratt

1. 12,000 of the shares went to C. H. Pugh, the vendor. Of the remainder only 10 shillings per share was called-up.

and Lisle) Limited of Wolverhampton, a £10,000 "private" flotation was managed in 1895 only with difficulty. According to its chairman, C. E. Shaw, a Stafford merchant, "When the company was formed only one-third of the capital was subscribed, and as the Wolverhampton people would not look at it, it was only when I took an additional 500 shares that the Company could be floated".[1] The success of fund-raising by "private" company formation depended upon good connections with mainly local people of wealth who were favourably disposed to the Company and its entrepreneurial leadership. Even so, the amounts of capital that could be so raised appeared to have marked upper limits. Correspondingly, the "small" public flotation issue that characterised the cycle trade in the late nineteenth century may have been an attempt to break open the constraints imposed by a lack of good local connections - apparently acute for the 19 cycle and two tyre enterprises which publicly floated for sums of £10,000 or less. Furthermore, even where good connections existed in the sense of entrepreneurial contact with men of substance, sums acquired in excess of £10,000 were exceptional. But, on the other hand, it may have been the case that the "well-placed" cycle-making entrepreneurs did not generally require, from "private" incorporation, capital sums greater than about £10,000, though, if they did, larger sums were available. Evidence for this not only emanated from the amounts raised by the Rudge Cycle Company and Hillman, Herbert and Cooper in the mid-1880's, but also from the capital-raising activities of some of the seamless steel tube producers

1. Cycle Manufacturer, 28 Nov. 1896, p.176.

and motor-car manufacturers. In January 1888 William Charles Stiff formally linked his Credenda Cold Drawn Seamless Steel Tube Company of Birmingham with the principals of Sir Joseph Whitworth and Company Limited of Manchester; an arrangement whereby the latter injected £20,520 into a new Credenda Seamless Steel Tube Company Limited. In December 1891 five per cent debenture placements were made to a nominal value of £25,000, and by January 1893 Whitworths had provided an extra £13,750 through ordinary share allotments.[1] In 1891 Arthur, Joseph, Herbert and Walter Chamberlain of Birmingham, in conjunction with John, and John Arthur Harrison of Handsworth, financed the establishment of the Endurance Seamless Tube and Vial Company Limited of Birmingham under the entrepreneurial leadership of George Hookham. These participants put £8,600 into the business (£6,000 from the four Chamberlains) by way of ordinary share allotments, but a further £15,000 (nominal) was provided in the form of debenture placements, mainly to Arthur Chamberlain (£12,500) but also to the screw manufacturer John S. Nettlefold and his wife (£2,000) and to George Hookham himself (£5,000).[2] In the nascent British motor-car industry of the 1900's, an astonishing £203,891 was "privately" raised from ordinary share subscribers in 1903 for the new A. Darracq and Company Limited. Ewen Cameron, "gentleman" of London, provided £45,000; Sir George Newnes, M.P., £40,000; Sir James Joicey, M.P. of Morpeth, Northumberland, £20,000; William B. Avery of Windsor, £30,000; Alfred Rawlinson of London, £30,000; and Edward F. Kelby of Lyndhurst, Hants. contributed £20,000.[3]

1. P.R.O., B.T.31, 4024/25649.
2. P.R.O., B.T.31, 5120/34521. The existence of the debenture placements was revealed by a subsequent debenture-to-share conversion operation.
3. P.R.O., B.T.31, 10233/76793.

The Utilised Formal Techniques Of Flotation.

A formal public flotation of a joint-stock company during the years prior to 1915 involved, at least, two things: firstly, the sale by the proprietors of an established business (or of patent rights, or manufacturing licence, or simply of an idea) of their assets to a newly registered, limited liability company; and, secondly, the issue of stocks and/or shares to the public by the company to provide the wherewithall with which to purchase the assets. The purchase price and its terms of payment were usually contained in a contract drawn up between the vendors and the company (the vendee) and were also usually detailed in the publicised prospectus which accompanied the public company's stock and share issues. In the dealings between the original proprietors of the assets and the joint-stock company, it was possible to have the intervention of an intermediary i.e. a company promoter, who sometimes bought the assets from the original proprietors and sold them to a company which he formed for the purpose, invariably with the possibility of a capital gain accruing to himself in mind. Among some of the flotations in the cycle, tyre, tubing and motor-vehicle trades the identification of such company promoters is possible. Sometimes they took the form of firms of brokers, such as Chadwick and Company who promoted the Rudge Cycle Company in 1887. Occasionally, they took the form of joint-stock financial syndicates. For example, the Cycle Contract Company Limited (which promoted the Endurance Tube and Engineering Company in June 1896), was especially formed in May 1896 with an issued share capital of £12,007, all by way of cash subscriptions from 43 shareholders in all, twelve living in Birmingham and nineteen in Coventry. The syndicate included a fair number of well-established cycle entrepreneurs, notably James and William Calcott of Coventry (500 £1 shares each), John Griffiths (500), Charles D. Turrall of Coventry (500), Walter Hewitt of Singer Cycle (250), Charles A. Palmer of St. Georges' Engineering of Birmingham (500), J. B. Dunlop of Dublin (500), William H. Herbert of Premier Cycle (500), Edward Mushing of Centaur Cycle (500), William Starley of Starley Brothers of Coventry (300), Bayliss, Thomas and Company Limited (200), J. C. Stringer of Singer Cycle (300), Charles Vernon Pugh of Rudge-Whitworth (500), Siegfried Bettmann of Triumph Cycle of Coventry (100), and Albert Eadie of Redditch (500 shares). It was dissolved in May 1897 with its assets, viz. cash, and shares in The Endurance Tube and Engineering Company, distributed pro rata to the syndicate shareholders.[1] Similarly, there was the Brotherton's Tube Company Limited organised in April 1896 to purchase a Wolverhampton seamless steel tube business from Edward Lisle, the cycle manufacturer, Julius Goodman, a commission agent of Harborne, and Edmund Bullivant, a japanner of Wolverhampton. These, in turn, had bought the enterprise from John Brotherton and Francis Simms in the March. The new limited company floated its acquisition off as the New Brotherton Tube Company Limited in April 1897, and again was a syndicate of 33 prominent cycle manufacturers and other mainly Midlands businessmen. 9,000 of its issued 12,000 £1 shares were allotted for cash, £500 coming from Levi Johnson, a licensed victualler of Wolverhampton; £641 from Samuel Gorton the Coventry cycle manufacturer; £500 from J. B. Dunlop; £600 from Calcott Brothers, cycle makers of Coventry; £570 from W. H. Herbert of Premier Cycle; £271 from Alfred Herbert, the machine-tool manufacturer; £645 from Charles E. Shaw, chairman of

1. P.R.O., B.T.31, 6796/47824.

Edward Lisle's Star Cycle Company; £500 from Edward Mushing of Centaur Cycle of Coventry; £500 from Brown Brothers, cycle and component factors of London; £500 each from John Rollings of Wolverhampton and Thomas E. Cook, cycle agent of Leeds; £441 from John Griffiths of Coventry; and £250 each from the Star Cycle Company Limited, and Bayliss, Thomas and Company Limited. Upon completing its promotion, the syndicate was duly wound-up in July 1897.[1] Another ad hoc promoting organisation was the Elswick Syndicate Limited formed only for the flotation in June 1913 of the Elswick-Hopper Cycle and Motor Manufacturing Company of Barton-on-Humber, Lincs. It had an issued share capital of £500, 377 £1 shares being held by Sidney Hereford-Lavey, a professional company promoter operating in the City of London, and 123 by two inscrutable gentlemen, Messrs. Scruly and Marx.[2] Additionally, there were finance and promoting companies of greater and lesser longevity. The New Premier Cycle Company of Coventry was successfully floated in June 1896 by the City of London Contract Corporation Limited, a well-established finance company headed by the reputable Osborne O'Hagen. The Bowley Pneumatic Tyre and Cycle Company Limited was floated in May 1896 with the aid of the South African, Australian and General Finance Company Limited - a concern incorporated in October 1895 for the purpose of promoting companies and carrying-on financial dealings of all kinds, but subject to a winding-up order by July 1897.[3] The pneumatic tyre combine of 1897, the Amalgamated Tyre Companies Limited, was promoted by the Birmingham Traders' Syndicate Limited, a financial structure initially formed in September 1895 under the title of the London Trading Company

1. P.R.O., B.T.31, 6766/47614.
2. Petition by Bosch Magneto Limited, presented to Mr. Justice Astbury in the High Court in 1914, and contained in the business records of the Elswick-Hopper Cycle and Motor Company Limited.
3. Cycle Manufacturer, 31 July 1897, p.11.

Limited. It had a nominal capital of 10,000 £1 shares, a Memorandum of Association which entitled it to deal in almost anything, and registered offices in Holborn Viaduct, London, E.C. In February 1896 London Traders had issued 507 shares for cash (there being no vendors' shares) entirely to the Assurance Trust Corporation Limited of Coleman Street, London, E.C., which vanished in the summer of 1897, when the Company changed its name to Birmingham Traders' Limited, moved its registered offices to Loveday Street, Birmingham, and increased its issued capital ten-times over. Shareholdings in the revamped finance company changed hands rapidly, but upon the formation of Amalgamated Tyre, 2,000 shares (the largest holding) were held by Henry J. Lawson and 1,000 by Walter Phillips, Humber Limited's Coventry factory manager. Neither of these gentlemen, however, had any overt stake in Birmingham Traders' Limited when it was wound-up in August 1900.[1] Sometimes the promoting intermediary was an individual acting upon his own initiative. Walter Halstead Frith, a London merchant, floated the cycle firm of Buckingham and Adams Limited in 1889; a Mr. Alfred Davis promoted the Ixion Pneumatic Tyre Company in 1896; a David Charles Davies promoted the Anglo-Swedish Steel Tube Company Limited towards the end of that year; and A. W. Byron of Chesterfield formed the Universal Weldless Steel Tubes Company (Ehrhardt's Process) Limited in April 1897. The promotion of the merger of Middlemore and Lamplugh Limited in October 1896 was the handwork of a William Gordon Hannay, and it was George Clare, a London banker, who promoted Dennis Brothers (1913) Limited of Guilford.

1. Ibid., pp.14-15; and P.R.O., B.T.31, 6446/45437.

The two most notable company promoters in the cycle and motor trades of the 1890's were, of course, Ernest Terah Hooley and H. J. Lawson. Rarely did they operate alone, but often in conjunction with other people, such as Harvey du Cros and Martin D. Rucker, who could provide finance. At times, they lurked anonymously behind the smokescreen of a limited liability, joint-stock syndicate, as H. J. Lawson did with the Birmingham Traders' Company Limited.

The Motives For Flotation.

There were various aspects to public company flotation in the U.K. during the late nineteenth and early twentieth centuries, viz. "conversion", the acquisition of additional "working capital", changes in the nature, or the abolition, of other people's financial liens on the firm, the formation of amalgamations, and attempts by promoting intermediaries to obtain capital gains. The objective which seemed paramount among the cycle and motor-car promotions of the 1890's was that of "conversion", i.e. a substantial change in the proprietorship of an established enterprise or other sets of assets. As the Investor's Review put it, in a cursory survey of the cycle and motor car flotations of 1896-7, vendors were ".....showing their very decided preference for sovereigns over shares".[1]

In Table 22, however, appears an analysis of the purchase considerations of a "sample" of companies, for which the vendor's terms were clearly stated, in the cycle, motor and related trades.[2]

1. The Investor's Review, vol. VIII, No. 43, Nov. 1896, p.277. Jefferys reckoned that this feature was not general. In the companies organised after 1885, he wrote "...the vendor appeared to have a controlling interest in the company. The amount of shares subscribed by the public tended to be less than those going to the vendor". J. B. Jefferys, op.cit., p.147.

2. The "sample" is as large as possible. The terms on which vendors were prepared to dispose of their assets to a company were sometimes not clearly stated, or, as in the case of the Dunlop Pneumatic Tyre Company, not publicly stated at all. In addition, the contracts of purchase drawn up between vendors and vendees were sometimes not presented to, or have not survived in, the company files preserved by the Public Record Office.

TABLE 22

The Proportions of Purchase Prices desired in the form of cash and/or in the form of cash with securities being a possible substitute.[1]

Percentage	Cycles	Tyres	Tubes	Motor-Cars
0	9	1	-	7
1 - 10	1	2	1	1
11 - 20	6	-	-	3
21 - 30	5	-	-	2
31 - 40	8	1	-	4
41 - 50	11	-	1	1
51 - 60	13	4	-	5
61 - 70	12	1	2	1
71 - 80	7	-	1	1
81 - 90	2	1	-	1
91 - 99	-	1	-	-
100	46	18	10	6
TOTAL	120	29	15	32

1. This latter term embraces purchase considerations stated in the form of "cash or shares". In these cases where the flotation met with full subscription, the vendors were, invariably, formally paid in cash despite their stated willingness to accept shares. Examples are the promotion of Robinson and Price Limited, a Liverpool firm of cycle manufacturers and retailers (in 1896); the Vanguard Cycle Company of Walsall (in 1897); and the Italian Spare Motor Wheel Limited (in 1908). The formal purchase provision of "cash or shares" was basically a form of insurance against the possibility of undersubscription. If the purchase terms were formally stated in just cash, undersubscription might have involved the trouble of renegotiating and redrawing up the contract of sale between vendor and vendee.

In so far as their purchase terms were concerned, not all the vendors in each trade apparently had the same objective in view, but it is also clearly apparent that the majority of vendors in the cycle, tyre and tubing trades had, "a priori", a decided preference for cash - unlike the motor-car industry where there was a greater willingness to accept securities.[1] With respect to the promotions involving complete cash sales, however, seven of the cycle company flotations, two of the pneumatic tyre, three of the tubing and one of the motor-car contained explicit provisions in their prospectuses that the vendors to, or the directors of, the new company - sometimes comprising the same people - would definitely subscribe for, or be allotted, a certain proportion of the securities offered to the investing public generally. The Rover Cycle Company, for example, floated in 1896 with a total public issue of £200,000 in ordinary shares and mortgage debentures, and with a purchase consideration of £180,000 in cash, stipulated that its principal vending entrepreneur, J. K. Starley, should himself be allotted 30,000 £1 ordinary shares. Other members of the vending enterprise were given the option to subscribe for and be allotted 17,000 shares. More simply, New Townend Brothers, also a Coventry cycle company floated in 1896 (a public issue of £80,000 with a vendors' price of £65,000 in cash) stipulated that the vendors should subscribe

1. The majority of motor-car flotations were, by the course of events, the product of the post-1900 period. Interestingly enough, G. L. Ayres' general study of the London capital market of 1899-1913 noted that, for newly-formed companies, for which figures for vendors' payments were available, and excluding issues made by railways, canals, docks, public utilities and finance companies, the cash preference of vendors declined markedly after 1900. G. L. Ayres, Fluctuations in New Capital Issues on the London Money Market, 1899-1913. (M.Sc. (Econ). thesis. London University, 1934), p.41.

for and be allotted £25,000 of the offered share capital. In the event, they took 16,034 preference and 8,966 ordinary shares. Other enterprises of note that adopted this policy, despite a formal commitment to a complete cash sale, were the Premier Cycle Company (in 1891), the New Jointless Rim Company of Birmingham (in 1897) and Dennis Brothers (1913) Limited. The result of these provisions, when firmly made and undertaken, was that the vendors did not really divest themselves of all interest in the non-money assets of their firms, and retained a substantial shareholding in them - unless they disposed of those holdings at some later date. They were fundamentally a variant of the purchase agreement which specified a price in terms of shares as well as cash. Even where shares were specified, in at least three important flotations, there was a willingness on the part of directors or vendors to subscribe for part of the total public share issue. Humber and Company's (1887) £125,000 flotation issue involved a subscription by the vendors and their friends for £40,000 of the total offer (the purchase price was £93,000 in terms of £21,000 in debentures and £72,000 in cash). Upon the reflotation of the Premier Cycle Company in 1896, the shareholders in the vending company applied at par for one-third of the £100,000 debenture and of the £300,000 preference share issues (purchase consideration : £600,000 cash and 100,000 £1 ordinary shares). Similarly, the directors of Vauxhall Motors (1914) Limited applied for 44,000 of the company's £134,000 share offer (the purchase price being £161,243 in 66,000 £1 ordinary shares, and £95,243 in cash).

It was not, correspondingly, so obvious in all cases that vendors desired "sovereigns over shares" where a substantial part of purchase consideration contained a cash element - a conclusion reinforced when it was possible, as they did, for vendors to subscribe for shares on their own account without making any explicit, public pronouncement of their desire to do so.

In so far as there was a very definite preference for cash by vendors in the cycle, tyre and tubing trades (excepting the cases where vendors proferred subscriptions), there is little evidence that directly refers to the precise motivations of the businessmen concerned. A hint was given in the prospectus of the Rudge Cycle Company flotation of 1887 in which it was stated that the principal proprietor of the concern, viz. George Woodcock, wished to retire from its active management.[1] The public flotation in the Spring of 1896 of the Concentric Seamless Steel Tube Company - hitherto a "private" limited company managed by Messrs. Nossiter and Holt of Birmingham since its foundation in 1891 - was reckoned to be "....in consequence of the ill-health of Mr. Nossiter, who is compelled to relinquish his share of the actual management, but who has consented to act as chairman of the board of directors, and will retain a considerable interest in the share capital of the Company".[2] But the desire to retire from the managerial role was not at all an important motive since most of the vending entrepreneurs in all the cycle, motor vehicle and related industries maintained executive directorships in their newly formed and floated companies.[3]

1. <u>Times</u>, 18 Oct. 1887, p.14.
2. <u>Cycle Manufacturer</u>, 2 May 1896, p.143. How much "interest" in an otherwise cash disposal remained unspecified. Ibid.
3. cf. J. B. Jefferys, op.cit., p.133. "The use of the limited form by the entrepreneur of a going concern to avoid possible loss or to retire with 'peace and honour' and a regular income, was not of great importance in the large companies".

With reference to the activities of company promoters, such as E. T. Hooley and H. J. Lawson, they purchased business enterprises or patent rights for cash, and envisaged only a short-term proprietorship over the assets at their command. The "cash sales" aspect of their promotions was explicable by the fact that eventually they wanted to sell-out at a profit taken out in the form of cash. Seemingly, a similar desire to take advantage of what appeared to be exceptionally favourable market conditions and obtain capital gains in cash through company flotation affected some of the businessmen themselves. Proprietors of certain companies were sorely tempted by the high purchase prices offered by individual company promoters or promoting groups. In May 1896 the Quinton Cycle Company Limited succumbed to the cash offers of a promoting syndicate represented by a E. T. Pierson of Coventry. During the last days of April the buyers' prices of Quinton's shares stood at £6.5.0d. Pierson offered £55,000 in cash such that each shareholder would receive £8.6.8d per £5 share. The Company's directors gave in quickly, Alderman Pollock of Birmingham, their chairman, declaring that the business of the firm had increased considerably during the current season and that capital had been expended on additions to its premises. "It would probably have been necessary in order to satisfy the demands made upon the Company, to call for more capital, but a proposal had been made to sell the undertaking to a syndicate". He preferred a good cash price to further anxiety.[1] In July 1896 E. T. Hooley offered £250,000 cash

1. Cycle Manufacturer, 9 May 1896, p.154.

for the business of the Coventry Machinists' Company that would enable the payment to shareholders of £20. 5. 0d per share at the final winding-up. The proposal was good enough in view of the fact that, in the first week of June 1896, the buyers' price for a £4.10. 0d Coventry Machinists' share was quoted at £17.[1] The ebullient William Starley of Starley Brothers and Westwood Limited was certainly carried away by the excitements of the 1896-7 "bicycle boom": Upon a train journey from London to Coventry "....he pointed to Gladstone bag on the rack above his head", wrote his biographer, "and, leaning forward, confided smugly that he had just bought another 'bucketful' of shares which he knew, from a confidential tip, would be certain to double their value within a few short weeks".[2] There is evidence, too, of the involvement of prominent cycle manufacturers in company promoting syndicates operating in the cycle trades of 1896-7.[3] Martin D. Rucker of Humber Limited, for one, was never far from the side of E. T. Hooley at that time.[4] Symptomatic of this general feeling was the flotation of "extension" companies by a number of major cycle companies during the 1890's. The rights to exclusive trade in certain areas of the world, or to operate exclusive wholesale agencies, were sold, by such firms as New Hudson, Humber Limited,

1. Ibid., 11 July 1896, p.245.
2. G. Williamson, Wheels Within Wheels. The Story of the Starleys of Coventry (1966), p.122.
3. See supra.
4. See supra.

