Chapter 8

An Introduction to the New Trading Environment of the Interwar Period

I

Arthur Bowley, writing at the end of the 1920s, reflected contemporary orthodoxy when he attributed the heavy and widespread levels of unemployment to the diminished world market for exports. Bowley was drawing upon the findings of the Balfour Committee when he wrote: 'It is in the failure to maintain exports that the principal cause of acute unemployment is to be found'. It was because world trade had not fully recovered from the shocks and dislocations of the Great War that Britain's export trades had failed to prosper. Bowley felt that the failure to resuscitate international trade was the direct cause of Britain's unemployment. Textiles apart, the 'difficulties of export have not been due to unreasonably high wages of producers', noted Bowley. Export difficulties were due to the baneful influence of the war, which had disrupted established trading links and destroyed the goodwill between firms and their foreign customers. New and hastily improvised trading connections had arisen in the aftermath of war, while new political boundaries and the appearance of new nation states, jealous of their identity, had intensified the disruption. Tariff barriers were indicative of the nationalism rampant among the new states and were clearly an impediment in the path of the desired reinstatement of the liberal pre-1914 trading system.[1]

One of the consequences of the war was that the United States had become a major creditor nation, while New York had emerged as a centre of the international monetary system. Moreover, world economic activity was now much more dependent on the United States economy and its level of activity, because of a profound improvement in the United States

share of world industrial production. In 1920 American industrial production was 20% above the prewar level and the United States was also responsible for a greater share of the world's output of commodities. It was therefore difficult for European nations to finance the import of American food and raw materials when the American market for manufactured goods was limited by the strength of home production. Britain's adverse trade balance with the United States was a reflection of more than simply a temporary dislocation of the prewar international economy.[2] It was symbolic of the changed nature of international trade.

Countries denied the products of European manufacturing capacity in wartime had set down their own productive capacity, while the vacuum in international markets had been met by increased industrial production from the United States and Japan. The Japanese share of world industrial production had been small in 1913 and the boost given to her production largely benefited the textiles industry. The wartime penetration of textile markets in India and the Far East by Japanese cotton piece goods, combined with a measure of Indian self-sufficiency, presented an unpleasant postwar legacy to the Lancashire cotton industry. Before the war the cotton trade had accounted for over a third of the commodities exported by Britain and had made a crucial contribution to Britain's export surpluses and her multilateral settlement of trading balances. If the prewar multilateral payments system was to be successfully restored Britain's merchandise trade had to recover her prewar shares of world exports and world trade in manufacturing. What the war and postwar upheavals concealed, however, was the structural weakness of an economy with a narrow industrial base, comprising several long-standing industries. It was the basic staple trades - coal, iron and steel, shipbuilding, engineering and cotton textiles - that continued to dominate Britain's export trade well into the 1920s and it was their depression that gave rise to Britain's

disappointing export performance. A comparison of British exports and imports of goods with world and European exports in 1913 and 1924 reveals a deterioration in Britain's foreign trade. Taking 1913 as 100, 'British exports and imports of goods stood at 75.8 and 103.7 respectively, while the volume of world exports had recovered to 90 and European exports to 74 (both of the latter series including the U.K. figures). Thus even in a period when most of Europe was recovering from the ravages of war-time damage and post-war disorganisation, British exports had done relatively badly'.[3]

The rationale behind the Government's postwar economic policy was the belief that prosperity required the restoration of the conditions of 1914. Inflation, currency instability and legal barriers to trade threatened the recovery of the world economy and with it the wellbeing of industry and the institutions of the City. What was needed was an act of faith that would set a moral lead to the world. Hence the appeal of the prewar international payments system (the gold standard) at the prewar parity, which offered an automatic mechanism of price-level changes to facilitate international payments. There was another attraction to the restoration of the gold standard, one shared by commerce and industry as well as the monetary authorities at the outset of peace. In recommending 'the conditions necessary to the maintenance of an effective gold standard', the Cunliffe Committee noted that the 'international trade position of the country' would be placed in jeopardy if 'an effective gold standard' was not restored. But in 1914 a substantial reallocation of resources into new growth sectors of the economy was clearly called for by fundamental developments abroad. The war simply 'accelerated many economic and social changes already in progress' and 'smashed the delicate framework of international economic and financial organization, which was the chief established instrument for guiding and easing adjustments to general economic changes'. The

extension of industrialisation and break up of the old pattern of trade created particular difficulties for the British economy, whose structure had altered little before 1914. Long before then Britain's trade balance had moved permanently into deficit and the surplus balance on current account was due to invisible earnings and investment income. Britain's export surpluses were important, however, because they financed some proportion of Britain's total deficits and permitted new investment overseas out of past income. The deterioration in Britain's trading performance after 1918 was one reason for the postwar strain on the balance of payments. Another was the net sale of some 10% of Britain's long-term foreign assets during the war. These two influences meant that it would be difficult to restore Britain's prewar surplus on current account. How difficult was explained by Moggridge, who studied the balance of payments estimates for 1924 arising out of 'basically unfavourable influences'. He noted that the increase in the current deficit evident by 1924 'swamped improvements in the invisibles position in money terms. In real terms the deterioration in both the trade and invisible accounts is striking. The value of the surplus on invisibles in terms of 1913 import prices was £250 million, or £89 million below that of 1913, while the trade deficit at 1913 import and export prices was over £60 million above that of 1913. The deterioration of the U.K. position implicit in these volume changes had been reduced by an improvement in the terms of trade by 25 per cent. Had import and export volume been unchanged, such an improvement in the terms of trade would have almost eliminated the 1913 import surplus'.[4]

II

Since the middle of the 19th century foreign trade had been fundamental to the wellbeing of the British economy. As a proportion of

national income foreign trade stood at about one-sixth at the start of the century, rising to almost three-fifths by the 1870s and remaining at that level down to 1914. Britain's comparative advantage in manufactures had been promoted by free trade legislation in the 1840s, rewarding the first industrial economy with a large share of a rising volume of world trade. Industrialisation abroad and the appearance of rivals for the supply of manufactures inevitably reduced the rate of growth in Britain's foreign trade and reduced her share of world trade and world manufacturing production. But the appearance of industrial competitors also determined long-term trends in the nature and direction of Britain's exports of merchandise. Britain's share of industrial markets was in continuous decline between 1870 and 1910. But were those responsible for Britain's exports striving to be competitive in industrial countries? By satisfying their own and their neighbours manufacturing wants the new industrial nations compelled British traders to adapt by developing new markets in developing economies both within and without the Empire. It was indicative of the end of Britain's industrial supremacy and the economy's continuing dependence on familiar staples that manufactured goods constituted only three-quarters of Britain's home-produced exports by 1911-13, whereas they had formed almost nine-tenths in the mid-Victorian years. Moreover, the growth of imports of manufactured goods in the last quarter of the 19th century was a 'most striking change' that was partly influenced by the structure of the economy and the inputs required by the staple trades. On the eve of the Great War, one-third of the manufactured imports 'were for direct use in industry' and were obtained from new industries, such as chemicals and electrical engineering, which were very poorly represented in British industry. Together with the other commodity imports - foodstuffs and raw materials - the import of manufactures tended to emphasise 'Britain's dependence for supplies on Europe and

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North America... just when these were becoming relatively less important among its export markets'.[5]

Aldcroft and Richardson discussed the rise in manufactures in terms of the costs and benefits of free trade to Britain. It was true that manufactures 'accounted for 5 1/2 per cent of total imports in 1860, 17.3 per cent in 1880, almost 25 per cent before the First World War and 29.4 per cent by 1930'. But the authors contended that the implications of this increase had to be drawn with care. They remarked that 'Many of the manufactured imports were complementary to rather than competitive with domestic production'; that some of them could only have been produced 'at uncompetitive costs' and that they reflected higher real incomes and greater 'consumer choice'. 'Imported capital goods which in the trade statistics might appear competitive with home-produced goods were frequently not; instead, there was often extreme specialisation so that if a domestic manufacturer wanted a certain machine for a specific purpose there would sometimes only be one producer in the world, and whether that producer was British or foreign would be largely accidental'. Manufactures 'were a high and rising proportion of total imports', but imports 'were in most cases only a small fraction of home-produced sales on the home market'. More serious in the long term was the slow development of the new industries upon which a 'solution of Britain's problems in the international economy depended'. For as long as the multilateral payments system was seen to benefit Britain's economy, it was possible to argue that the classical economists' support of free trade promoted the growth of world trade through the operation of the law of comparative advantage.[6]

The legacy of free trade and the doctrines of classical economics was a severe impediment to State control of the economy during the Great War. Government control of engineering began with the Munitions of War Act in the Summer of 1915 that extended the Government's powers of

economic control. Hitherto, the supply of munitions had relied upon the contracts policy of the War Office, which placed orders with armaments firms and those enterprises who wished to compete for military contracts. The policy of relying largely upon the technical capacity of established armaments firms broke down as a result of shortages of labour and machinery. Moreover, the sub-contractors on whom the armaments firms depended found that the demands on their resources were so great that they were unable to fulfil delivery on time. As early as October, 1914, the Chief Superintendent of Ordnance Factories was seeking the power to compell private firms to give preference to War Department orders. The War Office Secretariat considered such control and concluded that 'the legal question had better not be raised'. Serious deficiencies in munitions supply were evident by the Spring of 1915 and led to a new policy of munitions supply that was the responsibility of an innovatory department of state. The Ministry of Munitions 'controlled' over 700 engineering establishments by September, 1915, a number that had grown to 20,000 by the war's end, with arguably long-standing benefits to engineering because of the way the ministry addressed the problem. 'In organising production the ministry transmitted many of the latest ideas in technology and management practice to the firms under its control, generally trying to bring them all up to the standards of the best companies'.[7]

In the words of the official history: 'All the indications pointed to the need for vesting the responsibility for the supply of munitions in a new separate authority, for entrusting the task of mobilising the industrial resources of the country as a whole to a department specially equipped and unhampered by precedent'. This step involved the 'organisation of private industry' along new lines of State control that revealed the shortcomings of the past. Wartime demands highlighted the 'inflexibility of age' in the engineering industry's prewar

organisation. Government intervention disclosed an industry 'marked by a rigid individualism', where 'new methods introduced by first-rate firms were long confined to firms of that class' and where a 'great gulf' existed between the standards of best and worst practice firms. In terms of workmanship and variety of product the British engineering industry scored highly, while it presented a poor example in the use of labour-saving devices and an appreciation of repetition work. The official History of the Ministry of Munitions claimed a great advance in engineering during the period of direct control. There seemed to be no doubt

> that the result of Ministry control was a general levelling up of standards of accomplishment in the engineering trade, more economical use of material and of labour, the increased adoption of labour-saving and automatic machinery, more accurate costings, and a higher standard of accuracy, attained by the use of precision gauges on a scale hitherto unknown in England.

The contemporary view was that the experience of wartime control improved the postwar competitiveness of engineering by imposing rationalisation upon the industry. Moreover, some of the wartime additions to capacity 'faced a promising future in a world eager for improved capital equipment and hoping to progress by mechanisation'. Government financed capacity for shell manufacture at Hick Hargreaves did command the attention of the directors, who had a peacetime use in mind for the machine tools set down for the standardised supply of shells.[8]

Military needs ultimately revealed new areas of reward and may also have contributed to a weakening of the faith in practical experience that was so firmly rooted in engineering. Yet it would be wrong to

minimise the deep-seated attitudes of employers, who regarded themselves as individuals operating in a competitive environment. State control in wartime was regarded by employers as necessary, but it also evoked their hostility and gave rise to an 'individualistic reaction'. The machinery, the bureaucracy of control was resented in controlled establishments and it was indicative of the strength of laissez faire principles that the prospect of a continuance of control into peacetime led to protest. Early in 1918, for example, when the controlled establishments were asked to 'indicate their probable monthly demand for materials on the basis of their trading in time of peace, less than one fifth of the total number of controlled establishments sent in replies'.[9]

In the opinion of R.H. Tawney, the impact of state control on the economy 'accelerated the demise of the individualist, competitive phase of British capitalism' and prompted 'organisation and combination among manufacturers'. Employers' associations in engineering had existed for many years, while a national body, the Engineering Employers' Federation, had been in existence since 1896, when it rapidly established itself as an important development in industrial relations by its uncompromising defence of management rights and willingness to settle grievances through a formal disputes procedure. In the war the Federation offered a channel of complaint over the Government's lack of consultation with employers on such delicate matters as the dilution of labour. The substitution of unskilled labour - in the main women - for skilled craftsmen touched upon basic issues of workshop practice and the extent to which machinemen might be allowed to displace skilled workers. The machine question had been at the centre of the engineering dispute of 1897-98, when the Federation secured to employers the right to manage against a union of engineering workers whose policy was aimed at 'claiming a right to the tools of the trade'. The wartime bargains reached with trade union leaders by Government in order to raise

productivity, bargains that assumed legislative shape in the Munitions of War Act, unsettled some employers; there appeared to be too much negotiation and compromise with unions on sensitive matters such as wage policies at the expense of the employers. The feelings of many employers were expressed by the engineering association based in Huddersfield, which reported in the last year of the war:

> Employers have had imposed upon them conditions and restrictions which in normal times would be unthinkable. They have been deprived of almost all freedom of action. Their profits have been largely acquired by the Government. Their own personal income from their businesses has been controlled. Their men have to a large extent been spoiled not only by wages awards which have been expedient rather than just, but by marked weakness on the part of the Government. In many other ways the just rights of the employer have been ruthlessly put aside for the purpose of maintaining industrial peace.

Business attitudes in engineering towards state intervention at the war's close therefore welcomed an end to control and a return to individual enterprise, particularly where this was represented by managerial prerogatives and the established procedure for avoiding disputes.[10]

The misgivings of employers over control dated from the first year of the war. The Federation itself was excluded from the conference called by Lloyd George with union leaders that led to the Treasury Agreement in March, 1915. It was this agreement on munitions supply, involving dispute arbitration and dilution, that was contrary to the procedural agreements with engineering unions of Federation members. The employers' control of work practices was subsequently limited by

Inspectors from the Ministry of Munitions, who 'restricted their ability to hire and dismiss workers, and laid conditions on their wage negotiations'. The formation of the Association of Controlled Establishments arose out of the conflict between the ministry and enterprise. Disquiet among employers at the extension of State control and the readiness of Government to compromise with labour also lay behind the formation of the Central Association of Employers' Organisations, which sought to articulate and safeguard the interests of employers with Government. 'In structure and leadership the new movement seemed to be a conflation of three established tendencies: fear of hostile legislation.., a willingness to co-operate with employers in different trades to combat trade union organisation... and a fierce commercial nationalism...' The engineering employers doubts over the Government's handling of labour disputes and the apparent influence of trade union leaders in the shaping of Government policy led to a change in the policy of the Federation in the Summer of 1916. Goaded by the accusation that Federation policy had been 'supine and inactive' and had failed to 'educate Government and public opinion in order to counteract the activities of Trades Unions', the Federation reformed itself in order to provide its chief executive with 'greater authority in his dealings with government and other associations'. The result in 1917 was an affirmation of the masters' voice on labour matters within the Ministry of Munitions through the Employers' Advisory Council. Here, the Federation's chief executive, Allan Smith, limited further concessions to trade unions that threatened to weaken the rights of management after the war. By the close of 1917, the Federation was preparing a report on postwar labour relations based on the opinions of local associations. The report embodied the ethos of the Federation that the 'important aim was not to change society but to establish a permanent machinery for resolving disputes'.[11]

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Smith's desire that the ministry should listen to the advice of employers impelled him to initiate a national confederation of employers's associations. The result was the creation of the National Confederation of Employers' Organisations in 1919, one of the two peak associations for British industry, whose aim was 'to give coherence to the employers' position in negotiations with the government and the trade union movement'. The N.C.E.O. and the rival Federation of British Industries founded in 1916 'were set up to defend business interests in a political climate which all agreed was hostile'. There was disagreement over the nature of the threat and the best means of meeting it. But a strong measure of agreement that industrial and commercial interests needed to obtain some political influence in view of the likely strength of the Labour Party after the war. A party committed to a socialist objective since 1918. Hence the financial support given by firms to the British Commonwealth Union and its propaganda efforts against those bodies that posed a threat to a liberal, individualistic society. There is irony in the fact that the corporatist stamp which the F.B.I. wished in particular to impart to British politics was 'constantly undercut by their members' hostility to state intervention, based on wartime experiencies'. Rapid decontrol of the economy after 1918 met the desires of employers, the constituents of the peak organisations of industry, and helped curtail the aspirations of those who wished to strike bargains with Government for a postwar trade policy.[12]

The belief of employers in engineering was that their postwar interests would be served best by a return to the traditional norms of the economy. At the level of the engineering workshop change was unmistakeable. The scale and urgency of warwork had altered the products of the industry and the layout of workshops through the emphasis on standardised manufacture and the subdivision of production.

What the war had revealed in British manufacturing industry was a distinguishing feature evident from the late 19th century. This was the emphasis placed on the employment of labour skills rather than the use of special-purpose machine tools. Workshops equipped with heavy outlays of automatic and semi-automatic machine tools set down to offer economies in time and labour were those appropriate to the strategy of total war forced on Britain from 1915. In a struggle between whole peoples and economies, the manufacturing base in Britain had proved incapable of sustaining the military effort and earning the means to pay for imports through staple exports. The bankruptcy of the strategy of 'business as usual' showed that 'German and American manufacturing industries at the start of the war were more modern, more capital-intensive, specialised more heavily in capital goods, and proved better suited to cope with the demands of war'.[13]

American machine tools of the latest variety and unskilled domestic labour proved the keys to success by ensuring an adequate supply of munitions for Lloyd George's strategy of an all-out economic effort. After 1918 female employment disappeared from the workshop, while skilled male workers felt the influence of agreements that restored the managerial function. When the freedom of management in engineering seemed to be restricted the outcome was the 1922 lockout. The point at issue was the same as that in the great dispute of 1897-98, namely the right of managements to manage within the limits of agreements arrived at with unions. The Federation publicly stated: 'In any organisation for the direction of human effort, it is necessary that there shall be one directional authority, and all experience has shown that dual control... is incompatible with the proper working and efficiency of an industrial establishement'. Unfortunately, there could be no return to normalcy as far as Britain's place in the international economy was concerned.[14]

III

Bowley was right to emphasise that the state of world trade was crucial for industrial production, employment and national income in a free trade economy dependent on foreign trade. Britain had become the 'pivot of the international economy' partly because of the export orientation of her unique industries and fluctuations in domestic activity were influenced by events overseas. Unfortunately, the commercial environment was quite different in the 1920s to that in the prewar era, because industrialisation abroad had reached new heights against a background of a limited rate of growth in world trade, instability in the incomes of primary producers and an overvalued currency. World trade had expanded more slowly in the period 1870-1914 than before 1870, but its upward trend gave exports a role in British business cycles quite different to that after 1918. In the period 1870-1914 exports were unable to act as a leading sector as they had hitherto, because the growth rate in exports was halved. Nevertheless, exports had an impact on income fluctuations at the turning points by leading the economy out of slumps and into recessions. The slow growth in world trade after 1918 meant that the degree of conformity between exports and national income declined. In the interwar years 'exports did not lead the economy out of depressions', yet they 'played a major role in initiating downswings. Export collapse is relevant to an analysis of all three major downturns - 1920-1, 1929-30 and 1937-8'. Elsewhere it is noted that by the interwar years the influence of exports in income fluctuations 'was beginning to disintegrate, at least in the early phases of upswings. Though the downturns in economic activity were very much precipitated by unfavourable movements in export-sensitive industries, exports lagged at the lower turning-points,

especially that of 1932, and contributed little to the early phases of recovery'. Indeed, the recovery after 1932 was essentially an internal one, 'with industrial production expanding by more than 40 per cent over the 1929 peak compared with a decline in the volume of exports of 18 per cent'. In the interwar period internal developments became the 'critical forces' behind business fluctuations, as the role played by exports diminished because of the falling share of exports as a proportion of G.N.P. and the 'changes in the international economic environment'.[15]

An examination of the commodity structure of exports and their destination on the eve of the Great War reveals that Britain met the industrialisation of Europe and the United States through the 'redirection of existing export categories to new non-industrial markets'. Britain had no difficulty selling what she made - a point that seemed to confirm her comparative advantage in the staple trades - but, given the limited shift of resources to new industries, Britain's foreign trade was vulnerable to an acceleration of current trends within the world economy or a sudden dislocation of the system of world trade. In 1913 Britain's commodity exports were 'still completely dominated' by the staple industries. Half the output of the engineering trades was destined for overseas markets. But the specialist products of the staples largely comprised older lines, such as textile machinery and steam locomotives in engineering, rather than the new lines which had recently emerged in electrical engineering and motor vehicles. On the eve of the war the commodity composition of Britain's exports was changing, but the economy 'was not developing new export lines fast enough to maintain her market shares in industrial markets'.[16]

In the 1920s, the problems that faced exports were so great that they 'forced a new line of action on the economy', which was reflected in a new pattern of trade. It was during the interwar decades that new

industries 'increased their shares in total exports' as the importance of the staples declined. The redirection of exports up to 1914 had worked well as new economies entered a flourishing world economy. But conditions in the international economy were not favourable to Britain and the course she had adopted after 1918. Economic growth in Europe was slow, while economic nationalism found expression in protectionism. The multilateral payments system which had operated to Britain's advantage before 1914 broke down, while its crucial counterpart, the international system of payments and finance, based on the automatic mechanism of the international gold standard, was an imperfect likeness of the pre-1914 system. Out of the failure of multilateralism and the appearance of bilateral trade agreements in the 1930s, a radically new pattern of trade emerged that 'represented a volte-face with earlier periods when rising import surpluses with industrial countries had been directly paid for by export surpluses with primary producers'. Yet it would be incorrect to imagine resources in Britain accruing to new export trades in consequence of Britain's difficulties. Foreign competition at a higher level would no doubt have compelled a readjustment of the economy as industrialisation extended and new markets no longer existed to be developed. But the continued growth of competitive pressure, combined with stagnation in world trade, an imperfectly functioning international economy and monetary stringency at home did not lead to the replacement of the basic industries of the 19th century with new export sectors. 'Instead, more resources were concentrated on domestic activities', such as the provision of a system of electricity transmission to the country as a whole via a national 'grid', and the ratio of foreign trade to national income 'sank far below even its downward trend line'. Moreover, the 'pace of readjustment looked less healthy when compared with what was happening abroad', giving rise to the conclusion that Britain's reduced share of

world trade in manufactures between 1899 and 1937 'was not primarily due to a commodity structure adverse to growth as much as to an inability to compete in old and new sectors alike'.[17]