Rudge-Whitworth and Starley Brothers, to separate companies either wholly or partly for cash, with the cash component swelling the profits of the parent concern and its dividend pay-outs. Tyre manufacturers, particularly Seddon's, Pneumatic Tyre Company of the early 1890's, and the Dunlop Company, were adept at this practice, too, as was the Stepney Spare Motor Wheel Company of the 1900's. Seddon's, Pneumatic Tyre Company sold its French trading rights to Seddon's Pneumatic Tyre (French Patents) Limited in April 1893 for £35,000 in cash, and its trading rights for the rest of the European Continent to Seddon's Pneumatic Tyre (Continental) Limited, for a like amount, in the following May. B. A. Poole of the Stepney Spare Motor Wheel Company (floated in 1906) sold the Company's American trading rights to Spare Motor Wheel of America Limited for £42,000 in cash in 1907, and its southern European rights to the Italian Spare Motor Wheel Company in 1908 for £16,000 in cash and £13,000 in cash or shares. The disposable profits of Rudge-Whitworth Limited received a £25,000 boost in 1897 from the formation of Rudge-Whitworth (Foreign) Limited, and in so far as its chief entrepreneurs, Charles and John Vernon Pugh, were major shareholders, they benefitted accordingly. Additionally, the "spinning off" of publicly-floated companies from parent concerns occasionally had the aura of an entrepreneurial desire to be rid of loss-making assets at no loss to the entrepreneurs themselves, or to transfer very high risk activities to separate corporate entities owned by other wealth-holders. The formation and flotation of the Components Tube Company Limited in 1896-7 was a case in point. Harvey du Cros sen. blandly admitted in the June of 1896 that the seamless steel tube business of the Cycle Components Company had been "a fruitful source of loss" but added that it had "recovered its tone, and remunerative prices are now being obtained".[1] On the strength of this, a promoting syndicate, consisting of E. T. Hooley, Dr. F. F. MacCabe, D. D. Bulger, Harvey du Cros jun., and two gentlemen named Wotton and Cuthbert, purchased Cycle Components' tube plant for £50,000 in the July, and successfully disposed of it to a "gullible public" for £130,000 in early 1897. £20,000 of the difference was destined for the purchase of new plant and machinery by the new company, but after the payment of all promotion expenses, Hooley, Bulger, Harvey du Cros jun. and friends made a net cash profit of £29,500. The subsequent career of the Components Tube Company was one of commercial disaster sufficient to bring the enterprise into the High Court in 1898 and into liquidation by 1900.[2] The £100,000 flotation of the Enfield Autocar Company in March 1906 had much the same flavour. The Times noted that its prospectus was "...... in most respects a clear and satisfactory statement, but the absence of any figures with regard to the profits earned by the vendor company from its manufacture of autocars makes it impossible to

1. Cycle Manufacturer, 14 May 1898, pp.218-9.

2. Ibid., 7 May 1898, pp.204-5. The High Court action was that of The Components Tube Company Limited v Naylor in which the defendents accused the plaintiffs of issuing a fraudulent prospectus.

gauge the prospects of the new company". The newspaper also observed that the vending company, Enfield Cycle, desired its price to be payable fully in cash.[1] Neither aspect was surprising since during the previous year the directors of Enfield Cycle declared that their motor department failed to match their anticipations.[2] And the commercial career of Enfield Autocar was miserable and shortlived: for the 19 months ending 31 July 1907 it made a loss of £19,264, with its formation expenses unliquidated, and owing £18,154 to trade creditors only offset by debts due to it of £4,475.[3] In January 1908 it was in voluntary liquidation.

Since "conversion" was the principal aim of company flotation in the cycle and related trades, it followed that the raising of extra "working capital" often had a subordinate role. There were, of course, exceptions to the "conversion" aspect. The Raleigh Cycle Company flotation of 1891 stipulated its purchase consideration in terms of £39,012 in ordinary shares and £1,000 in founders' shares. William Bown wanted 60,000 £1 ordinary shares for his cycle manufacturing business in 1893. In the motor-car industry, S. F. Edge (1907) Limited and S. Smith and Sons (Motor Accessories) Limited - floated in 1914 - had purchase considerations specified entirely in the form of ordinary shares. The vendors, in other words, were prepared to carry much of the risk of conducting a manufacturing concern, without switching to cash or "safer" types

1. Times, 7 March 1906, p.13.

2. Ibid., 12 Oct. 1905, p.12.

3. The Investor's Review, vol. XX, New Series, No. 507, 21 Sept. 1907, p.370.

of securities such as debentures or preference shares.[1] For these, the principal purpose of flotation was the raising of additional "working capital", but even for most of the others, the aspect of "conversion" was muted in the flotation prospectus, whereas the notion that the enterprise was profitable, expanding and in need of additional capital was invariably and fullsomely elaborated.

In Tables 23 and 24 appear the proportionate and absolute amounts of "working capital" desired by a "sample" of public flotation issues in the cycle, motor-vehicle and related trades.[2] Once more there was a contrast between the cycle, tyre and tubing industries, and the motor-car trade. For 63 per cent of the "sample" of cycle company flotations, and for the majority of tyre and tubing flotations, 50 per cent of the value of each issue, or less, was destined for extra

1. Interestingly enough, a substantial proportion of vendors, involved in public company flotations in the cycle, motor-car and related trades, saw their vending terms as a straight choice between cash and ordinary shares; the latter being the security bearing the greatest amount of risk with respect to capital and income. At least 46 of the "sample" of cycle company flotations, six of the tyre flotations, four of those in cycle tubing, and 18 of those in motor-car manufacturing specified purchase considerations in terms of cash and/or ordinary shares. Very few proprietors in any of these industries required debenture stocks - the "safest" of the non-cash assets - in total or part settlement of the purchase price. The promotions of Humber and Company Limited in 1887 (in which the vendors desired £21,000 in debentures out of a total price of £93,500), and of J. B. Brooks and Company, the cycle saddle makers, (where a purchase price was settled in 1896 by 100,000 £1 ordinary shares, £25,000 in debentures and £75,000 in cash) are examples of those who did.

2. Again the size of the "sample" is dictated by the availability of the requisite information, i.e. it is as large as possible.

TABLE 23

Public Flotation Issues in the Cycle, Tyre, Tubing and Motor-car Trades and the proportionate amounts desired for "working capital".

percentage of issue for "working capital"	Cycles and Motor-Cycles	Tyres	Tubes	Motor Cars
0	2	-	1	1
1 - 10	13	2	5	1
11 - 20	23	8	3	2
21 - 30	21	7	2	3
31 - 40	14	10	2	2
41 - 50	11	2	1	3
51 - 60	16	-	-	2
61 - 70	11	-	-	3
71 - 80	6	2	1	4
81 - 90	4	-	-	3
91 - 99	-	1	1	2
100	12	2	-	6
Total	133	34	16	32

TABLE 24

The absolute amounts of "working capital" desired from public flotations in the Cycle, Tyre, Tubing and Motor-Car Trades

Amount of "working capital" £	Cycles and Motor Cycles	Tyres	Tubes	Motor Cars
0	2	-	1	1
1 - 10,000	37	3	5	2
10,001 - 20,000	41	11	3	4
20,001 - 30,000	26	10	2	4
30,001 - 40,000	6	4	1	4
40,001 - 50,000	6	4	-	4
50,001 - 60,000	6	-	-	2
60,001 - 70,000	3	1	-	1
70,001 - 80,000	3	1	1	1
80,001 - 90,000	-	-	-	-
90,001 - 100,000	3	-	1	3
over 100,000	-	-	1	6
Total	133	34	16	32

"working capital". 62.5 per cent of the "sample" of motor-car promotions, on the other hand, desired "working capital" sums which amounted to more than 50 per cent of the total value of each issue: a reflection, in part, of the greater willingness of motor-car manufacturers to accept shares and/or stocks in satisfaction of their vendors' considerations. Again, a very high proportion of the cycle, tyre and tubing manufacturers desired amounts of "working capital" from company flotation of £30,000 or less, while very few required £70,000 or more. 11 out of the 32 "sample" of motor-car flotations, on the other hand, desired "working capital" sums of £30,000 or less, while 10 wanted over £70,000 compared to six of the cycle promotions, one of the tyre and three of the tubing.

It would be dangerous to generalise about the characteristics of the enterprises which stipulated that greater or lesser proportions of their flotation issue values should go towards additional capital formation. Certainly, some of the comparatively small businesses making relatively "small" public flotations of £30,000 or less desired a high percentage of the funds raised for additional capital formation. The "Otto" Cycle Company of 1882 wanted 76 per cent of its £26,000 issue for "working capital"; the Bard Cycle Company of 1896 62 per cent of its £25,000 issue; the Rosser Cycle and Vehicle Brake Company, floated in the same year, 67 per cent of its £15,000 issue; the New Hudson Cycle (Extension) Company of 1897 required 67 per cent of its £15,000 issue for "working capital"; and A. J. Stevens and Company, a motor-cycle firm promoted in 1914, designated 78 per cent of its £19,000 issue for extra capital formation. British Orto Tyres, floated in 1912, wanted all of its £30,000 flotation issue for capital formation. On the other hand, some of the "small" flotations were more of a "conversion" nature, and not the products of firms simply striving for extra investible capital. All but £1,365 of the £20,000 flotation issue by Richard's Beau Ideal Cycle of Wolverhampton was destined for the pockets of the vendors in 1896. Only one-fifth of the £20,000 issue made by Presto-Gearcase and Components Company, also of Wolverhampton and also in 1896, was required for "working capital". Cambria Cycles of Swansea, the Vanguard Cycle Company of Walsall, and the Birmingham Criterion Engineering Company made issues of between £12,000 and £15,000 in 1897 and all required less than 30 per cent for additional capital formation. Just as entrepreneurial policies and motivations varied widely among the small firms, so did they among the large. For sure the four companies, floated without any intention of raising extra capital at all, were relatively large and well-established. They were the New Premier Cycle Company of Coventry in 1896, Brown Brothers Limited of London (factors of cycles and accessories) and the Climax Weldless Tube Company in 1897, and D. Napier and Son Limited in 1913. It was equally true, however, that some fairly well-established enterprises required a high proportion of their flotation issues for the purpose of business expansion. William Bown Limited in 1893, "Argyll" Motors in 1905, and S. F. Edge (1907) Limited wanted *all* the funds for capital formation. So, too, did Rudge-Whitworth, floated in 1894, to combine the Rudge and Whitworth cycle companies. J. A. Phillips and Company of Smethwick, founded initially in 1897 and promoted in 1913, required 78 per cent of its £55,000 flotation issue for extra "working capital".

The supposition that companies, formed solely to exploit some patent right or trading or manufacturing licence, would demand a higher proportion of the finance raised for capital expansion than businesses already established, held true - with the exception of the motor-car industry. The value of "working capital" requirements as a proportion of the total value of all flotations, for which details are known, by established enterprises was 38 per cent for those in the cycle trade, 30 per cent for tyre businesses, 23 per cent for tubing manufacturers and 62 per cent for those in the motor-car industry. The corresponding percentages for flotations based upon patent, manufacturing or trading rights only were 54, 35, 53 and 60, respectively. Nevertheless, generalisation would be hazardous given the relatively small number of flotations of the latter type, and the dispersion of their individual proportions. Thus in the cycle industry these proportions ranged from 20 to 100 per cent; in the tyre industry from 16 to 100 per cent; in the case of tubes from 33 to 73 per cent; and for motor-cars from 27 to 89 per cent.

The diversity in entrepreneurial motivations and requirements, even within the context of a single trade, appeared with respect to the absolute amounts of "working capital" desired from company flotation. It was unlikely that Rudge Cycle in 1887, Premier Cycle in 1891, Rover, Star and Swift Cycle in 1896, and New Centaur, New Jointless Rim and New Triumph Cycle in 1897 needed to resort to the full panoply (and expense) of public flotation to raise their additional capital funds of between £10,000 and £25,000. All were joint-stock companies prior to public flotation, and some, e.g. Rudge, Star, Swift and Triumph, already had a substantial collection of shareholders on their books. A "rights issue", or the publication of a prospectus, inviting subscriptions for an additional share issue which equalled, in value, the amount of additional finance required, was perfectly possible for these enterprises - and, indeed, was done by similar firms when conditions in the relevant industry and in the capital markets were deemed to be favourable. Cycle Components, for instance, successfully issued 20,000 £1 ordinary shares, at a premium of ten shillings, to its existing shareholders in 1896. Obviously, other factors, such as that of "conversion", were of overwhelming importance for these particular enterprises, and consequently it was not invariably the case that the "small" amounts of "working capital" desired by "small" and established firms in the cycle and related trades was the cause of the capital requirement pattern shown in Table 24; though there was at least one case where a relatively large unincorporated cycle maker desired additional finance on terms and on such a scale that made public flotation inevitable, that being William Bown Manufacturing which looked for £70,000 in 1893. Strikingly enough, and indicative of entrepreneurial ambitions and perceptions of investors' attitudes, some relatively heavy "working capital" requirements were stipulated by firms that had hardly got off the ground. For instance, the Cycle Industries Corporation (a finance company) which wanted £100,000 in 1896; and British Motor Carriage and Cycle Limited (£95,000 in 1896). The year 1897 saw £70,000 required by Metropole Acatène (Chainless) Cycle Limited; £67,000 by Starley (Russia) Limited; £70,000 by the Pneumatic Tube Machine Company; and £150,000 by the London Motor Van and Wagon Company. Of all these companies, floated with no more than patent or manufacturing rights to go on, Lawson's Great Horseless Carriage Company of 1896 topped the lot with a "working capital" requirement of £250,000. The rubber tyre promotions, however, that fell into this category, were modest in their demands. Eleven out of the 16, for which details are known, desired amounts of "working capital" of £30,000 or less, and a further two only required £35,000 each. The exceptions were provided by Bagot Pneumatic Tyre, which wanted £75,000 in 1896; the Bell-Hall Unpuncturable Tyre and India-Rubber Company (£50,000 in 1900); and the "K.T." New Pneumatic Tyre and Rubber Company that required £50,000 in 1910.

The cycle, tyre, tubing and motor-car industries fully shared in the contemporary development of using joint-stock structures for the formation of monopolies and combinations.[1] In fact, there were only three important amalgamations in these trades before 1914 that

1. For the contemporary development in general see J. B. Jefferys, op.cit., pp.128-9.

did not involve a formal company flotation, namely, the takeovers of the Eadie Manufacturing and the Daimler Motor-Car companies by B.S.A. in 1907 and 1910, respectively, and the merger between Abingdon Works and Albert Eadie Chain to form Abingdon-Ecco Limited in August 1906. With regard to these, the objective was secured by an exchange of shares (in the cases of Eadie Manufacturing and Abingdon-Ecco) and by outright purchase of the equity capital (in the case of Daimler Motor Car), and was possible since the participants were already large corporate structures. For the first significant amalgamation in the cycle trade - the formation of Humber and Company Limited in June 1887 - a flotation was necessary, since none of the four enterprises concerned were joint-stock companies to begin with, and a purchase price of £93,500 had to be covered as well as £52,500 found for "working capital".[1] Of these the investing public was asked to - and did - provide a good part in cash as the vendors were only willing to accept £21,000 in five per cent debentures in the way of securities, plus an offer to subscribe for £40,000 of the shares.[2] The policy of arranging a merger with an invitation to the public not only to subscribe the requisite "working capital" but also to purchase

1. Times, 17 June 1887, p.13. The objective of the "amalgamation" was basically to permit the rapid expansion of Humber and Company of Beeston, Nottingham. See supra, p.161. Thomas Humber was designated as general manager of the new concern, and his erstwhile partner, T. Harrison Lambert, a Nottingham lace dyer and finisher, sat on the board. Of the entrepreneurs concerned with the other firms involved, only Christopher N. Baker of the Coventry Cycle Company obtained a directorate. The proprietors of the Express Cycle Works of Wolverhampton and the Wellington Works of Coventry simply got their purchase considerations.

2. Ibid.

the bulk of the assets of the new concern characterised the flotations of Cycle Components Limited in 1894; the Midland Cycle and Tyre Company, and Clément, Gladiator and Humber (France) Limited in 1896; Weldless Tubes Limited, New Turner and Wadeley Cycle of Birmingham, New Rapid Cycle, and the Amalgamated Pneumatic Tyre Companies in 1897; and D. Napier and Son in 1913. For two it was the principal objective of the combinations. The acquisitive hands of the promoting E. T. Hooley and his associates were paramount in the flotation of Clément, Gladiator and Humber. The amalgamation, designed to combine the French cycle firms of Adolphe Clément and of Aucoc and Darracq with Humber's French agency, had little of real economic substance to commend it, and had to be reconstructed in 1901.[1] Amalgamated Pneumatic Tyre was essentially the product of the desire of four unprofitable pneumatic tyre firms to escape the predatory competition of the Dunlop Tyre Company, and at the same time unload over-valued assets upon an investing public to the profit of the vendors. As the <u>Economist</u> noted, the shareholders of the participating Turner Pneumatic Tyre Company were due to receive £350,000 for what was valued on the market at £115,761; Scotts' Standard Pneumatic Tyre £160,000 for assets with a market value of £135,170; and Beeston Pneumatic Tyre £300,000 for shares valued at £143,520.[2] And Basil Gee, chairman of Turner Pneumatic Tyre, was very ready to point out to his shareholders as an additional carrot to secure their

1. See, Supra, pp.228-9.

2. <u>Economist</u>, 24 July 1897, pp.1055-6. The four companies had a total nominal share issue amounting to £885,768 with a total market valuation of £534,451.

compliance, that "Mr. Hooley was taking a most energetic part in the issue of this new scheme, and his belief was that the capital of the new company would be subscribed at least twice over".[1] The flotation was heavily under-subscribed, however; Dunlop's competition proved inexorable, and the Amalgamated Company was finally dissolved in 1906 after a reconstruction in 1900.[2]

A lack of profits and the need for defensive market postures were not the problems facing the constituent firms of Cycle Components, Weldless Tubes and D. Napier and Son. The formation of Weldless Tubes Limited in March 1897 - a time when the demand for tubing was good - out of the New Credenda Tube Company, the Star Tube Company, Climax Weldless Tubes, and the St. Helen's Tube and Metal Company, was rather an aggressive operation with the purpose of profiting from a quasi-monopolistic position in the seamless steel tube trade. Shareholders in the constituent companies were liberally advised to exercise their options of subscribing for shares in the new company in proportion to their existing holdings, but the initial aggressive stance turned to one of defence of market price levels when the demand for tubing began to contract in the early 1900's. Similarly, the desire to sell for cash was a supplementary aspect, and not the main consideration, behind the amalgamation of S. F. Edge Limited and

1. Ibid., p.1069. The project also had the promoting expertise of H. J. Lawson behind it.

2. At the beginning of September 1897 it was rumoured in City financial circles that only £30,000 was subscribed by the general public to Amalgamated Tyre's £1,300,000 offer of shares and debenture stocks. Soon after its launch, its £1 ordinary shares were discounted by the markets by 12/6d. Cycle Manufacturer, 4 Sept. 1897, p.75.