The unremarkable periodicity of British business cycles over the interwar period has been well established. The postwar boom (in prices rather than output) reached its peak in 1920 when monetary ease was replaced by monetary stringency, bringing on a severe slump. Bank Rate rose to 7% and both employment and industrial activity declined. A feature of the postwar boom was that it had been an inflationary one, with demand outstripping supply prices, not output, had risen. Indeed, 'at no stage did industrial output approach, let alone exceed, that of 1913'. The upswing from 1921-2 'was weak and unsteady' and subject to interruption 'by a number of random shocks', such as the General Strike. The severe restriction of credit lasted until April, 1921, as the Bank's control over the market was determined by external needs. Bank Rate and the cost of credit did not become appropriate to a recovery of activity until July, 1922, when the rate reached 3%. 'The upswing continued until late 1929', a decade in which monetary control aimed to restore the pound to the gold standard and having achieved this aim prevent an external drain of the Reserve due to the adverse balance of payments. In 1929 the economy turned down as economic activity abroad contracted and world trade collapsed. The financial crisis set in motion by the cessation of American foreign lending and curtailment of imports struck London in 1931, driving the pound off gold. Out of the purely financial and foreign exchange crisis emerged a cheap money policy with Bank Rate at 2%, that 'ushered in a period of stable prices, stable interest rates and stable exchange rates'. The depression in activity 'deepened until the third or fourth quarter of 1932, after which a recovery based on domestic impulses got under way'. The upswing that followed was 'one of the longest uninterrupted upswings in British

economic history, fully five years in duration'. A 'recession' in 1937-8 was 'as much due to the bursting of a domestic boom as to external factors' and was 'quickly eliminated' because of rearmament. Pollard's opinion of Government economic policy in the 1920s is that the decision to return to gold at the prewar parity 'contributed to the depressed conditions of British industry in 1925-9, at a time when the rest of the world enjoyed a prolific boom, just as the removal of the handicap in 1931 was responsible for the sudden spurt of British exports relatively to other countries'. Indeed, it is noted elsewhere that there was a 'marked difference in amplitude between British cycles and world cycles over the inter-war period'. By comparison with the world cycle pattern, Britain's postwar boom and slump were 'sharper' and the upswing of 1925-9 was 'much weaker', while the depression after 1929 was 'relatively mild' and the recovery from 1932 'more complete'.[18]

The 'real deflationary forces at work', according to Sayers, were the 'depression in the export trades and the competition of imports'. While Aldcroft and Richardson recognise that monetary policy in the 1920s was 'persistently at odds with the requirements of the domestic economy', they believe that the 'causes of the economy's sluggishness are to be found outside the monetary sphere', and would dispute the dismal judgement passed on the economy as a whole in that decade. To Aldcroft and Richardson the Twenties marked a divide in Britain's economic history. This was a time when 'Not only were vital structural adaptations being made to our industrial sector', but businessmen were also 'making a concerted effort to modernise their methods and techniques'. New industries made a significant contribution to the 'substantial productivity growth' realised in the 1920s by drawing on resources hitherto employed by such old staple industries as coal, shipbuilding and cotton. One reason behind the improved industrial productivity was the role of replacement investment as the 'main vehicle

of new techniques'. Aldcroft notes that capital replacement proceeded at a rapid rate and was 'concentrated in more productive techniques than before 1914 when the chief tendency had been routine replacement in static techniques'. The 'rapid shift from steam to electrical power' in industry between 1912 and 1930 provides an obvious example. However, the emergence of a new growth sector, embracing industries such as electrical engineering, provided an opportunity for mechanical engineering to adapt and participate in the adjustment of the economy as their traditional markets contracted. The share of the metal products group in total manufacturing increased from 19% in 1913 to 25% in 1929 and rose to 29% by 1937. Within the structural changes underway between the wars the basic engineering industry appears to have responded well to the impact of 'basic forces' on the 'pre-war export economy'. Engineering was unique among the staple industries because of its heterogeneous nature. This conferred a high degree of responsiveness evident in the industry's contribution to the establishment of a national 'grid' from 1926. According to Catterall, mechanical engineering was the 'laggard progenitor' of electrical engineering and this industry's 'growth record between 1920 and 1938 was second only to vehicles among major industrial sectors'.[19]

IV

Stability was absent from the mechanical engineering industry's performance in the interwar period. When Gourvish attempted to determine the industry's growth, assess its productivity and measure its dependence on exports he found that instability was a recurrent theme. The dissimilar growth rates yielded by the indices of Lomax and the work of Matthews and Feinstein provided a 'clear suggestion that mechanical engineering experienced a definite but modest growth, lower than that of both manufacturing and industrial production'. However, it was the

volatile character of an industry sensitive to cyclical swings and exhibiting wide fluctuations in output and employment which discouraged 'the acceptance of a single trend rate of growth for the inter-war years as a whole'. The same problem of fluctuating output and employment and 'widely differing degrees of capacity utilization' over the whole period made a 'comparative assessment of productivity ... an even more hazardous exercise'. In the period 1920-38 engineering 'experienced a considerable rise in labour productivity', while 'estimates for 1924-37 indicate that labour productivity was stationary'. In his examination of the role played by exports in the course of the industry's progress between the wars, Gourvish found 'large variations in the experience of the constituent trades'. But he also recognised a 'considerable move towards the home market, compared with the pre-war position ... of a home/export ratio of approximately 40:60'. Although engineering exports 'appear to have fared worse than output', Gourvish found it difficult 'to accept a single figure' and 'fluctuations' were again the dominant theme. But he also noted that 'while both exports and imports fluctuated markedly in the short run there is no doubt that imports strengthened considerably over the inter-war period as a whole'. These remarks are significant when it is borne in mind that British exports as whole played a 'major role in initiating downswings'. According to Aldcroft and Richardson, 'Export collapse is relevant to an analysis of all three major downturns' in the interwar period and Britain's inability to compete in iron and steel and engineering lay behind the decline in Britain's share of world trade. They assert that 'technological leadership' was one of the 'special advantages' that accounted for the superiority of the American and German engineering industries. While recognising the difficulty of generalisations concerned with trends, Gourvish believed that the experience of the engineering industry between the wars 'suggest an industry with limited

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growth, but with considerable fluctuations in output, employment and exports'. The possibility of a 'weak export response' at a time of growing imports is discounted by Gourvish because of the import substitution involved in the greater exploitation of the home market.[20]

The three traditionally dominant sectors of the industry - textile machinery, prime movers and boilers and marine engineering - experienced a decline in importance after 1918 as their dependence on overseas sales was exposed as a source of weakness. The growth in world trade of engineering goods evident up to 1929 sustained the absolute level of British exports, but in foreign markets traditionally dominated by British firms there was greater competition from indigenous producers and new competitors. Over many years Hick Hargreaves had won a reputation for the supply of motive power and had extended their specialities to the extent that they could provide complete steam-power plants for factories, particularly cotton and jute mills at home and abroad, requiring steam for heating and manufacturing purposes. The market structure facing the textile machinery trade, a dominant sector of engineering before 1914 and one related to the manufacture of stationary steam engines, experienced 'considerable changes' after 1918 because of import substitution and Japanese competition. The power-plant trade to which Hick Hargreaves belonged was also dependent on foreign orders. 'In 1907-8 exports probably accounted for about 45 per cent of total output. After the war this level of dependence did not diminish'. But the contraction in home demand 'posed serious problems for prime movers, for while Britain continued to specialize in steam plant, the principal influence, at home and abroad, was the shift from steam to other forms of power for industrial use, and particularly towards the use of electricity'. According to Gourvish, the greater use of electricity in factories 'naturally reduced the scope of steam-plant

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manufacturers, who lost most of their industrial customers'. The makers of stationary steam engines, 'already heavily dependent on the home market, suffered badly: output in 1935 was only 30% of that in 1924 much of the demand coming from the electricity supply industry itself, whose output was almost entirely produced by steam power'. The power-plant trade was, however, presented with a breathing space because British industry was slow to end its dependence on the thermal energy of steam raised by coal-fired boilers on site. Electricity as a source of motive power was more efficient than either steam or gas, more flexible, and in industries where power costs formed a large proportion of total costs, electricity reduced 'the latter as much as 5 or 10 per cent; for apart from the cost of electricity per unit, electrical power is highly efficient because it replaces long distance belt and pulley transmission by direct individual drive'.[21]

In an industry as heterogeneous as mechanical engineering the experience of one sector could be far removed from that of another. Given the industry's heterogeniety and the varied experience of the constituent sectors, Gourvish believed that it was unwise to attempt to measure the industry's overall performance and 'response to the difficulties of the inter-war years'. He did 'pursue some tentative conclusions', remarking that output, profits, market responsiveness, marketing and other features of the industry were 'potentially useful in an evaluation of industrial success'. The incidence of profitability, for example, within the industry was such that it was 'difficult to pronounce on profits'. Not all firms in a buoyant sector were successful, while there were successful enterprises in the old and declining sectors. 'On the whole', remarked Gourvish, prime movers and boilers, textile machinery, marine engineering and agricultural machinery 'suffered badly'. But he also noted: 'It is perhaps advisable to distinguish between the best practice, and profitability, of a few

leading firms, and the average practice, and more doubtful position, of the majority'. Clearly, the practice and experience varied from firm to firm and Gourvish was correct to say 'It should not be assumed that the sectors of mechanical engineering may be divided simply into (1) "old", "export-based", and "depressed", and (2) "new", "home-based", and "prosperous"'. In the trading environment of the interwar period managements could do little against economic nationalism, while there was an inevitability to Britain's diminishing role in overseas markets. Yet there was a strengthening of imports despite the industry's structural readjustment. Some traditional trades, such as prime movers and boilers, 'continued to devote a large proportion of output to export markets, despite the difficulties involved'. This suggests that new products were neglected by producers who were content to supply traditional goods to established markets. The industry as a whole can be criticised for 'weaknesses in industrial organisation, production methods, research, and marketing'. Management policies taken 'in the face of depression' can also be criticised. 'Too often, the reaction to adverse trading conditions was diversification, rather than rationalization of production'. When it came to marketing 'there appears to have been ample scope of improvement' because firms in Britain generally adopted a 'haphazard and unadventurous' approach, 'with little being done to educate customers to accept a more standardized product'. Marketing in Britain may therefore have been 'inferior to those of her rivals, especially outside the Empire'.[22]

Chapter 9

Orthodox Response In A Changed Environment[1]

I

Early in 1919 there was a significant addition to the management of Hick Hargreaves with the appointment of Wyndham D'Arcy Madden as Assistant to the Managing Director. When ill health forced the Managing Director to resign in October, 1921, Madden became the General Manager. The next year he was appointed Managing Director, a position he was to hold for the next 41 years. Madden was 34 when he arrived at the Soho Foundry and had been trained as an electrical engineer. Born at Longcroft, Hayward's Heath, Sussex, the son of a Gentleman, and educated at Haileybury, Madden grew up in a world far removed from that of traditional engineering, remote from the long-established conventions of the industrial regions. Madden attended Faraday House Engineering College and first encountered practical engineering problems in 1913 when he was employed as an electrical engineer at Stothert & Pitt, Bath. As an engineer he was highly regarded by his employers having 'given us most complete satisfaction'. But Madden quickly became Assistant to the Managing Director and in this role he displayed 'the necessary ability and personal qualities' required of someone who 'had direct dealings with the Works Manager and Foremen, answering all correspondence, and meeting and dealing with people, including customers, Government Inspectors ... etc'. Government control of Stother & Pitt during the war had revealed that Madden was 'extremely tactful in handling difficult situations'. Not surprisingly his superior was 'extremely sorry to lose him'.[2]

Madden's 'engagement' with Hick Hargreaves was one of several appointments made by the firm during the 1920s. The Directors Minutes record as early as November, 1918, that an application had been received for the position of London agent 'by Mr. Shaw of the Bradford Electricity works who wished to make a change'. From February, 1919, J. H. Shaw was the firm's London and district agent, earning a commission of 2 1/2% on sales. Shaw also enjoyed a long association with the Soho Foundry that continued well beyond 1939 and like Madden he was an electrical engineer. In 1919, Shaw earned a total commission of £1,425, rising to almost £2,000 in 1920. Orders from six municipal corporations, such as Westminster and West Ham, for condensing plant, and two diesel engine sets for the Metropolitan Water Board, accounted for his income in 1919. Tenure of the London agency allowed Shaw to earn a commission on overseas sales and in the final quarter of 1920, the Shanghai Municipal Council, the Bombay Electrical Supply & Transmission Co., and the Nizam of Hyderabad, ordered condensing plant from Hick Hargreaves, with a total net price value of £66,000.[3]

Shaw was convinced that the company required a sound sales office and expressed his opinion in a letter written to Madden at the time of the firm's Centenary celebrations in 1933. At a point when Hick Hargreaves were 'experiencing an awful time', Shaw felt that 'if we let this centenary pass without some form of celebration, it will furnish our competitors with propaganda such as they are always looking for to enable them to say we are "down and out"'. Shaw reminded Madden that they had joined the firm at the same time, and 'both realised that as all competitors were quoting about the same price and all competitors' plants were somewhat similar, it was only by getting to know the customer well that we had any chance of getting a bare living, quite apart from being prosperous. It was also quickly realised that calling

at a man's office was a feeble and tedious way of getting to know him, and that a moderate amount of entertaining was necessary'. This sales policy had 'repaid' itself 'one hundredfold', as Shaw did not hesitate to point out. In 1919 'there was not one of our condensing plants in London or the Home Counties, and there are now at least 51 in addition to a further 38 supplied through Consulting Engineers situated in London, but erected in the Provinces, Overseas and the Colonies, and I am sure you will agree that all of them have not been sold by reason of our price being the lowest or solely by their superiority'[4]. Madden and Shaw had apparently arrived at Hick Hargreaves already well aware of the value to the firm of a selling organisation. They saw that the marketing of a firm's specialities was equally as important as the design and manufacture of goods and as marketing therefore played a key role in the function of the firm Hick Hargreaves needed to employ skilled salesmanship.

In the early Twenties, Hick Hargreaves already possessed a Sales Manager at the head of the Sales Department, one of the four departments of the company. In 1924, the company appointed W. A. Christianson as Sales and Contract Engineer. This was a 'senior' staff appointment, 'directly responsible to the Managing Director', though 'attached to the Sales Department', where Christianson was employed in the 'closest collaboration with the Sales Manager'. This appointment arose out of an approach made by Christianson for a position. The firm had not identified a vacancy in the Sales Department and invited applications for the post. Indeed, at the time of his approach, Christianson was employed by W. H. Allen of Bedford. Madden seems to have been alert to the value of Christianson's expertise, for he remarked to the Board that he 'had come to the conclusion that it would be advisable to offer him a position, which would materially strengthen our Sales Department, which

... was inclined to be a little weak'. By June, 1924, Christianson had commenced his duties at the Soho Foundry, but within a short time circumstances required that both he and Dacres, the Sales Manager, had to be released by the company.

Christianson's appointment was 'for one year certain, and terminable at the end of that period, or at any time thereafter, by 3 months' notice given by either party'. It was 'understood' that he would be placing his 'services and experience generally at the disposal of the Company'. Christianson was expected to perform his duties 'in a proper manner', giving the 'best' of his 'ability', obeying 'all lawful orders from the Company's authorised representative', and keeping safe the 'Company's secrets'. All selling operations would be directed from 'headquarters', so as to ensure 'the best efficiency under present day conditions', and Christianson's instructions would 'generally' come through the Sales Manager. As to his duties, these were explicitly stated by Madden:

> Your work is expected to consist mainly in following up enquiries and tenders outside, particularly with reference to Turbine, Condenser and Oil Engine work. You will also be expected to assist in the inside work of the Sales Department when it is desirable for you to do so. It is intended that in the case of certain large Contracts, that you will keep in touch with the work throughout, acting as liason officer between the Company and the customer, and between the Sales, Drawing Office, Works and Commercial Departments dealing with the Contract.

At the beginning of the Twenties, the company's manufacturing specialities were the same as in 1914. Hick Hargreaves catalogues promoted its ability to provide 'COMPLETE POWFR PLANTS for Cotton and

Jute Mills supplied and erected in any part of the world'. The company's 'Horizontal and Vertical Single, Compound, and Triple Expansion Engines' could be found in several industrial sectors, embodying the 'Special attention ... given to all details of design and construction affecting economy in steam consumption'. 'As evidence of the satisfaction given to clients, and their confidence in the quality of our products', Hick Hargreaves boasted 'that, since the year 1880, we have supplied engines for a variety of duties developing a total of approximately half a million indicated horse power'. They made a point of publicising their responsibility 'for the introduction of the Corliss Valve Gear' into Britain in the 1860s. From that time, the company had built 'about 1,400 engines, fitted with this type of valve gear, ranging from 40 to 4,000 indicated horse power, of the simple, compound and triple expansion types, with steam pressures up to 200 lbs. per square inch'. In addition to its engines, the company was capable of supplying the 'most modern practice in Power Transmission Gearing'. Moreover, as an addition to its traditional range of prime movers, the company had developed the 'Hick-Diesel Oil Engine', in recognition of the diesel engine's superior thermal efficiency and reliability.[6]

From 1911, Hick Hargreaves had 'successfully manufactured and sold Diesel Engines' having taken 'account of its exceptional advantages in certain cases where economical considerations are favourable'. They had also 'recognised that the progress recently made in the construction of internal combustion Engines has enabled such prime movers, under conditions favourable to them, to compete with the Steam Engine'. This recognition was bound to lead to others. Although they were aware of the advantages of the internal combustion engine over traditional prime movers, the steam turbine seemed a more admirable power plant for Hick Hargreaves to manufacture, but not to the exclusion of the established[7]

lines. The steam turbine complemented perfectly the steam raising and condensing plant manufactured by the company, such as the Hick-Breguet jet or surface condenser and ejectair, an apparatus built by arrangement with Maison Breguet of France and Maurice Delaporte, the ejectair's patentee. It was in order to 'keep fully in line with modern requirements', that Hick Hargreaves manufactured steam turbines from 1923. Only after 'careful consideration' did the firm adopt the 'impulse type of turbine', with its many 'points of superiority for units of moderate size'. According to the firm's publicity, Hick Hargreaves 'extensive knowledge and wide experience' of industrial power supply, led it 'to introduce a steam turbine of our own design and manufacture as an alternative to our well-known slow-speed engine'. The consequences of this decision were both dramatic and unexpected. In 1927, all nine of the engines built by Hick Hargreaves were steam turbines and the majority were supplied not to manufacturing firms but to electricity generating stations. Three of the nine turbines were supplied to Fraser & Chalmers for installation at the city of Birmingham Hams Hall power station where they drove extraction and circulation pumps.[7]

To manufacture a successful steam turbine of its own design, Hick Hargreaves had to acquire the necessary design skills, and in June, 1923, George Arrowsmith was appointed to a position of 'full control & responsibility on all matters relating to steam turbines'. Formerly the Principal Assistant to the Chief Turbine Designer of English Electric, Arrowsmith became Hick Hargreaves' Chief Turbine Designer, and was appointed Chief Engineer and Director of the company at the close of 1928. Arrowsmith was the ideal choice because of his 'wide experience in all classes of steam turbine work, in fact since completing my university training in 1909 my attention has been mainly devoted to this

branch of engineering'. He was 'equally conversant with both Impulse and Reaction machines and ... fully acquainted with the latest developments & improvements in both of these types'. Born in 1889 and educated at the Kings School, Chester, Arrowsmith read Mechanical Engineering at Manchester University (Faculty of Technology), graduating in 1908 with a first. Arrowsmith subsequently carried out 'special research' under Professor Nicolson that earned him an M.Sc (Tech) in 1909. A three year apprenticeship followed at Vickers shipyard, Barrow, where he obtained workshop training and experience in erecting and setting to work marine turbines. A further period of three years was spent in the Engine Drawing Office (Turbine Section), gaining a knowledge of engine drawing and calculating the performance 'of large direct coupled marine turbines & smaller geared units'. One of his duties involved carrying out 'steam & coal consumption tests' during the sea trials of 'numerous' capital ships. In 1915 Arrowsmith became Chief Assistant to the Turbine Designer of Willans & Robinson, Rugby, and 'transferred' four years later 'to the English Electric Company at Rugby' and its Ordnance Works, Coventry. Consequently, he gained 'detailed' experience of turbine manufacture through his association with the design of Willans & Robinson's 'reaction & Impulse reaction turbines and the English Electric Impulse Turbines'. By 1923 Arrowsmith had also acquired an understanding of 'General office management & executive work. The Technical Side of Sales & Tendering. Advertisement & Publicity'. But it was as an engineer that his expertise would prove valuable to the company, for he knew a great deal about the maintenance, repair, inspection, running, and testing of steam turbines. Furthermore, Arrowsmith had carried out original research in the form of 'Experimental investigations on blading & nozzles, critical speeds, disc vibration and resonance'. He had also taken out patents 'for improved governor gear and "split-flow" exhaust turbines'.[8]

Of all the staff appointments made by Hick Hargreaves between the wars, Arrowsmith's was perhaps the most significant. But there were lesser staff appointments which were nonetheless crucial for the efficient performance of the company. Early in 1927 Edgar Scott became the Senior Engine Draughtsman, following 'nearly twenty years experience on engine work', mainly 'in connection with the design and detail of Steam Engines, including Uniflow and Heat Extraction Engines, modern Condensing Plants, Millwright work and General Engineering'. Scott was 33, possessed 'some experience in connection with Diesel Engines', and undertook his duties at a salary £5 10 0 per week. Thomas Thomson was 37 when he applied for the post of Chief Draughtsman in 1927. He was then Assistant Chief Draughtsman in the Condensing Department of Mirrlees Watson, Glasgow, with 'experience in the latest Condenser design, Feed Heating, Evaporating & Deaerating schemes and ... accustomed to supervising and controlling a fairly large staff', as well as 'acting in a position of responsibility'. The position of Chief Draughtsman was filled by someone else, and Thomson was offered the 'post of Leader of the Condenser Section', with a weekly salary of £7. This job involved 'the handling of Condenser Contract Correspondence in addition to the charge of Drawing Office Work'. When Thomson asked for an assurance that his salary was 'not a maximum one', and raised several other points, Arrowsmith was compelled to respond in some detail. He declared that the salary offered was 'not necessarily the maximum', but was 'the figure at which at the present time, we value the position'. Arrowsmith continued: 'We can make no definite guarantee as to the future, as this will depend both upon yourself and the further responsibilities which you may be asked to undertake, also, you will realise that it must necessarily depend upon the prosperity of the Engineering Trade'.

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A. J. Taylor and Harry Purslow became Draughtsmen at the Soho Foundry in November, 1928, and April, 1929, respectively. Taylor like Scott sought employment with Hick Hargreaves because of the financial plight of his employer, Browett Lindley, whose liquidation was imminent. Taylor had been employed for seven years by the Metropolitan Vickers Electrical Co., partly in the fitting shops and partly 'in their General Engineering Drawing Office where the work concerned the draughting of Rateau Steam Turbines, Condensing Plant and Auxiliary Pumps etc'. Taylor was 24 and expected a weekly salary of £4 10 0. Purslow was 28 and in employment with Worthington Simpson, receiving a salary of £3 15 0, the minimum he expected to receive from Hick Hargreaves. Purslow had acquired 'a sound technical and practical experience in your line of manufactures' having spent nine years in the shops and drawing office of George Saxon, Manchester. Recently, he had worked for five years in the London Drawing Office and Newark works of Worthington Simpson where, 'in conjunction with my chief, I designed a new type of cam operated positive drop valve gear for the biggest steam engine in Europe ... installed at the Metropolitan Water Board'. Purslow was currently 'engaged upon a new type of high speed 4 cyldr. vertical uniflow engine ... now undergoing its experimental stage. You will agree', he wrote, 'that this is a new departure of steam engine design in this country'. Purslow wrote 'in confidence' of his work at Worthington Simpson.

At the beginning of 1929, V.V. Ashworth successfully applied for a vacancy in the Rate Fixing, Planning and Progress Office of the company, working 'under the jurisdiction of the Works' Manager', for a weekly salary of £7. Ashworth was 42 and had served his apprenticeship with 'Messrs John Pickles & Sons. Saw Mill Engineers & Woodcutting Machinists. Hebden Bridge', qualifying at the same time as a 'Teacher of

Engineering Subjects'. Since October, 1927, he had been the 'Production Engineer on the staff of Messrs William Asquiths Ltd Machine Tool Makers', and was now offering Hick Hargreaves his 'experience gained over a very wide and varied field in General Engineering, concerning the most up-to-date methods in modern production including: Planning, Rate fixing. Progressing. Jigs and Tools. Heat Treatment. Inspection etc'. In the Autumn of 1929, Hick Hargreaves made one of its last staff appointments for some time when T. H. Gerrard was accepted as the 'suitable applicant' for the post of Steam Turbine Draughtsman at a weekly salary of £5. In 1927, he had 'passed the A.M.I. Mech. E Examination' having 'studied Steam Turbine design under Proff G. Stoney'. Before this Gerrard had served his apprenticeship 'with Messrs Hick Hargreaves Bolton, with whom I was employed ten years and the past year I have been engaged by Messrs English Electric Co Rugby. Both firms are as you no doubt know ... turbine & Condensing plant manufacturers of the highest standard'. Gerrard added: 'The plants that have come under my category have been for leading power Stations over this country, and those on the Continent, vary from 6,000 K.W. to 30,000 K.W.'.[9]

At the start of the Twenties, Hick Hargreaves were manufacturing the type of goods that Purslow was familiar with. These were 'boiler plants, piping arrangements ... [and] all types of horizontal and vertical corliss and drop valve steam engines, the uniflow steam engine, condensing plants ... and various types of power drives'. By the close of the decade, Hick Hargreaves had also become a steam turbine manufacturer of the 'highest standard'. But the long-standing market for industrial power had contracted to such a degree that the company came close to sharing the same fate as the Burnley Ironworks; Ashton Frost & Co., Blackburn; James Carmichael & Co., Dundee, and George Saxon

of Openshaw, who were among those leading firms of textile-engine builders that closed in the 1920s. Other famous names were to follow in the Thirties, including W. & J. Galloway, Knott Mill, Manchester; John Musgrave & Sons, Bolton and Scott & Hodgson, Guide Bridge, Manchester.[10]

II

Madden's appearance at the Soho Foundry quickly led to changes in the running of the office. In August, 1919, a comprehensive filing system was adopted, whereby all correspondence was placed on file, according to whether it fell into one of four sections: Enquiries; Orders; Miscellaneous and General. Moreover, a card indexing system was instituted in which details of Miscellaneous & General correspondence were recorded on white cards in one cabinet, while details of Enquiries and Orders were recorded on buff and orange coloured cards respectively and stored in separate cabinets. Each enquiry received by the company was given a number and provided the enquiry was not declined, it was placed 'on an "individual" file', with the enquiry number stencilled to the file. If a tender was rewarded with an order this could be added to the enquiry file, which then bore an order number beneath the enquiry number. In the card index, the enquiry cards gave the 'name of the firm, town, date and particulars' of each enquiry, with, if appropriate, the order number 'entered in red'. Order cards bore similar details and showed the enquiry number where a tender had been submitted, as well as the customer's order number 'for ready reference'. The Miscellaneous files dealt with "Enquiries Declined", "General Correspondence with Government Departments", the firm's "Agents", "Advertisements", and "Applications for Employment" etc. and were numbered from one upwards. All correspondence dealing with enquiries or orders which was 'not sufficient in bulk to warrant an "Individual" file', was placed in the General box files and arranged alphabetically. There was one card index

for the Miscellaneous and General sections, offering the titles of the files and their numbers, in the case of miscellaneous correspondence, and giving 'particulars of the correspondence and dates'. The Miscellaneous cards were also 'cross-indexed by making a separate card for the different firms or individuals entered' on them, while every firm had a separate card in the index. Strict rules governed the use of this new system. All files had 'to be "booked" out' by the staff, and then 'returned to the Filing Department at night and restored to their correct position, in the filing cupboards'. Under no circumstances was correspondence to 'be taken off the file', nor added, 'except by the Filing Department'. Furthermore: 'All correspondence must be passed out for filing immediately it' had 'been attended to'. 'No file must be taken away from the Offices under any circumstances'. And: 'All correspondence received for filing must be filed the following day'.

The adoption of a new filing system was the outcome of a thorough appraisal by Madden of the day-to-day running of the enterprise, that reflected an awareness of the problem of communication within the company structure. In September, 1919, the organisation of the company itself was deemed worthy of improvement through a revision of the 'System of General Organisation'. Under this system the business of the company was dealt with through 'four Departments under the general supervision of the Managing Director and the General Manager, the Head of each Department being responsible for the internal organisation of his Department:

(1) The general Commercial Dept. under the control of the Secretary.
(2) The Works' Dept. under the control of the Works' Manager.
(3) The Drawing Office under the control of the Chief Engineer and specially supervised by Mr. Richardson.
(4) The Sales Dept. under the control of the Assistant Sales Manager, specially supervised by Mr Madden with Mr Halson.

The Sales Department specifically dealt 'with Estimating and the preparation of tenders and all correspondence in connection with enquiries, following up enquiries, Agency matters, Sales records, the preparation of catalogues and lists, photographs and advertising, official trials on site ... and all "Sales" matters generally'.

Under the 'Routine' of the new system, a strict procedure was laid down for the handling of mail received by the company. This was 'opened in the Secretary's Office, stamped, entered in the "Letters Received Book" and all enquiries and orders and correspondence in connection therewith marked with' the firm's 'filing reference'. The mail was then 'divided into 4 baskets', one for each of the firm's four departments, with each letter 'stamped' with the title of the department to which it now belonged. Provision was made on these stamps for the correspondence 'to be copied for other Departments as required'. The majority of letters would require a wide circulation because of the nature of their contents. For example, the correspondence 'regarding official trials at site' would need to be 'marked' for the attention of Drawing Office, with copies for the Works and Sales Departments. Once the mail had been sorted into the baskets, they were 'taken to the Board Room for Joint Inspection by Messrs. Richardson, Madden and Halson by 9-30 a.m.' 'Later "Mails"', were dealt with in a similar way, and were also distributed 'departmentally' following inspection by the same managers. 'All telegrams received and sent' were 'copied in triplicate and one each sent to Messrs. R. M. and H. immediately'. The 'Routine' also established that 'All letters were to be answered, if possible, the same day as received'.

Outgoing letters had to bear a department prefix letter, as well as a 'filing reference if in connection with any enquiry or contract'. Those responsible for the overall running of the departments had to sign

all the letters leaving their domain. In the case of the Sales Department, Madden signed the outgoing correspondence, the writer simply initialled 'both letter and carbon copy at the bottom left hand corner of the last page'. The copies were 'put into a folder and placed in the Board Room first thing the following morning for joint inspection by Messrs. R. M. & H.' before they were 'immediately filed'. Incoming letters were also filed, once they had been 'marked off in the "Letter Received Book"', and where 'necessary' copies were sent to the firm's London office or agents. Detailed procedures also governed the receipt of Enquiries and Orders. The latter had to be 'formally acknowledged by the "Sales" Dept.', which then made 'four copies for distribution to the "General Commercial" Dept. "Drawing Office", "Works" Dept. and file'. The company secretary received the original order, which was 'afterwards filed on a special "order" file'. As an instance of the interdepartmental work required of the staff, where 'special labour costs' were involved in the execution of an order, the Assistant Sales Manager had 'to obtain this information from the "Works" Department', which also supplied 'all information respecting delivery times for estimating'. It was the duty of the Costing Department 'to supply full information to the Sales Department'. Given that the company's new procedures needed to be understood and adhered to in order that costly delays could be eliminated, it is understandable that a 'Works Committee' was created with Madden as one of the members, sitting 'once a fortnight to discuss inter-departmental matters'.[11]

Madden's reform of the company's internal organisation extended to an examination of salesmanship in the market, particularly the overseas market. The agent employed by merchant houses abroad brought the company's specialities to the attention of potential customers and represented the link between supplier and buyer. Madden believed that

sales of the company's plant abroad could be improved by employing an overseas representative dealing exclusively in the products of Hick Hargreaves. By 1923 sales in India were promoted by two substantial agency houses: N. Wadia & Sons, Bombay, and McLeod & Co., Calcutta. The London correspondents of the latter were McLeod, Russel & Co., who employed a representative shortly to be engaged by Madden in possibly the most intriguing of the appointments made by Hick Hargreaves between the wars. His appearance at the Soho Foundry appears to explain how a paper, dealing with the work of agents in the East, became part of the company's papers. It is likely that the 'Notes on Export Sales Work' originated from McLeod, Russel and if so they offer a glimpse of the service provided by one of the merchant houses that represented British manufacturers abroad. The Notes were meant to guide the agency's salesmen in India and 'prevent you from making mistakes or taking unnecessary responsibility in the building up of a satisfactory business in ... large machinery lines'. How selling agencies represented manufacturing industry in such traditional markets as India is revealed by the 'Notes On Export Sales Work'.[12]

The author of the Notes recognised that advertising and publicity in general were 'an essential part of selling work'. But he also recognised that opinions varied 'as to the best way to do this. There is no question that intelligent advertising is very helpful, and some firms have a special publicity department and pay high salaries to experts to draft advertisements'. However, he warned that the 'unchanged illustrated advertisement' was 'about the worst form of advertising' imaginable, because it did 'more harm than good'. He cautioned that 'Advertisements should not be too ambitious to start with and should be continually changed. They should be very carefully drafted in modest language and properly displayed'. As a rule, the

'American type of Machinery advertisement' was not 'acceptable to English buyers. Some of the more extreme advertisements, at the best, amuse: and more often irritate'. Circulars were 'absolutely worthless, and in the majority of cases find their way into the waste paper basket'. The proper approach was 'a direct appeal in the shape of a properly typed and signed letter. A running fire of carefully worded letters sent to the right parties does more to keep your firm before the customer, and persuade him that you are live people, than any other method'.

The use of a 'Mailing List' was commended by the author of the Notes, who enclosed a 'Specimen' which he had 'found useful'. It could easily be expanded and corrected, and 'should be constantly on the Salesman's desk ... compiled not from a directory, but from the active files in the office'. Arranged alphabetically, with the names of customers and potential customers, the list should be brought up to date each day. 'Care should be taken' over the 'proper description of the person on the list, together with his correct initials and spelling'. The salesman was assured that he 'should be able to devise a system whereby you can rapidly classify these names, and be able to tell at a glance what kind of goods your client is likely to be interested in'. Each week, the salesman should 'Make a point ... of selecting an interesting subject pertaining to one of the agencies which you hold, and write a brief informative letter enclosing particulars and printed matter to amplify any statements'. Once the 'Mailing list' was 'in being', the 'labour involved' would not be great. 'You simply draft a letter, look over your Mailing List, and put a cross opposite each client whom you consider would be interested in the particular subject of the week. The mailing list can then be handed over to a clerk and the work will proceed automatically'.

The salesman was advised 'to make very cautious use of any hurry up phrases such as "urgent", "Rush", etc.', in his telegrams and order forms. Such words lost their 'value' when 'misused a few times'. The author explained that 'Every order is naturally urgently required and we will always assume that this is the case, and push the manufacturers as hard as possible. Should you impress on us the urgency of any particular order we will treat it as really being particularly urgent, and take appropriate steps'. In his estimates, the salesman was recommended to pay attention to the weight of the plant, and to 'make a point of carefully figuring the weight of each detail', and writing 'it down in lbs. opposite the price'. This idea was of 'immense value' when called upon to provide a quotation 'without exact data'. Nevertheless, the salesman should 'endeavour to build ... up a price book based on actual transactions', as quickly as possible. 'Our invoices to you will give particulars of freight, insurance and other charges, and you will probably have access to other invoices in respect of past shipments. Where you are asked to quote C.I.F. you can do so with a great deal of confidence, if you have already imported similar material and to any current agency prices are able to add exact charges for freight, insurance, etc'. As 'outward shipping rates' were 'subject to conference terms' there was no variation in the freight rates offered by 'the different Steamship Companies'. However, the salesman would be kept 'regularly' informed 'about this'. The erection of plant was an obligation which he was to avoid whenever possible. 'Don't under any circumstances offer to do it, and if you can get the order without, so much the better'. The author's reason for this recommendation was quite straightforward: 'As merchants we should not be asked to do erection, and I consider it out of our province'. To this he added: 'The Merchant who deliberately undertakes to import a Plant, erect it, and turn it over in running order (perhaps under penalty) is looking for trouble,

and usually gets it. Immediately you assume such responsibility you open the door wide to all sorts of unfair and unprofitable contingencies, some of these beyond your control. The erection of a Plant by a Supplier, sometimes turns a nice clean cut contract into a first class squabble that upsets everybody concerned'. But the provision of skilled supervision was another matter. This could be 'exactly estimated' and offered when necessary to a client, but erection was his responsibility, not that of the agent. Where a contract was so badly wanted that the contract price included erection, then the salesman was advised to 'get a Local firm to sub-contract this work for you, and to their figure add a reasonable amount for contingency'.

The author of the Notes was equally insistent that contracts offered under penalty should be ignored, unless there was 'an overwhelmingly good reason' for accepting them. 'I doubt very much whether an English manufacturer nowadays would consider taking the order for a Plant under penalty whether in regard to time of delivery or performance. Even under normal conditions a manufacturer who accepts a penalty will usually require a corresponding bonus should his performance be better or his delivery accelerated'. The author explained that 'In the old days some firms would cheerfully swallow penalty clauses and give the most extraordinary guarantees, trusting to bribery or wangling to get them out of a corner, if their plant did not live up to its estimated performance. You will be safe at any time if you only bind yourself in the manufacturers guarantees'. Moving on to consider 'Specifications', it was recommended to the salesman that he 're-draft every specification received from home', in order to preserve their confidentiality. 'Even if we at this end are rather generous with information, you should use discrimination in passing any information onto a customer to which he is not strictly entitled. Your

specifications and estimates will probably not be treated confidentially (especially in the case of a native client) and competitors may be given access to them'. Therefore, 'the description should be as general as possible' in the absence of a 'good reason' to the contrary. A 'pushing' client, anxious for 'exact dimensions of the component parts of a plant', ought to make the salesman 'suspicious. The ordinary buyer does not look for information of this description any more than a bona fide customer would ask you for dimensioned working drawings, sufficiently detailed to enable him to make the plant. Keep always in view the strong probability that your competitors in Calcutta have means of access to your specifications'. Once an 'important enquiry' had been secured 'it is a good plan to call on your client, go carefully step by step through his requirements and get him to approve any departure you may have to suggest to conform with your standards - this will save a lot of trouble, misunderstanding, and cable expense'. Where the client was ignorant of his wants, the agent had 'a chance to educate him on the lines of the plant you are handling'. But he should not 'send in a lot of specifications or literature without being at hand to go through it with him'. And the agent must not 'run the risk of a competitor "explaining" your plant'.

A small section of the Notes was devoted to the 'Use of the Word "Complete"' by the salesman. To prevent a 'misunderstanding' arising between the salesman and his customer, he was asked not to use the word 'complete' in his 'specifications, estimates, and correspondence' when describing 'Engineering Plant'. 'It is an ambiguous and dangerous term', the author wrote, 'that has never been defined either by lawyer or engineer and never will'. The proper procedure to adopt involved the use of an 'exact schedule of all the material included in your price'. This did 'not mislead the customer, and prevents the possibility

of misunderstanding'. Unrealistic 'Times of Delivery' should not be assured by the salesman. 'A reasonable client should not be led away by competitors promises of quick delivery in cases where they would start level in manufacturing, and should appreciate your more conservative attitude. It does you more good to quote a long delivery and deliver before your time limit, than to exceed it'.

The agent's 'Quotations' were the subject of detailed advice. Here, the agent should 'endeavour to quote Free on Board English Port', while resisting 'a c.i.f. or f.a.s Calcutta quotation'. A plant involving 'heavy lifts, deadweight and measurement freights, etc', could easily complicate and increase freight costs. However, 'It should be possible to persuade any customer to take a f.o.b. English Port quotation if you offer to do freight, insurance and shipping charges at actual cost to yourselves. When quoting on heavy machinery, if you have to include freight, try and make your quotation f.a.s. and not d/d Calcutt. Watch this phrase "delivered" and remember that if you use it, this may involve discharging overside into lighters at ports like Bombay or Rangoon, and payment of any import duty ruling. If you quote c.i.f. or d/d at a port that is not reached by the large mail or cargo steamers it will include transhipment and exorbitant local freights (sometimes at double the rate of the overseas freight)'. The movement of heavy machinery posed problems of their own. The 'B.I. boats even up to 5000 tons say they cannot handle loads over 4/5 tons with the ships' gear. In these cases you would be heavily penalised for the special arrangements that would have to be made to handle heavy transhipment cargo'. In the tender for a 'big contract', requiring 'a quotation including delivery at an outport in India or Burma', the agent should 'prepare an exact shipping specification showing the heaviest lifts, etc. and get a definite quotation from the Steamship Company'. This was

a 'good plan', and the salesman would find the 'B.I. people ... always ready to do this, and it will save you a lot of trouble'. The author concluded his advice on 'Quotations' by stating: 'It does not seem to be generally understood that in a c.i.f. quotation the risk is the buyers once the goods are put f.o.b. English Port'.

The 'utmost forethought and discrimination should' govern the agent's use of cables, with 'detailed specifications' and prices on contracts reserved for the mail. 'Our experience has shown that 50% of the cabling about large contracts could have been dispensed with and a lot of misunderstanding avoided'. To avoid confusion, the agent was advised to code his messages personally, rather than rely on someone else, even though that man might be a cable expert. 'In his anxiety to save a word or incorporate an attractively coded sentence, the most experienced man may obscure your meaning. A good plan in cabling is to endeavour to put yourself in the place of the recipient of the message, and try it out from every possible angle to see whether your meaning will be clear to someone several thousand miles away'. 'Price lists' and other confidential information should be kept 'under lock and key and if possible in a private safe. In any order that is worth getting you will always meet competition of one kind or another, and it is most important that you keep your final figures secret'. Whenever possible tenders should be submitted 'at the very last minute'. If the agent's office possessed the 'press copying system', then tenders could be 'drafted and typed without the prices'. These could be added later 'and the letters copied under personal supervision, afterwards being taken away, addressed and sealed, and the press copy book locked up in the safe'. If possible 'important tenders' should be 'delivered personally'.

The prices embodied in the agent's tenders formed an important aspect of his work. He should not cut them induly, 'but be content in the first instance with a reasonable profit', and 'stick' to his price figure. Customers could be persuaded of their correctness, particularly when competitive plant appeared cheaper, by breaking the price into so much per ton or lb. of material involved. By this means, the price differential would be erased. A high price was usually a reflection of the heavier weight of the plant in the expensive tender, or the cost of additional items such as spares and accessories. The agent must not 'become a "low" price salesman. Any one can give an article away or sell at a lower price than his lowest competitor - this is not salesmanship. You are not out there to hammer down your manufacturers' prices but within reason to keep them up. If an important contract gets into the "auction" stage your duty is to submit a clients offer to the manufacturer, but don't use your position as confidential agent to extort unfair terms from your principal'. And 'don't, after you have received an order, attempt to squeeze more profit out of the transaction by suppressing the fact that you have the order and asking for further discount. It is a common practice and some of the biggest firms in the world (with an undeserved reputation for straight dealing) are the wickedest sinners in this respect. Your manufacturer absolutely trusts you (otherwise you would not be his representative) so don't do anything to forfeit his confidence. His interests should be identical with your own and both should be studied in preference to those of a client out to get an unfair advantage either in price or terms'.

One section of the Notes was devoted to 'Consulting Work', and in his comments the author touched upon the role of salesmanship. 'Some engineers', he wrote, 'seem to think that selling machinery is rather an undignified occupation when compared with designing and manufacturing

it. Why this should be the case I don't know, as salesmanship is just as much a brain job as designing, and palpably one profession could not exist without the other'. In remote places 'engineer salesmen' had to perform the role of consulting engineer, but 'some engineer salesmen like to pose as consulting engineers'. The 'buyer' possessed no right '(on the strength of the merchant's profit contained in your tender) to demand that you should do his consulting work for him free of charge. There are rare cases where the Directors of a new enterprise will recognise the good quality of a firms' technical staff and put themselves unreservedly in their hands in regard to the supply of plant. These are the "plums" of the trade, and should they come your way you will no doubt be able to take advantage of them, but always be careful in these cases to see that the results of your work are not exploited, in other words do not give a man information (which he should call in and pay a consulting engineer to supply) which he will send out broadcast and get tenders on to your disadvantage'. Having referred again to tenders, the author went on to advise the agent to prepare them 'as attractively as possible', 'bound in a neat cover with specifications and enclosures arranged and classified for ready reference. A busy client particularly a consulting engineer handling a lot of tenders, expects and appreciates this'. The author's experience of tenders led him to believe that 'the majority of firms do not pay enough attention to the shape in which their tender arrives on the buyers desk'.