Napier Motors in August 1913. S. F. Edge sold Napier's motor-cars at ever increasing profitability during the 1900's while Napier's purely manufacturing business began to show declining profitability after 1910. Maker and retailer quarrelled over this development until both realised that the divorce between manufacturing and selling must end.[1] The dispute was settled with Montague Napier arranging to buy out completely the business of S. F. Edge Limited. Napier wished to continue the full control which he hitherto had enjoyed and so cash was necessary. £400,000 in cash out of a total purchase price of £750,000 was raised by a debenture and preference share flotation, and Edge retired to a pig farm in Sussex.[2] The formation of Rudge-Whitworth in 1894 was the only merger flotation in the cycle and related trades that stipulated its purchase terms entirely in the form of securities, with the whole of the flotation issue destined for "working capital". On the other hand, there were good reasons for this. C. V. Pugh and his brother, John, of the Whitworth Cycle Company were able, far-sighted entrepreneurs who required the assets of the Rudge Cycle Company for thefulfilment of their expansionary aims, and a solid basis, rooted in share ownership, from which they could take-over

1. C. Wilson and W. Reader, Men and Machines. A History of D. Napier and Son, Engineers Limited. 1808-1958 (1958), pp.96-99.

2. Ibid., and Times, 28 July 1913, p.16.

control of the new concern.[1] Full executive control was what they achieved by 1896, but in the meantime the Rudge interest demanded an equal say. Charles Wallis of the Rudge Company was appointed chairman of the Rudge-Whitworth board, and Charles Pugh had to share the managing directorship with Rudge's John F. Wright. The Pugh's won through the demonstration of their superior entrepreneurial talents - qualities which the Rudge Company was in dire need, as it had been in a parlous financial position during the year prior to the amalgamation; a trading profit of £39,265 for thefinancial year 1889/90 having run down to a loss of £14,864 for the ten months ending 31 August 1893.[2] This became public knowledge before the formation of Rudge-Whitworth, and militated against a cash disposal of the new company's assets to the investing classes. Indeed, as it turned out, the "working capital" requirement in the flotation was not fully subscribed; an allotment of 20,461 £1 shares being made as against a desired 30,000.

The Motives For Flotation: The Operations Of Some Promoters.

In their severest moods the "reputable" financial press alleged that the sole purpose of many company flotations among British commercial activities was to line the pockets of the promoter. With respect to the cycle trade in 1896 the Investor's Review was moved to say:

> "Now that ladies have taken so readily to the wheel, promoters have anew seized the chance of floating new companies..... From Dublin, the disease has spread to

1. See supra, pp.164-5.
2. See supra, pp.114-5.

pious Birmingham and other places, until the courage of the promoter, and his greed, brought him to conquer the London Market. Against the industry itself we have not a word to say; it is a perfectly legitimate industry, and the trade in cycles has grown enormously. But some investors may be in need of warning against the machinations of speculators and company mongers, who always endeavour - oftimes with success - to catch on to a sound industry, inflate it, and fill their own pockets at the expense of trustful Josephs".[1]

Even the cycle trade press become upset, as for instance the Cycle Manufacturer:

"It is about time that certain limited companies connected with the cycle and allied trades were favoured with a little closer investigation. It is simply beyond comprehension how shareholders and creditors put up with the transparent manner in which they are systematically swindled, particularly in the original formation and ultimate decay of pneumatic tyre companies. That men of hitherto honourable repute should, in the first case, lend their names to concerns merely formed for the purpose of professional promotion, and afterwards become parties to an even more decided form of swindling, passeth all understanding....."[2]

1. Investor's Review, vol. VII, No. 38, June 1896, pp.340-1.
2. Cycle Manufacturer, 26 Jan.1895, p.10.

And the two most notorious promoters in the cycle and motor-car trades of the 1890's were Ernest Terah Hooley and Henry John Lawson.

Hooley came from a moderately prosperous family background. He had entered into a partnership with his father in 1882 as a lace manufacturer of Long Eaton, Derbyshire, and ten years later the firm was turned into a limited company, T. Hooley and Company Limited, with a nominal capital of £100,000. In 1894, with the aid of a £35,000 legacy from his mother's estate, he established himself as a stockbroker in the Royal Exchange Buildings, Nottingham.[1] There he made contact with Martin D. Rucker, managing director of Humber Limited, and began his promoting career with off-shoots of the Humber Company; Hooley and Rucker agreeing that the latter should take one-half of all the profits on business introduced by him.[2] Humber and Company (America) Limited came, first of all, in 1894, followed by Humber and Company (Russia) Limited and Humber and Company (Portugal) Limited in 1895, and by Humber and Company (Extension) Limited in 1896. Hooley never did establish a London office but early in 1896 he took a fine suite of rooms at the Midland Grand Hotel, St. Pancras - the rent averaging about £200 a week - and pursued his financial ventures from that address.[3] During the next two years Hooley handled the flotations of some of the most important companies in the cycle and associated trades of his day.

1. G. Williamson, op.cit., p.117; Times, 25 July 1898, p.3.
2. Times, 28 July 1898, p.14.
3. Ibid., and H. Osborne O'Hagen, Leaves from my Life (1929), vol. 1, p.409.

The Trent Cycle Company (a £100,000 flotation), Raleigh Cycle (£133,334), Dunlop Pneumatic Tyre (£5million), Singer Cycle (£810,000) and Swift Cycle (£375,000) received his attention in 1896. So too did Clément, Gladiator and Humber (France) Limited (a £900,000 flotation) which combined the French cycle firms of Adolphe Clément and of Aucoc and Darracq with Humber's French agency. In 1897 he was involved in forming the £1,300,000 combination of ailing pneumatic tyre firms - the Amalgamated Pneumatic Tyre Companies Limited.

Hooley did not operate alone but formed ephemeral syndicates for the purpose of providing the initial finance requisite in floating a large company. In the promotion of Humber (America) Limited he was partnered by Messrs. Rucker and Orris, and similarly had two partners in the promotion of the Trent Cycle Company, who contributed £2,958 each.[1] The initial expense of organising the Dunlop Pneumatic Tyre Company required not only the services of Rucker but also the financial assistance of Emerson Bainbridge M.P. of the mining engineering firm of Seymour Bainbridge and Company.[2] The attraction of Hooley to his associates was his ability to yield to those involved in his schemes substantial speculative gains from the subsequent sales of the securities he had created and allotted. As one of them, W. F. M. Weston-Webb recorded, Hooley told him what and when to buy or sell, and, furthermore, "Mr. Hooley never lost sight of the money I had made, and it was always reinvested in his companies, and I may say that almost to the end of our dealings my investments turned out successfully".[3] Rucker, claimed Hooley

1. Times, 2 Aug. 1898, p.12.

2. The involvement of the wealthy Bainbridge came to light when he sued Hooley for large sums of money due to him for his participations in Hooley's promotions. The suit cost Hooley £100,000. O'Hagen, op.cit., pp.411 and 417.; Times, 28 July 1898, p.14.

3. W. F. M. Weston-Webb, The Autobiography of a British Yarn Merchant (1929), pp.165-6.

during his bankruptcy examination in late 1898, made £478,238 out of his promotions between September 1895 and December 1896, and £25,000 between January 1897 and January 1898.[1] "It is strange", recorded Osborne O'Hagen, "what a persuasive character Mr. Hooley was. For a short while he was looked up to and followed to an extraordinary extent, and he made a great mark in the financial world. He came upon the scene suddenly; like a meteor he floated across the skies, carrying all before him, for it appeared that everything he touched turned to gold".[2]

Unlike Hooley, Henry J. Lawson, the son of a Brighton Methodist minister, began his commercial life in the cycle trade itself, at first in the employment of Messrs. Haynes and Jeffries of Coventry in the late 1870's. He quickly distinguished himself as a cycle innovator - claiming to have invented the first "safety" bicycle in 1879 - and became manager of the Tangent and Coventry Tricycle Company in 1880.[3] By 1882 he had moved into partnership with Barnet J. Vanderlyn, a Coventry ironmonger and merchant, to form the "National" Bicycle and Tricycle Manufacturing Company, with himself as works manager.[4] His first taste of company promotion came in 1883 when he attempted to float his enterprise as a

1. Times, 28 July 1898, p.14.
2. O'Hagen, op.cit., p.409.
3. The Cyclist, vol. 1, No. 27, April 1880, p.271.
4. Ibid., Vol. 4, No. 195, 11 July 1883.

(short-lived) joint-stock concern with a public issue of £40,000. He subsequently became sales manager to the Rudge Cycle Company, and it was he who suggested to its owner, George Woodcock, that it be publicly floated in 1887.[1] Lawson's serious career as a company promoter began during the pneumatic tyre company "boom" of 1893 when he successfully floated the Beeston Pneumatic Tyre Company Limited. 1896 was his most active year when he acquired the well-established cycle firm of Barton and Loudon Limited of Coventry and floated it as the Beeston Tyre Rim Company Limited, the latter purchasing some of Lawson's patents in the process.[2] A month later - June 1896 - appeared his New Beeston Cycle Company Limited which was a reflotation of the Quinton Cycle Company of Birmingham.[3] His most notable creations, nevertheless, were the first British motor-car companies. His most successful one was the £100,000 flotation of the Daimler Motor Company in February 1896, and one of his most spectacular, the attempted £750,000 promotion of the Great Horseless Carriage Company of the following May.[4]

1. Ibid., Vol. 9, No. 452, 13 June 1888, p.881.
2. <u>Times</u>, 4 May 1896, p.16.
3. <u>Times</u>, 16 June 1896, p.3.
4. Ibid., 19 May 1896, p.17.

In so far as they were at work in the cycle, motor-car and related trades, the principal interest of the intermediary company promoters was in the gain to be derived from the difference between their buying and selling prices, and this "flotation cost" was occasionally relatively heavy. With respect to the Dunlop Pneumatic Tyre Company, floated in May 1896, Hooley paid £3 million for the original enterprise, £100,000 for the Westwood tyre patent and £200,000 for the Clincher tyre patent, disposing of the whole to the public for £5 million - a gross promotion profit of £1,700,000.[1] He purchased the Coventry Machinists' Company for £266,000 and sold it to its successor, Swift Cycle for £355,000 in cash, securing a gross promotion profit of £89,000.[2] Singer Cycle he bought for £543,000 and resold for £750,000 - a gross profit of £207,000. With respect to the Cycle Manufacturers' Tube Company Limited, a £250,000 issue successfully made, Hooley took steps to ensure not only a gross promotion profit, but also gains from "stagging" operations. A shareholders' committee of investigation, examining the affairs of the Company towards the end of 1897, revealed that 3,863 applications (amounting in aggregate to £966,528) were received for the £250,000 issue, but the number of persons to whom shares were allotted was limited to 620. The most prominent shareholder in the new company was a "Mr. Doncaster" who was allotted 102,371 shares. "Mr. Doncaster" turned out to be Hooley, such that "The

1. <u>Times</u>, 25 July 1898, p.3; and 28 July 1898, p.14.

2. <u>Cycle Manufacturer</u>, 11 July 1896, p.245.

practical result had been that the voting power of the company and the control of the market price of the shares were in the hands of a few - whilst many members of the cycling trade whose allegiance it was desirable to secure were put off with letters of regret, although the directors stated that 'the greatest possible care was taken by the directors, who spent many hours personally in considering the whole of the applications; but, owing to the enormous number before them, it was impossible for them to allot to every individual'".[1] On a smaller scale F. S. Buckingham sold his cycle business in 1889 to the promoters of Buckingham and Adams Limited of Birmingham for £1,784 and the promoters fixed a total purchase price of £17,000.[2] The Pattison Hygienic Cycle Saddle Syndicate Limited purchased Pattison's patent for £1,000 cash plus £2,500 in shares of the Syndicate, and planned to resell it to the British "Pattison" Hygienic Cycle Saddle Company of October 1896 for £80,000.[3] Osborne Dan, promoter of the British Cycle Manufacturing Company of 1897, acquired T. F. Toovey's cycle business of Camden Town for £19,500 and sold it to the new company for £35,000.[4] More modest in their demands, relative to their buying prices, the promoters of the Rover Cycle Company of 1896 purchased J. K. Starley's Coventry business for £150,000 and resold it to the company for £180,000.[5] The Endurance

1. Ibid., 20 Nov. 1897, pp.209-10.
2. The Cycle Trade Journal, Aug. 1892, p.234.
3. Times, 10 Jan. 1900, p.14.
4. Ibid., 3 March 1898, p.4.
5. Ibid., 15 June 1896, p.4.

Seamless Tube and Vial Company of Birmingham sold its business assets to the Cycle Contract Company Limited for £70,000 while the sale price to the newly formed Endurance Tube and Engineering Company of June 1896 was fixed at £90,000.[1] Out of these promotion profits, of course, preliminary and other expenses had to be paid, and correspondingly not all accrued as clear gain to the promoting fraternity. Hooley, for instance, claimed he made a net profit of only £25,900 on his Swift Cycle transaction, and £56,000 with Singer Cycle. There were high commissions to brokers and solicitors and payments to financial associates. He alleged that the promotion expenses relating to the Dunlop flotation amounted to £38,800, while "other payments" incurred £486,901, and the shares of other persons in the gross promotion profits represented £825,280.[2] Van Praagh, solicitor to the Birmingham Traders' syndicate, declared that out of the £200,000 gross promotion profit anticipated from the flotation of the Amalgamated Tyre Companies Limited, a minimum of £150,000 was committed to promotion expenses.[3] And with regard to the flotation of the Components Tube Company Limited in 1897, two of the firm's promoters, MacCabe and Bulger, revealed under judicial cross-examination that expenses reduced their gross promotion profit of £60,000 to a net £29,500.[4]

1. Ibid., 26 June 1896, p.15.
2. Ibid., 28 July 1898, p.14; and 2 Aug. 1898, p.12.
3. <u>Cycle Manufacturer</u>, 11 Sept. 1897, p.89.
4. Ibid., 7 May 1898, pp.204-5.

The size of the promoter's mark-up varied considerably, both absolutely and relative to the issued capitals of the companies floated, since their sale prices were determined by their estimates of the market values of the assets in their hands. They were criticised by contemporary financial opinion for taking into account more the current market values generated by "boom" conditions in the cycle and related trades, and less the market values that might be created by subsequent depressed or changed competitive conditions.[1] This, however, demanded some degree of prescience on the part of the promoter: with reference to his Dunlop Pneumatic Tyre Company, Harvey du Cros said, "....the original capital was not designed for a commercial competitive concern; it was designed for a monopoly", but infringements "....bled the resources of the company so freely during the existence of the patents" which the company had acquired as a result of its 1896 flotation, that a reduction in its capital liabilities was, by 1906, considered desirable.[2]

1. There is room for doubt as to whether "reputable" investment bankers would have assessed vending prices on criteria anyway different from that which the market would currently bear - if inter-war experience is anything to go by. "In arranging with the vendor, the issuing house must give great care to the price which the public is asked to pay for the business, for if, after the issue is made, the shares go to a substantial premium on the Stock Exchange, the vendor of the business is apt to be disgruntled (unless he has taken a large part of the purchase price in shares) and think he has been badly advised and sold his business too cheaply....." Thus wrote B. Ellinger in 1939. See his The City. The London Financial Markets (1940), pp.289-90.

2. Times, 15 March 1906, p.15.

In a similar fashion, very few cycle manufacturers anticipated the collapse of the "boom" of 1896-97 and the prolonged period of depressed profits which followed. Despite alleged "over-capitalisation", good dividends were paid by the major, recently-floated, cycle companies in 1897, and often, a substantial proportion of the net profits declared were retained (see Table25).[1] It was the subsequent slump in profitability after 1897 that made "over-capitalisation" apparent, and this was sooner or later remedied by some of those manufacturers, who avoided liquidation, by cuts in their ordinary and/or preference share liabilities. Hooley's promotions were not the only ones which underwent this painful surgery; the Rover Cycle Company, managed by the austere and biblical J. K. Starley, who spurned all of Hooley's blandishments, had one-half of its ordinary share capital written off during the course of 1902-3.[2] The New Premier Cycle Company also had to

1. c.f. Economist, 21 Aug. 1897, p.1202. A manufacturer, it said, "......has been enabled to get ridiculously high terms for his business, and, as a consequence, the new company which has acquired it finds itself saddled with a huge capital on which it is unable to earn a dividend". The dividend percentages given in the table might not seem astonishingly high, but note the views of two contemporaries: G. H. Cartland of the New Enfield Cycle Company said that "Some might say 10 per cent was not a big dividend. For his part he thought it was, and if industrial concerns generally could maintain such a result in these hard times they would do very well". A Mr. E. Y. Pearson, a shareholder in New Jointless Rim Limited, was satisfied in 1897, saying ".....a 10 per cent dividend being somewhat exceptional in commercial undertakings. In the iron trade 10 per cent would make their mouths water". Cycle Manufacturer, 23 Oct. 1897, p.162; and 30 Oct. 1897, p.174.

2. G. Williamson, op.cit., p.123. The Cycle Manufacturer reported: "Mr. Starley informs us that he could have got considerably more money for the business, but was anxious to keep the capital down to a reasonable figure to enable him to live with it, and satisfy all reasonable expectations on the part of future shareholders without difficulty". Cycle Manufacturer, 13 June 1896, p.208.

TABLE 25

Dividends Paid on the Ordinary Shares of Established Cycle and related trades Companies, floated during 1896-7, for the year 1897; and their profit retention ratios.[1]

Company	Ordinary Dividend %	Percentage of net profits retained
Bard Cycle Manufacturing	20	58.3
Bayliss-Thomas	10	41.5 *
Coventry Cross Cycle	20	57.3
Swift Cycle	20	48.4 *
New Buckingham and Adams Cycle	10	58.6 *
Starley Brothers and Westwood Manufacturing	10	88.6 *
Dunlop Pneumatic Tyre	10	44.2
New Premier Cycle	7½	75.7
New Rapid Cycle	10	3.9
Raglan Cycle	15	61.7
Perfecta Seamless Steel Tube	15	**
New Centaur Cycle	10	79.5 *
Elswick Cycle	8	22.1
New Jointless Rim	10	37.2 *
New Townend Brothers	10	41.4
James Cycle	10	50.7
Raleigh Cycle	10	19.1
Singer Cycle	10	39.2
Enfield Cycle	10	60.3
Humber (Extension)	10	36.5
Rover Cycle	10	58.1
Middlemore and Lamplugh	6	54.8
Metallic Seamless Tube	12½	**
J. B. Brooks	10	***
New Victoria Cycle Manufacturing	10	55.5
Quadrant Cycle	20	81.3
Star Cycle	17½	31.5
Smart and Parker	7½	29.9 *
Brookes Cycle	10	54.8
Brampton Brothers	5	21.4
Albert Eadie Chain	10	24.9
Joseph Lucas	7½	40.3
H. Miller	8	36.2

1. The figures refer to the financial year ending sometime in 1897, usually August or September. The dividend percentages include bonuses and are expressed as a rate per annum. The profit retention percentages refer to profits after depreciation has been deducted unless otherwise stated.

* ratio refers to "trading profits" i.e. before deduction of depreciation, and depreciation enters into both the numerator and denominator.

** profits record not discoverable.

*** profits published in a form that preclude adequate assessment of retentions.

reconstruct its finances in early 1902 though floated by the comparatively reputable Osborne O'Hagen, a man severely contemptuous of Hooley and his associates. The firm reduced its ordinary share capital from £300,000 to £50,000, and its preference shares from £300,000 at six per cent to £125,000 at 7½ per cent. The Brampton brothers, Birmingham cycle chainmakers, in recognition of the fact that they had miscalculated future trends, spared their "outside" investors and cut capital liabilities by surrendering 75,000 £1 ordinary shares held by themselves.

The other cycle and tyre manufacturers, however, who were obliged to cut their capital liabilities, on the whole, felt no such moral conscience. All the holders of Swift Cycle's 200,000 £1 ordinary shares had to stand a four-fifths reduction in 1901; New Centaur Cycle cut its £99,875 ordinary share capital to £49,937 with 10 shillings paid-up in July 1903; both the preference and ordinary shareholders of Singer Cycle accepted large reductions in the nominal value of their holdings in August 1903;[1] the £80,000 ordinary share capital of Middlemore and Lamplugh, cycle saddle-makers of Birmingham and Coventry, was halved to £39,909 in 1900; the £120,000 of ordinary shares of the Raglan Cycle Company were reduced by two-thirds in 1905; and Premier Cycle, Raleigh Cycle and the Dunlop Pneumatic Tyre Company had to be completely reconstructed in 1902, 1899 and 1906, respectively.[2] A number of companies, floated in the hectic days of 1896-97, nevertheless managed to avoid capital

1. From 400,000 £1 ordinary and 200,000 £1 preference shares to £48,918.10. 0d in ordinary of 2/6d each and £74,820.15. 0d in preference shares of 7/6d each.

2. As with Brampton Brothers, the original vendors to New Premier Cycle felt obliged to surrender their holding of 100,000 £1 shares as part of the reconstruction scheme. Economist, 7 Dec. 1901, p.1810.

liability reductions altogether, notably James Cycle, Star Cycle, J. B. Brooks and Company, Enfield Cycle, Joseph Lucas Limited, New Hudson Cycle, Riley, and Triumph. Although finding the post "cycle boom" days difficult, they did not appear to experience the cataclysmic (and sometimes prolonged) drop in net profits, relative to those of 1896/7, that the others underwent. The reconstruction of Dunlop Pneumatic Tyre was precipitated by an almost continuous fall in net profits from the level of £610,437 in 1896/7 to £129,445 in 1904/5. Similarly with New Premier Cycle whose £78,133 net profit of 1896/7 ran down to losses of £3,264 in 1899/1900, £3,959 in 1900/1, and of £7,000 in 1901/2. Raglan Cycle's profit of £15,521 of 1897/8 slid to £3,020 in the following year and was down to £1,108 by 1904/5, the year of reconstruction. Singer Cycle's profit of £75,396 of 1896/7 vanished to £3,067 by 1901/2, with reconstruction following in 1902/3. New Centaur's £22,920 profit of 1896/7 was reduced to a £2,767 loss three year's later, mitigated by a profit of £4,393 in the subsequent year of 1900/1. Violent changes in commercial fortunes, such as these, were as much the cause of eventual reconstruction as the company promoter's art, although the contemporary financial press occasionally preferred the latter explanation taken by itself. "Generally speaking", said the Economist, "we do not believe there is any real depression in the cycle trade such as would be caused by a falling off in the demand. The real evil.... is the competition arising from the formation of too many companies, and the over-capitalisation of many of the larger concerns".[1]

1. Economist, 8 Dec. 1900, p.1725. The concept of "over-capitalisation" is essentially meaningless. Contemporary financial opinion, steeped in conventional accounting practices, tended to identify its presence by the item of "goodwill" that may have appeared on the assets side of company balance sheets.

Another complaint against the company promoting fraternity - that they had only a short-term interest in their promotions - was, with little equivocation, applicable to Hooley, who quickly tried to shed all his financial involvements in his companies, even when allotted shareholdings upon the undersubscription of some of his creations.[1] Hence, upon the flotation of Humber and Company (America) Limited in December 1894, Hooley subscribed for, and was allotted, 6,160 £5 shares in the Company, disposing of 3,860 of them in February 1895 and 2,200 in the following April. By 5 April 1898 he had none at all, having disposed of the lot.[2] The same attempt was made by Hooley upon the receipt of vendor's shares in the undersubscribed issues of Humber and Company (Portugal) Limited and Humber and Company (Extension) Limited. In the case of the former he was allotted 9,470 £5 vendor's shares in October 1895, got rid of 6,410 of them in the November and a further 455 in the December.[3] Upon the flotation of the latter in 1896 he was awarded 74,155 £1 shares out of a total issue of 200,000 of which 175,000 was allotted. By the Christmas Eve of that year he had reduced his holding to 27,302, the other 46,853 having gone to 16 obliging purchasers.[4] Hooley, moreover, only once accepted a seat on the boards of directors of the companies he created.[5] In this,

1. Although in the case of his non-publicly floated company, Simpson's Lever Chain and Cycle Company, he felt obliged to inject £29,000 into it in order to help provide £50,000 "working capital" - the buyers of Hooley's shares contributing the remainder. Times, 6 Aug. 1898, p.5.

2. P.R.O., B.T.31, 6046/42746.

3. P.R.O., B.T.31, 6462/45,525.

4. P.R.O., B.T.31, 6738/47,377.

5. This was in the case of the Cycle Manufacturers' Tube Company and was occasioned by the failure of the contractors employed by Hooley to install the plant of the new Coventry enterprise by the agreed time; by the expenses incurred by Hooley in financing the Company's experiments with a new patented process for tube production; and by the retirement from the board of the Earl of Winchelsea and Nottingham on the grounds of ill-health. Times, 23 Sept. 1897, p.10.

he behaved differently to Lawson and to a number of other company promoters. Lawson, in fact, became chairman of his Beeston Tyre Rim Company Limited, and evinced a continued entrepreneurial interest in his promotions by accepting directorships on his Great Horseless Carriage Company, his New Beeston Cycle Company, and on his British Motor-Car Syndicate Limited. He also became chairman and managing director of his Beeston Pneumatic Tyre Company, and when this enterprise degenerated into a parlous financial position in 1895, he took it upon himself to liquidate and then reconstruct the concern, with the promise that he and others would ensure that the debts of the original company would be paid, and that the new Beeston Company would hence start with "unblemished credit".[1] Later, having promoted the Daimler Motor Car Company, Lawson was elected to the board by the initial directors after their third or fourth meeting; and chaired the first statutory meeting of the Company's shareholders giving an account of the firm's activities and answering questions. This position he relinquished a year later, however, "....finding his time so fully taken up with the British Motor Car Company".[2] He was followed by some less conspicuous men in the field: Thomas Hazelton-Black, promoter of the Midland Cycle and Tyre Company of June 1896, took a seat on its board, as did A. W. Byron with his Universal Weldless Steel Tubes Company.[3] George Clare, who promoted the motor-vehicle manufacturing company of Dennis Brothers in 1913, became chairman immediately upon its formation.[4]

1. Cycle Manufacturer, 6 July 1895, p.281; and 2 May 1896, p.147.

2. Ibid., 30 May 1896, p.181; and 23 Oct. 1897, p.163.

3. Times, 22 June 1896, p.4; and 14 April 1897, p.14.

4. Professor Payne's statement that "....such promoters did not continue with the company after its change of form in the capacity of promoter-manager or auditor" therefore requires some qualification. See P. L. Payne, "The Emergence of the Large-Scale Company in Great Britain, 1870-1914", The Economic History Review, 2nd Ser., Vol. XX, No. 3, Dec. 1967, p.522.

Although one cannot be certain, on the information to be gained from company prospectuses and purchase contracts, to what extent promoting intermediaries were employed, not every cycle, tyre and tubing firm of the 1880's and 1890's required their intervention; and judging from prospectuses as published in the Times, and/or commented upon by the Economist, their services were in less demand for the motor-car flotations of the 1900's, than for the cycle, tyre, tubing and motor promotions of the 1890's. During both the 1890's and 1900's there were notable instances in which the flotation of the company was undertaken on the initiative and under the supervision of the proprietors of the firm itself.[1] In the case of the Quadrant Cycle Company of Birmingham (floated in October 1895), the "vendors were the promoters", the vendors being William Priest and his two sons, Henry G. and William A. Priest. The Perfecta Seamless Steel Tube Company Limited was promoted by its owner, A. H. Hills of Aston, Birmingham, in May 1896; John B. Brooks handled the flotation of his cycle saddle-making concern in October 1896; and the Rileys' had no time for promoter-intermediaries: "Syndicates who have recently been endeavouring to purchase cycle factories in the Midlands have made one or two tempting but unsuccessful efforts to buy up Messrs. Bonnick and Company's business. ....No

1. The pattern typical of joint-stock company formation before the mid-1880's. Ibid. See also J. B. Jefferys, op.cit., p.304. The cycle and motor-car trades provide a corrective to any impression that might be gained that promoting intermediaries ruled the roost so far as company flotation was concerned during the late Victorian and Edwardian eras. Since vendors invariably maintained a managerial role in publicly floated companies, enterprises promoted by proprietor-entrepreneurs correspondingly experienced a subsequent identity between the executive direction and the "de facto" promoters.

promotion money is to be paid in any shape or form, and the vendors will defray all expenses in connection with the Company's formation up to the date of allotment".[1] Joseph and Henry Lucas also rejected the use of intermediaries upon the flotation of their Joseph Lucas Limited in the autumn of 1897, such that ".....no promotion has, therefore, to be paid...."[2] The promoter-intermediary characterised the large and important cycle and motor-car flotations of the 1890's (though very few of the small), but not so all the comparable flotations of the 1900's. Argyll Motors' £233,337 issue of 1905 was handled by the vending Hozier Engineering Company of Glasgow, as represented by its directors.[3] No promoter-intermediary appears to have been employed in the flotations of Rolls-Royce in 1906 (a £100,000 venture); S. F. Edge Limited in 1907 (£75,000); A. Darracq and Company (1905) Limited (£521,500); D. Napier and Son Limited (£400,000 in 1913); Leyland Motors (1914) Limited (£200,000); and S. Smith and Sons (Motor Accessories) Limited in 1914 (£50,000). The £170,000 flotation of Automobiles Rolls-Royce (France) Limited of 1911 was promoted by its parent enterprise, Rolls-Royce of the U.K., and the Italian Spare Motor-Wheel Company (£40,000 in 1908) was floated by its "manager, vendor and promoter", B. A. Poole.[4] Straker and MacConnell (1906) Limited - a £135,000 issue - was handled by its predecessor, the "private" company

1. <u>Cycle Manufacturer</u>, 6 June 1896, p.194. Bonnick and Company was the original name of the Riley concern.
2. Ibid., 27 Nov. 1897, p.223.
3. <u>Times</u>, 16 March 1903, p.13.
4. Ibid., 3 March 1908, p.15; and 31st May 1911, p.20.

of Straker and MacConnell Limited. The promoter of New Girling Cars Limited was Girling Motors Limited of London, one of the two "private" vending companies involved in the £60,000 flotation of June 1913. New Leader Cars Limited (£45,000 in 1906), the Beaufort Motor Company (a £50,000 issue during the same year), the Calthorpe Motor Company (1912) Limited (£70,000), and Straker-Squire (1913) Limited (£75,000) were promoted by their vending entrepreneur-proprietors.[1] Certainly, the flotations of the 1900's boasted no one of the notoriety of Hooley or Lawson, although in occasional instances promoting syndicates were at work. They were behind the abortive flotation of Resilient Tyres in April 1908, for example, and that of the "K.T." New Pneumatic Tyre and Rubber Company of 1910, and of the Elswick-Hopper Cycle and Motor Company of 1913. The individual promoter was operative, as has been seen, in the case of Dennis Brothers (1913) Limited.

The immediate objective of the promoters of publicly floated joint-stock companies was, presumably, full-subscription. One indirect technique of securing this was to make the prospectus accompanying the flotation appear as glamorous as possible to the potential investing public. More directly, full-subscription could be secured by the arrangement of a full underwriting of the issue. Despite the opinion of contemporary financial journals and books that underwriting was common in the 1890's, it was in a doubtful

1. Ibid., 4 April 1906, p.14; 6 April 1906, p.12; 21 May 1906, p.13; 5 Nov. 1912, p.19; 10 June 1913, p.20; and 25 Nov. 1913, p.19.

legal position until the Companies Act of 1900.[1] Correspondingly, many an entrepreneur in a publicly-floated cycle enterprise of the 1890's replied vaguely on this issue when directly questioned by shareholders. Thus Colonel Cox, chairman of Hearl and Tonks Limited of Birmingham, answered, ".....so far as the present company is concerned, the directors had nothing to do with any underwriting. If there was any it was a matter which simply concerned the vendors".[2] Similarly, when asked whether the shares of the New Rapid Cycle Company Limited had been underwritten, G. H. C. Hughes, the chairman, said "....the directors had not underwritten any. The vendor pleased himself what he did; the board had no control over him".[3] For sure, the shares offered by Joseph Lucas Limited and the Endurance Tube and Engineering Company were not underwritten: at any rate, their spokesmen said so – the vendors and/or promoters apparently being prepared to accept the risk of failure in their activities, and forego the expense of employing brokers, wealthy individuals, or institutions to underwrite their issues.[4] On the other hand, full or partial underwriting was entertained by some. Alfred Davis, the promoter, arranged a partial underwriting of the shares of the Ixion Pneumatic Tyre Company, formed in May 1896, but this did not prevent the flotation from being an abortive affair.[5] With respect to the first issue of the Elswick Cycle Company in June 1896, "......it was well known", said the Financial News "that the capital was underwritten while the applications considerably exceeded the

1. See J. B. Jefferys, op.cit., p.347.
2. Cycle Manufacturer, 24 July 1897, p.9.
3. Ibid., 13 Nov. 1897, p.198.
4. Ibid., 27 Nov. 1897, p.223; and 11 Dec. 1897, pp.256-7.
5. Economist, 9 May 1896, p.608.

shares offered for subscription".[1] The "enormous sum" of £13,000 was reckoned to have been paid for the underwriting of the flotation of the Components Tube Company of Bournbrook, Birmingham. According to Bulger, one of the promoters, a wide range of people were involved including prominent cycle manufacturers: he detailed the Raglan Cycle Company, and S. Bettmann of the Triumph Company; George Singer got £625 for underwriting £5,000 of stock (a 12½ per cent commission!); Mr. Fulwell of the Fulwell Cycle Company of Coventry received £31. 5. 0d for underwriting 250 shares (again a 12½ per cent commission); and Basil Riley of Coventry obtained £250 for underwriting £1,000 worth of Components' shares (a 25 per cent commission!).[2] Furthermore schemes tantamount to full or partial underwriting were devised by some vendors and promoters in the cycle and tyre trades. The subscription of the whole of the share capital of the Credenda Tube Company was assured in February 1893 when M. Gledhill, H. H. Smith-Carrington, William R. Lake and W. C. Stiff, shareholders in the vending company, undertook to apply for the full issue and to accept such allotments as may be made to them. The directors of the new Company, on the other hand, reserved the right to allot shares to the general public in priority.[3] And the signatories to the Articles of Association of the Dunlop Pneumatic Tyre Company of May 1896 subscribed for one-quarter of its share capital.[4] The flotation of the Rover

1. Cycle Manufacturer, 4 July 1896, p.235.
2. Ibid., 7 May 1898, p.203; and 14 May 1898, pp.218-9.
3. The Birmingham Daily Post, 25 Feb. 1893, p.4.
4. Economist, 9 May 1896, p.592.

Cycle Company had £30,000 of its shares privately subscribed for in addition to the allotments promised to the vendors, and Lawson's New Beeston Cycle Company (floated in June 1896) had a "guaranteed" cash subscription of £50,000 upon which the directors were prepared to go to allotment. The directors and their friends applied for 80,000 of the shares of the "Non-Collapsible" Tyre Company, prior to its flotation in December 1896, though ".....a fair allotment will be made to the public".[1]

It was among the motor-vehicle company flotations - plus two of the cycle flotations - of the 1900's that more formal and explicit underwriting arrangements appeared, though usually partial in extent.[2] The £166,667 in ordinary shares of "Argyll" Motors Limited, floated in March 1905, were underwritten by the vending and promoting enterprise, the Hozier Engineering Company, for a 2½ per cent commission, payable by the vendee company.[3] Underwriters guaranteed the full-subscription of the 65,000 £1 ordinary shares offered by A. Vedrine and Company - a French motor-car firm - in April 1905.[4] Also floated in 1905 was A. Darracq and Company with a total public issue of £371,500 in preferred ordinary shares plus £150,000 in five per cent debenture bonds. The company's broker, C. Birch Crisp of London, underwrote the whole of the debenture issue and at least £100,000 of the

1. Times, 3 Dec. 1896, p.15.

2. Jefferys wrote "The extent to which it (underwriting) was used and the methods are more difficult to determine", but offered the suggestion that "....its influence in home industry was comparatively small". J. B. Jefferys, op.cit., p.347.

3. The four proprietors and directors of the Hozier Engineering Company Limited performed the underwriting. They were William A. Smith, merchant; A. W. Steven, ironfounder; Anderson Roger, shipbuilder; and Alexander Govan, managing director of the Hozier Company - all of Glasgow. The £66,670 six per cent preference shares also issued were not underwritten. Times, 16 March 1905, p.13.

4. Ibid., 13 April 1905, p.13.

preferred ordinary shares for a five per cent commission payable by the vendors. In addition, each of the Company's five English directors sub-underwrote £5,000 of the preferred ordinary shares for a five per cent commission.[1] Formal underwriting, when arranged, by vendors among the post-1900 flotations was not uncommon. The vendors to Friswell (1906) Limited guaranteed the full-subscription of the Company's ordinary and preference shares, a nominal £50,000 each, in return for a cash payment of £7,500.[2] Rolls-Royce underwrote, for a five per cent commission in 1911, 100,000 shares of its off-shoot, Automobiles Rolls-Royce (France) Limited, floated in that year with a public issue of £170,000.[3] The vendors to J. A. Phillips and Company of Smethwick, cycle manufacturers, underwrote £45,000 of the Company's £55,000 preference share flotation issue of 1913 for a 7½ per cent commission. Also in 1913, the vendor to New Girling Commercial Cars agreed to underwrite 16,000 £1 shares of its £60,000 issue at a five per cent commission with an "overriding commission" of 1½ per cent, both payable in cash by the vendee company.[4] Alternatively, underwriting was performed, or arranged, by the promoter-intermediaries. George Clare, promoter of Dennis Brothers (1913) Limited, underwrote £200,000 of the Company's £300,000 share issue for a commission of 7½ per cent.[5] Underwriters,

1. Ibid., 20 Nov. 1905, p.15.

2. Ibid., 19 July 1906, p.13.

3. Ibid., 31 May 1911, p.20.

4. Economist, 15 March 1913, p.653; and Times, 10 June 1913, p.20.

5. Economist, 15 March 1913, pp.650-3. op. cit

independent of the vendors, appeared to be at work in the cases of De Dion-Bouton (1907) Limited (with £165,000 of its £185,000 ordinary share issue underwritten), and of the Italian Spare Motor Wheel Limited of 1908 (£27,000 of its £40,000 in shares at the relatively high commission of 10 per cent).[1] But in so far as company flotation was concerned in the motor-vehicle industry of the 1900's, the intervention of merchant banks, investment trusts and insurance companies as underwriting institutions was conspicuous by its absence.

Five of the seven cycle flotations of the 1900's, however, dispensed with the cushion of formal underwriting altogether, as did many of the pneumatic tyre and motor-car company promotions. Among the last group were Deasy Motor Car Manufacturing, floated in 1906; Maudslay Motor and S. F. Edge in 1907; D. Napier and Son, V. C. Oil Engine, and Straker-Squire Limited in 1913; and Leyland and Vauxhall Motors in 1914. Rolls-Royce, floated in 1906, did without underwriting but made a contract with a Mr. E. A. Claremont who was to receive a commission of 7½ per cent for procuring subscriptions, "not exceeding at most 20,000 shares", from customers of the Company.[2] The decision not to arrange underwriting terms involved the acceptance by vendors and/or promoters of a considerable element of risk of a degree of undersubscription, which might make the flotations abortive.

1. Times, 11 March 1907, p.14; and 3 March 1908, p.15. It is interesting to note, by way of contrast, that a £1 million issue of four per cent mortgage debenture stock by Sir W. G. Armstrong-Whitworth and Company in 1908 was acquired and "placed" by the Law Debenture Corporation at a cost of 2½ per cent - a commission significantly lower, in proportionate terms, than that charged to the majority of cycle and motor-car firms. Armstrong-Whitworth's issue was described as "a gilt-edged industrial investment" (see the Economist, 8 Aug. 1908, p.276). Obviously the underwriters of cycle and motor-car issues regarded them as riskier propositions.