'Business correspondence', too, required care and the agent was advised 'to be as dispassionate as possible in all business correspondence'. If he thought a mistake had been made 'at this end', then the agent should 'write for an explanation. It never pays for one branch to be continually slating the other over small mistakes that may

crop up from time to time. In an organisation such as ours everyone must pull together or else we cannot progress. Situated so far apart misunderstandings will occur, and these are not helped by acrimonious correspondence. Number all estimates, orders and letters - this is obviously the only thing to do in a business that uses the cable to any extent. Try and keep all stationery uniform in size and style and don't send in about half a dozen different sizes of stationery with a tender'. The 'mention' of 'private matters in business letters' was unwise, as private or semi-private letters could become lost in a private file. Use of the 'personal touch' carried no great importance. '"My dear Tom" or "Bill" etc. always ... looks incongruous in a business communication and endearments of this description ... should be avoided'. The keeping of 'exact records of all ... transactions' would help avoid 'confusion' in the agent's absence, and he should 'Be careful to send regular reports of all business in train, orders booked, etc. to each manufacturer' that he represented. Irrespective of the state of business, the agent should 'write a monthly letter' to his manufacturers. 'Tell him about prospective business, particularly where he can help it along at home, ask for any information you need to further his interests and tell him frankly all your troubles, if you can do this without grousing'. And when he had obtained 'a big order don't sit back and admire yourself (or get tight on the strength of it) but get after another to keep it company'. At the close of the Notes, the author provided his observations on the 'native'. 'You have probably found that Asiatics want a great deal of tact to handle properly. No one is quicker than the native of India to recognise a Sahib, and their prejudices under this heading are very strong'. His advice was that familiarity with a 'native', no matter how important he might be, was improper. The 'native' should, however, be treated with 'courtesy and consideration', and in return, the agent would 'find him appreciative'.

III

If Madden was familiar with the techniques of salesmanship in overseas markets, he may also have believed that there were shortcomings in the agency system that called for a marketing initiative on the part of the company. Whoever penned the Notes remains obscure, but they date from the same time as Hick Hargreaves appointed Alexander Colledge M.I. Mech.E., as their 'Overseas Representative'. He joined the company in 1923 and was employed for a period of three years, during which time Colledge 'undertook ... a tour of the British Empire and the appointment of Agents in the countries visited'. The itinerary of this world-wide 'programme' shows that Colledge planned to remain for several months at a time in each country visited so that he could negotiate 'the appointment of Agents'. A purpose of Colledge's tour was the examination of the company's existing foreign agents. In his first visit to India 'he investigated the work of our Indian Agents and made recommendations for our future policy in that country'. His second visit to India and the Far East occurred when Colledge had 'left our service' and was acting 'in an independent capacity'. The reports he submitted 'showed a wide grasp of the commercial and political situation and of the possibilities of expanding trade'. Yet there is no mention in the company's records of the marketing initiative stimulating greater sales abroad. The reason for this omission lies with the programme's poor reward. The tour was a failure and it was seen to have failed at the time. This was not the fault of Colledge, Hick Hargreaves Overseas Representative, because he was suitably qualified for carrying through the company's foreign sales drive. Before joining Hick Hargreaves, Colledge 'was Manager of the Machinery Exporting Dept., of McLeod, Russel & Company, the London Agents for the Eastern Side of India'. Hick Hargreaves came to regard Colledge as 'a man of the highest

character', with 'first class technical and commercial abilities and wide contacts in all parts of the world'.[13] Admirable though these qualities were in the service of Hick Hargreaves, they could do little to overcome the checks to growth felt by the traditional engineering industry as a whole.

The conception of a major tour of foreign markets appears to have originated with Madden. At the Board Meeting held in January, 1923, Madden announced that 'owing to financial difficulties' the company's agents for the Federated Malay States and Canada were unable to act on their behalf. Two months later, Madden 'brought up the question of Overseas Representation and read extracts from a correspondence he had had with Mr. Colledge'. Following a 'full discussion', it was agreed in principle that the company should have 'a senior official travelling abroad' without 'outside interest', but giving 'his whole time to the business of the firm'. It was also decided that Colledge should be invited to the next meeting 'when his suggestions could be discussed with him personally'. These 'suggestions' had been conveyed to Madden not only through a correspondence, but as a result of a conversation the two men had had. In April, the directors interviewed Colledge and appointed him to the 'position of Overseas Representative to the Company' for a period of three years, with the 'option of a further 3 years' employment, at a salary of £1,200 p.a., 'plus expenses'.[14] Four months later, Colledge embarked for Canada at the outset of his tour. What were the 'suggestions' put forward by Colledge and what had he achieved in the past to merit this lucrative appointment?

Colledge had written to Madden in March, 1923, and explained that he had 'been thinking seriously over our conversation in regard to an overseas representative and in view of Hick Hargreaves present and contemplated manufacturing programme, consider that your idea has tremendous possibilities'. Colledge discussed the merits of Madden's

idea, namely the value of an overseas respresentative to a manufacturing enterprise. Colledge wrote: 'An agent abroad, usually a merchant firm doing general business' was 'apt to neglect the special interests of a manufacturer' because of 'his other business'. The 'principal in England' was in a difficult position to 'gauge the extent' of the neglect and the 'best cure' lay in 'periodic visits from a direct representative. If he is a trained man and able to supplement the work of the agent's salesmen, the selling effort of all concerned can be more efficiently maintained than would be possible by trusting entirely to the merchant firm even if they employed an Engineer'. The cost of 'maintaining a competent engineer to travel overseas markets' was a heavy one, particularly in the 'initial stages'. Colledge therefore felt that 'it might be a good plan to ask others to co-operate. Your own firm, a Boiler manufacturer, and a High Speed Engine maker, should go well together'. It would be a 'good thing' if 'one of the large Beama firms' could be persuaded to join, providing it did 'not clash with H.H.'. Colledge knew of 'three firms who work on precisely these lines - they maintain a first class man abroad and it has paid them handsomely for a number of years'. If Hick Hargreaves were determined to pursue 'this business in the near future', Colledge 'should like to take it on; but would require to know definitely before committing' himself to a fresh agreement with McLeod & Co. Colledge had travelled through many regions of the world, acquiring 'good friends', with 'a brother in Johannesburg and some of my family ... in Australia'. He did not look 'forward to a further long spell in London'. His 'inclinations' lay 'in the direction of travelling abroad for a few years, as I believe with the above connection, I could make a success'. Colledge offered to provide 'particulars' of his career for Madden to lay 'before your Board', as well as the expenses likely to be incurred by the 'contemplated programme'. These details were brought to the

attention of the directors at their meeting in March. In his next letter to Madden, Colledge disclosed that after April 17th, he could 'give McLeod & Co. one month's notice'. Moreover, he did 'not anticipate that there would be the slightest friction with them as Sir Charles (McLeod) is a fair man and would not be inclined to stand in my way as he realises that this job has not turned out as profitable as all of us would like'.[15]

Colledge subsequently enclosed 'full particulars' of his career, 'together with testimonials'.[16] He wrote of his 'thorough technical and commercial training' and 'practical work in the field in connection with the complete erection of large plants, also the maintenance of steam and internal combustion machinery'. His 'sound knowledge of business procedure' had permitted Colledge to hold 'responsible positions' in engineering and he could 'claim to have an intimate knowledge of overseas market requirements and business methods' because of his 'special business missions to Australia, New Zealand, Canada, U.S. and South Africa'. Born in 1885 and educated at Shebbear College, Alexander Colledge was an 'Engineering Pupil' with Fraser & Chalmers, Erith, from 1899 to 1902, becoming manager of their Singapore Office 'during the major portion of the period 1906 to 1911'. He was also the Chief Mechanical Engineer to the Government Collieries, Sarawak, 1905-6, and employed in the service of the Island Trading Syndicate Ltd., Labuan, 1903-5, as 'Engineer and general assistant'. As Fraser & Chalmers 'Representative' in the Far East, 'he showed considerable initiative and energy in developing the business in that territory, and his conduct and trustworthiness' gave rise to 'full satisfaction'. For five years from 1912, Colledge 'displayed considerable ability' as the 'Consulting Mining and Mechanical Engineer' to McAlister & Co., Federated Malay States, in 'charge of all Engineering sales work'. As an employee of the Sarawak Government, Colledge gained experience in the

erection and maintenance of steam turbines in addition to 'Winding and Hauling Engines'. As well as representing Fraser & Chalmers - manufacturers of steam turbines and power plant - Colledge also acted on behalf of Babcock & Wilcox and 'Tosi Diesel Engines', travelling throughout the Far East, with 'special trips to Australia, Canada and U.S.'. His career as consulting engineer to McAlister & Co. came at a time when the agency represented 'Hick Diesel Engines, Clayton & Shuttleworth Semi-Diesels, Thompson & Co., Australia, and Allis-Chalmers, Steam Turbines, Mining Machinery, etc'. Once again, his duties required 'Special trips to Australia, New Zealand and South Africa'. From 1917 to 1919, Colledge served with the Royal Flying Corps and after the war he was employed by 'McLeod, Russel & Co., London. McLeod & Co. Calcutta - Agents, Hick Hargreaves, Browett Lindley, etc., etc'.

Colledge was able to offer an impressive curriculum vitae, with some degree of technical training and practical knowledge of prime movers, particularly steam turbines, that was complemented by practical experience of Far Eastern markets. It was on the strength of this experience that Colledge proposed to undertake a world tour on Hick Hargreaves behalf, extending for two years at a total cost of £4,060, of which £2,400 represented Colledge's salary. He explained that the 'actual steamer fares and expenses on boats would be amply covered by £500 ... travelling at the rate laid down in the time table'. Railway and living expenses could be met through an allowance of £2 per day. McLeod Russel's shipping agents had provided Colledge with a statement of fares and a schedule of travelling times, while the daily expenses were based on the experiences of 'a friend who has done this tour and ... tells me definitely that £2 is a liberal allowance and in a great many cases ... could be done cheaper'. On the basis of an 'actual travelling time' of 150 days, Colledge arrived at a sum of £500, while

the 'liberal allowance' for 580 days added £1,160 to the cost of the tour. Once Colledge's salary of £1,200 p.a. was taken into account the total cost of the venture amounted to £2,000 p.a. Colledge hoped that this figure would 'not be considered excessive by Hicks' and remarked that it might be reduced if their 'regular sub-contractors such as Beeley and Green make some contribution'. But if 'Hicks' chose to shoulder the venture alone, Colledge 'would be prepared to guarantee that the expenses did not exceed £2,000 per annum, and would take the job on at this figure paying all my own fares and expenses'. Colledge wondered whether Aster's with their 'saleable line suitable for all markets', might participate in the venture. They possessed 'a capital of £180,000 and manufacture a fine line of small Lighting Sets, Pumping Sets, etc which have a big sale in South America, South Africa, Australia and the Far East'. There was 'also the question of Browett Lindley, Sisson, or other High Speed Engine maker. I fancy that without much trouble we could get half of the suggested expense borne by outside firms, but this is a matter for your own decision'. When Colledge next wrote to Madden, he was pleased 'to note that your Directors are inclined to go on with the proposal. I would certainly prefer to work for one firm only and am glad that this would seem to be your intention'.

The preliminary draft agreement between Hick Hargreaves and Colledge was drawn 'to cover a period of three years'. Colledge objected to the 'wording' of the clause dealing with the retention of his services upon the expiration of the contract, claiming that it was a 'little one-sided'. Madden acceded to this and other 'points' raised by Colledge, who admitted to 'a little difficulty in criticising or objecting to any of the clauses in this agreement, due to the fact that it was drawn up by Mr. Davies who is one of your own Directors and might be inclined to resent any criticism'. The approved contract was 'for a

definite period of three years' and it was agreed that, 'subject to notification by either party, six months before the termination of the agreement, the engagement shall continue thereafter subject to six months' notice on either side, and on the same terms as specified ... but that the remuneration may be reviewed and shall be subject to modification from time to time as may be agreed upon between the parties'. The first 'notice of continuation' was to 'be given six months before the expiration of the agreement'. Colledge signed the contract of employment in June, 1923, commencing his duties from that date. In August he was sailing to Canada with 'a travelling letter of credit for £1,000'. Before his departure, Colledge penned his 'Details of Export Work', providing 'a brief resume of the methods' he would 'adopt in conducting the Company's business while away from Bolton'. Numbered copies of the estimates provided by Colledge to his clients abroad, would 'be regularly forwarded to Bolton for criticism, filing and reference'. The firm would receive an 'exact duplicate' of his proposals in 'all important enquiries'. His correspondence to Bolton would 'bear a number in addition to a subject heading and reference', and he requested the firm 'to start a separate series of numbers for any letters written to me, to facilitate cable reference and prevent misunderstanding'. Colledge proposed to 'classify all enquiries' into three classes, the first requiring from the firm 'the best price and delivery...for a bona fide client, who means business and will require full specifications, drawings, etc., and where there is a possibility of an immediate decision by the client'.

Colledge attached 'the greatest importance to efficient cabling, and ... arranged to use Bentley's Code exclusively'. This code should 'be kept for Agency work entirely', while a 'supplement of useful phrases' could 'be added to from time to time'. The overseas agents would assist in the 'building up' of a 'supplement' to Bentley's Code,

that would 'appertain exclusively to Hick Hargreaves business'. New agents appointed by Colledge would receive a copy of Bentley's Code, to be used 'for our business exclusively', and a copy of the 'supplement' with 'blank words for his particular use'. Colledge intended to register his name 'as a telegraphic address in any centre where a long stay' was 'contemplated', and 'cable' the firm when this was done. He also remarked that 'all the price lists' had been coded with code words from the Marconi Code listed 'in your copy of the Bentley Code'. Colledge advised that a cable made up from some of these words should be delivered to the Sales Department for decoding. 'There is an advantage in this, namely that technical matter will be dealt with in a technical department, and the possibility of error obviated'. Colledge's instructions regarding the firm's catalogues and price lists were equally detailed and derived from his experience of agency work. As the representative of Hick Hargreaves, Colledge did 'not propose to push for business in merchanted goods', but if a client should make 'an enquiry for something that we can buy, I propose to attempt to get his business'. He added: 'There are certain lines such as haulages and small vertical and colonial type Steam Engines, which we can easily handle, and I am taking M.B. Wild & Co's. catalogue and price lists with me, also those of Hindleys and Davey Paxman'. If Colledge should receive enquiries for their goods, 'I suggest that you get the best possible prices and we will add a merchant's profit, and endeavour to secure the business. In this connection, if we can have our nameplate put on the goods it might perhaps be advisable'. Colledge's concluding 'Suggestions' to the Sales Department, with their reference to the importance of 'monthly reports' and 'weekly' letters were strikingly familiar from some other Notes.

Colledge arrived at Montreal on September 1st, 1923, for the first stage of his tour and by the close of October Messrs. Whitehead, Emmans

Ltd. had, at his suggestion, been appointed Hick Hargreaves agents for Eastern Canada. In November, Madden read to the Board of Directors a letter received from H.M. Senior Trade Commissioner, Montreal, 'in which reference was made to Mr. Colledge, and which expressed warm approval of our policy in sending a travelling representative to the Colonies'. The directors 'agreed that this was a very satisfactory letter to receive'. Early in February, 1924, Colledge left Vancouver bound for New Zealand. Whitehead, Emmans had been appointed agents for Ontario and Eastern Canada, and in the Middle West, Hick Hargreaves were representative by the Manitoba Steel and Iron Co.Ltd., of Winnipeg and Calgary, while Brown, Fraser and Co. Ltd., Vancouver, represented the firm in British Columbia. By May, Colledge's endeavours in Canada appeared to be bearing fruit. Whitehead, Emmans wrote to the firm, saying that the Wayagamack Pulp and Paper Co. was 'interested in a Cross Compound Condensing Engine', and that their General Mechanical Superintendent was sailing for England soon, and would 'make a special point of seeing you regarding this equipment'. Meanwhile, Colledge was progressing through New Zealand, where he remained for five months before departing for Australia at the close of July, 1924. It had been agreed that Colledge would maintain a regular correspondence with the firm and this Madden 'laid on the table' before the directors. In July, Madden reported that a representative 'of John Chambers & Son, New Zealand, had paid us a visit regarding the taking up of our Agency. He satisfied himself with our Manufactures and cabled his firm that he had fixed up the Agency with us'. Four months later, it was minuted that Colledge 'had provisionally fixed up an Australian Agency with Elder Smith & Co. Ltd. who are very substantial people. We have already received two enquiries through this Firm, one for Oil Engines and the other for Condensing Plant, and we are now awaiting draft agreement from Mr. Colledge'. This 'appointment' was 'confirmed' by the Board and replaced the existing

agency agreement with Coates & Co., of Melbourne and Sydney.

IV

By the end of 1924, Colledge's tour was well advanced. He had already visited Canada and New Zealand and most of Australia, replacing one agency and establishing new ones. Ahead lay tours of South Africa and India, the latter an important market for Hick Hargreaves. But the expectations held out at the outset of the tour were not being fulfilled, while the company itself was confronted by a crisis that threatened to require the liquidation of Hick Hargreaves. By the Summer of 1925 the poor trading performance of the company was calling for 'heavy sacrifices' in order to reduce expenditure to a minimum. An 'unsatisfactory outlook for the Engineering Industry' was recognised at the Soho Foundry, causing the 'Directors considerable anxiety'. In April, 1925, Madden informed the Board that Colledge had 'left Australia en route for South Africa' and as his agreement terminated in June, 1926, 'subject to 6 months previous notice', this was a 'matter' that ought to be discussed no later than the October meeting. Well before then, the background against which Colledge's tour was taking place had radically altered. At the previous year's Ordinary General Meeting, the directors reported a net profit of only £465 for the year ending March, 1924. Yet Hick Hargreaves was able to bear a dividend payment of five per cent, free of income tax, because over £29,000 was brought forward from the previous account. Indeed, a balance of almost £18,000 was 'carried forward to the credit of the current year's account'. But when that year's account ended in March, 1925, there was a 'net loss on the year of' £28,814, reduced to a 'net deficit' of £12,242 by means of the previous year's credit. The Board were able to 'discharge' this deficit - and pay a dividend of two per cent - by means of £20,000 transferred from the 'Reserve Fund', leaving a balance of £4,038 'to carry forward

to the next Account and a balance in the Reserve Fund of £20,000'.

The Board Meeting held on the same day as the presentation of the Directors' Report, considered the implication of the firm's poor trading performance. Madden put forward three 'proposals' to deal with the firm's difficulties. One: 'That all "Staff" salaries and wages shall be reduced by 10% from the Managing Director to the junior clerk'. Two: 'That immediate steps be taken to close down as early as practicable the Oil Engine business, but that in the event of orders being offered in the intervening period they be accepted and should such orders be obtained the position shall be further considered'. Three: 'That the outside "Sales" Staff be reduced by asking Mr. Christianson to resign; Mr. Dacres to undertake the necessary outside duties in his place'. Madden's first and third 'proposals' were 'taken together' by the Board and accepted. The 'question of closing the Diesel Oil Engine business' was left open until the next meeting. The directors already had before them Mr. Everett's report on Diesel Engine manufacture and the response of Charles Robson, Chairman of the Board. Everett was the Technical Controller of Hick Hargreaves Oil Engine Section, and he had studied the options open to the firm with regard to its oil engine business. Robson, who considered Everett's report to be a 'very straightforward and exhaustive one', was 'more convinced than ever that our best policy' should be 'to follow Mr. Everett's No. 2 course, and ... give up entirely the manufacture of Diesel Engines and put all our energies into the manufacture of the Turbine which ... is more suitable for our Soho Works and Staff, and also to our financial position'. Robson 'strongly' recommended that the oil engine department be closed 'without further delay', because the alternative, a thorough commitment to the 'Diesel business', would 'mean a certain and considerable loss for the next two or three years, to get ourselves on a par with the various other large Makers, and this we cannot afford'. Robson believed that the

manufacture of Turbine engines was 'more in our line'. But the Board were not convinced of this, hence their decision to defer the issue.[19]

The reduction in salaries was instituted immediately 'in two equal instalments' and was necessary, according to the notice issued by Madden, because 'the loss resulting from last year's trading, together with the continued unsatisfactory outlook for the Engineering Industry', gave rise to a grave 'position'. It was 'prudent' to 'conserve' the firm's 'resources', which required a reduction in expenditure and this in turn called for 'heavy sacrifices. The Directors have reduced their fees by 50% and they have decided that the Staff must be asked to accept a 10% reduction in the salaries paid to-day'. Madden reminded the staff that the 'future prosperity' of Hick Hargreaves was 'a vital matter for most of us, and the steps now being taken are in reality for the benefit, in the long run, of everyone concerned'. He concluded: 'I need hardly say that our success depends on our own collective efforts and it is up to each in his particular capacity to continue to give his best and to do all he can by economy and efficiency to assist the Firm to return to a profit earning basis, and at the same time to secure his own personal prosperity'. At the Directors Meeting held in July, Colledge's recommendation that the Associated Engineers Ltd., Johannesburg, should be appointed agents for South Africa was accepted. Madden laid before the Board Colledge's 'Report on Australia' and said that this gentleman was now returning home. Madden also reported that the letter sent to each member of staff, informing them of 'the proposed reductions in wages', had 'been fairly well received by the Staff with the exception of the Drawing Office Members, who had asked that the Management should meet a deputation from their Office Committee'. A meeting had taken place when it had been decided 'that the matter would have to go before their Association. A further meeting was accordingly arranged, at which the draughtsmen were accompanied by a member of their

organisation from London'. At this meeting, the firm's 'proposals' could not 'be agreed to' and as no other 'definite decision' could be reached 'it was decided that this matter should go to Local Conference' in August. If a settlement still could not be reached, the dispute would 'go to Central Conference in London'. The draughtsmen may have been proving troublesome but this was not the case with the foremen, who had pledged their support to Madden's plan for a recovery of the 'Old Firm'. Madden 'laid on the table a letter which he had received from the Foremen and which was read to the Board by Mr. Davies. The Board expressed their great appreciation of the loyalty and assistance shown by the Foremen'.[20]

Hick Hargreaves 'Oil Engine Business' was examined again at the meeting in July 'and after a lengthy discussion it was resolved ...:

> "That we dispense with the services of Mr. Everett and close the special Department organised for this section of the business, but arrange, as far as possible, to go on with our standard design of Engines should such business continue to come our way".

At the August Meeting, Madden reported that he and H.A. Richardson had held a discussion with Everett, who was told that the July resolution could not be reversed. 'At the same time it was thought desirable to retain, if possible, the services of Mr. Everett until the Oil Engines ... under construction are completed and running'. In a letter to Everett, Madden explained more fully the directors' attitude toward oil engines. Everett had argued that this line of business could be a lucrative one, but the Board were not convinced and 'decided, with very great regret, that the financial position to-day makes it impossible to adopt the progressive policy you have recommended'. However, 'after the expenditure and development already carried out (particularly the recent

and successful development of the new "K" Engine) it would be too drastic a step to close down the Oil Engine business altogether'. Consequently, the firm proposed 'to continue to bid for Contracts for the "K", "C", and "D" Engines for which we have patterns, and also for the "K" type as a marine auxiliary'. The execution of the outstanding orders for four "K" type engines would provide an opportunity 'for some indication to be obtained as to whether this policy will enable the Firm to keep in the business until better conditions enable a more progressive policy to be adopted'. In the meantime, Everett's services would be retained until the four engines were 'safely in operation', but if he wished to take advantage of some new 'opportunity', the firm 'should fully understand' and hope 'to retain your services for a time, at least, in a consultive capacity'. Madden spoke for the Board when he wrote 'that the present position is due entirely to the trading conditions which have obtained since you joined us, that you personally have done everything that could have been done, and there is no reflection whatever on yourself that circumstances over which none of us have had any control, should have nullified a policy which, under more normal circumstances, had every prospect of success'.[21]

When Colledge returned to the Soho Foundry he found the directors wrestling with the crisis confronting the company and preoccupied by the Oil Engine Business and the dispute over Drawing Office salaries. The Local Conference did not settle this issue and Madden reported that the 'matter' would go before a Central Conference in London. Referring to Colledge, Madden 'stated that he did not think it advisable to discuss the question of future policy at the moment' and Colledge was left 'over until the next Board Meeting'. At the September meeting, Madden 'informed the Board that Mr. Christianson had been offered a position under the Sunderland Corporation, and in view of all the circumstances he had recommended him to accept same'. It was now that the 'question

of the future activities of Mr. Colledge' were 'very fully discussed by the Board'. They decided that without a change in 'present trading conditions...it would be impossible to renew the present agreement' with Colledge beyond its termination in June, 1926, 'and that under these circumstances notice should be given to terminate the agreement on this date'. Colledge 'could best serve the Company's interests' by continuing his tour through India and 'that on his return some arrangement should be made, if possible to retain his services in some capacity after the expiration of his agreement'. It was suggested that he 'might act independently as the travelling representative abroad of two or three non-competing Firms. It was generally felt, however, that this future question must be left over until Mr. Colledge had returned from India (probably next May)'. It was resolved:

> "That Mr. Colledge be given notice that his agreement will be terminated on 15th June, 1926. That he spend the rest of his time by visiting India on behalf of the Company. That on his return the question of future arrangements can be considered".

Colledge was 'subsequently' admitted to the meeting and 'in the course of a general discussion brought up the question of his expenses'. He objected to the 'present arrangement of detail expense sheets', and it was agreed 'that in future Mr. Colledge should receive an expense allowance of £1 10 0 per day plus railway fares when working for the Company in this country away from Bolton, and ... abroad he should receive an expense allowance of £3 0 0 per day plus railway fares'.[22]

At a later date, Madden wrote to Colledge 'to place on record' what had already been arranged, and explain the reason for the termination of his agreement. In spite of the 'very great advantage of the present arrangement', its 'continuation' could not be justified under 'present trading conditions'. These made it 'impossible for us to continue the

heavy expense of a special representative travelling abroad solely on our behalf'. The directors considered that, in the time available before the agreement's close, 'the interests of the Company could best be served by your visiting India and particularly in investigating the position of the Calcutta Agency and any changes which may be advisable or necessary'. Colledge might 'be able to bring to a successful conclusion some of the important negotiations at present outstanding, and ... your presence there will have a most beneficial effect on this most important and valuable of our markets'. Madden concluded by expressing the directors 'very great appreciation' to Colledge, for his 'valuable work' on the 'recent world tour, and not least, your efforts to carry out this work at as reasonable expense as possible...in these difficult times. As a result of your tour we feel that we are now represented by the best possible Agents, all of whom have had the benefit of first hand information from yourself, respecting our manufactures, and the manner in which they should be handled. The Results will undoubtedly be forthcoming immediately any general improvement in trade allows these new Agents an opportunity of showing what they can do'.[23]

At the end of October, 1925, Colledge was in London 'making enquiries with regard to possible Firms to act as' agents 'for South America'. Early in December, he was preparing to leave for a tour of India. Colledge arrived at Bombay in mid-December and by the end of January, 1926, the Board were able to discuss the company's Indian agencies. Colledge's letters 'were very fully discussed' and the Board approved Madden's letter 'giving notice to terminate the present agreement' with McLeod & Co. However, 'It was the opinion of all the Directors that no decision could be made pending the receipt of further reports from Mr. Colledge, but that it would be in the highest degree undesirable to take any action which might lead to breaking our

connection with Mr. Wadia'. Colledge's 'future activities' were also discussed and it was agreed 'to obtain his views regarding representation of two or three Firms, and the terms under which such an arrangement might be made'. At the same meeting, Madden 'reported that we had ordered two Diesel Engine crankshafts on the continent, through the London Agents of the Skoda Works. The various prices quoted to us were read by Mr. Madden, and after hearing the large difference between the Continental and English prices, the Board agreed that we had no option in the matter'. The 'financial position' of two firms to whom Hick Hargreaves had submitted turbine tenders was discussed, following the submission of 'reports' by Madden. In the case of the Bury Paper Co., Mr. Davies 'had prepared a hire purchase agreement, which provided that in the event of an order being placed with us, the material should remain the property of H.H. & Co. until final payment has been made'. A more encouraging item was the 'list of ... Home and Export orders ... placed during the year 1925'. From this 'it was noted that the Firm had obtained their full share of the work available'.[24]

At the February meeting, the Board were informed 'that the list of orders included the sale of the Stock Diesel Engine to the Newquay Electric Light & Power Company, at approximately £1500 below Stock Book value'. This was one of only four engines contracted for in 1926. The question of Hick Hargreaves 'Indian Agencies' was discussed again in March, 1926, by which time McLeod & Co. had written, accepting a new agreement with the firm. McLeod's reply to the 'draft agreement' was accompanied by a 'covering letter' from Colledge and it was his future association with the firm that was examined in the Summer of 1926. In June, the Board 'fully discussed' the 'TERMINATION OF MR COLLEDGE'S AGREEMENT AND CONSIDERATION OF FUTURE ARRANGEMENT, ALSO INDIAN AGENCY AND OIL ENGINE BUSINESS'. Colledge was present for part of these discussions and it is clear that he had made some suggestions concerning

the future direction of the firm's Oil Engine Business. The 'proposal that ... Colledge should return to India as the independent Representative of say three Firms (including H.H. & Co.) met with approval'. This scheme was discussed with Colledge 'personally' and 'left over until the next Meeting by which time Mr Colledge may be in a position to put forward a definite proposition for consideration. In the meantime' his agreement would terminate as agreed in June. At the same time, 'Colledge's proposals with reference to Oil Engine Business received the sympathetic consideration of the Board and' he 'was asked to go further into the matter with a view to submitting more concrete proposals for consideration'.[25]

In July, the directors presented another dismal report on the firm's trading performance 'for the year ending March 31st, 1926'. A net loss of £20,619 was 'reduced by a Credit to Profit and Loss Account from previous year's account' and became a 'net deficit' of £18,161. Once again, the directors 'decided to transfer the sum of £20,000 from the Reserve Fund and out of this ... discharge the balance ... appearing to the debit of the Profit and Loss Account in the Balance Sheet, leaving a balance of £1,839 1 6 to carry forward to the next account'. On the same day as the Ordinary General Meeting of the company, the Board met to consider, amongst other matters, the 'Future Policy' of the 'Oil Engine Business'. Mr. Everett, Madden reported, 'had secured another position' and would leave at the close of July, while the firm would 'only tender for Standard Engines for the time being'. If Everett's assistance should prove necessary 'in connection with any of the Contracts running at the present time, arrangement could be made for him to pay us a visit at a suitable weekend'. At this point, Colledge 'attended the Meeting and put before the Board his proposals for the formation of a Company... specialising in the manufacture of Oil Engines. After discussion it was decided that Mr. Davies and Mr Madden[34]

should go further into these proposals with Mr Colledge and submit a report to the Board'. Colledge's 'Future Arrangements' were considered next, but the proposal that he should 'continue to represent the Company abroad together with other non-competing firms', was again deferred in order that he could 'submit a definite proposition for the consideration of the Board, when he was in a position to do so'.[26]

Under a rearrangement of the Drawing Office, aimed at dividing work 'more equally' and raising the 'efficiency' of that department, George Arrowsmith was given the 'responsibility for all Design'. His agreement with the firm was 'nearing its termination, and in recognition of his work in the successful development of the Steam Turbine during the past 3 years and the additional responsibility now to be given to him, it was decided to increase his salary to £800 per annum, and Mr. Madden was instructed to arrange, if possible, for the present agreement to be extended for a further 3 years'. Mr. Dacres, formerly the Sales Manager, 'had refused' to accept the position of Head Office Assistant under his successor 'having accepted a position with Messrs. J. Musgrave & Sons of Bolton'. It was decided to mark the departure of Everett, formerly of the Oil Engine Section, with 'a small presentation, in the form of a cigarette case'. Colledge's next appearance before the Board took place in September, when the firm's 'Indian Agencies' were discussed once more. Madden had mentioned to Sir N. Wadia the appointment of an assistant in Bombay, where a vacancy had arisen at the firm's agency. Colledge had proposed that he 'should return to India' and he 'was asked to attend the Meeting' to explain his proposals more fully. 'It was finally agreed that ... Colledge should forward in writing as soon as possible, definite proposals for a 12 months tour in India, Burmah and Federated Malay States, representing 3 or 4 Firms'. If these 'proposals' met with the Board's 'approval', Hick Hargreaves would 'join the scheme', but 'on the understanding that the total cost

to ourselves shall not exceed £500'. In October, 'Madden reported that the appointment of an assistant was still pending'. Once he had chosen the two most suitable canditates, he would 'arrange for Mr. Wadia to interview them'. By this time Colledge had submitted his proposals, 'previously circulated to each Director', and the Board resolved to accept Colledge's offer 'for a period of 12 months and subject to reconsideration thereafter; his services to commence from the date he leaves this country and his salary to be paid to him monthly'. On November 24th, Colledge sailed for India, with a letter of credit for £250, his first six months salary. At the final Board Meeting for 1926, Madden announced the arrival of a cablegram 'that morning', ordering 'a Winding Engine through our South African Agents at a figure of £19,500, C.I.F. Durban'.[27]

Expectations may have been raised by this substantial order at the outset of Colledge's second tour of the East. Perhaps this order from one of the agencies established by their Overseas Representative, heralded the long awaited upturn that would promote the company's recovery. Colledge's second tour of the Indian market shows that the directors of Hick Hargreaves were persistent in their attempt to generate orders for prime movers and engine-room equipment. The Indian market for mill engines and millgearing was seen to be crucial for the wellbeing of the company. Hence, the attention devoted to Hick Hargreaves Indian agencies. The Board's concern for the company's share of a market that was not only depressed but also in decline was again apparent in the response shown to the closure of a long-standing competitor in the traditional market for industrial power. Colledge arrived at Calcutta early in December and later the same month he visited Ceylon. From Colombo Colledge reached Madras at the beginning of January, 1927, and a fortnight later he was in Rangoon, where he remained until the middle of February, before departing for Calcutta.

In March, Madden was able to report the arrival of 'a number of letters' from Colledge, 'containing two or three enquiries for the Burmah area'. Madden also reported on the 'closing down' of J. Musgrave & Sons, an event 'of considerable importance to us'. Spencer, 'the head of their Millgearing Dept.,' had already been engaged, but there was 'also the question of Engine Repairs'. The firm 'had approached the Liquidator with regard to the purchase of drawings, etc. but were informed that nothing could be done in this direction at present'. However, 'As a large number of ... Musgrave's Engines are installed in the Fine Cotton Spinners' Mills, we approached the Chairman of this Company when we informed him that we had this matter under consideration with a view to assisting them as far as possible'.[28]

The 'Bombay Appointment' was still vacant in April and the Board 'agreed to include the question of the Calcutta Agency in this discussion'. It was 'arranged to leave the matter in the hands of Mr. Madden to approach ... W.H. Brady & Company in a provisional way in regard to the possibility of their taking over our Agency for the whole of India, and also to cable ... Colledge for his opinion of Mr Yates who had been employed by ... Musgrave & Sons in Bombay; also, that we endeavour to hold Mr Temperley one of the prospective candidates for the time being'. In May, Madden reported that he had met Sir Joseph Kay of Brady & Co., who represented 'Messrs. Allens for Turbines in Calcutta' and were in 'communication' with Galloways 'since they gave up with ... J.Musgrave & Sons; so this matter must be left over until Messrs Brady are in a position to discuss the question'. Madden also reported that Colledge 'had written to say that he would not be returning to England until 1928'. Not surprisingly, the Board discussed the 'question of his Agreement' and it was resolved that this could not be extended, although the firm was 'prepared to give him a commission on any work he may obtain'.[29]

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The Directors' Report for the financial year ending March, 1927, gave a bleak picture of the company's trading performance. There was a profit, albeit one of £24 17 10, but this translated into a net loss of £2,075. The previous year's Credit on Profit and Loss Account, of £1,239, left a debit balance of £836 'to carry forward to next account'. There was no dividend payment and no sum was set aside for depreciation because, in the opinion of the directors, '(notwithstanding the amount capitalised from the depreciation fund in September 1921) the amounts set aside for depreciation in some of the previous years were much larger than need have been'. At the Board Meeting held the same day, it was revealed that Brady & Co. were unable to 'enter into negotiations with us regarding representation in India'. At the same time, arrangements were being made for Sir N. Wadia to interview two candidates 'for the Bombay Appointment ... when in all probability a decision will be arrived at'. By July, the fate of the Calcutta agency had at last been decided. McLeod & Co. would 'cease to be our Agents', and Madden reported that Messrs. Carey & Daniels were 'prepared to act on our behalf'. This 'business' had come to the attention of Sir N. Wadia 'who spoke very highly of these people' and 'then suggested that as we are making a change, we should open an office in Calcutta with him and give him the whole of India, the cost of which he estimated would be approximately £2400 per year or £1200 as HH & Co's Share'. Wadia's proposal 'was favoured by the Board, but it was finally decided to leave it to Mr Davies and Mr Madden to arrange an appointment in London with Sir N.N. Wadia, in order that they may discuss the matter and come to a satisfactory arrangement'. In August, the Board were told that the 'satisfactory arrangement' agreed upon by Davies, Madden and Wadia was 'that Messrs, N. Wadia & Sons should take over our Agency for the whole of India'. Colledge had by August visited Penang and had written suggesting that Messrs. Huttenbach Lazarus & Sons should become the

firm's agents in Malaya. He also invited Madden to an 'appointment with Messrs. Lewis Lazarus & Sons in London', which Madden accepted. Other business brought before the Board in August, included the 'matter' of J. Musgrave & Sons goodwill, patterns and drawings etc. The Board sought the 'opinions of Mr Lewis and Mr Spencer, the latter being in the employ of ... Musgrave until recently', and decided to offer a maximum of £500 for the late company's assets. The minutes noted that 'it was generally agreed that it would be to our advantage to purchase ... at a reasonable figure'.[30]

Madden subsequently disclosed that the Liquidator to Musgrave & Sons had declined 'our offer' for the firm's assets. Madden had visited Lazarus & Sons, London, in the hope of appointing them company agents in Malaya. Unfortunately, they already represented Tangyes, manufacturers of small oil engines, and Madden saw little 'hope of business in this direction'. But the Board 'decided that we should quote for any enquiries they may send us for Oil Engines ... within the range of sizes ...we manufacture'. At the end of 1927, the Board sanctioned a continuation of Colledge's 'expense allowance for an additional three months over and above the twelve months originally agreed upon'. By November, Colledge was in Saigon, still seeking his first 'definite order' of the second tour of the Fast, a state of affairs that had given rise to 'disappointment' at home. Through Colledge Hick Hargreaves showed tenacious perseverance in the search for profit with the marketing of traditional engineering lines. At the close of 1927, the company was 'in negotiation with the Anglo-Siam Corporation ... regarding our representation in Siam' and had submitted a draft agreement to Bangkok for approval. In the Summer, it had been decided that Mr Howell should fill the vacancy at the Bombay agency, while Mr Dacres, formerly of J.Musgrave & Sons and Hick Hargreaves, would go to Calcutta having accepted a place offered by Sir N. Wadia. Howell and

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Dacres arrived at Bombay in October 'and after a short stay proceeded to Calcutta', where Dacres 'was successful in finding a suitable office', while Howell 'returned to Bombay'. In February, 1928, Madden reported that the 'Anglo-Siam Corporation in London' had 'received approval of the proposed Agency Agreement from their Bangkok Branch'. This agreement 'was sealed and signed' at the next meeting. The previous October, Madden had announced the receipt of a letter from Messrs Yates & Thom 'stating that they were prepared to receive offers for the Goodwill, Patterns, Drawings, etc' belonging to them. The Board declined to submit an offer. Madden later disclosed that these assets had been purchased by Messrs J. Foster & Sons of Preston, who had also 'engaged some of the late members of ... Musgraves & Yates & Thom's Staffs'. Madden added that Hick Hargreaves 'must expect to be in competition with this Firm for engine work' and large Condensers which they also intended to manufacture.[31]

Chapter 10

The Search for Profit in the Postwar Decade

I

Hick Hargreaves peacetime activities appear not to have been unduly disturbed by the outbreak of war in 1914. Some eight engine jobs were undertaken in 1915 that included two four-cylinder diesel engines bound for Guayaquil in Ecuador and a vertical compound steam engine required by the C.W.S. at Irlam. The next year the firm supplied only one engine, the last to be built before 1919. Prior to August, 1914, the directors had been preoccupied by negotiations with Breguet for the right to use their patent condensing plant and following the outbreak of war they were occupied by the Directors' Report for the forthcoming Ordinary General Meeting. The minutes contain no indication of the grave commercial and financial worries that troubled the minds of many with the start of hostilities. The minutes also disclose that the directors of Hick Hargreaves did not envisage that their capacity either could or should be made available for War Office contracts. In 1914, expert opinion was advising the Cabinet that 'established armament manufacturers alone possessed the requisite technical capacity, and that the introduction of new firms could best be achieved under their tutelage by means of sub-contracts'. As Hick Hargreaves was not an expert armament firm the directors felt justified in withholding an offer of assistance to the War Office. But this private company could contribute to the needs of a laissez-faire economy at war. In January, 1915, Hick Hargreaves signed an agreement with Vickers to manufacture marine oil engines under licence for the Admiralty. Three months later, the firm agreed to supply Hick Breguet jet condensing apparatus to St. Annes U.D.C.[1]

'Business as usual' at the Soho Foundry came to an end in March, 1916, when arrangements were made with the Ministry of Munitions for the conversion of two bays of the old boiler shop into a shell factory. Henceforth, the firm was largely engaged in the supply of munitions. The firm initially turned out 9.2-in. shells, but from June, 1917, the firm was supplying 6-in. shells to the Manchester Board of Management of the Manchester & District Armaments Output Committee. Nevertheless, the firm retained the capacity to pursue a peacetime role, contracting to supply surface condensing plant to the Yorkshire Electric Power Co. in November, 1916. This was not long after the Chairman had disclosed that the power expected of the firm's engine and dynamo 'had reached the absolute limit'. Existing demands required the boilers to be 'heavily fired all the time' and the heating demands of the shell and recuperator shops in Winter exceeded the boiler capacity. 'The only remedy was to utilize Corporation authority current' at a capital cost of £2,000. The financial consequences of the repetition work undertaken for the Government only became clear after the war. Early in 1918, the Chairman explained 'how the account for Munitions Levy for ... 1916 had been dealt with'. Less satisfactory was the delay experienced in the later years of the war at the hands of the Inland Revenue in arriving at a figure for excess profits. The postwar arrears of Excess Profits Duty was to prove an unwelcome legacy of control.[2]

In the three years 1919-21 Hick Hargreaves trading performance justified dividends of 10%. The financial years 1922-23 also saw the company's trading rewarded with substantial profits, that allowed dividend awards and additions to reserve. The Directors' Report for 1922 referred to the 'very satisfactory result' evident in the profit and loss account and acknowledged the 'accommodation and assistance rendered' by the bank. Shareholders were also apprised of the knowledge that the 'immediate postwar period' had proved a 'difficult phase' for

the company. But they were reassured that the bank overdraft 'carried last year' had been replaced with a 'very substantial sum to our credit'. The outstanding claims for Excess Profits Duty had bedevilled Hick Hargreaves financial affairs throughout the postwar period by enlarging the liabilities shown on the Balance Sheet and the following year, 1923, the claim for E.P.D. was still 'subject to final Settlement'. The Treasury demands for E.P.D. had 'proved to be the final straw for many firms' in the nascent aircraft industry. In the early postwar months, aircraft manufacturers desperately attempted to diversify from a collapsing market for engines and airframes. An obvious choice for many was the motor trade. However, by the close of 1920 this trade had also entered a depression, an event of immediate relevance to Hick Hargreaves prosperity following the decision of the directors to enter the market for motor car engines. Early in 1919 the directors resolved to purchase some of the machinery installed by the Ministry of Munitions for their new venture. They bought an additional number of machine tools in the Summer, raising the total cost of the petrol engine business to £22,000. By the end of 1919, Hick Hargreaves were also quoting a price for vehicle front axles, a line of manufacture that required further machine tools to the value of £15,000. Hick Hargreaves preoccupation with the 'Petrol Engine Policy' continued into 1922 when the 'question of experimenting' with a smaller engine was investigated. At a time when sales of the firm's major products were encountering difficulties, Madden was being authorised 'to take such steps as he might consider necessary to design and manufacture' a second petrol engine, 'with a view to ascertaining whether there was an outlet for this size of Engine at a price which would show a profit'.[3]

Such a speculative venture as the company's petrol engine business called for substantial outlays in order to develop efficient petrol engines that could be produced at a remunerative price. Before that

point could be reached the prosperity of the company was dependent upon the orders and prices of conventional contracts for industrial power. Unfortunately, the costs incurred by the new venture, allied to the claims of the E.P.D. account for past as well as present excess profits, compelled the company to seek accommodation from the bank and subsequently sell the investments in War Loan and Victory Bonds in the course of the year ending March, 1922, so as 'to avoid further calls on the bank'. Some idea of the magnitude of these sales can be gained from the fact that in 1917 the directors discussed the purchase of £10,000 5% war loan. It is not hard to discern how the 'difficult phase' of the immediate postwar years arose. In the Spring of 1916, the Ministry of Munitions had reached agreement with the company for the establishment of a 'separate shell factory' at the Soho Foundry, the cost of the necessary machine tools and alterations to be borne by the Ministry. By August, 1917, the company 'had been busy for the past year almost entirely on direct munitions of war' and 'it was impossible to present a correct balance sheet' because the finance department of the Ministry, 'who had been considering the company's accounts ... had as yet, given no decision regarding the amounts to be allowed for depreciation of plant & machinery, increased output over pre-war years, writing off from capital account etc'. However, the Board had been presented with statements from the auditors that 'quite justified' the payment of a dividend notwithstanding the 'impossibility of preparing a balance sheet'. In 1917 a dividend of 10% was distributed and a similar dividend was paid the next year when a 'balance sheet or complete accounts' could not be presented 'as the completion of the accounts for excess profits for the year ending 30th June 1917 had not yet been made by the Inland Revenue authorities'.[4]