2. Times, 17 Dec. 1906, p.13.

On the other hand, it was understandable, for underwriting, judging by the evidence available, was a relatively expensive business for the companies concerned. It was an expenditure over and above the "preliminary expenses" that had to be borne in forming, registering and advertising a publicly floated joint-stock company, and often, both in percentage and absolute terms, in fact, amounted to more than the "preliminary expenses" themselves. Furthermore, both underwriting commissions and preliminary expenses were payable - though not invariably - out of the funds raised by company flotation, and would appear as non-profit earning "assets" in the company's balance sheet, extinguishable only by drawings upon future net profits. Underwriting commissions, it would appear, cost "Argyll" Motors £4,167 as compared with estimated preliminary expenses of £3,000. A. Darracq and Company (1905) Limited undertook to pay at least £13,750 in commissions as well as estimated preliminary expenses of £9,500; and Friswell's £7,500 underwriting commission was some £2,800 greater than its preliminary expenses in 1906. Dennis Brothers (1913) Limited paid a commission of £15,000 for underwriting services in addition to preliminary expenses of £10,000; while the vendors to J. A. Phillips and Company Limited were prepared to pay a £4,125 underwriting commission as well as £6,000 in estimated preliminary expenses probably recouping both sums out of their selling price for the business. The infrequency of underwriting, especially by people not directly connected with the promotion of companies in the cycle and motor-car industries, may have been a reflection of the view that professional underwriters took of such flotations. As Osborne O'Hagen put it: ".....underwriting was.....some little safeguard to the investing public that they were not being offered rubbish, inasmuch as the bulk of the underwriters, being in the financial world with some knowledge of finance and the standing of those connected with the company, could judge better of its bona fides than the general public were able to do...."[1]

The glitter of the prospectus encrusted with the names or aristocrats, willing to serve as directors of newly-floated companies, was a device to attract subscriptions from the public much used by Hooley and Lawson during the "boom" days of the mid - 1890's, though not confined to them alone. The ornamental - as some financial commentators put it - aristocratic director was even placed in the chairman's seat as can be seen in some instances in Table 26.

In contrast to the "boom" of the mid-1890's there appeared to be little exploitation of aristocratic titles among the flotations of the 1900's.[2] Baronets appeared on the board of Deasy Motor-Car Manufacturing viz. Sir Richard Waldi Griffith of Kelso, and Sir Robert Buchanan - Jardine; and on the board of Straker and MacConnell (1906) Limited, namely, Sir John Heron Maxwell.[3] Charron Limited, however, a French motor-car firm floated on the London market in 1906, boasted a collection of French nobles on its board of directors, notably the Duc F. de Brissoc, Baron H. Foy, the Marquis de Mun, the Duc. M. de Noailles, and

1. Osborne O'Hagen, op.cit., p.151.

2. Even during the 1890's it was only the relatively large issues which could afford the luxury of a titled director.

3. Times, 22 Feb. 1906, p.13; and 4 April 1906, p.14.

TABLE 26

Peers of the Realm appointed to the Boards of Directors of publicly floated companies in the Cycle, Motor-vehicle and Related Trades.

Company	Peers on Board
Humber and Company (Portugal) Limited (October 1895)	Lord Hawke
Pneumatic Tube Machine Company Limited (April 1896)	Earl of Norbury Baron de Wagstaffe
Dunlop Pneumatic Tyre Co. Ltd. (May 1896)	Earl de la Warr (Chairman) Duke of Somerset Earl of Albermarle
Trent Cycle Co. Ltd. (May 1896)	Viscount Templetown (Chairman)
Endurance Tube and Engineering Company Limited (May 1896)	Earl of Aylesford
The Great Horseless Carriage Co. Ltd. (May 1896)	Earl of Winchelsea and Nottingham
Cycle Manufacturers' Tube Company Limited (May 1896)	Earl of Winchelsea and Nottingham (Chairman)
Accles Limited (June 1896)	Earl of Verulam
Singer Cycle Co. Ltd. (June 1896)	Earl of Warwick (Chairman) Earl of Norbury
New Cycle Company Ltd. (June 1896)	Lord Ribblesdale (Chairman)
New Beeston Cycle Co. Ltd. (June 1896)	Lord Norreys
British Motor Carriage and Cycle Company Limited (June 1896)	Earl of Aylesford (Chairman)
Dunlop Pneumatic Tyre Company (France) Ltd. (Aug. 1896)	Earl of Albemarle Earl de la Warr
Anglo-French Motor Carriage Ltd. (Aug. 1896)	Earl of Lonsdale
Clement, Gladiator and Humber (France) Limited (October 1896)	Earl de la Warr (Chairman)
Bagot Pneumatic Tyre Co. Ltd. (October 1896)	Earl of Aylesford (Chairman) Lord Raglan
Swift Cycle Co. Ltd. (October 1896)	Lord Churchill (Chairman)
British "Pattisson" Hygienic Cycle Saddle Co. Ltd. (October 1896)	Earl of Warwick (Chairman)
British Motor-Car Syndicate Ltd. (Nov. 1896)	Lord Norreys
Clipper Pneumatic Tyre Co. Ltd. (March 1897)	Lord Raglan
Amalgamated Pneumatic Tyre Companies Ltd. (Aug. 1897)	Earl de la Warr
Calthorpe Motor Company (1912) Ltd. (Nov. 1912)	Lord Teynham (Chairman)

Baron E. de Waldner, as well as Admiral Sir C. Fane K.C.B. of London.[1] Two French aristocrats also associated themselves with the Bell-Hall Unpuncturable Tyre and India-Rubber Company, floated in January 1900, namely, the Count de Clermont-Tonnerre, and the Viscomte de Chambure.[2]

It is certainly questionable whether some of the titled gentlemen who graced the company boards of the 1890's had sufficient business experience and acumen to be of much service to the enterprises under their direction. Most of them were very much of a type: Raglan, Templetown, Aylesford, Warwick, Somerset, and Winchelsea and Nottingham were substantial landowners; Raglan, Templetown, Hawke, Verulam, and Somerset, followed a public school education by a spell at Sandhurst and a commission in one of the more exalted army regiments. Prior to elevation to the House of Lords, Albermarle, Warwick, Verulam, and Winchelsea and Nottingham pursued political careers in the Commons on behalf of the Conservative Party, while Viscount Templetown was founder and president of the Unionist Clubs of Ireland. The eighth Earl de la Warr was only in his late twenties when he headed the Dunlop tyre and other companies; Norbury, despite his education at Harrow and Christchurch, Oxford, apparently distinguished himself at nothing at all; while Hawke's principal interest was his captaincy of the Yorkshire XI during 1883-1910. Only Albermarle and Norreys could claim any prior connection with the cycle and tyre trades before the promotion of their companies, but only as keen cyclists and organisers of cycling

1. The Stock Exchange Yearbook, 1909, p.1802.
2. Times, 15 January 1900, p.13.

associations.[1] Exceptionally Lord Ribblesdale had business experience as director of the Nobel Dynamite Trust, Buchanan-Jardine was a director of the Caledonian Railway Company, and Heron Maxwell sat on the board of the Westminster Trust Limited. The role of the titled company director in the cycle and related trade flotations of the 1890's came out very much in the wash upon the examination of Hooley's bankruptcy petition in the autumn of 1898. £25,000, alleged Hooley, was paid to the Earl de la Warr for being named on the prospectus as Chairman of the Dunlop Pneumatic Tyre Company, and a further £11,300 was handed over for the appearance of the Earl's name on the prospectus of Dunlop's French subsidiary.[2] The Earl of Winchelsea and Nottingham received £10,000, claimed Hooley, as his price for a seat on the board of the Cycle Manufacturers' Tube Company, while £2,000 went to Sir Edward Sullivan, and £1,000 to four other directors for the same purpose and in connection with the same enterprise.[3] The Earl of Warwick was allegedly bribed to become chairman of Singer Cycle, and £500, according to Hooley, was paid over to Lord Templetown for joining the board of the Trent Cycle Company.[4] The nobles concerned were

1. These assessments of the careers of these nobles are based upon information given in <u>Burke's Peerage, Baronetage and Knightage</u>, 102 ed., 1959; and the consecutive volumes of <u>"Who Was Who"</u>.

2. Hooley said he paid the Earl de la Warr in connection with Dunlop Pneumatic Tyre, £50,000 ".....of which he was to have £25,000 and the balance was for the others......The Duke of Somerset received nothing. Lord Albermarle received only £12,500. He ought to have had half, but I don't think he knew what the half amounted to". <u>Times</u>, 28 July 1898, p.14.

3. Ibid.

4. Ibid., 30 July 1898, p.10; and 3 Aug. 1898, p.12.

quick to deny the veracity of Hooley's statements, though payments were made of an ambiguous character.[1] Hooley, nevertheless, made transparently clear the motives lurking in the minds of the promoting fraternity when titled directors appeared on company boards:

> The Official Receiver - "What was the object of paying the directors to join the board?"
>
> The debtor - "I could not get them to join unless I did so".
>
> The Official Receiver - "What was the object of having such names on the prospectus?"
>
> The debtor - "It was to get the company subscribed".[2]

"Expert" And Press Opinion.

Despite the attempts by vendors and promoters to confer a degree of "respectability" and market appeal upon their joint-stock progeny, they nonetheless had to contend with an unfavourable climate of opinion emanating from contemporary "experts" on the "science" of investment, and from the financial press. As J. B. Jefferys noted, the books and circulars issued by the most respectable stockbrokers, during the 1890's and 1900's, advised only "gilt-edged", railways and debentures, and guaranteed loans for prudent investors. "From

1. Albemarle denied the receipt of a "bribe" from Hooley to sit on the boards of the Dunlop companies but admitted to having received £9,000 from him. "This I understood to be the result of a 'deal' he had done for me on his own responsibility in another undertaking and I accepted it as much". The Earl de la Warr wrote that he received only £8,000 from Hooley after the promotion of the Dunlop Pneumatic Tyre Company as a "gift" in view of the work the Earl had put in during the process of promotion and share allotment. Ibid.

2. Ibid., 28 July 1898 p.14. During his bankruptcy examination, Hooley waxed eloquently, and in detail, about his devices to silence potential critical opinion in the financial press, and to secure favourable press coverage of his promotions. These consisted of straightforward bribes to journalists and editors; "preliminary puffs" i.e. advertisements in newspapers announcing the imminent publication of an attractive prospectus; and "press calls" on shares i.e. calls on shares given at par to gentlemen of the Press who would take them up if their market price after flotation showed signs of rising.

the point of view of the methods used to secure the investors for a company, it is only necessary to mention that in the 'Practical Construction of an Investment Scheme', which this type of book invariably attempted, the companies cited were, without exception, old established companies. New companies were specifically stated time and time again as being doubtful investments (except of course in the frankly speculative pamphlets) and....the emphasis was on pre-ordinary stock, the fluctuating character of equity being anathema to these instructors on investment".[1] The flotation issues generated by the cycle, tyre, tubing and motor-car trades received no peculiar favours in this respect. They were treated by the contemporary financial commentators with considerable circumspection and, occasionally, with sheer contempt. The pneumatic tyre "boom" of 1893, based largely on the exploitation of patent rights, provoked, for example, adverse comment from the Economist: "It is understood that in regard to several of the companies legal proceedings are pending for infringements of patent rights so that in all probability the legal profession will be benefitted at the expense of foolish investors. The 'boom' in these cycle-tyre shares has centred in Dublin, some of the issues being quoted on the Stock Exchange there at from 100 to 300 per cent premium - thanks, it is said, to the personal supervision of a promoter who was identified with a group of Companies which has long passed into the limbo of joint-stock failures. It is scarcely necessary to add a note of warning, for....the craze stands self-condemned".[2]

1. J. B. Jefferys, op.cit., pp.356-8.
2. Economist, 17 June 1893, p.728.

The complaints, during the cycle "boom" of 1896-97, concerning the absence of extensive and detailed information on past profits upon prospectuses, were legion. On this score, the Investor's Review found cause to comment critically on such sizeable enterprises as French Dunlop, Middlemore and Lamplugh, Howe Cycle and Sewing Machine, Swift Cycle, Starley Brothers and Westwood Manufacturing, and Perfecta Seamless Steel Tube.[1] The finger of over-capitalisation, "to use no stronger expression", was pointed at "such fine specimens of the promoters' art" as New Jointless Rim, New Triumph Cycle, the Components Tube Company ("this is a Hooley") and the Anglo-French Pneumatic Compensation Cycle Company.[2] Comment on promotions designed to exploit patent and/or manufacturing rights was scathing, as for example Scotts' Standard Pneumatic Tyre Company of June 1896: "for £170,000 in cash and 30,000 shares the public buys a miscellaneous collection of 'sole rights', 'goodwills', 'businesses', 'trade names', 'contracts', 'orders', 'assignable licences' about which it knows as much as the Man in the Moon. Better buy Consols".[3]

Summary advice (or implied advice) to prospective investors in the cycle and related trades was dispensed liberally. "The

1. The Investor's Review, Vol. VII, No. 38, June 1896, p.381; Vol. VIII, No. 42, Oct. 1896, pp.254 and 256; Vol. VIII, No. 43, Nov. 1896, pp.318-9; and Vol. VIII, No. 44, Dec. 1896, pp.383-4. The Economist remarked "...a very large number of enterprises have been turned into joint-stock companies which depended entirely on estimates of future profits for the success of their appeals for capital, no record of past results being furnished in the prospectus, or if supplied have covered only the short-period during which the 'boom' has been in progress - an obviously fallacious basis on which to calculate average results". 4 July 1896, p.859.

2. The Investor's Review, Vol. IX, No. 47, March 1897, pp.191-2.

3. Ibid., Vol. VII, No. 38, June 1896, p.383.

Dunlop cycle tyres", said the <u>Economist</u>, "manufactured by the company have had a magnificent innings in the past seven years, but patents do not last for ever; there are many other tyres in the field, and the success of the company cannot but act as a stimulus to inventors to endeavour to secure success in such a remunerative form of enterprise".[1] With respect to the flotation of Singer Cycle: "The two vendors seem between them to have extracted all the juice from the pie, and nothing is left but crust for shareholders".[2] Dunlop Pneumatic Tyre Company (France) Limited drew the opinion "....the vendor has the impudence to ask the British public to buy the business, after he has skimmed all the cream from it, at his own valuation;"[3] and as for Coventry's first cycle-manufacturing firm, "If the full history of the Company which was established in 1895, was given, it would be a melancholy record, and therefore we have no hesitation in dissuading the public from taking a hand in the gamble".[4] The first motor-car flotations were similarly treated: "This is by no means attractive, and while, no doubt, these motor-cars are the coming thing, the industry is not ripe for investors" (The Great Horseless Carriage Company).[5] "Altogether a most impudent prospectus, and the affair is unworthy of

1. <u>Economist</u>, 18 April 1896, p.486.

2. <u>The Investor's Review</u>, Vol. VIII, No. 39, July 1896, p.64.

3. Ibid., Vol. VIII, No. 42, Oct. 1896, p.256.

4. Ibid, Vol. VIII, No. 44, Dec. 1896, p.383. The date of establishment is wrong. It should be 1869, when the Coventry Machinists' Company Limited was registered.

5. Ibid., Vol. VII, No. 38, June 1896, p.384.

the attention of English capitalists" (the Anglo-French Motor Carriage Company).[1] Lawson's British Motor Syndicate extracted the view that "The prospectus inviting subscriptions, though it leaves no doubt as to the persons who are to be benefitted, is vague and unsatisfactory in the extreme; so much so that any investor paying out money on the strength of it, should write himself down a fool, and would well deserve to suffer for his folly".[2] With respect to the whole wave of cycle and related trades flotations in the mid-1890's, the Investor's Monthly Manual opined, "One thing is.....quite apparent, viz. that the purchase considerations are usually of such an excessive character as to deter any prudent investor from subscribing the capital offered";[3] while the Economist was cool on the grounds that "....though it is indisputable that many of the companies which manufacture cycles and cycle accessories are making large profits, it would be distinctly imprudent to purchase the shares of those undertakings at prices which would hardly be warranted if there were the assurance that the rush for machines would be prolonged indefinitely, and if, in addition, the existing patents were not only unassailable, but were absolutely incapable of being superseded".[4] Even the gentlemen of the cycle trade press,

1. Ibid., Vol. VIII, No. 42, Oct. 1896, p.256.

2. The Investor's Monthly Manual, vol. 26, No. 11, 30 Nov. 1896, p.610.

3. Ibid., Vol. 27, No. 3, 31 March 1897, p.113.

4. Economist, 16 May 1896, p.618. This journal remarked in 1897: "....it is not surprising that a great many brokers, when applied to for advice by their clients, do their best to discourage the buying of most of the cycle issues, for the simple reasons that the particulars available are generally of a very vague character, and that, even in the cases of well-established undertakings, the valuation placed upon the shares freely discounts future profits". Ibid., 20 Feb. 1897, p.274.

often more tolerant of the financial machinations of the entrepreneurial interest than the staid financial journals, were occasionally moved towards adverse comment. The Cycle Manufacturer thought little of the prospectus of the Bamboo Cycle Company Limited: "In the opinion of nearly everyone, the bamboo cycle has been, so far, an utter failure, yet eighty thousand pounds is the proposed capital, of which only twenty is reserved for working the concern in question, the rest, sixty thousand, being mostly pocketed by the vendor, for rights, goodwill and other property to be acquired; what these are goodness knows!........ The prospectus, from beginning to end, is a most impudent attempt to obtain the money of the public, but we are afforded considerable satisfaction by the reflection that once more there is every probability of promoters burning their fingers".[1] Even H. J. Lawson's wide circle of friends in the Press could not silence this journal when it came to his New Beeston Cycle Company Limited: "The prospectus of the New Beeston Cycle Company.....is, to say the least, a remarkable document, depending more upon the faith and credulity of the public than upon facts. Indeed, we have seldom or never seen a prospectus so full of generalities and platitudes, and so bare of plain statements of facts as the New Beeston document".[2]

The same circumspection on the part of financial commentators greeted the promotions of the 1900's. Complaints about the lack of detailed past-profits data marked the flotations of Enfield Autocar

1. Cycle Manufacturer, 16 March 1895, p.85.

2. Ibid., 20 June 1896, p.220. This trade organ was well pleased, however, with the offer of Joseph Lucas Limited in 1897: "..... so high is the firm in the estimation of the public that, so we are given to understand, the whole of the shares were practically applied for before the list opened. The details given in the prospectus are commendably lucid and definite". Ibid., 27 Nov. 1897, p.223.

(March 1906), New Leader Cars (April 1906), Vici Motors (1907) Limited, Maudslay Motor Company (1907) Limited, Belhaven Engineering and Motors (May 1907), and Associated Rubber Manufacturers Limited (May 1913).[1] Too much was asked for "goodwill" in the cases of A. Vedrine and Company (April 1905), Beaufort Motor Company (May 1906), Friswell (July 1906), S. F. Edge (1907) Limited, Bluemel Brothers (May 1913), Straker-Squire (1913) Limited, and the Austin Motor Company (1914) Limited;[2] while the taint of over-capitalisation allegedly marked Elswick-Hopper Cycle and Motor (June 1913), Associated Rubber Manufacturers, and D. Napier and Son Limited (July 1913).[3] In the opinion of the Times, the prospectus of the Motor Ricksha Company of June 1906 "contains nothing but the vaguest estimates, and the undertaking must be regarded as speculative";[4] and in respect of the Motor Manufacturing Company of February 1907, "Little information is forthcoming on the Company's financial position, and we are unable to discover the amount of the purchase price. Its shares must thus be regarded as speculative".[5] The Economist saw serious flaws of various kinds in the flotation issues of a whole series of motor-car companies. For "Argyll" Motors the financial data given were "merely estimates", and with regard to De-Dion-Bouton (1907) Limited,

1. Times, 7 March 1906, p.13; and 6 April 1906, p.12. Economist, 16 March 1907, pp.468-9; 11 May 1907, p.826; 1 June 1907, p.944; 3 Aug. 1907, p.1316; and 3 May 1913, p.1048.