The motor industry attracted the attentions of some unlikely enterprises after the Great War. Ruston-Hornsby of Lincoln, who had[4]

originally been concerned with agricultural machinery, entered the industry, as did Cubitt. William Cubitt & Co., the engineering contractors, manufactured a cheap and simple motor car that was intended to meet the low priced American models imported into Britain. Hick Hargreaves had no intention of marketing a complete car of their own. They wished to limit their presence in the market to the petrol engine and other standardised components. This was a rational decision to take, providing an outlet for a proprietary engine could be found capable of successfully marketing the assembled product. The Board approved of the purchase of the Ministry of Munitions machinery because this capacity appeared to lend itself to a rewarding peacetime role. Machinery hitherto devoted to the supply of HE shells and recuperators could be turned to repetition work on the company's account by manufacturing motor car engines. By May, 1919, negotiations were in progress with C.B. Wardman of the Vulcan Motor & Engineering Co. Ltd., Southport. Wardman was to acquire 'many connexions with the motor industry' after the War. In 1920 he became the London agent of Lea-Francis - one of motoring's Lost Causes - through C.B. Wardman and Co. Two years later he had become managing director of both Lea-Francis and Vulcan and he was a dealer in Ruston-Hornsby vehicles. In 1923 Wardman succeeded Sir Thomas Polson as chairman of the British Motor Trading Co., a syndicate that included Vulcan Motors, who were in 'alliance' with Lea-Francis as a result of their weak finances. C.B. Wardman and Co. held a majority of the equity capital in Lea-Francis, whose late vintage sportscar was a machine that deserved a fond memory. The reputation of Lea-Francis seems to have been blighted by their association with Vulcan from 1922. A late Vulcan saloon, the Kirkstone, was invested with the unofficial title 'Kerbstone' by some at Lea-Francis on account of its mediocre performance. The Vulcan-Lea-Francis association had the merit of establishing a common

chain of dealers and some division of responsibility for components, as well as allowing the development of joint models. However, inferior designs such as the Vulcan Kirkstone and the inherently weak LFS, both of which bore the Lea-Francis badge, discredited the name of Lea-Francis. The six-cylinder LFS engine built at Southport was a disaster, a design of car with which Wardman was strongly identified. It was he who organised a high-speed trial of six of these tourers at Brooklands in 1927 when only three cars finished the course. On that Lea-Francis day, a gathering of agents and customers might have witnessed a catastrophe. 'Mercifully Wardman's hospitality was so good that the guests on this beautiful summer day became rapidly inebriated and filled with bonhomie. Nobody, therefore, seemed to notice' the debacle unfolding upon the circuit. Poor financial results and an awareness of the nature of the association with Vulcan led to Wardman's resignation from the Board of Lea-Francis in 1928.[5]

Vulcan dated from the Veteran era of motoring when they had specialised 'in good, sizeable, heavily-built machines'. In the Twenties the company produced trucks and 'fairly pedestrian motor cars', powered by Dorman and Meadows engines as well as their own units. For a short time some of Vulcan's engines were built by the Soho Foundry and were probably intended for their line of heavy touring cars. By August, 1919, Hick Hargreaves had 'in hand' an order for one thousand four-cylinder engines of 20 b.h.p. The Chairman, Percy Hargreaves, expressed Hick Hargreaves aspirations when he said the company wished 'to develop this part of the business to a much greater extent, in order to cope with the demand for this type of engine for both pleasure and trade vehicles'. As well as turning out engines, the company subsequently built gear boxes for Vulcan and supplied axles to the British Commercial Lorry & Engineering Co. None of these operations met the mood of optimism voiced by Percy Hargreaves. In truth, doubts were

raised by the Board over Vulcan's financial strength at the outset and these doubts became manifest when, in the latter half of 1920, the motor trade collapsed before entering a 'deep depression' in 1921, that was marked by 'cut-throat competition' and falling prices and sales. In 1919 Vulcan had belonged to a group that was to include Swift, Harper-Bean, A.B.C. Motors and Hadfields, a group created to rationalise output and produce in American quantities. The consortium did not last beyond the mid-Twenties having proved incapable of meeting the demand for a cheap, reliable small-medium car in a much altered market. Hick Hargreaves other client, British Commercial Lorries, was faced with difficulties of their own in the shape of creditors, who threatened its existence. Another problem concerned the axles themselves. They proved to be defective in both design and material. Although these faults were not the responsibility of Hick Hargreaves they complicated the contract.[6]

Within three years the optimism generated by the prospects for an expansive market in motor vehicles had evaporated and Hick Hargreaves venture into repetitive petrol engine work had soured. By September, 1920, it was admitted that the Vulcan company was 'unquestionably short of money', but doubts as to their ability to pay were allayed by an arrangement that required Vulcan to pay a minimum of £600 per week. This was to be increased subsequently 'to a sufficient sum to pay for 10 engines per week'. In the meantime, Hick Hargreaves accepted 'as part payment in kind, a car from the Vulcan Company'. In July, 1921, the company was delivering engines at the rate of 12 per week and a total of some 55 engines had been delivered that covered the payments already made. Madden was instructed to interview Wardman 'with a view to arriving at the best possible terms regarding payment for further deliveries'. The outcome was a report by Madden that persuaded the Board to authorise him to 'negotiate with the Vulcan Company for cancellation of contract'. Vulcan's continuing difficulties had

eventually convinced the Board that they should terminate the contract, but there was no intention on the part of Hick Hargreaves to end petrol engine manufacture. Indeed, in January, 1922, the Board discussed the possibility of manufacturing an 11.9 h.p. engine, if it could show a profit on a total outlay of £1,000. However, a month later the Board learnt that Vulcan's creditors had filed a bankruptcy petition against the firm. By March, the Board were discussing their 'Petrol Engine Policy', resolving to 'discontinue the manufacture of this class of work'. We know that Hick Hargreaves selling price for each engine was £106 and that 106 of them had been delivered by November, 1921. Not many more engines could have been produced for Vulcan before the closure of the Petrol Engine Shop in March, 1922. At the most no more than 50 engines could have been turned out, raising the revenue generated by the contract to possibly £16,500. This assumes that engines were delivered at the rate of approximately 13 per month and that Vulcan paid for them, which is by means certain. By June, 1922, Hick Hargreaves had arrived at a settlement with Vulcan and received 'an immediate payment of £10,000 in cash, together with 10,000 ... Ordinary Shares at par value'. This sum and the payments received from Vulcan cannot have exceeded a third of the revenue envisaged in August, 1919, when Hick Hargreaves were contracted to manufacture one thousand engines. The shares in Vulcan Motors were to prove a useful source of liquidity later in the decade. After 1928 Vulcan abandoned the production of their 'stodgy and unappealing' private cars, devoting their attention to commercial vehicles.[7]

Together, the costly failure of the petrol engine venture and the outstanding liability for profit duty beyond the repeal of E.P.D. in 1921 were the cause of the company's 'difficult phase'. In spite of these adverse circumstances the trading performance yielded profits that provided for debenture interest, depreciation and allowed

dividend payments, as well as additions to the reserve. The gross profit for the year ending June, 1919, was £79,000, which resulted in a net profit of £57,000 after charging debenture interest, depreciation and certain fees and commissions. A dividend award of 10% on the capital of the company, less income tax, withdrew £13,440 from the business, leaving a balance of £109,222 to carry forward to the next account. The Annual Report for the year ending March, 1923, disclosed a profit of almost £56,000, permitting a dividend of 7 1/2% from the 'net amount' available for distribution. This sum included the previous year's credit to Profit and Loss Account and in 1923 a balance of £33,756 was carried forward 'to the credit of the current year's account'. Moreover, the General Reserve Fund had been raised to £40,000 by the addition of £7,827. The previous year this fund had increased from £10,000 to £30,000. In 1922 the Chairman, Col Hargreaves, noted that the past year had proved a 'difficult and troublesome one', partly because of labour disputes and partly because orders had been 'exceedingly difficult to obtain', while prices had fallen 'to an almost unremunerative level. It must not be forgotten', the Chairman reminded shareholders, 'that the real prosperity of your Company lies in a full and prosperous order book'. From 1923 and throughout the remainder of the decade prosperity eluded Hick Hargreaves as the company experienced a hard life. In 1924 the gross profit of £16,666 gave rise to a net profit of just £465. The next year's trading resulted in a loss of £12,901 and net losses also resulted in 1926 and '27. Modest profitability was achieved in 1928 and the following year the directors were 'pleased to be able to report an improvement in the trading results', with a net profit of £11,445. In 1930, the directors reported a 'further improvement in the trading results', because after providing for depreciation, debenture interest and income tax there remained a profit of £15,110. The directors felt unable to recommend the payment

of a dividend for three years, 1926-28, and when dividend awards were resumed in 1929 the award was a modest 2 1/2% less tax.[8]

The disappearance of internal funds for the direct financing of new sources of profit was an inevitable consequence of the decline in the rate of return on capital. Another result was the disquiet shown by the institutional holder of the company's fixed interest debenture issue. The directors' concern for Hick Hargreaves financial difficulties was shared by Williams Deacon's Bank, but the response of the company's bankers was not one that the directors found congenial. In 1912 an agreement had been reached whereby Williams Deacon's Bank was bound to advance £35,000 to the company and advance further sums not exceeding £15,000 as the company should require. The bank was not bound to make any advance after July, 1914, and the sums advanced were secured by a new issue of debentures. The principal sums amounted to £60,000, the sum required for repayment of the company's original debentures on maturity in July, 1912. The 'present advance' of £35,000 to the company was secured by the issue of 35 debentures of £1,000 (part of a total authorised issue of fifty) each bearing interest at 4 1/2% and the amounts owing to each of the original debenture holders were paid by the bank debited to the company's Debenture Loan Account. This account was credited by the company with the 'proceeds of sale of £26,000 4 1/2 per cent Sterling Bonds of the Japanese Government'. In 1916 it was agreed that the interest charged on the company's Debenture Loan Account 'should be at Bank Rate with a minimum of 4 1/2%'.[9] Subsequently, the agreement between the company and the bank was not substantially altered.

In 1922, the decision to make the shares fully paid required the deletion of a clause from the agreement. On this occasion R.T. Hindley, the General Manager of Williams Deacon's Bank, Manchester, expressed the bank's 'great pleasure at the evident prosperity of the Company

as shown by the new Balance Sheet'. Six years later, the Managing Director of Hick Hargreaves was requested to attend a meeting with Hindley, who was now the Manager of Branch Offices. 'He said that this old established Concern had come through a difficult time, on the whole successfully and should be congratulated on doing so, but that the position from the Shareholders' stand-point was not so satisfactory'. Madden was asked whether the company would be able to award a dividend 'in one year, two years or three years'. Hindley 'remarked that it was possible for a Company to carry on for a long time, paying wages and overhead charges and making no profit or loss, and that such a condition of affairs might be satisfactory to the workpeople, the Staff and the Directors, but would be most unsatisfactory to the Shareholders'. Madden 'took exception to this suggestion that the interests of the Shareholders were not the first concern of the Directors and Mr. Hindley explained that he had not intended to suggest this'. Nevertheless, Hindley wondered 'whether we had considered the possibilities of amalgamation and whether there were any prospects of our being able to amalgamate with a group and so strengthen the position of the Company and of the Shareholders'. Hindley raised the company's account with the bank and referred in particular to the Debenture Loan Account. At the time that this loan was arranged for the redemption of Hick Hargreaves first debentures 'there had been no intention that it should be a permanent investment' and Hindley asked 'what prospect there was of our re-paying the whole or some part in the near future'. Hindley finally 'referred to the rate of interest on this loan which he said was not satisfactory to the Bank'. Apparently, the interest had been 'overlooked and should have been increased sometime ago, and would have to be raised by one half percent as from the 30th June last, thus bringing the rate of interest to half percent above bank rate with a minimum of 5 percent'.

When Madden reported his interview to the Board he remarked that the bank's request for an increase in interest 'was a reasonable one' and that the company had 'no alternative but to accede to their request'. But there were 'certain aspects' to Madden's interview which he felt required the consideration of the Board. What these aspects were remains unclear, but when the Board considered the interview Madden informed his fellow directors 'that he had privately and unofficially approached the Manager of the Midland Bank Ltd. with a view to ascertaining the terms under which they would be prepared to take over our account in the event of it being thought desirable to make a change'. The Board authorised Madden 'to approach other Banks with a view to ascertaining the terms upon which they would be prepared to take over our account and to report at the next Board Meeting'. The Midland Bank were prepared to accept the company's account and 'advance the sum of £50,000 on Mortgage Deed, but with regard to a further advance of £50,000 application would have to be made for this as and when it became necessary'. The opinion of the company's recently deceased co-director and legal advisor had been that a change was not desirable. He had 'preferred not to make a change provided Williams, Deacon's Bank dealt reasonably with us, but if on the other hand the Midland Bank offered us better terms, he would then agree to transferring our account to them'. It was this opinion which persuaded the Board 'that the offer put forth by the Midland Bank was not sufficient to justify our making a change'. Hick Hargreaves account remained with Williams Deacon's Bank and the Midland Bank were 'advised that the Board did not see their way to accept the offer put forward by them'.[10]

II

Steam-engine manufacture still predominated at the Soho Foundry at the commencement of the interwar decades. Between 1919 and 1924 the

company fulfilled one turbine and eight diesel contracts out of a total of 47 engine jobs. As a supplier of power plant to large industries Hick Hargreaves were vulnerable to any curtailment of demand for power in traditional markets, such as the textile industry, while the impact of electric power transmission to factories might nullify the development of a steam turbine as the successor to the steam engine for the supply of motive power in industry. Indeed, electric power transmitted from utilities to electric motors at the factory, rather than mechanical or electrical power from a prime mover on site, represented the new basis of production. By 1912 electricity was accounting 'for about a quarter of all the power used' by British industry. 'One striking feature revealed' by the estimates of total power used in British industry in 1907, 1912 and 1924 'is that although the total amount of power increased substantially, the total amount of non-electric power grew very little after 1907. Between 1907 and 1924 non-electric power increased by only 3 per cent, while the total amount of power rose by 80 per cent'. The demand for non-electric power plant remained buoyant, however, as existing plant came to the end of a useful life and was replaced. Byatt inferred that within the British market for power 'about half of the power plant installed both between 1907 and 1912 and between 1912 and 1924 was electrical'. It was fortunate for Hick Hargreaves that there were 'big differences between the industry groups', with the adoption of electricity making 'little headway' in textiles up to and beyond 1907. Yet the trends within the engineering industry itself presaged the future. Here 40 per cent of machinery was electrically driven in 1907. The industrial application of electricity for fixed motive power developed further between 1907 and 1924, but the industrial differences remained.

'By 1924 engineering was nearly 90 per cent electrically driven', while the mining and textile industries 'still had a low degree of

electrification: in mining only 40 per cent and in textiles only a quarter of total power was electric'.[11] In textiles, the stationary steam engine could retain its hold, because the frictional losses and other difficulties inherent in the mechanical transmission of power to machinery did not constitute a major disadvantage. The several distinct manufacturing processes that transformed bales of cotton into yarn and yarn into cloth could be arranged in factory buildings driven by a mill engine and geared by an arrangement of rope drives, line shafting and strap pulleys. After the Great War, the relative importance of the non-electric industries, such as cotton textiles, began to decline. The instability in the Lancashire cotton industry, arising from the loss of foreign markets, was reflected in the experience of engineering trades supplying textile machinery and mill power. Moreover, the cotton industry in Bombay, one of Lancashire's competitors in the Far East, was also depressed and beset with difficulties for most of the Twenties, limiting the demand for mechanical equipment in this overseas market. When the decade opened India, particularly Bombay, was a valuable market for Hick Hargreaves mill engines and gearing. The company was represented in Bombay by Nowrosjee Wadia & Sons, while McLeod & Co. represented the company in Calcutta. By the decade's close Hick Hargreaves presence in the Indian market had collapsed and both agencies had been dispensed with. Bombay was a valuable market for the company's specialities in 1919, one that proved compelling over the ensuing decade when the problems encountered by this industrial centre created difficulties for the traditional suppliers, such as Hick Hargreaves. They had to contend with the depressed circumstances of Bombay's cotton industry as well as the consequences of industrial electrification and a strong foreign presence in the market for textile and power machinery. Hick Hargreaves dealings with Wadia and McLeod in the Twenties chart the eclipse of traditional British engineering in a market where even the

best of connections failed to avert decline and failure.

Following the war Hick Hargreaves met orders arising from first the boom at home and then the high level of demand in India. When the home boom burst it was mill engine demand from Bombay and Calcutta that kept the company busy in 1921. Britain's postwar boom reached its peak in 1920 when a decline in exports initiated the downturn of the economy into the slump of 1920-1. Overseas demand became important to Hick Hargreaves following the onset of the slump at home. Of the twelve engine jobs undertaken in 1919 three only were supplied to India, the remainder satisfied home demand. But the next year twelve of the thirteen engine jobs were undertaken for the Indian market. As the Indian economy also went into a depression some of the Indian contracts were cancelled and in 1921 the Soho Foundry felt the consequence of depression both at home and abroad. That year only one engine job was executed, a mill engine required by the Keshoram Podder Mill and placed by McLeod Russel. After the war India returned to her previous role as a supplier of raw materials to the international economy, but by the close of the interwar period the composition of India's imports had changed. Throughout these decades 'India was transforming her relationship with the international economy by import-substitution in consumer goods, drawing more heavily instead on outside supplies of raw materials and capital goods'. Cotton textile manufacture had been stimulated by wartime conditions, following the war India's self-sufficiency in cotton goods rose from 57.6% to 85.3% between 1919 and 1936. The Twenties represented the boom time for the Indian cotton industry. The 'real' value of machinery and millwork imports between the wars 'suggest that investment in new plant...was never as high' in the Thirties 'as it had been during the restocking booms of the early and late 1920's'. The year 1921-2 stands out as a particularly significant one.[12]

The 'virtual monopoly' of output presented to the Calcutta jute industry by the war was reflected in this industry's 'fantastic profits'. The Bombay cotton industry also made 'very large profits' because of the decline in Lancashire's exports of cotton piece-goods. After the war 'most of the companies in the modern industrial sector had enough liquid resources to finance substantial expansion', and there occurred a boom in output, consumption, company formation and capital acquisition. Import substitution had clearly taken place in the case of cotton piece-goods and exports, too, had risen. Over the next few years, Indian exports of piece-goods declined, while imports staged a recovery. However, both mill output and handloom production remained firm and the real value of imports of textile machinery and millwork grew. Bombay's imports of cotton machinery were significant, because the Bombay cotton industry was paramount within the industry as a whole. In Bombay, the real value of imports of cotton textile machinery increased from 33,42 (Rs. '000) in 1919-20 to 214,26 (Rs. '000) in 1922-23.[13] The Indian textile boom presented opportunities to firms in Britain already well adapted for the supply of textile machinery. Hick Hargreaves were an established supplier of complete steam-power plant for mill driving on the eve of the boom and could cater to the Indian demand for power. The decision to persevere with the marketing of the company's specialities when sales became more difficult to secure raises the question: Did the decision-taking directors expect a recovery in demand similar to that enjoyed in the past? Did the directors act on the judgement that India would offer a rewarding market for power following a general recovery in demand? Against the background of a deterioration in the opportunities for the company's lines, the directors might have been responding only to those signals perceptible to managers familiar with a combination of known circumstances and oblivious of the signals pointing to a fundamental change in the market

environment.

The directors anxiety to maintain a keen presence in India is easily understood. Before the war India was a supplier of primary produce to industrial economies, accepting in return 'their exports of capital and mass-production consumer and capital goods'. It appeared likely that India would continue to fulfil the role as key to both Britain's payments pattern and the international pattern of multilateral settlement by providing a major market for Britain's exports, thereby generating a substantial export surplus to finance Britain's total deficits. In 1913 India accounted for a seventh of Britain's machinery exports and Britain 'supplied 78 per cent of India's imports of electrical apparatus and machinery, a much higher proportion than in other parts of the Empire'. Capital goods, as a proportion of India's imports, increased from 'over 18 per cent of the total in 1904-06' to 'nearly 20 per cent in 1911-13' as the earnings from primary exports rose and 'large amounts of capital' were attracted to India. A recent study of imperial India's economy has emphasised India's 'immense importance to British cotton manufacturers' and her value to Britain's other staple industries in 1913. Although India's importance varied from one engineering trade to another, by 1911-13 'she was the largest single customer for British exports of textile machinery, boilers, prime movers, locomotive and miscellaneous machinery'. Moreover, Britain's exports of capital to India 'created a potential market for British metal manufactures and engineering products'. There were 'important structural reasons why British firms were likely to be asked to supply India's import requirements before 1914'. Britain's manufacturers of textile machinery were unique as the only source of supply capable of satisfying India's wants. In 1913, the textile engineering industry and the related engineering trades in Lancashire represented the only industries 'willing or able to supply suitable goods for the Indian

market' and where the excellence of British goods failed to win orders there was another unique influence at play. 'Other British manufacturers were cushioned by the facts that it was easier for them to make contact with the British export/import firms that dominated India's foreign trade, [and] that the majority of their customers in India bought goods through London agencies'.[14]

At first, the directors expectations seemed to be borne out by the strength of demand for motive power in the Indian market. Twenty of the thirty-five steam and diesel engine jobs completed by Hick Hargreaves in the years 1919-22 were destined for power users in India, who also required replacement components and smaller items of plant in addition to complete engine sets. The company's Monthly Reports of Orders Received illustrate the value and significance of the Indian market to Hick Hargreaves during the postwar boom. The Monthly Reports were provided to each director prior to meetings of the Board and itemised all work currently being undertaken by the firm, revealing the agent or contractor who had placed the contracts and the destination of the work, as well as offering a description of the work itself and the sales value. The Monthly Reports were intended to assist the directors' deliberations by presenting them with present-day facts of the company's performance. The information given extended to the total value of materials paid for and wage costs incurred up to that point in the company's financial year, the total value of goods sold and invoiced, the state of the bank balance after payment of monthly accounts and the value of accounts owing to the firm. Those Monthly Reports compiled between November, 1921, and November, 1922, are intact and illustrate both the variety and value of the work undertaken by the company, and the preponderant demand for power equipment in India.[15] The greater value of this market by comparison with that at home is apparent in the first report of the series for the month October-November, 1921. The total

value of Orders Received amounted to £18,074 and of this sum McLeod Russel's order for an engine for the Keshoram Podder Mill accounted for £12,560, while a 'Hick-Breguet' Jet Condensing Plant, ordered by Wadia & Sons, Bombay, was worth £2,056. Minor orders for millgearing and steam piping also required in India accounted for a further £2,040. The home order with the highest value was for millgearing required by A. Stott & Sons of Oldham, amounting to £85. The majority of contracts placed with Hick Hargreaves were concerned with the manufacture of replacement parts for existing engines, plant and machinery. Orders for complete items of plant and machinery naturally commanded a far greater value than orders for replacement parts. The order for millgearing placed 'in connection with E 26/21', the engine job for Keshoram Podder Mill, had a sales value of £14,060. The 'Hick-Breguet' condensing plant ordered by Wadia for their Spring Mills Bombay, was only one item 'Constituing The Complete Power Plant' of this enterprise, the total cost of which amounted to £34,956 f.o.b. Moreover, as Hick Hargreaves possessed the authority to award subcontracts - the three boilers were the responsibility of Babcock & Wilcox - the company was able to earn a commission of £1,434 in addition to the sales value of goods that the company manufactured.