2. Times, 21 May 1906, p.13; and 19 July 1906, p.13. Economist, 15 April 1906, pp.631-2; 3 Aug. 1907, p.1316; 3 May 1913 pp.1048-9; and 29 Nov. 1913, p.1196. The Investor's Guardian and Joint Stock Companies Review, 14 Feb. 1914, p.214.

3. Ibid., 28 June 1913, pp.156-7; 3 May 1913, p.1048; and 2 Aug. 1913, pp.235-6.

4. The company was formed to exploit patents designed to convert motor-bicycles into a "sociable" car for two persons. Times, 20 June 1906, p.15.

5. Ibid., 21 Feb. 1907, p.13.

"The arrangement is not satisfactory and if the Company is successful, it will certainly have difficulty with the interests of the vendors and promoters".[1] It objected to the "old feature of founder's shares" in Maudslay Motor which afforded the vendors a controlling interest "while the public are asked to provide the cash"; and dubbed Spare Motor Wheel of America Limited as "speculative".[2] Dennis Brothers (1913) Limited was reckoned to have been able to acquire its £40,000 "working capital" from its existing shareholders without recourse to a reflotation of the company; the future profitability of Vickers Cars Limited (March 1913) was doubted; and the journal argued that the promotion profits from the flotation of Stelastic Tyres in April 1913 were too high and that the shares were "a risky venture".[3] The Economist was again particularly critical of those promotions designed to exploit patent or manufacturing rights. An issue by the Pedlar Brake and Two-Speed Gear Company in November 1905 invited the comment: "There is nothing to show that the device has been adopted by prominent riders, or by the trade, and it is, in fact, one of those commercially unproved inventions which constitute about the most risky ventures in which to put money".[4] With reference to Partington Pneumatic Wheel (March 1908): "We are always sceptical of the value of patents until they have been worked for a considerable time, and are proved to be a commercial success. This the Partington Pneumatic Wheel has yet

1. Economist, 18 March 1905, p.449; and 16 March 1907, pp.468-9.
2. Ibid., 16 March 1907, pp.468-9; and 26 Oct. 1907, p.1830.
3. Ibid., 15 March 1913, pp.650-3; and 26 April 1913, p.996. Vickers Cars Limited had no connection with Vickers-Maxim, the large engineering and armaments company.
4. Ibid., 2 Dec. 1905, p.1934.

to do, although the expert opinions as to its value are - as is not unusual - very favourable".[1] An issue by Resilient Tyres Limited in April 1908 received, "Nothing but the rights are acquired, and the proposal seems a very cool one indeed...... Patents are notoriously speculative ventures, and this is more so than ordinarily";[2] and the V. C. Oil Engine Company, floated in October 1913, "Although the promoters take their consideration in shares, they appear to be in too much of a hurry to get the public to put up the money for an untried invention".[3] Unless he was particularly interested in the cycle and motor trades, or had some local knowledge or connection, the "general investor" was discouraged by the Economist from investing in a number of concerns. J. A. Phillips and Company was one - "The issue may have attractions for local investors" - and F. Hopper and Company (February 1907) another - "The stock will not, we imagine, prove tempting to the majority of investors at a distance, as it is not a first-class security, and will be of quite unmarketable character".[4] The business of A. J. Stevens and Company (1914) Limited "...is a young one, and the shares are not likely to appeal to any but those specially interested in the motor industry".[5] By 1914 the Investor's Guardian was warning potential investors in motor-vehicles that, though the motor-trade had experienced a general prosperity in recent years, there was no guarantee that the prosperity would

1. Ibid., 14 March 1908, p.556.
2. Ibid., 18 April 1908, p.846.
3. Ibid., 1 Nov. 1913, pp.968-9.
4. Ibid., 2 March 1907, p.376; and 15 March 1913, p.653.
5. Ibid., 1 Aug. 1914, pp.236-7.

continue and that the capital accumulation process within the industry was in danger of being overdone. In commenting upon the flotation of Leyland Motors (1914) Limited, the journal opined: "The rise (in profits) has been rapid, and those thinking of taking up shares have to consider whether it will be maintained or whether there will be a collapse. Motor manufacturing concerns have been very prosperous, but can it be assumed that the demand for motor-vehicles will continue at the same rate as has recently been experienced? We think not".[1] And in the context of an issue by S. Smith and Sons (Motor Accessories) Limited in July 1914: "The enterprise must be regarded as speculative; the motor manufacturing business has been prosperous in recent years, but increasing competition must be expected to interfere with that prosperity".[2]

Against the current of scepticism and criticism emanating from the financial press, there were strong economic forces, nevertheless, running in the 1890's in favour of the flotations by cycle and motor car enterprises. Indeed financial commentators were well aware of them. For instance, one periodical remarked:

> "A great change has come over the temper of the public within the last year or two. Up to the end of 1894, it might be said that the public mind was still oppressed by the memory of the Baring crisis. Investors were up to then timid and anxious for the safety of their capital, but the year 1895 brought with it a remarkable change. The revival of speculation, first in the shares of Transvaal

1. The Investor's Guardian, 9 May 1914, p.655.
2. Ibid., 25 July 1914, p.122.

mining companies, and afterwards in various other directions, swiftly obliterated the recollection of past experiences and losses, and, from being timorous and careful, the monied classes throughout the country passed almost at once into a mood of over-confidence. The question of safety for capital risked slipped into the background, and an eagerness for 'profit' on the deal took its place..... All this is natural enough, and indeed inevitable, in present circumstances. Too often in these pages we have had to lament the prolonged cheapness of money - a cheapness which experience has taught us to be invariably the producer of just that change in popular sentiment we have described. It is not in human nature to sit still with money in hand earning nothing. Nor is it human to be satisfied with investments purchased at continually vanishing rates of interest. Deep-seated in the human mind also is the desire to find, for money paid, investments likely to increase in market value. No man buys a stock or share with the probability before his eyes that its price will go down....... Given extremely cheap money over a prolonged period of time, and the motives to speculate 'for the rise' become overpowering. It ceases to be profitable to invest for the more interest obtainable.......Intrinsic merits are not any more looked for. All that is wanted is something bound to go to higher prices, and therefore the very rottenest class of joint-stock companies are now being floated with a success wholly impossible even twelve months ago".[1]

1. The Investor's Review, Vol. VIII, No. 39, July 1896, pp.1-2.

The Response Of The Investing Public.

If the yields on Consols are anything to go by, long-term rates of interest reached their nineteenth century nadir during 1896-98 - Consols yielded 2.5 per cent during these years - and began to climb thereafter; unsteadily during 1899-1908, but continuously during 1909-13.[1] The cheap money of the mid-1890's was obviously a help to the flotation of the cycle, tyre, tubing and the first motor-car companies of 1895-97, but the flotations of the 1900's - predominantly motor-car company promotions - had to contend with times of dearer money, and the competitive claims of borrowers demanding money for capital export. It was in this latter period that extensive use of the "cumulative participating preference share" and the "preferred ordinary share" made its appearance.[2] Public offers of these types of security marked the flotations of Darracq in 1905; Charron, Rolls-Royce, and the Beaufort Motor Company in 1906; De Dion-Bouton and Maudslay Motor in 1907; Auto-Carriers Limited and the "Captain" Rim Company in 1911; British Orto Tyres and Calthorpe Motor in 1912; and the Searle Unburstable Inner Tube Company and Associated Rubber Manufacturers in 1913. To the potential investor they proffered a minimum dividend yield should the company make any profits at all, plus the opportunity of participating in any profits distribution over and above that necessary to pay the minimum preference dividend. The precise rights of the shares tended to vary from company to company.

1. See B. R. Mitchell and P. Deane, Abstract of British Historical Statistics (1962), p.455.
2. Jefferys noted the tendency for participating preference shares and the like to become popular during the first decade of the twentieth century, but said little about the types of commercial enterprise which adopted them, and the precise reasons for their use. J. B. Jefferys, op.cit., pp.212-32.

Thus Charron Limited entitled the holders of its participating preferred ordinary shares to a preferential dividend of 7 per cent, and forty per cent of the surplus net profits, the remaining 60 per cent to go to the deferred shareholders.[1] Auto-Carriers (1911) Limited entitled its preference shareholders to a cumulative dividend of 6 per cent and to one-half of the remaining distributable profits after a payment of 6 per cent on the deferred shares.[2] The holders of preferred ordinary in Rolls-Royce had similar rights to those in Charron except that the minimum dividend was 6 per cent and that they shared two-thirds of the remaining divisible profits.[3] The "Captain" Rim Company offered the relatively high cumulative dividend of 10 per cent and one-half of the remaining profits distributed in any year.[4] In all, the objective was roughly the same: to offer investors the chance of some security of income combined with the opportunity of receiving even higher incomes should the profitability of the company warrant it.[5] Neither straight-forward preference shares nor ordinary shares could obviously offer this type of dividend receipt.

An indication of the response, in terms of full-or under-subscription, of the investing public to the flotation offers made by the cycle, motor-vehicle and related trades is given in Table 27.

1. The Stock Exchange Year book, 1909, p.1802.
2. The Stock Exchange Official Intelligence, 1913, p.540.
3. Times, 17 Dec. 1906, p.13.
4. The Stock Exchange Official Intelligence, 1913, p.592.
5. c.f. The problem of attracting investment funds as H. W. Richardson saw it: "In general, scarcity of capital may have hindered the development of new industries, especially as whenever capital was in short supply investors preferred the security offered by the older industries or the high returns from foreign investment and shunned the greater risks involved in investment in new industries". D. H. Aldcroft and H. W. Richardson, op.cit., p.199.

TABLE 27

Full-or under-subscription of flotation issues made by companies in the cycle, tyre, tubing and motor-vehicle trades.[1]

Amount of issue	Cycles and Motor-cycles			Tyres		
	full	under	unknown	full	under	unknown
0 - 30,000	12	44	9	3	10	-
30,001 - 100,000	27	58	3	3	20	2
100,001 - 200,000	16	14	-	2	8	-
200,001 - 1 million	3	7	-	1	1	-
over 1 million	-	-	-	1	1	-
Total	58	123	12	10	40	2

	Tubes			Motor-vehicles		
	full	under	unknown	full	under	unknown
0 - 30,000	1	5	-	-	5	2
30,001 - 100,000	7	6	2	6	21	1
100,001 - 200,000	4	1	-	3	4	1
200,001 - 1 million	2	2	-	5	2	-
over 1 million	1	-	-	-	-	-
Total	15	14	2	14	32	4

1. Subscription details have been gleaned from the trade and financial press, from the Stock Exchange Official Intelligence and the Stock Exchange Yearbooks. With respect to many flotation issues, however, resort has had to be made to the original company files maintained by the Public Record Office. The issues for which subscription details are "unknown" refer to companies whose files are missing at the P.R.O., or located in Dublin or Edinburgh with no alternative source of information to hand. Three of the "unknown" cases refer to companies that made debenture issues before debentures were made registrable by the 1900 Companies Act, and, again, with no alternative source of information available.

Obviously, the majority of companies appealing to the market failed to obtain their desired objectives, on the assumption that full-subscription fulfilled them in a manner considered most appropriate by the entrepreneurs concerned. Only among the seamless steel tube producers, (and for reasons unknown) did the numbers of fully-subscribed companies achieve anything like parity with the numbers of those under-subscribed. Significantly, too, (with the exception of the tyre trade), firms making flotation issues of £30,000 or less incurred a relatively higher rate of under-subscription than all companies in each respective industry. The capital markets, apparently, tended to discriminate against the small concern, though issues of much larger sizes were not necessarily free of an unfavourable reception. 93 flotations, nevertheless, achieved full-subscription despite the strictures poured upon the cycle and motor-vehicle issues by the reputable financial press. Some were greeted by an investing public in a mood of euphoria. £512,000 was subscribed for the 20,000 £1 shares offered by the Puncture Proof Pneumatic Tyre Company in May 1893.[1] The 2,000 £5 shares issued by the newly formed Jointless Rim Company in January 1894 were "heavily oversubscribed".[2] The £5 million offer by Dunlop Pneumatic Tyre in 1896 attracted approximately £10 million in applications from the public; and the ordinary shares offered by Swift Cycle in October 1896 were over-subscribed four times over, as were the 15,000 £1 shares of New Hudson Cycle Extension in January 1897.[3] The £125,000 ordinary and preference share issue by New Centaur Cycle in March 1897 was over-subscribed six times over, and Leyland Motors in 1914 had to close its subscription lists days earlier than anticipated.[4]

1. Cycle Trade Journal, Sept. 1893, p.621.
2. Cycling, 20 Jan. 1894, p.13.
3. Cycle Manufacturer, 30 May 1896, p.189; 6 Feb. 1897, p.285; and 20 Feb. 1897, p.302.
4. Ibid., 20 March 1897, p.345; and Times, 7 May 1914, p.24.

Usually, the relatively large, established enterprises, well-known in their respective industries and to the interested public, obtained a favourable response. Raleigh, Swift Cycle, New Premier, Singer, Star Cycle, New Enfield, New Townend Brothers, Raglan, Starley Brothers and Westwood Manufacturing, J. B. Brooks and Company, Rover Cycle, Perfecta Tube, New Credenda Tube, and Dunlop Pneumatic Tyre (France) Limited all achieved full subscription in 1896. James Cycle, Albert Eadie Chain, New Buckingham and Adams, Brampton Brothers, Ormonde Cycle, Brown Brothers, Joseph Lucas, New Jointless Rim, and New Triumph Cycle were equally well-received in 1897. J. A. Phillips and Company and Bluemel Brothers, both founded before the turn of the century, obtained full-subscription in 1913. Among the motor-car manufacturers, "Argyll" Motors (subscribed three times over) and A. Darracq and Company - the latter a French Company registered in England - were well received by investors in 1905. Dennis Brothers and D. Napier and Son were fully-subscribed in 1913; and Leyland Motors, Vauxhall and Austin had no difficulty in finding investors in the following year.[1] On the other hand, company flotations based solely on the promise of a future exploitation of patent or manufacturing rights fared relatively badly. There were at least 48 of such issues in the cycle, tyre, tubing and motor-car industries of 1882-1914 of which only five achieved full-subscription. Two of these "notoriously speculative ventures" that received full-subscription were the

1. Firms well-known and well-established in the cycle and motor-car trades which failed to obtain full-subscription were Rudge Cycle in 1887; Premier Cycle in 1891; Joseph Appleby, the Birmingham chain-maker, Bayliss, Thomas and Company of Coventry, Riley Cycle and the Howe Cycle and Sewing Machine Company of Glasgow in 1896; Thomas Smith and Sons of Saltley, Birmingham, in 1897; and S. F. Edge in 1907. The Maudslay Motor Company, which sprang out of the old-established marine engineering firm of Maudslay Sons and Field in 1903, had its £80,000 issue of March 1907 under-subscribed to the extent of £50,000.

Beeston Pneumatic Tyre Company of 1893 and the Daimler Motor Company of 1896 - both tributes to the promoting flair of Henry J. Lawson. Another two were off-shoots from established firms viz. Starley Brothers (Russia) Limited of 1897; and the Italian Spare Motor Wheel Company of 1908.[1] It was not invariably the case, however, that the guiding presence of an established and profitable parent concern brought the money rolling in. Not one of Humber Limited's four progeny of 1894-96 achieved full-subscription despite the active involvement of E. T. Hooley.[2] Rudge-Whitworth (Foreign) Limited suffered under-subscription when floated in 1897 and so, too, did De Dion-Bouton (1907) Limited.

Investors' scepticism of the relatively untried and unknown, though not carried so far as much "expert" financial opinion would have liked, accounted for the under-subscription of some of the large flotations, i.e. over £200,000, in the cycle, motor-car and associated trades.[3] H. J. Lawson was asking a good deal from the investing public when he invited it to subscribe £750,000 for the Great Horseless Carriage Company, the purpose of which was to purchase patent rights and licences and to manufacture motor cars therefrom. £1 million for his New Beeston Cycle Company of June 1896 was an equally tall order, in view of the fact that only the relatively small Quinton Cycle Company of Birmingham was

1. The shares of Starley (Russia) Limited were entirely subscribed for by the shareholders in Starley Brothers and Westwood Manufacturing. Cycle Manufacturer, 13 March 1897, p.336.

2. Namely, Humber (America) Limited, Humber (Portugal) Limited, Humber (Russia) Limited and Humber (Extension) Limited.

3. Two of these "large", under-subscribed flotations were Clément, Gladiator and Humber (France) Limited (£900,000) and the Amalgamated Pneumatic Tyre Companies (£1,300,000). See supra, pp. 79-81 and 228.

to be purchased (at an unspecified price) plus a number of patent rights and licences. Lawson's London Motor Van and Wagon Limited, formed in February 1897 with an issue of £300,000 to acquire the privilege of manufacturing motor vans and wagons under license, was just as risky and over-ambitious. The attempted flotation of the Bell-Hall Unpuncturable Tyre and India-Rubber Company (£350,000 in January 1900) was doomed to failure not only because patent rights were the principal assets to be acquired but also since the venture was untimely - the cycle trade was depressed, and tyre producers generally were experiencing declining profitability.

The small firms, even when prospectuses were nationally advertised and circulated, also failed to attract adequately the attention of the investor "at a distance". The £29,988 issue by Raleigh Cycle in December 1891 attracted subscriptions from 205 people living throughout England and Ireland, but £13,526 of the subscribed £25,984 came from the proprietors and their senior employees.[1] The £25,000 6 per cent debenture stock flotation of February 1907 by F. Hopper and Company of Barton-on-Humber, Lincs. appealed to 34 investors resident throughout the British Isles but in aggregate they provided only £5,100.[2] 154 people in all - most living in various parts of the United Kingdom but some in Spain, Portugal and Roumania - subscribed to the £13,921 offer by the V. C. Oil Engine Company of Birmingham in September 1913, but afforded only £3,712.[3] By contrast, the

1. P.R.O., B.T.31, 5218/35386.

2. Of this sum £1,780 was subscribed by people dwelling in Hull and north Lincolnshire, or having identifiable business or personal connections with the firm. Source: Business records of the Elswick-Hopper Cycle and Motor Manufacturing Company Limited.