Contracts for complete engines, millgearing and surface condensing plant in the year from November, 1921, numbered 19 and 13 of these orders originated from power users in India. The majority of the Indian orders stemmed from textile mills requiring steam engines and or millgearing. Only three of the Indian contracts were for condensing plant while four of the five home orders were for this type of plant and placed by municipal authorities. The most valuable of the three condensing plants destined for India was a 15,000 K.W. set required by the Calcutta Electric Supply Corp., 'per Kennedy & Donkin', with a sales value of £15,139. Another set of two 'Hick-Breguet' condensers was

provided for the Eastern Bengal Railway, via Fraser & Chalmers. The third order for condensing plant was, as we have seen, provided by Wadia & Sons for the Spring Mills. India also required one of the four diesel engines built by Hick Hargreaves in 1922, when Worthington Simpson placed a contract on behalf of the India Office, for a four-cylinder engine of 320 b.h.p., at a sales value of £8,970. Only one home order was for a steam engine and this contract had a sales value of £3,766. The total value of the Indian orders to Hick Hargreaves amounted to £123,326 in 1921-22 and this compared with a total value of £25,464 generated by similar work in the home market. The greater value of the market in India to Hick Hargreaves was undoubtedly present in the minds of the directors and explains their preoccupation with the company's agencies in that market throughout the decade.

McLeod Russel & Co. were the London correspondents of McLeod & Co., who had offices in Calcutta, Bombay and Cawnpore. Hick Hargreaves agency for eastern India was held by the Calcutta office. Before 1914, Sir Charles C. McLeod, one of the partners in McLeod Russel, was President of the Indian Jute Manufacturers Association, a trade 'primarily in the hands of Europeans'. In 1914, McLeod Russel managed five sterling tea companies operating in India and the Soorah Jute Mills. McLeod Russel were not, however, the most valuable of Hick Hargreaves links with India. Of the 13 high-value orders that arose in India, McLeod Russel of London provided three, with a total sales value of £33,120, whereas Wadia & Sons of Bombay placed six contracts with a total value of £57,817. What is significant is that Wadia & Sons had already demonstrated their ability to promote sales when the market was depressed. McLeod & Co. placed two orders for engines with Hick Hargreaves in 1920, both of which were subsequently cancelled. By contrast, not one of Wadia's engine orders was struck from the Engine Job Book. Wadia therefore appeared to possess those skills of

salesmanship which could reward all parties to a contract, even in depression when outright cancellation seemed the likely outcome. To the directors of Hick Hargreaves N. Wadia & Sons represented the company's most valuable link with India. The Monthly Reports show that Wadia managed to cultivate dealings with those engaged in the Calcutta jute industry. Nowrosjee Wadia & Sons gained the lucrative business of Sir Sarupchand Hukamchand and his Calcutta jute enterprise, 'one of the first Indian-controlled jute mills'. Sir Sarupchand, along with other Indian businessmen, such as the Birla brothers, had entered the Calcutta jute trade at the close of the war, and for his venture, the Hukamchand Jute Mills Ltd., Hick Hargreaves had built in 1919 a 2,000 I.H.P. jet condensing engine, supplied through McLeod Russel & Co. But in 1922 it was Wadia who placed the contract for the engine and boilers required by the Hukamchand New Mills Ltd. This order was worth £12,709 and at the close of the year Wadia also provided the order for Millgearing, value £3,990. This was not all. Hick Hargreaves had already received from Wadia an order for Gearing, worth £590, for the Hukamchand Mills, followed in May/June, 1922, by an additional contract for Extra Cost of Millgearing, sales value £2,650, for the New Hukamchand Mills. A short time later, Hukamchand Mills required a 15-ton overhead crane and some mill fittings all of which were supplied by the Soho Foundry. In total, the Calcutta based jute enterprise of Sir Sarupchand Hukamchand, placed contracts worth £22,020 with Hick Hargreaves in 1922 and all of them

passed through Wadia & Sons, Bombay.

The total value of the contracts received by Hick Hargreaves from India in 1921-22 amounted to almost £160,000 and of this sum Wadia & Sons were responsible for orders worth £90,500. The Bombay agency therefore provided 56% of the company's work from India. The relationship between Wadia & Sons and Hick Hargreaves was a close one. Nusserwanjee Nowrosjee Wadia became a shareholder in the company when he

bought four thousand shares from Harman Hargreaves in 1925. No other gesture could best express the affinity between the Lancashire engineering firm and its Bombay agents. This 'famous house of Wadias' was one of 'many individual business groups' that collaborated with British enterprise in India during the 19th century. The Wadias belonged to the Parsi group, the most important section of that part of Indian society which was attracted to European economic activity in Bombay, entering first the trading and business communites of western India, and then its industry. The Wadias were 'master ship-builders for the East India Company until the Bombay dockyard was closed in the middle of the nineteenth century'. The Wadia family, from shipwrights in the Bombay docks, became 'the most successful and forward-thinking of the Bombay mill-owning families'. By the 1920s, N. Wadia & Sons were one of the five 'great family-based managing agencies' in Bombay, controlling 'over half the spindles and looms in the city'. According to Bagchi, the Parsis possessed 'some special advantages over' other Indian classes, one of which was the absence of a caste system. Indeed, 'no gainful occupation was shameful to them'. This 'made them more flexible in their trading methods, and conferred some initial advantage on them in technical education'. In the Bombay of the interwar period, the Parsis 'continued to be the dominant entrepreneurial group' and among those who made their mark at this time was Sir Ness Wadia. He 'made the Bombay Dyeing and Manufacturing Company one of the best cotton mills in India'.

As a result of their long association with the British, and their business methods, language and culture, the Wadias possessed a westernised outlook. The Wadia family like others in the 'inner circle' of Bombay millowners 'sent their sons to England to be educated'. Sir Ness Wadia himself 'received a technological education in Lancashire', becoming a M.I. Mech. E., in 1902. He was not the only member of the

'modern-minded Wadias' to receive a technical education, a formative experience that may explain why the Wadias became the 'most successful' of the Parsi millowners. By the late Twenties, the Wadias 'controlled the Bombay Dyeing, Spring and Textile mills and a total of 180,296 spindles and 4,810 looms'. Sir Ness Wadia was the most 'prominent' of the Wadia family and 'something of a spokesman for the millowners', leading 'them in their various campaigns to straighten out their lines of supply and gain certain political concessions. Of the millowners, he was the supreme manipulator and had well developed contacts with government'. Sir Ness Wadia's 'modern approach to business' tended to make him 'something of a maverick'. Nonetheless he was 'one of the chief architects of the Bombay-Lancashire rapprochement through his secret activities in Lancashire'.[17]

III

After the collapse of the postwar boom in India the prospects for British trade in this market became clouded. A decline in world trade in 1920-21 had caused the rupee exchange to fall and from 1920 to 1923 the 'Government of India faced a major financial and exchange crisis'. The rupee's rapid depreciation played havoc with importers who had ordered goods under a strong rupee and were compelled to pay for them with a depreciated currency. They protested 'vigorously' to the Government, while the difficulties faced by an exporting firm such as Hick Hargreaves were illustrated by the Notes on Drafts provided by their Calcutta agents. Merchant houses like McLeod & Co. were the link between manufacturers at home and buyers within India. This linkage was severely tested in the Twenties as the role played by the Indian economy vis-a-vis Britain altered. In these years India was still 'running up visible trade surpluses with most areas of the world to meet a visible

and invisible deficit with Britain'. But by 1931, 'for the first time since the 1880s, Britain imported more from India than she exported to her', a feature of trade that marked Britain's declining importance 'as a supplier of Indian imports and of the increasing importance of Britain as a market for Indian exports'. Basic to this adjustment of India's pivotal role within Britain's multilateral pattern of settlements was the 'decreased marketability of staple British exports in India'. Manufacturers of staple goods who, in 1913, had found India the 'largest single market for British exports of cotton piecegoods, iron and steel manufactures and general and electrical machinery', were subsequently confronted by the 'growth of protected import-substitution in India and the decreasing competitiveness of British goods against both indigenous manufacturers and foreign competitors'.[18]

Cotton textiles are the classic example of industrial decline caused by import-substitution and heightened competition in those export markets that had hitherto accounted for a large proportion of output. In 1913-14 Lancashire's piece goods had formed 94% of India's imports in this category, by 1938-39 the proportion was 32%. This experience was not unique to cotton. British electrical and general machinery had shares of 79% and 92% respectively in 1913-14, but on the eve of the Second World War they had both declined to 57% of India's imports in these classes. In 1924, the value of British engineering exports to India was £12m., representing 4.2% of production. By 1935, the engineering exports to India had fallen in value to £7m., or 2% of production. By the close of the Thirties India had 'regular visible deficits' with only two industrialised nations. One of these was Germany, 'an important supplier of capital goods as well as of consumer goods'. India apparently offered opportunities to German manufacturers that were not taken up by manufacturers at home, who failed to adapt to India's new requirements. According to Tomlinson, private British

overseas and expatriate investment was 'virtually stagnant' between the wars. Between 1921 and 1938, industrial investment in several private sectors of the Indian economy, 'showed a rise of only £17m'. But estimated new investment in Indian industry amounted to £144m. over the same period on the basis of the value of imported machinery and millwork.[19]

Hick Hargreaves link with the Indian market was through its agencies in Bombay and Calcutta. Tomlinson argues that this established linkage between British industry and the foreign purchaser was a source of weakness after the Great War. He asserts that throughout the interwar period the 'performance of established British based companies dealing with India was mixed', with 'some evidence to suggest that several of the major firms that had dominated India's foreign trade' before 1914 restricted 'their operations in the 1920s'. Indeed, as early as 1919, the British Trade Commissioner was 'expressing disquiet at the lack of enterprise being shown by British expatriate entrepreneurs and the implications of this for the successful marketing of British exports:

> The attitude of the old-established conservative and yet powerful British merchant houses in Calcutta and Bombay, through whose hands in the past both the export and the import trade of the country was transacted, had undergone a gradual change of recent years. During the war... they have amassed considerable fortunes without any particular effort, and are consequently now inclined to confine their attentions to the most lucrative and least troublesome branches of trade... [In the case of engineering]... The large engineering firms are also now so interested in managing local engineering works that they cannot be expected to pay the same attention to the interests of those United Kingdom engineers whom

they represent, and in certain cases their manufacturing and their distributing interests clash.

In Tomlinson's opinion the 'defects in the marketing networks of British manufacturers were providing opportunities for their rivals' from the outset of peace. American engineering firms, 'prospering as a result of technical collaboration agreements with the Tata Iron and Steel Company, dominated the market for public utility enterprises'. However, by the Thirties some of the 'major Calcutta business houses' were taking advantage of the 'new opportunities for industrial expansion... especially in civil engineering and steel manufacture, and also set up insurance firms and investment companies'. The interwar period also 'witnessed a number of mergers as large companies took control over smaller concerns. Yet what is more striking is the conservatism of expatriate enterprise. Very few established managing agency houses made any attempt to expand their operations into the "new" industries being developed in the 1930s, and those that did acted only in collaboration with British-based corporations'. The entrepreneur who was active in fields such as cement, paper, chemicals and electrical goods, was more likely to be Indian than British. Tomlinson concludes that India's changing relationship with the world economy after 1919 'did not necessarily mean the end of her links with Britain. What it did mean was that the firms and individuals who created and exploited such links had to adapt their activities. The traditional sectors of the British metropolitan and expatriate communities seem to have been unable, or unwilling, to do so'.[20]

Given the circumstances of the Twenties a timely adaptation into new ventures may not have been the appropriate option to pursue by the agency houses. A pragmatic approach might have appeared preferable at a time when protectionist ideas were gaining expression through the

activities of the Tariff Board and currency instability was interfering with trade. Nonetheless, opportunities did exist for British manufacturing. Indian customs duties had been low in 1914, standing at a level of 3.5% for cotton textiles. By 1921 the general rate and duty on cotton stood at 11%, with duties on such luxury goods as sugar higher still. The Government of India's increasing reliance on customs revenue proved a stronger stimulus to the growth of import substituting industries than the activities of the Tariff Board, whose aim was to grant protection to those industries possessing the potential for growth. In 1922 the general rate reached 15% and was increased to 25% in 1931 when certain classes of goods, such as machinery and rolling stock, were admitted at lower rates. Throughout the decade Lancashire's textile industry was penalised by India's tariff policy, but engineering was presented with opportunities to profit from the scale of duties on luxury items. 'By the early 1930s some protective tariffs had... reached remarkable levels, imported sugar being charged at 190 per cent in 1931', so that 'it is hardly surprising that imports of sugar mill machinery increased in real terms by 3000 per cent between 1928 and 1933'. Lancashire's engineering firms might have been expected to gain from an Indian textile industry able to satisfy the needs of a protected home market. But the Bombay cotton industry like that in Lancashire was in difficulties for much of the decade. The rupee exchange charts the progress of the Indian economy after the collapse of the gold exchange standard in 1917. Wartime demands for India's primary goods required stringent exchange controls to ensure that rupees were only bought for essential war supplies, while 'new techniques of currency management' arose with the high levels of wartime expenditure that led to an expansion of the currency and price inflation. After the war, Government officials were reluctant to pursue an active monetary policy and looked to the adoption of an automatic, self-regulating system of

currency management. Meanwhile, the rupee exchange was free to rise. By the end of 1919 the rupee exchange had been pushed well above its prewar rate of 1s.4d. sterling to a value of 2s.4d., partly because of the rise in the world price of silver, which raised the bullion value of the rupee, and partly because of a deterioration in the sterling/dollar exchange. The self-regulating system chosen for the Indian currency was the gold standard, with the rupee at 2s. gold. This was the 'optimum level... needed to ensure stability against rises in the price of silver while minimising disruption of trade'. From February, 1920, India possessed a gold standard rupee. 'By September the new monetary policy lay in ruins'.[21]

A slump in trade, 'a balance of payments deficit and massive speculation' resulted in a currency crisis. In response, the monetary authorities 'consciously refrained from any action to influence the rupee exchange rate for four years, during which time the rate fell to 1s.3d. sterling in early 1921 and then rose slowly to 1s.6d. sterling by late 1924 as world demand for Indian exports increased'. The problem of the rupee exchange reflected in part the collapse of the Indian postwar boom from 1921-22. This 'was particularly severe in certain sections of the Bombay mill industry, and in contrast to the general recovery in the Indian economy after 1924, this industry experienced a slump, and even at times depression, throughout the whole of the 1923-30 period'. Consequently, the value of cotton textile machinery imports declined markedly, while Bombay's share of Indian textile production was reduced. By 1926 almost 14% of Bombay's mills were closed, although the 'mill industry itself did not suffer universal decline. Certain agencies, notable Tatas and Wadias, remained reasonably strong'. Bombay's problems stemmed from the collapse of the Chinese market for its yarn and the vulnerability of the home market to highly efficient Japanese competition. The volume of Japanese imports was small by comparison

with Indian production, but they threatened to drive the price of the Indian product down. Bombay was particularly sensitive to this threat because labour costs, having risen with the boom, proved inflexible in the slump, while the high degree of capitalisation undertaken in the boom aggravated the problem created by the industry's large stocks of unsold cloth and yarn. To some extent average wholesale cloth prices recovered from the slump to 'resettle well above the pre-boom level. But the problem was not so much prices as the saleability of the product and the failure of costs to readjust'. The Bombay industrialists identified their troubles with the Government of India's monetary, taxation and tariff policies and strove hard to influence these so that they accorded with the ideas of the Bombay school of economic thought. At the time that the gold standard was discussed there was unanimity between the Bombay school and orthodox opinion on the desirability of a gold standard rupee. But the Bombay school wished to depreciate the rupee exchange to 1s.4d. sterling in order to raise prices. Bombay had long called for the adoption of the gold standard so that control of monetary policy could be removed from the hands of the India Office, while Manchester and City interests would no longer 'manipulate' India's currency.[22]

Further fears of a currency crisis in the mid-Twenties led the Government to sell rupees as the rupee exchange hardened above 1s.6d. Once again, the Bombay millowners were moved to criticise the Government's foreign exchange policy and the monetary measures required to maintain the exchange at 1s.6d. The millowners disliked the apparent overvaluation of the rupee, which 'in 1926 was seen as a device to stunt India's industrial growth and to open up the internal market to artificially cheapened imports'. Moreover, they 'had always advocated a cheap money policy to stimulate industrial growth and welcomed currency inflation as a way of easing credit and raising internal prices and

purchasing power'. Opinion in Bombay was represented on the Hilton-Young Commission, which enquired into the rupee exchange. The findings of the commission majority recommended a rupee exchange of 1s.6d., or a rupee 'fixed at Rs. 13.33 to the (gold) pound sterling'. The minute of dissent that reflected Bombay's views favoured a 1s.4d. rupee and was penned by Sir Purshotamdas Thakurdas, who was a cotton exporter and mill director, the leading figure in two business associations, and like Sir Ness Wadia, an associate of European firms.[23]

In Tomlinson's opinion, the 'most interesting of the many questions raised in the course of the ratio controversy is that of the role that Government saw for its monetary policy in the development of the Indian economy'. Here there is 'no evidence to suggest that the Indian authorities advocated a high ratio to benefit British exporters or to make Government remittances to London cheaper'. Officials believed that imports would not rise significantly with a 1s.6d. rupee because prices had adjusted to that ratio. Moreover, the experience of Government since 1917 'had convinced officials that monetary policy ought to be passive rather than active: no amount of concern for the interests of Indian commerce, nor provision of emergency currency, could produce a monetary policy as efficient or as smoothly working as that which would result from linking the Indian currency system to the world economy through the gold standard'. The Bombay cotton magnates were unimpressed by Government currency policy and suspicious of its motives. But any currency policy 'in the colonial Indian setting' was open to attack, irrespective of whether it depreciated or appreciated the rupee exchange. If Government allowed the rupee exchange to fall, it could be accused, 'from the point of view of certain English businessmen, of encouraging indigenous industrial expansion at the expense of British industry', while the rupees appreciation laid the Government open to the charge 'of mulcting the Indian taxpayer; of inhibiting Indian industry

and agricultural exports; or of causing scarce capital'. The Bombay industrialists in their agitation for a classical gold standard were really concerned with the exchange ratio, 'although a gold standard was desirable in that it prevented government from "manipulating" the ratio'. To the industrialists, an artifically high ratio involved 'the creation of monetary stringency'. Worse still, a 1s.6d. rupee 'amounted to a 12.5 per cent bounty for foreign imports at the expense of the Indian producer. This was the most common argument put forward, and was related especially to the decline of the Bombay textile industry in the 1920s and early 1930s'.[24]

Opposition to the recommendations of the Hilton-Young Commission, particularly its support of a 1s.6d. ratio, was carefully marshalled through the Indian press, which had millowning proprietors and directors. The Bombay industrialists also established their own press agency, the Free Press of India, 'founded in 1924, and run by a coalition of Bombay industrialists and journalists'. This had financial ties with the Indian Currency League, established in 1926 by forty industrialists and employed as a 'vehicle of propaganda'. It was through the F.P.I. that currency propaganda reached a number of newspapers and in addition to a remuneration from the Currency League, the F.P.I. obtained a contribution from the Bombay Millowners' Association. At another level, the industrialists cultivated support for their ideas in the Assembly via the Swaraj Party, who needed the financial support offered by Bombay interests. Unfortunately, Sir Ness Wadia's pledge of Rs. 25,000 for the party from the millowners was not fulfilled, despite 'the fact that the Swarajists had already supported them during the 1925 Assembly Session. This failure led Nehru to comment caustically: "It is rather difficult for me, a commoner, to understand the ways of the merchant princes. I thought the promise made by Mr Wadia had no connection with the state of the money market"'. The

threat posed by the millowners to Government currency policy was potentially great. In 1926, they could count on the support of the Swarajists and the newly formed Indian Nationalist Party who, with the Independents, such as Jinnah, possessed a majority in the Assembly. In practice the Government was able to weaken the alliance that opposed it by dividing the accord between the Swarajists and industrialists. The offer, in 1930, 'of protection for the Bombay mills in return for acceptance of imperial preferences' was one measure that tended to increase 'the suspicion of the Swarajists concerning the motives of the industrialists'.[25]

A clear theme in the agitation of the Bombay industrialists 'was their persistent equation of government's currency policy with the recession'. As well as presenting a guilty party to those who fell victim to the slump, the Government's currency policy conveniently lent itself to the 'general conspiracy theory of British economic policy towards India'. According to this theory, currency policy was 'a weapon used by England for the purpose of killing India's economic renaissance, and a "high" ratio was held to be in conformity with Britain's, and particularly Lancashire's, mercantilist tendencies'. Yet it was Japanese cotton imports which spurred the Bombay industrialists to seek greater tariff protection, and following a poor year in 1925, they prompted the Government into appointing a Tariff Board to enquire into the textile industry. The report was something of a mixed blessing, because the recommendation that an additional duty should be levied was accompanied with evidence which confirmed the growing suspicions of middle class investors, 'that the plight of the mills was in part due to bad management'. The Government's response was to ignore the Board's recommendations which led to further agitation on the part of the millowners. This moderated the Government's attitude, but the issue of protection for Bombay was now complicated by the offer of imperial

preferences in return for Indian tariffs.[26]

Imperial preference was the issue that deprived the millowners of support in the Assembly and 'placed both the Bombay millowners and the Bombay press in a dilemma. On the one hand, it was felt that without additional protection the Bombay mill industry, and the city with it, would "go to the wall", while on the other the idea of offering preferences to Lancashire was anathema to the nationalist press, and the millowners also had to condemn it in public, if not in private'. In Bombay, the Lancashire lobby was perceived as the bogey that lay behind Government policy. Nonetheless, 'it was the Bombay millowners who approached Lancashire in 1925 and secretly offered preferences in return for protection'. Sir Ness Wadia was the millowners emissary, secretly visiting Lancashire in 1925 and 1927. It was he who 'first hinted to Lancashire that Bombay, feeling its main competition to be from Japan, might be willing to accept preferences for Lancashire'. This was at a time when Wadias colleagues were publicly spurning the notion of imperial preference. Wadia, as one of the 'chief architects of the Bombay-Lancashire rapprochement', took the first steps that led to the controversial Mody-Lees pact of 1933 between the Bombay Millowners' Association and Lancashire.[27]

IV

Throughout the Twenties the difficulties of trading with a depressed and competitive market were intensified by a fluctuating rupee exchange. The strong rupee of December, 1919, with a value of 2s. 4d., found temporary stability at a fixed rate of 2s. gold in February, 1920, before a collapse to 1s. 10d. sterling by September, 1920. Over the next six months, the rupee's market value fell lower still and for the remainder of the decade the rupee exchange was set by the free market. In 1923, the demand for India's primary goods raised the rupee exchange

to 1s. 4d. and Hick Hargreaves received certain Notes On Drafts that were meant to promote the payment of the company's goods in India.[28] The Notes dealt with two methods of payment, one of which was illustrated by means of an hypothetical sale to Sir Sarupchand Hukumchand through McLeod & Co., who were responsible for the Notes. One form of payment involved Documents In Acceptance and McLeod & Co. remarked that it had become an 'extremely dangerous practice to draw a D/A or Document on Acceptance draft on a foreign client. In the case of a manufacturing firm selling through their agent abroad, who is strong financially, and guarantees del credere, it is quite permissible to draw on D/A draft on the agent, as he may wish to take delivery of the goods and make partial deliveries, or indeed partly finance a contract'. However, in the case of India 'D/A bills on India are unacceptable by Banks in England. As a matter of fact during the trade slump last year no Bank in London would buy a D/A draft even for a well known firm, for anything like a large amount'.