3. P.R.O., B.T.31, 21728/131259. Only eight of the shareholders lived in Birmingham. Ibid.

small flotations of £30,000 or less that achieved full-subscription obtained their objective in the main by the existence and support of a sizeable body of local investors. The £30,000 share issue by Morgan's Chains and Pedals Limited of Birmingham, for example, was successfully trotted out in March 1897 to 148 shareholders of whom all but 25 resided in that city.[1] Also in March 1897 the Coventry Gearcase and Belting Company, with factories in Coventry and Birmingham, allotted its £17,000 share offer to 115 subscribers of whom only 18 lived outside Birmingham, Coventry, Solihull and Dudley.[2] The 15,000 £1 shares issued by the New Simpson Cycle Company of Nottingham in May 1899 were fully subscribed by 70 shareholders of whom 32 dwelt in Nottingham and a further 20 in Derby.[3] A. J. Stevens and Company of Wolverhampton owed the full-subscription of its £19,000 issue of July 1914 to 452 investors living almost entirely in Birmingham or Wolverhampton.[4] The Belle Vale Tube Company of Halesowen, formed in July 1896, and the only "small" tubing flotation to achieve full subscription, owed its success to the contributions of 72 shareholders. Of these only four, investing £590 of the subscribed £20,000, dwelt outside Birmingham and the Black Country towns, while six investors, who were allotted £1,000 or more in shares each, all lived in Halesowen itself. The mean shareholding in this company amounted to £278; eight holders

1. P.R.O., B.T.31, 7311/51758.
2. P.R.O., B.T.31, 7281/51528.
3. P.R.O., B.T.31, 8535/62135.
4. P.R.O., B.T.31, 32192/137062. One can go on in this vein and cite the many small allotments to mainly local investors in the successful "small" flotation issues of Jointless Rim in January 1894, Bard Cycle Manufacturing in October 1896, the New Vanguard Company in February 1897, New Hudson Cycle Extension Limited in January 1897, and Robinson and Price Limited of Liverpool in September 1896. See P.R.O., B.T.31, 5742/40189, 7058/49726, 7248/51253, 7228/50981 and 7009/49377.

maintaining allotments to the value of £500-999, 25 to the value of £100-499, and 33 had allotments amounting to less than £100 each.[1] Compared to the characteristics of "private" company formations - their reliance upon a few local or business connections - the non-abortive, "small" flotation, in fact, acquired relatively modest sums of money from a relatively substantial number of people of whom not all were likely to possess personal and/or business contact with the firm and its entrepreneurial leadership. Jointless Rim in January 1894 obtained full-subscription of its £10,000 flotation issue with the aid of 22 shareholders possessing allotments of £50 or more (but less than £100) and of 24 investors with allotments of less than £50 each.[2] The Bard Cycle Manufacturing Company in 1896 received a full-subscription to its £19,000 share offer with the applications from 243 non-vending investors, (all but ten living in Birmingham), of whom 37 were allotted £100 worth of shares or more, 44 exactly £50 each, and 162 less than £50 worth.[3] In 1897 Reuben Chambers floated his Birmingham cycle fittings and components business with a £13,000 share offer, which attracted a full-subscription from 61 non-vending investors of whom 37 held £100 worth of shares or more, 11 £50 worth but less than £100, and 13 less than £50. Only nine shareholders lived outside Birmingham, and three of these were designated as "travellers".[4] During the same year, the £15,000 share offer by the New Hudson Cycle Extension Company fully received the support from 194 non-vending investors; 56 holding 100 £1 shares or more, 62 holding 50 to 99 shares, and 76 investors with less than 50 shares.[5] The size of the average shareholding among 200

1. P.R.O., B.T.31, 6931/48771.
2. P.R.O., B.T.31, 5742/40189, op.cit.
3. P.R.O., B.T.31, 7058/49726, op.cit.
4. P.R.O., B.T.31, 7316/51798.
5. P.R.O., B.T.31, 7208/50981, op.cit.

investors in Raleigh Cycle in 1892 (excluding the cash subscriptions of the proprietors and their employees) was £62. Excluding the Morgan brothers, 146 shareholders in Morgan's Chains and Pedals Limited held an average of £190 in 1897, while the £9,500 offer by Lindall's Cycle Fittings Company of April 1897 attracted £6,039 in subscriptions from 39 investors (34 living in Birmingham) - an average holding of £155.[1] £79 was the mean holding, in August 1899, in Simpson Cycle, with its 70 shareholders, if the subscriptions of the two entrepreneurs in the concern are excluded. 21 investors, with no apparent alternative connection with F. Hopper and Company had an average stockholding of £158 in April 1907, and the 154 shareholders in V. C. Oil Engine had an average investment of £24 by January 1914. Not counting the allotments to the vendors, the 452 investors in A. J. Stevens and Company averaged £42 each in November 1914. Nevertheless, the importance of the relatively large shareholder in the cash subscriptions to some of the "small" flotations cannot be denied. The Belle Vale Tube Company obtained £8,001 (or 40 per cent) of its fully-subscribed £20,000 from five Halesowen people, each holding £1,500 in shares or more - the largest being one of £3,000 contributed by Jesse Hickton, a local manufacturer.[2] £7,675 (or 26 per cent) of the £30,000 allotted by Morgan's Chains and Pedals came from a Birmingham clerk (£2,500), an accountant (£2,000), and three Birmingham industrialists - the five largest shareholders.[3] Of the £19,000 in cash raised by the Bard Cycle Manufacturing Company of Birmingham, £2,026 came from a Thomas Ratcliffe, an Edgebaston manufacturer, and £2,001

1. P.R.O., B.T.31, 7338/51983.
2. P.R.O., B.T.31, 6931/48771.
3. P.R.O., B.T.31, 7311/51758.

from William James Lancaster, also a Birmingham industrialist.[1] The £13,000 received by Reuben Chambers of Birmingham came, in part, from his solicitor, Arthur L. Crockford (£2,000); two local manufacturers who provided £1,000 each; and from George F. Jackson "gentlemen", who also invested £1,000.[2] The Cyclists' Supply Company of Leeds received £2,857 upon a £21,000 flotation in April 1897, £1,350 of the subscription coming from John R. Ford, a Leeds solicitor, his wife and his sister, each of whom constituted the principal, non-vending shareholders.[3] £1,000 of the £5,100 subscribed to F. Hopper and Company in 1907 came from one man, the Rev. C. C. Fowler of Gainsborough, Lincs. Conversely, there were no outstandingly large cash subscribers to the offers of New Hudson Cycle Extension, Lindall's Cycle Fittings Company, V. C. Oil Engine Limited and A. J. Stevens and Company. The "small" flotations maintained a diversity in experience on this score.

For the companies so affected the impact of under-subscription varied. Subscriptions from the public were so low in a number of instances that the vendors or promoters abandoned the flotation and declined to proceed to allotment. At least 20 of the undersubscribed cycle flotations, were "abortive" in this sense; four among each of the tyre and tubing promotions, and three of the motor-vehicle companies.[4] Some game entrepreneurs, however, did not permit very low subscription to be the end of matters. The promoters of the Endurance Tube and Engineering Company, upon the desultory response to their £210,000 offer of May 1896, abandoned their flotation and refloated their enterprise during the following month with an over-subscribed issue of £110,000.

1. P.R.O., B.T. 31, 7058/49726, op.cit.
2. P.R.O., B.T. 31, 7316/51798, op.cit.
3. P.R.O., B.T. 31, 7364/52194.
4. One cannot be exact on the number of abortives. Usually, the Registrar of Joint Stock Companies was informed whether a company went to allotment or not, but sometimes the Registrar received no information either way. It would be wrong to assume, however, that an empty company file at the Public Record Office meant that no allotment was made. The New Merlin Cycle Company of 1896 proceeded to allotment, according to reports made in the Cycle Manufacturer but no record of share allotments appear in the relevant P.R.O. file.

The Premier Tube Company abandoned its £100,000 issue of May 1896, but obtained a higher subscription - though still undersubscribed - when floated as the Anglo-Swedish Steel Tube Company in the following November. The £130,000 flotation of Hearl and Tonks Cycle and Components Manufacturing was designated a "fiasco" in July 1896, but the same enterprise's £160,000 offer of March 1897 was handsomely over-subscribed.[1] Despite a poor investors' response to their offers and consequent abysmal financial resources at their disposal, a number of other companies proceeded to allotment and attempted to operate as commercial concerns, only to come to a quick end. A case in point was the Leamington Cycle Company whose £60,000 share offer of June 1896 (plus £15,750 in 6 per cent debentures) attracted a subscription for 5,361 shares.[2] Its attempt to establish a cycle business at Leamington continued - though less ambitiously since its three-firm amalgamation scheme was given up - until wound-up on the petition of the Credenda Tube Company, a trade creditor, in late August 1897.[3] The public only subscribed £3,000 to the flotation offer of £60,000 in shares by the Hampton Cycle and Foundry Company Limited in July 1896, and its chairman, J. M. Horner, was initially against going to allotment but was persuaded that "....they had prospects of further considerable applications for shares". More capital did not materialise, however,

1. Cycle Manufacturer, 27 March 1897, p.355.

2. It was a company designed to relocate three London cycle manufacturing firms in Leamington in order to obtain cheaper labour and more extensive premises. Economist, 27 June 1896, p.1V.

3. Cycle Manufacturer, 21 Aug. 1897, p.52; and 18 Sept. 1897, p.99.

and Horner registered his opinion that he was "grievously disappointed with the work done by the company", which finally disappeared in 1898.[1] The Anglo-French Pneumatic Compensation Cycle Company went to allotment in February 1897 despite a public subscription of £7,000 in response to its £67,000 ordinary share offer. £5,000 of the subscribed moneys went to the vendor leaving the Company with a "working capital" of £2,000; the firm's chairman later justifying this policy "....that inasmuch as the directors themselves were prepared to find more money, and actually found £5,000, making the working capital £7,000, and inasmuch as the Company was supposed to take over a factory which during the month of January had turned out 600 cycles, the directors were justified in their action, and in the assumption that they would have a business which was paying expenses, and that therefore no very large amount of capital would be required". But orders for 4,000 machines, which the Company took-over as part of the business which they bought, were repudiated in the March, and the enterprise was forced into liquidation in the following October.[2] The British "Zenith" Adjustable Cycle Company went to allotment upon the receipt of 2,300 share applications for its £53,500 offer of March 1897, the promoting syndicate taking shares for its purchase consideration, but only to go bankrupt in the following August.[3] More usually, however, undersubscription of the issue was not so intractable a condition that vendors and promoters could not come to terms with it without inviting either abandonment of their flotations or very rapid financial disaster. Among the cycle company promotions of the 1880's and 1890's, the majority of vendors were, "a priori", prepared to be

1. Ibid., 2 Oct. 1897, p127.

2. Ibid., 23 Oct. 1897, pp.160-2.

3. Times, 24 Aug. 1897, p.10.

flexible in the terms (as between cash and securities) under which they would accept their purchase considerations - no doubt with the possibility of undersubscription in mind - and a number were, too, in the pneumatic tyre, cycle tubing and motor-car trades. Conceivably, there might have been tensions in the event of undersubscription between the newly-formed companies, which required "working capital" to maintain and expand themselves as viable commercial enterprises, and promoters and vendors who desired the receipt of their purchase considerations in a form e.g. cash, which most suited them. Despite undersubscription, it was possible for some of the cycle, tyre and tubing companies to have obtained all or a good proportion of their "working capital" requirements from public flotation so long as vendors and promoters were prepared to accept the whole, or the major part of their purchase considerations in the form of non-cash securities. In so far as vendors and promoters were committed to the payment of legal and other charges, there were constraints upon the extent to which they could do this. Such constraints were all the greater for company promoters, such as Hooley, who sometimes contracted to pay cash for his assets, and dispensed with the cushion of under-writing in the process of disposing of them to the public.

In the event, there were companies, formed under flexible vending arrangements, and meeting undersubscription, which took full advantage of that flexibility. Humber and Company (Portugal) Limited of 1895 was one for which the purchase consideration was fixed at £60,000, payable in either cash or shares, or partly in one and partly in the other. Upon undersubscription, the vendors took their consideration in shares, leaving all the publicly subscribed £20,435 available for "working capital", though £40,000 was desired. Osmond's Limited (a Birmingham cycle manufacturer) was another, floated in 1897 with a purchase price of £177,500 payable as to £10,000 in cash and £167,500 in either cash or cash and/or shares. The public subscribed for only £21,043 of its £250,000 issue, the vendors took their £167,500 in fully paid shares, leaving £11,043 for "working capital". The requirements of the company took precedence over the desires of the vendors in the case of the Australian Cycle and Motor Company.[1] A purchase price of £25,000 fixed in 1896 as payable in either cash or shares, was settled by £21,500 in shares and the balance in cash, which left the Company with £31,330 even though it desired £50,000. A desire to salvage as much "working capital" as possible, given the terms of the purchase consideration, was also evinced by the Elswick Cycle Company of Newcastle in 1896 and by Stelastic Tyres Limited in 1913. The former obtained £25,346 of its £75,000 required "working capital" because the vendors took £58,000 in cash instead of a possible (given the terms of the purchase contract and the amount of public subscription) £73,346. The latter maximised its "working capital" at £23,000 since the vendors took a £43,000 part-purchase consideration - payable in either cash or cash and/or shares - entirely in the form of shares.

1. An enterprise formed to acquire agencies in Australia, which sold cycles, motor-cars and components, and the patent rights for Australia, New Zealand and Tasmania relating to the Kane-Pannington Oil Motor. It was voluntarily wound-up in 1899, upon the post-"boom" contraction of the Australian cycle market. Times, 11 Nov. 1896, p.12; and P.R.O., B.T.31, 7097/50044.

The existence of tensions between the interests of the vendors and those of the companies is borne out, however, by the cases of Rudge-Whitworth (Foreign) Limited, Automatic Cycle Rack Limited, the Clipper Pneumatic Tyre Company, and the "Jewel" Pneumatic Tyre Company - all floated, and under-subscribed, in 1897. With respect to these, the vendors' interests appeared paramount despite a large "a priori" degree of flexibility in the purchase terms. Rudge-Whitworth (Foreign) Limited could have formally satisfied its vendors completely in terms of shares. As it was, the purchase price of £100,000 was paid £75,000 in shares and £25,000 in cash, and a desired "working capital" of £25,000 fully obtainable given the public subscription for 35,940 shares, was reduced to an actual £10,940. Automatic Cycle Rack achieved a public subscription of £61,275 for its £70,000 share offer, and yet obtained a "working capital" of £11,275 instead of a required £20,000 since the vendors took their £75,000 price - possibly payable entirely in shares - in the form of £50,000 cash and £25,000 in shares.[1] The Clipper Pneumatic Tyre Company could have come more closely to its required £30,000 had not its vendors limited it to £10,088 by accepting their £120,000 consideration in the form of £83,034 cash and £36,996 in shares.[2] Similarly, the "Jewel" Pneumatic Tyre Company

1. It was a short-lived concern - liquidated in 1901 - and formed for the purpose of securing the patent rights to an invention for automatically securing and holding cycles on a penny-in-the-slot principle. Economist, 6 Nov. 1897, p.1572.

2. The purchase price payable by the Company was formally stated as £50,000 cash and £70,000 in either cash or cash and/or shares. The public subscribed for £93,122 of its £150,000 ordinary share issue.

could have injected an extra £7,819 into its achieved "working capital" of £4,000 (it wanted £17,000) had it allotted its vendors £28,000 in the form of shares, which formally they were prepared to take, instead of an actual £20,181.[1]

There were instances, of course, in the cycle, tyre, tubing and motor-car trades where the purchase terms, as between cash and securities, were fixed by vendors in an inflexible form, and where undersubscription did not permit of any bargaining between the vendors and the company <u>within</u> the terms of the purchasing agreement. Necessarily, undersubscription of company flotations, made under such conditions, meant that either the companies had to fulfill their fixed terms of payment and, perhaps, be content with very little in the way of "working capital", or that the purchasing agreements be revised in order to take into account the unpleasant fact of lack of market appeal. Examples of the former case were the Turner Pneumatic Tyre Company of 1893, which obtained only £5,086 in "working capital", instead of its desired £20,000, since the vendors stuck to their original sale price of £30,000 in cash for Walter Turner's tyre patent. Despite undersubscription, De Dion-Bouton (1907) Limited had to pay its vendors £78,300 in £10,000 in deferred shares and £68,300 in cash, leaving it with a "working capital" of £90,929 instead of a desired £116,700. Similarly, the Maudslay Motor Company (1907) Limited obtained a capital of only £26,800, and no nearer to its required £66,800, since its vendors demanded £13,200 in cash and £20,000 in deferred ordinary shares - their original sale terms. There were also promotions where vendors had necessarily to be inflexible, come what may, because they

1. The purchase consideration was fixed at £48,000 payable as to £20,000 cash, and £28,000 in either cash or cash and/or shares. It, too, was formed to exploit a pneumatic tyre patent, but was dissolved in 1902. <u>Times</u>, 6 April 1897, p.16.

stipulated their purchase considerations entirely in the form of securities. The 1891 flotation of the Raleigh Company was a case in point: its vendors asked for 39,012 £1 ordinary shares and £1,000 in founders shares, and a public appeal raised £25,984 although £29,988 was requested.[1] Likewise, Rudge-Whitworth Limited, floated in 1894, obtained £20,461 instead of £30,000; no amendment of purchasing terms being permissible since they were satisfied by £37,860 payable in shares. Rolls-Royce, floated in 1906, and S. F. Edge (1907) Limited, fell into the same category, and both also met with undersubscription.

The wholesale revision of purchase agreements to cope with the problems posed by undersubscription was not confined to companies whose purchase terms contained no element of flexibility as between cash and securities. Sometimes the "a priori" degree of flexibility was not great enough, in view of the level of public subscription, to permit some arrangement to be arrived at, which satisfied both vendors and vendees, within the terms of the existing purchasing contract. Without any alteration in the total purchase consideration, some companies in the cycle- motor-car and related trades, upon undersubscription, revised the original stipulated allocations of cash and securities. Humber and Goddard Limited, cycle manufacturers of Nottingham, was one. Floated in 1896 with a total purchase price of £55,000, which required a minimum cash receipt of £33,000, the company came to accept, upon undersubscription, an allocation of £27,000 in cash and £28,000 in shares to its vendors, in order to obtain a "working capital" of £15,127 (it originally wanted £30,000).[2] The Acatene Cycle Company, also of 1896, was another.

1. Of the £25,984 subscribed, £10,000 came from Frank Bowden the principal entrepreneur in the business, and £1,000 each from his co-partners, R. Woodhead and P. Angois.

2. P.R.O., B.T.31, 6870/48319.

The public subscribed £40,007 for its £150,000 share offer, and the purchase consideration of £25,000 in cash and £95,000 in either cash or shares was revised to an actual settlement of £10,067 in cash and £109,993 in shares. As a result a "working capital" of £29,940 was obtained - very close to its desired £30,000. In a similar fashion, the small Self-Acting Pneumatic Tyre Pump Syndicate, floated in 1898, changed its purchase consideration from £8,500 in cash to £8,000 in shares and £500 in cash, in order that a "working capital" of £10,861 should be obtained and near to its required £11,500. The public had responded with £11,181 to its £20,000 share offer.[1]

In a few instances in the cycle trade, undersubscription was sufficient to induce vendors to reduce the total amount of the purchase consideration - an explicit recognition that they had over-estimated the current market value of their assets offered to the investing public. Noteworthy firms affected by this type of decision were the Rudge Cycle Company, floated in 1887, and Joseph Appleby and Company, and Accles Limited, both floated in 1896. The undersubscription of Rudge Cycle provoked the vendors to reduce their total price from £175,000 to £155,000, and a Mr. Orris of the promoting firm of Chadwick and Company, induced George Woodcock and his associates (the vendors) to take shares for their cash considerations and to subscribe for more shares over and above those amounts, leaving more room for the actual acquisition of "working capital".[2] Messrs. Smart and Parker Limited of Birmingham, and the Universal

1. Acatene Cycle was floated to acquire the English patent rights, relating to the invention of a chainless cycle as devised by two Frenchmen, Messrs. Malicet and Blin, but was dissolved by 1902. The Self-Acting Pneumatic Tyre Pump Syndicate acquired patent rights with regard to a self-acting air pump for pneumatic tyres. Times, 10 Dec. 1896, p.6; and The Stock Exchange Official Intelligence, 1899, p.1583.

2. The Cyclist, vol. 9, No. 430, 11 Jan. 1888, p.324; and No. 452, 13 June 1888, p.881.

Weldless Steel Tube Company also reduced their purchase prices after flotation to maintain "working capital" requirements. The Birmingham cycle chain-making firm of Joseph Appleby reduced its purchase price, not to salvage the amount of the desired "working capital", but to reduce the vendor's lien upon ordinary share dividends that might be paid by the company in the future. The company's £100,000 issue of March 1896 attracted a subscription of 35,120 shares, including 20,000 from Joseph Appleby's family, all living in Birmingham. The original purchase price was £85,000 payable either wholly in cash, or wholly in shares and debentures, but a supplementary agreement reduced this to £65,000, in satisfaction of which the vendor (Joseph Appleby) took 24,880 shares, £10,000 in debentures and the balance in cash. The reduction involved a sacrifice, on the part of Appleby, of 20,000 ordinary shares, but his company had only an actual "working capital" of £5,000 compared with the £15,000 desired.[1] Accles Limited, on the other hand, reduced its purchase consideration to maximise the available "working capital". The original price was £300,000 - two-thirds of it payable in cash - and the company appealed for a like amount by an ordinary share and debenture offer (£200,000 and £100,000 respectively), which flopped, the ordinary shares raising only £85,000. This latter sum it reserved for "working capital", though it wanted £100,000, by agreeing with its vendors (the Accles Arms, Ammunition and Manufacturing Company of Birmingham) to reduce the purchase price to £165,000 payable in

1. P.R.O., B.T.31, 6743/47416.

shares.[1] The vendors took £100,000 in shares, but the remaining £65,000 was paid in cash as a result of further share allotments to the public - much of the money coming from John Cooper and James Greig, bankers of London (£25,000), and George Todd and John Imrie, bankers of Glasgow (£11,127).[2]

The impact of under-subscription upon the actual physical expansion of newly-floated, joint-stock companies might have been a retraction of entrepreneurial ambitions when less-than-desired "working capitals" were obtained. However, in public, some entrepreneurs appeared not unduly perturbed. Shortly after the under-subscription of Rudge-Whitworth's share issue, Charles Wallis, the Company's chairman, announced that in his opinion the prospects of the firm were "very satisfactory"; and at the first ordinary general meeting of shareholders, held in December 1895, stated that under-subscription meant that they had "....suffered nothing from that, despite what rumour said".[3] Despite the under-subscription of its share issue, A. C. Hills, chairman of the New Merlin Cycle Company of Birmingham, reported in the summer of 1897 that the arrangements mentioned in the prospectus, as to the purchase of freehold land and an enlargement of premises, had been duly effected, and that the Company had taken new works and had made various alterations and additions to the premises "so that the factory is now in full going order, and the output steadily increasing".[4] Dover Limited's share issue of May 1897 was under-

1. The nominal authorised capital of the company was 300,000 £1 shares plus 1,000 £100 debentures, so the vendors had no opportunity to accept their £300,000 entirely in the form of shares, and also permit the company to retain its subscribed £85,000 in cash.
2. P.R.O., B.T.31, 6847/48172.
3. Cycle Manufacturer, 16 Feb. 1895, p.41; and 21 Dec. 1895, p.276.
4. Ibid., 7 Aug. 1897, p.26.

subscribed but Pickering Phipps, a director, declared three months' later that: "Not only has the output been materially increased, but there has been a substantial increase in the profit earned, and I have every reason to believe that the profit that was anticipated will be more than realised, which will ensure a very substantial dividend. The new Xylonite works are now in full working order, and by September the extension of works will be fully completed.... The premises in St. Nicholas Street, Coventry, are now fully equipped, and we find the Coventry trade has materially increased. It is our intention to manufacture the cases (gear-cases) at these premises for the convenience of the Coventry manufacturers, also to open a similar branch at Birmingham."[1] Also under-subscribed were the £75,000 share offer of the Beeston Tyre Rim Company and the £85,000 flotation of Metallic Seamless Tube Limited, both of May 1896. Despite this, W. Neale, the chairman of the latter, later felt able to declare that "....the result of (the first) fourteen months working was very satisfactory. Everything promised in the prospectus of the Company - and more- had been carried out"; and Beeston Tyre Rim, according to trade press reports, immediately set about making arrangements for extending its premises and erecting new buildings, the board of directors additionally resolving to add another branch (viz. hub manufacture) to the components business, and for this purpose ".....have laid down the latest labour saving machinery entailing a very large expenditure".[2] Undersubscription

1. Ibid., 14 Aug. 1897, p.40.
2. Ibid., 16 Oct. 1897, p.149; and 18 Dec. 1897, p.266.

did not prevent the New Victoria Cycle Manufacturing Company (a £25,000 flotation of June 1896) from removing all its plant and machinery from Cathedral Street, Glasgow to new premises in Craigpark "....which were very large and very suitable for the business"; and neither did it preclude the Alfred Appleby Twin-Roller Chain Company of Birmingham (a £33,000 issue of March 1897) from moving into new works in Saltley.[1] Again, despite under-subscription of its £60,000 offer of November 1896, the Anglo-Swedish Steel Tube Company of Birmingham went ahead to construct its planned new mill "fully equipped with the most modern machinery".[2] In fact many entrepreneurs resorted to other sources of finance, for example, bank loans, trade credit, private allotments of different types of stocks and mortgages, to supplement what capital was acquired from flotation, and to proceed with expansion as planned. The Badminton Cycle and Components Company Limited, under-subscribed in July 1897, determined upon the course of relying on trade credit.[3] Plans to acquire works in Stanhope Street, Birmingham, were abandoned in favour of the acquisition of larger premises in Lombard Street, and the manufacture and sale of cycles on a greater scale commenced. The firm, though, essentially courted a higher degree of risk: some trade creditors eventually lost patience with the delays in payment, and petitioned in court for a winding-up, although the Company's shareholders had

1. Ibid., 11 Dec. 1897, p.255; and 2 April 1898, p.139.
2. Ibid., 7 May 1898, p.207.
3. Its £10,000 issue received applications of £2,500 from one person. Times, 2 Feb. 1900, p.3.

come forward with capital to help satisfy the creditors and continue the business. Such actions and the collapse of the mid-nineties boom were sufficient to liquidate the enterprise in February 1900.[1] Rudge-Whitworth and Humber and Company (America) Limited, both floated towards the end of 1894, took advantage of the subsequent arrival of a more favourable investment climate to unload the shares left on their hands. During the "boom" days of 1896-97, Rudge-Whitworth issued about 10,000 £1 ordinary shares - unsubscribed and unallotted in 1894 - at various premiums,[2] while American Humber, despite an initial response of £40,905 to its £75,000 ordinary share offer, managed to privately allot the unissued balance by April 1898.[3] The Quadrant Cycle Company of Birmingham obtained only £3,465 of its desired "working capital" of £16,938 upon a £30,000 preference share issue in 1895 but nevertheless issued a further 3,605 of the same shares at par during 1897-98.[4] Useful, in this respect, was a capacity to exploit favourable financial and personal connections. The public applied for £25,000 - worth of shares upon the £150,000 flotation of the New Cycle Company Limited in June 1896, but shortly afterwards a further £75,000 was raised from "four or five influential men": Lord Ribblesdale of the Nobel Dynamite Trust, and the Hon. Mark F. Napier, vice-president of the National Life Assurance Society, had, after all, seats on the company's board.[5]

1. Ibid; and Cycle Manufacturer 16 Oct. 1897, p. 149; and 7 May 1898, p. 203.
2. Stock Exchange Official Intelligence, 1899, pp. 1444-5.
3. P.R.O., B.T. 31, 6046/42746.
4. Stock Exchange Official Intelligence, 1899, pp. 1418-9.
5. Times, 9 June 1896, p.15; and 7 Oct. 1896, p.11.

Among the companies that incurred under-subscription and yet wished to stay and expand in business, there was, perhaps not co-incidentally, a tendency to issue, subsequently, securities of different types, more safe with respect to both capital and income, than those not entirely issued upon flotation. Reuben Chambers Limited, Raleigh Cycle, Daimler Motor-Car, and "Argyll" Motors were exceptional enterprises in that fully-subscribed flotation issues were followed during the next two or three years by debenture and other security issues.[1] Successfully floated companies were, on the whole, free of this necessity, but several under-subscribed flotations were supplemented in the fairly immediate aftermath by debenture stock or preference share allotments,

1. Raleigh Cycle, as floated in 1896, was obliged to issue £65,964 in debentures by the beginning of 1899, possibly on account of the expense incurred in constructing its new and extensive Lenton works. The company spent £69,216. 9. 11d on capital account during its financial year 1896/97 although its flotation raised only £19,134 in "working capital". The debentures were issued partly to secure a bank overdraft of approximately £47,000. Daimler Motor Car suffered from poor profitability for years after its flotation. For the period 14 January 1896 to 31 May 1897 it made a trading loss of £4,335 (covered by a capital gain of £10,905 on a factory sold to the Great Horseless Carriage Company plus another windfall of £2,605.17. 9d). For the financial year 1897/98 the company made a net loss of £1,423.10. 0d; for the year 1898/99 a small trading profit of £1,045. 2. 10d; and for 1899/1900 a profit of £4,430. 8.11d. Despite the capital provided by the fully-subscribed flotation issue, the firm suffered from a lack of funds to finance heavy stocks of finished motor-cars and components. It made no resort to the banks but obtained a £3,000 mortgage in 1896 from the Hon. Evelyn Ellis, a director of the enterprise, increased to £10,000 by June 1898, and to £13,000 in November 1900, and secured by the issue of an equivalent amount in debentures. "Argyll" Motors made a £100,000 debenture stock issue in December 1905, a £50,000 preference share issue in July 1906, a £100,000 ordinary share issue in the following December, a £15,000 preference issue in February 1907 and another of £100,000 in the August, mostly on account of the construction and equipment of "a palatial factory costing over £200,000". The Stock Exchange Official Intelligence, 1899, pp.1424-5; Cycle Manufacturer, 4 Dec. 1897, p.241; St. John C. Nixon, Daimler 1896-1946: A Record of Fifty Years of the Daimler Company (1946); and S. B. Saul, "The Motor Industry in Britain to 1914", Business History, V, (1962), p.31.

occasionally as co-lateral for bank loans.[1] The "private" issue of debenture stocks to satisfy financial requirements was the most common policy (see Table 28), as investors or banks would only accept the least risky type of security made available by enterprises whose prospects were not recently deemed promising by the capital markets generally. A £14,181 preference share allotment to its existing shareholders by Humber and Goddard was essentially a bailing-out operation, engendered by the amount of trade credit the Nottingham company had incurred relative to its cash assets.[2] Undersubscribed upon flotation in 1896, the cycle firm stretched the patience of its creditors such that liquidation was talked about in September 1897, but the provision of capital in the following December prevented disaster, despite an attempt by a Northampton firm of electrical engineers to obtain a compulsory winding-up order from the High Court.[3]

The necessity to make post-flotation security issues, or rely heavily on the availability of trade credit, was avoided by some few firms, however, since profits, despite undersubscription, turned out to be delightfully high, enabling generous dividend declarations, substantial profit plough-back, and correspondingly no lack of investible funds. Rudge Cycle, undersubscribed in 1887, earned a net profit of £24,122 with a 10 per cent dividend declaration during its trading year 1887/88, £28,763 (with a 10 per cent dividend)

1. Ormonde Cycle was a case of a company which, exceptionally, a year after its successful flotation in February 1897, found itself in need of a bank loan secured by debentures - amounting to £7,044 by August 31, 1898. The Stock Exchange Official Intelligence, 1899, pp. 1398-9.

2. By the autumn of 1897 the Company had assets valued at £25,871. 4. 7d. of which all but £2,200 was tied up in buildings, plant, machinery, tools and stocks. Debts due by the Company, including bank overdraft, amounted to £9,667. 2. 5d. It had got itself into an illiquid situation. Cycle Manufacturer, 30 Oct. 1897, p. 172.

3. P.R.O., B.T. 31, 6870/48319, op.cit.

TABLE 28

Security Issues made by undersubscribed Companies in the Cycle, Motor and Related Trades after flotation

Company	Date of flotation and the securities offered	Details of securities placed after flotation
Elswick Cycle Co.	June 1896 £175,000 in Pref. and Ordinary Shares.	By 1899 loan from bankers of £7,200 secured by deposit of £25,000 in debentures.
Humber and Goddard	June 1896 £55,000 in Ordinary Shares	In December 1897 £15,000 in preference shares created and £14,181 issued for cash to existing shareholders.
New "Victoria" Cycle Co. of Scotland	June 1896. £25,000 in Ordinary Shares	6,356 of Ordinary Shares unsubscribed. These converted to 7% cum. preference shares and fully allotted in 1898.
Wearwell Cycle Co.	June 1896 £20,000 in Ordinary shares and £10,000 in Preference Shares	In January 1897 an "equitable charge" on the Company's freehold premises, amounting to £5,500, created to secure a bank overdraft.
Riley Cycle Co.	July 1896. £40,000 in Ordinary Shares	During 1897 £7,000 in 4¼% debentures allotted. In 1898 £2,000 in 4¼% debentures and £5,000 in 5% debentures allotted.
Osmond's Limited	April 1897. £250,000 in Ordinary Shares.	By 1898 bank loan of £24,916 secured by an issue of £30,000 in first mortgage debentures.

TABLE 28 (continued)

Company	Date of flotation and the securities offered	Details of securities placed after flotation
Stirling Motor Carriages Limited	Dec. 1897. £50,000 in Ordinary shares	By 1902 private loan of £6,080 obtained
Belsize Motors Limited	April 1906. £60,669 in Ordinary Shares	In March 1907 loans amounting to £28,457 secured by £30,000 in 1st Mortgage Debentures.
Beaufort Motor Co.	May 1906. £50,000 in 6% preferred ordinary shares	£8,000 in 6% Mortgage debentures placed in 1908.
F. Hopper and Co.	March 1907. £25,000 in Second Debenture Stock.	£1,350 of Second Debenture Stock issued during 5 August 1907 - 1 August 1908. £1,771 in dividends taken out in the form of ordinary shares during 1907/8. £500 private loan received during 1907/8. Issue of £12,000 First Debentures plus £5,000 Second Debenture Stock in July 1907 to secure bank overdraft of £15,000. £200 in ordinary shares issued in 1907.
"K.T." Pneumatic Tyre Co. Ltd.	Jan. 1910. £160,000 in Ordinary Shares	£2,399 in 8% debentures issued at par in Dec. 1911.
Calthorpe Motor Co. (1912) Limited	Nov. 1912. £70,000 in Ordinary and 6% participating Preference Shares.	£15,000 in mortgage debentures issued during 1913-14.

(Sources: P.R.O. Company Files; Stock Exchange Official Intelligence; Stock Exchange Yearbooks; and the Business Records of the Elswick-Hopper Cycle and Motor Manufacturing Company Limited) for 1888/89, and £35,532 (with a 15 per cent dividend) for 1889/90. During these three years ploughed-back profits amounted to £47,518 or an average of 54 per cent of net profits, and in 1889 "finding that they had more cash on hand than was required to carry-on the business", the company bought back £14,250 of its issued debentures.[1] The firm desired only a "working capital" of £15,000 from its flotation, and obtained £11,125 in profit plough-back even in its first trading year. The Bowden Brake Company, undersubscribed by £5,229 upon its £50,000 issue in 1901, was, by 1902/3, paying a 20 per cent dividend plus a 4 shillings per share bonus out of a net profit of £28,638 of which £12,614 (or 44 per cent) was retained. Similarly, Stepney Spare Motor Wheel, floated and undersubscribed to the extent of £19,950 in December 1906, made net profits of £20,930, £26,060, and £33,043 on a share capital of £87,550 during its first three trading years, declared a 20 per cent annually, and ploughed-back a total of £31,485 of those profits at an average annual rate of 39 per cent. The capacity to earn <u>some</u> profit was a factor in the ability of going-concerns to cope with any deficiencies in "working capital" engendered by undersubscription of flotation issues. Not only did profits yield a financial resource that could be fully-utilised, if need be, for real capital expansion, but without them banks and investors were quite unlikely to provide loans or accept securities, and trade creditors would become alarmed and prove recalcitrant.

1. <u>Times</u>, 11 Dec. 1889, p.10.

The objectives and experience of firms in the cycle, motor and related trades, with respect to the public flotation of joint-stock companies during the late nineteenth and early twentieth centures, might not have been shared by other manufacturing and trading enterprises, whether in the "old" or "new" sectors of the United Kingdom's economy. This constitutes a question that can only be answered by further research, industry-by-industry. In the cycle, motor-vehicle and related industries, nonetheless, the fact that the principal firms, and a good many of their smaller brethren, decided to embark upon public, joint-stock company flotation had some important longer-term consequences, apart from the immediate ones of success, or lack of success, in raising extra capital and changing the structure of firm ownership. The embrace of a much larger number of people, financially interested in the firms, afforded entrepreneurs of the commercially successful the opportunity to finance expansion in later years by means of "rights issues": an essentially cheap and easy method of capital acquisition. On the other hand, the entrepreneurs of those firms that underwent commercial misfortunes had, at least once a year, before questioning and at times irate shareholders, to explain themselves and justify their policies. Occasionally, they had to accept the inquisition of a shareholders' committee of inquiry, or the appointment of an additional director whose clear job it was to monitor their policy decisions. Shareholders were primarilly interested in dividend declarations and the growth of their firms' real assets which reflected themselves in the market prices of their paper securities. Entrepreneurs, in making decisions, were correspondingly under a stronger pressure, than before incorporation, to follow the perceived path of economic rationality. Clearly, however, sober, contemporary financial opinion regarded the flotation issues generated by the cycle, tyre, tubing and motor-vehicle industries as high-risk propositions invariably unworthy of the prudent investor's attention - an attitude that appeared to manifest itself in various forms. The terms of individual flotation issues were criticised, often severely, by the "respectable" financial press. More broadly, it disliked the preference for cash which seemed, unjustifiably in a number of cases, to typify the cycle, tyre and tubing flotations of the 1890's, and scorned the appearance of the "small" flotation issue which was obviously undeterred by the alleged high costs of a public appeal for capital. Company promoters and vendors came in for harsh criticism for dividend-robbing "over-capitalisation"; for basing their selling prices on the current profitability of their firms (in a time of "boom"), or on glowing estimates of future profitability, with no reference to past performance or to the chance of a future trade depression. Even after the legalisation of formal underwriting in 1900, many enterprises in the cycle and motor industries explicitly, either by choice or by compulsion, made do without it;[1] and of those that obtained underwriting facilities, some acquired only a partial coverage, and most paid relatively high commissions, which could amount to as much as the other preliminary costs incurred. The

1. The Elswick-Hopper Cycle and Motor Manufacturing Company was an enterprise that tried to find underwriters for its issue of June 1913 but failed.

established financial institutions, such as merchant banks, investment trusts and insurance companies, did not involve themselves, and the companies relied mainly on the underwriting provisions afforded by their own vendors or promoter-intermediaries.

Although it would be dangerous to make sweeping generalisations about investors' behaviour, the investing public also tended, to some extent, to share this high-risk view. Significantly, more companies suffered under-subscription upon flotation than enjoyed full-subscription, with the "small" issues incurring a greater incidence of undersubscription than the larger ones. Companies formed to exploit patent, manufacturing or trading rights also incurred a relatively high incidence of undersubscription. The investing classes, however, did not follow the advice of their financial mentors to its logical conclusion - hardly one cycle, tyre, tubing or motor vehicle company would have achieved full-subscription if they had. Well-established and/or well-boosted companies sometimes successfully took advantage of the surges of speculative interest which occasionally overtook the capital markets, such as the pneumatic tyre mania centred on Dublin in 1893 and the original home of the astonishingly successful Dunlop tyre company. Cheap money was a factor that built-up investors' interest in the exceptionally profitable cycle companies of 1896-97, and a "speculative bull account" in motor shares marked the company flotation movement of 1906-7 in the motor car trade.[1]

1. Investor's Monthly Manual, vol. 38, No. 1, January 1908, pp.3-4.

Some "small" flotations achieved full-subscription through the interest of a body of local investors, more numerous than those typically associated with "private" company formations. When the investing public, as a whole, deemed a company as too high a risk as not to warrant a full-subscription of its issue, it was not always or necessarily the case that its expansionary plans or its commercial viability should inevitably be threatened. Firms could make adjustments to vending terms, or take advantage of flexible contractual arrangements, in order to salvage as much "working capital" for expansion as was available or thought desirable, though here a conflict between the interests of the vendors and the company could have been a source of trouble. But, for some flotations, the acquisition of more "working capital" was not the principal objective, judging by the absolute amounts required and their value as a percentage of the value of the flotation issue. For such flotations undersubscription was more a discomfort to the vendors or promoter-intermediaries than a threat to the viability of the firms. Finally, the structure of the British capital market was sufficiently well-developed to permit the use of a number of "second-best" solutions to the problem of capital supply: bank loans with debentures as co-lateral, the "private" allotment of types of securities safer than those previously offered to the public, the stretching of net trade credit received, and subsequent profit plough-back when profits could be earned.

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