In cases where a D/A draft was 'refused acceptance or accepted and payment afterwards refused, recourse' was 'made to the drawer and he is the sufferer. In most countries where the law is strongly upheld the acceptor of a bill, who afterwards refuses payment, should be rigorously prosecuted, and mulcted in heavy damages, as the export business is largely financed by drafts and Exporters have to put themselves in funds by selling this paper to the Bank'. Indeed, the credit of an 'ordinary firm' could easily be destroyed by not very many dishonoured bills, and the Notes advised that 'every case should be strongly dealt with'. India presented special difficulties because

> the political situation unfortunately is such that the Native appears to be pampered at the expense of the Europeans; he cheerfully throws up drafts when it

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> pleases him and loves litigation. The state of the Courts out there is unfortunately so congested that it may be months and even years before an action brought against an Indian client would be due for hearing, and in the meantime important witnesses may be absent and the bias anyhow seems to be against the European firm. Should a D/A draft at long usance be drawn enabling the client to get possession of the machinery he has enough time between acceptance and payment of the draft to find all sorts of faults and raise endless quibbles which he will do if it can benefit him at all. The only cure for this is to draw at short usance with the instructions (documents on payment) clearly written on the draft.

In order 'to protect the credit of the exporting house', the draft should be written out in such a way that in case of need it could be referred to the agency house in India. The example of a draft provided with the Notes, showed how McLeod & Co. would be empowered to exercise such a protective role.

The second method by which exported machinery was financed involved Documents On Payment. This may have been the preferred means of payment, because an example of such a draft was provided in the Notes. Before presenting this example, the Notes provided detailed advice on, for example, the implications of a f.o.b. transaction, where freight and insurance was not prepaid. Banks, it was noted, played an active role in trade by means of 'the system of making partial deliveries either against payments or trust receipts', in order 'to encourage small importers of integrity'. The Notes explained that the 'system of trust receipts' had originated in America, and was 'simply an undertaking which the Acceptor of a D/P bill at a foreign port signs in order to obtain delivery of the goods before he retires the bill'. The Acceptor recognised 'the bank's lien on the merchandise' and undertook 'to sell

and pay the proceeds into the Bank as soon as received'. This system of partial deliveries was assisted by the banks' possession of storage accommodation (godowns) which allowed them to check deliveries. At times of brisk business, it was 'possible for a firm to turn over the whole of a shipment received in partial deliveries within say 30 days against a bill drawn at 90 days. In this case they get a rebate representing the difference in interest charged for the longer usance of which they have not availed themselves'. The Notes advised that it was 'better to draw a sterling bill on a foreign country with different currency than an exchange bill and for this reason quotations should, where possible, be in sterling to prevent the question of exchange arising'. But where an exchange bill was used in a sale, it was wise to endorse the draft with the rate of exchange, as quoted by the bank. This system worked well, provided 'the rate of exchange is not too much against the foreign drawee when times for payment arrives'. If this proved the case a dispute could arise between the drawer and drawee of the bill. Banks had adopted 'the habit lately of quoting the drawer of the bill the rate of exchange and insisting on him endorsing it', so that a dispute arising out of the bill's presentation, would be referred to the drawer 'for settlement between the drawee and himself. Trouble', the Notes advised, 'can be obviated by the drawer immediately he ascertains the rate of exchange from the Bank cabling this rate to the drawee for his confirmation which should ensure the Bill going through without trouble'.

In the example of a D/P draft, it was 'assumed that Hick Hargreaves received an order direct from Sir Sarupchand Hukumchand of Calcutta for machinery to the value of £15,000 ...to be paid for in sterling by means of a 60 days' sight draft on the client'. The procedure was 'to draw a sterling draft, as per sample, in duplicate (first and second of exchange) and attach to it a complete set of documents, consisting of

Bills of Lading in triplicate, invoices, insurance policy, etc'. The drawer endorsed the draft 'and the Bills of Lading and Insurance Policy' were 'made out to order and similarly endorsed, thus constituting a blank endorsement, and establishing the Banks title to possession of the goods as collateral security'. The bank split the documents, forwarding 'one set with the first of exchange' and 'the other set or sets with the second of exchange by separate mail (usually the following week). On arrival abroad in the present case (i.e. a D/P draft) the bank' detached the draft and presented it to the client, who wrote 'accepted across the face of the bill'. He then signed and returned 'it to the bank with his cheque'. Delivery of the shipping documents had now taken place and from the point of view of the bank, the transaction was complete. Following the sale of the draft to the bank, the drawer advised the drawee 'by first mail that shipment of his order' had been made, and that he had 'drawn a sterling bill at ___ exchange, mentioning the rate and usance and asking his clients protection of the draft on presentation. A similar letter' was written to McLeod & Co., Calcutta, 'to whom recourse' would 'be made in case of dispute'.

The Notes On Drafts reveal the extent to which a manufacturing enterprise such as Hick Hargreaves was dependent on its agents in India. The value of McLeod & Co.'s expertise in promoting sales was enhanced by the problems that a fluctuating rupee brought to the market for mill machinery. When that market fell in Bombay, following the collapse of the rupee exchange, Wadia & Sons managed to avert the wholesale cancellation of engine jobs currently being undertaken by Hick Hargreaves, thereby enhancing their worth as agents. Saving orders was just as important as winning contracts. Two engine jobs placed by McLeod Russel in 1920 were cancelled and struck off, but not the nine orders placed by Wadia. These were apparently fulfilled. The cancellation of the two Indian orders first came before the Board in

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April, 1921, when it was noted that the Keshoram Podder Co. had cancelled their order (E20/20) 'for Engines, Boilers and Gearing' to the value of £64,759. The clients wished 'to reduce the order by half', which meant 'putting down the H.P. side of the Engine only, with half quantity of Boilers and Gearing for 25,000 Spindles and 600 looms, thus reducing the contract price to £49,759'. There was an alternative, the whole order could be cancelled. In which event Hick Hargreaves 'would claim 15% of the total contract price viz., £9,714', a sum refunded if the job was 'proceeded with in two years'. The Kalyanmal Mills also sought a reduction in the 'Original gearing contract value £31,070...to £13,030; Engines and Boilers unaffected'. It was noted: These people are in financial difficulties, and wish to make some reduction in the order we have in hand. They suggest reducing the Gearing to cover 7,000 Spindles with 208 looms, for which we have quoted the sum of £13,030, making a reduction of £18,040 on the gearing contract'.[29]

A more serious loss was the cancellation of the whole of the Benjamin Mills order (E13/20) placed through McLeod Russel and amounting to £37,467. Once Hick Hargreaves had 'sufficient information' from the sub-contractors responsible for gearing and machinery the company was able to arrive 'at an amount to cover cancellation'. The minutes also recorded a degree of acrimony between the firm and the mill company: 'It might be as well to mention that they put forward the claim that had we been up to time with delivery, they would have taken over the plant before the fall in the value of the rupee came about'. By July, 1921, the Benjamin Mills contract had been 'definitely cancelled and the majority of the work transferred to E21/20', freeing the company to pursue its claim for compensation. By design or good fortune the partially completed Benjamin Mills engine was the 'duplicate of the one recently ordered by Messrs Menzies', and five of the six Benjamin boilers could be used for the same contract. Thus an engine and steam

raising plant originally intended for Calcutta was installed in the Presidency mill, Bombay. In order to safeguard Hick Hargreaves interests in the Benjamin Mills contract, the Board were prepared to grant Power of Attorney to McLeod Russel & Co. and the 'proper steps' were discussed with Sir Charles McLeod. These arrangements were disturbed by rumour from one of the sub-contractors that McLeod & Co., Calcutta, 'had made them an offer to take over their part of the work...at contract prices'. While Sir Charles McLeod clarified this point with the Calcutta house, the Power of Attorney was left incomplete. A year later, in the Summer of 1922, a settlement of Hick Hargreaves claim had still to be reached.[30]

The cancellation of mill contracts was not confined to the Calcutta market alone. Power of Attorney was awarded to Wadia & Sons in June, 1921, 'to enable Messrs. Wadia's to act on our behalf in connection with the various Indian Orders pending cancellation'. Why this was necessary became clear in October when Madden 'reported on the position of the following contracts:

E 15 Engine for The Ahmedabad Cotton Waste & Mfg Co.

E 22 Engine, Boilers & Millgearing for The Silver Cotton Mills

E 23 Engine & Boilers for The Ahmedabad New Laxmi Cotton Mills

E 24 Engine & Boilers for The Swadeshi Laxmi Cotton Mills'.

The companies behind these contracts 'had endeavoured to cancel' their orders, but 'acting on Mr. Wadia's recommendations on his arrival home in June', Hick Hargreaves had 'proceeded with the work'. The Board 'agreed that we should continue...with these contracts for shipment as early as possible, including the Beeley's Boilers involved'. Madden

'pointed out that the work on the Engine and Boilers for the Swadeshi Laxmi Mills was at present suspended...pending further news from Bombay'. Another contract causing concern was E 19/20, ordered through Wadia by Ramanlal Kashavlal & Co. for mills at Petlad. This company had 'refused to accept the Beeley's Boilers supplied', and following 'offers' and 'counter offers', they had filed a lawsuit against Hick Hargreaves. The dispute with the Petlad Mills was still unresolved at the close of 1921, but the Board had decided to act on the contents of a cable received from Wadia & Sons and leave 'the question of settlement...in Mr. Wadia's hands to make the best terms possible on our behalf'. Wadia had also cabled the firm concerning the Silver Mills job, 'asking for a reduction of £530 on each of the two Boilers supplied, together with a reduction in the supplementary charges on the Engine to the extent of £480'. The Board agreed to concede 'the claim on the Boilers', but allow only half the supplementary charges on the engine, 'making a total reduction of £1,300. Against this Beeleys have already agreed to allow us the sum of £720 on these two Boilers'. Elsewhere, Wadia's handling of the cancelled contracts was soon producing results favourable to the company. In January, 1922, the minutes 'reported on the settlement which had been arrived at regarding the seven Boilers for Petlad, Silver, Ahmedabad New Laxmi, and Swadeshi Laxmi Mills'. Although the company incurred a net loss of £525, it was noted that this sum included 'an amount of £240 for Supplementary Charges, which was not really entitled to come under the Boiler settlement, and if this amount were deleted, the net loss on the Boilers would then be £285, or approximately £41 per Boiler. The Board considered this to be a very favourable settlement'. However, the two engines ordered as E 23 and E 24 remained 'under suspension'.[31]

Wadia & Sons success in placating those Indian mill owners who had threatened to cancel their contracts brought its reward to the agency.

Hick Hargreaves and Beeley arranged to 'ask Messrs. Wadia to act as joint agents with regard to the sale of Boilers in India'. It may not have been coincidental that the minutes should note the arrival of a 'similar proposal' for a boiler agreement from Wadia at the time of the boiler settlement. Six months later, a Boiler Agreement was concluded between Messrs. Wadia, Beeley and Hick Hargreaves and a month afterwards, in July, 1922, Madden reported that the firm 'had settled the cancellation of the Swadeshi Laxmi Engine (E 24/20) for £2,000'. Wadia's negotiations on the company's behalf concerning the Ahmedabad New Laxmi contract were continuing. But in this case, the company had 'offered to accept cancellation for £2,230 and the withdrawal of all claims for Interest on the deposit paid when the order was placed'. In October, Madden disclosed that a settlement had been reached 'in connection with the cancellation of the Engine Contract, these friends having made us a payment of £2,315 in full settlement'.[32]

In the same month, Hick Hargreaves received an order for a 1500 H.P. engine from the Benjamin Mills, Calcutta, through McLeod Russel. This new order was accepted for £9,750, with '£6,500 in cash, which represented the cost price of the engine, and £3,250 of 7% debentures, thereby cancelling our previous settlement in connection with the original contract for the Benjamin Mills'. That settlement - £3,000 of 7% debentures - had only recently been reached and fell short of the Board's demand for debentures equal to two-thirds of the company's claim of £6,130. The minutes testify that at least two of Wadia's engine contracts, E 23 and E 24, were not completed. However, Wadia's handling of the cancellations constituted a success for the agency. They had been instrumental in ameliorating a circumstance in which several partly completed engines seemed likely to be left on the company's hands. The minutes record no criticism of the company's Bombay agents. Indeed, they reveal how influential Wadia & Sons were in promoting the interests

of Hick Hargreaves, whilst mollifying the grievances of Indian power users penalised by the rupee's collapse.[33]

The prestige enjoyed by Wadia & Sons amongst the directors of Hick Hargreaves was such that the Bombay agents were able to influence the company's dealings with India. Wadia's did not respond passively to the company's bidding, for the agents had interests of their own to preserve. In January, 1922, Madden 'put before the Board a proposal to send a man out to India', because a direct representative of Hick Hargreaves in this market might be of 'considerable benefit' to the firm. A suitable member of staff was found and the Board discussed his salary and terms of employment. It was suggested that the appointment should last two years, with the possibility of an extension, and it was also noted that 'whilst Lever was in Bombay he would come under the control of Messrs. Wadia'. Madden's proposal was not a novel one, many British companies with interests in the Bombay market sent personal representatives to India. In some cases, according to Rutnagur, the representatives could be drawn from the highest reaches of the firm. This was true of John Musgrave & Sons, whose visitors to Bombay included Walter and Frank Musgrave. However, Madden's scheme came to an abrupt end, because of 'a cable from Messrs. Wadia stating that they did not recommend us to send out Lever'. No reason for Wadia's decision appears in the minutes, although a 'confirmatory letter' was sent by the agency.[34]

Six years later a similar event took place when the minutes noted the Chairman's wish for 'the Board to consider the desirability of Mr. Harman Hargreaves paying a visit to India on behalf of the Company in the coming Autumn'. The Chairman 'explained how Sir N. Wadia had frequently urged the importance of a Director visiting India from time to time and how this was regularly done by other and competitive Firms'. Moreover, in 'view of the importance of our Indian market and also of the special steps taken last year to improve our representation both in

Bombay and Calcutta', Robson 'felt that this year was a very suitable time for such a visit'. The Chairman's reference to 'special steps' meant Colledge's investigations into the work of the firm's agents in India in 1925-27. The Board agreed that Harman Hargreaves should visit India and arrangements for the trip were initiated. But at the next meeting, the Chairman quickly 'drew attention to the Resolution passed' at the previous meeting, because 'the Minute as written, did not quite represent his views on the subject; what he wished to convey to the Board at the last Meeting was that he felt this year was a very suitable time for Mr. Harman Hargreaves to visit India, but that such visit would be subject to the approval of Sir N. Wadia'. The reason for this alteration was soon apparent: Wadia's approval was not forthcoming. At the May meeting Madden gave a report of his discussion with Sir N. Wadia concerning the projected visit. Wadia 'had expressed the opinion that the present time was not suitable for Mr. Hargreaves to visit India owing to trade depression there', and he suggested that the visit 'be postponed until such time as the conditions in India had improved'. Harman Hargreaves then 'intimated that in view of the conditions referred to he was of the opinion that the visit should be definitely cancelled' and this was resolved by the Board.[35]

V

The wish of one Governor of Bombay in the 18th century had been for the settlement to become a 'mart of many peoples'. A century later Bombay was transformed into a manufacturing and trading centre, becoming a 'new Manchester-cum-Liverpool' of the East. Bombay's fortunes rested on exported cotton, first as a raw material and then as finished cloth. The first cotton mill had appeared in the 1850s and during the American Civil War a shares mania developed that extended beyond the price of

Indian cotton. Company promoters and commodity dealers thrived. These were 'silver times' for those caught up in the speculation, with its 'seething Share Market' and 'tiffin' at the club where one 'ordered a pint of champagne - no one ever drank anything but champagne in those days'. Bombay's 'Black Day' came with news of Appomattox. Prices fell and companies failed. But the crash did not irreparably depress the city's prosperity as a commercial and industrial centre. When the boom broke the fortunes of Dadabhoy Pestonji Wadia was one of those that suffered. His was one of the three original native firms who were among the dozen founder members of the Bombay Chamber of Commerce. The creation of the Chamber in 1836 followed the removal of Company monopolies and signified the presence of commercial dealings. The four established commercial houses remained aloof from the Chamber until the 1860s. One of these was Forbes & Co., an agency house founded by John Forbes, a young Scot who had sought his fortune in Bombay. The British community in Bombay was not the only one attracted by Bombay's offer of reward. The Sassoon family of Baghdad and other Sephardi Jewish families found Bombay more congenial than the Ottoman Empire. British India offered 'religious tolerance and trading opportunities' upon which the Sassoons prospered. David Sassoon, the patriarch of the family, was another Persian-speaking Baghdadis who found wealth and status as a British subject in Bombay. His eldest son, Abdullah, later wished to be called Albert and after settling in London became Sir Albert Sassoon, First Baronet of Kensington Gore.[36]

By 1875 there were 28 mills in Bombay and the city had become a focus for mill floatation, mill management and the sale of mill machinery. Maclean's Guide to Bombay of 1877 remarked: 'Building is ... constantly going on; and already there are numerous cotton mills, with their surroundings of labourers' houses stretching across the Flats from Tardeo all the way to Parell. Before the end of this century there will

be as many tall chimneys in this region as in any equal space of ground in Lancashire'. The cotton industry boomed from 1884, following the introduction of the Ring Spinning Frame on a large scale by Greaves Cotton & Co., who were for many years the sole British firm involved in mill floatation in Bombay. By 1895 the number of mills had grown to 70 and the industry continued to grow, notwithstanding the checks to growth through plague and famine. Between 1905 and 1925, nine mills were built, a smaller number than in earlier periods but with a capacity greater than that known hitherto. Moreover, there were 'large extensions made in existing factories during 1915-25'. It was a feature of the industry, that control of the mills was exercised by mill agencies. These managing houses fell into several ethnic groups, with the European or British mill agents relative latecomers to mill floatation and management. In 1924-25 there were five British agencies in Bombay, managing eleven mills. Greaves Cotton had by now retired from this activity, devoting their energies to the sale of machinery. W. H. Brady & Co. were both mill agents and sellers of engineering plant. As mill agents Brady & Co. had control of 5 mills, 'or nearly 40% of the spinning power of the total of the European Agencies'. In the Jewish community there were 3 mill agencies controlling 14 mills, each agency bearing the name Sassoon. The European, Muslim and Jewish houses were, however, overshadowed by the Parsi and Hindu agencies and the mills they managed. Among the Parsis Nowrosjee Wadia & Sons were the agents for the Bombay Dyeing and Manufacturing Co. Ltd. of which Sir Ness Wadia was managing director. The Spring and Textile mills that made up this firm, along with the Bombay Dye Works, possessed a total of 180,296 spindles and 4,810 looms. Wadia & Sons, the textile company, had 'two of the most successful and prosperous of cotton mills in the city'.[37]

3

Wadia & Sons were also one of the oldest of Bombay's agencies for machinery, representing ten engineering and specialist mill suppliers, such as Wilson Bros., Liverpool, manufacturers of Bobbins and Shuttles. Wadia's had 'designed and equipped a large number of cotton spinning and weaving mills complete with power plants, gearing and other accessories', and as a result they had become 'closely associated with the Indian business of Messrs. Platt Brothers ... and Hick Hargreaves'. Bombay's emergence as a textile centre had promoted the creation of machinery agencies, and by 1925 there were over a dozen firms representing the interests of predominantly British manufacturers. Greaves Cotton was one of the earliest of the agencies and in 1925 it imported the steam-power plant of Yates & Thom, Blackburn, the steam turbines of Daniel Adamson & Co., Dukinfield, and the oil engines and pumps of Ruston & Hornsby, Lincoln. Another well established agency, and one with ties with Hick Hargreaves, was Sorabji Shapurji & Co., a Parsi firm, who represented the interests of Carels Diesel & Steam Engines (London) Ltd., builders of steam and uniflow engines. W.H. Brady, the machinery importers, represented W.H. Allen Sons & Co., Bedford, makers of engines and pumps, while the oil engines of Petters Ltd., Yeovil, and the electric motors and generators of British Thomson-Houston, Rugby, were imported through the agency of Turner Hoare & Co.[38]

Hick Hargreaves competitors had well established links with the Bombay market for the supply of engines and boilers. Galloways were represented through a branch of the British export house of Felber Jucker & Co., while John Musgrave & Sons and Marshall Sons & Co. had their own branch offices, staffed with technical experts and 'business canvassers'. Marshall's were one of the first engine and machinery builders to establish a branch office and showroom in Bombay. From 1919, Marshall Sons & Co. (India) Ltd., represented the parent company

and several other firms, including Blackstone & Co., Stamford, builders of oil engines. Musgrave's Bombay office was directed by D.H. Yates, M.I. Mech. E., M.I. Struct. E., 'whose experience and technical knowledge of power plants' had proved 'of service to the local millowners and engineers'. Mather & Platt, the Manchester firm of textile bleaching and finishing machinery manufacturers, had, from their arrival in Bombay in 1896, maintained an office of their own, although local agencies, such as Wadia & Sons, did 'handle the different specialities of the firm'. The engines and millgearing of George Saxon were imported through H.M. Mehta & Co., who had particularly strong ties with Lancashire 'being closely associated with the expanse of the Indian business of Messrs. Dobson & Barlow, Ltd., Kay and Wilkinson, Hacking & Co. Ltd., Wilson & Co., (Barnsley) Ltd., and other well known Lancashire manufacturers and mill suppliers'.[39]

Macbeth Brothers & Co. was another agency with strong links with Bolton having been founded by a representative of J. and E. Wood in 1885. Forty years later, J. and E. Wood had ceased to exist, the firm's drawings, patterns and goodwill acquired by Musgrave, but Macbeth & Co. remained in business, representing Norris Henry & Gardners, Ltd., oil engine builders, Manchester. Holt & Co.'s agency represented the steam engine manufacturers Scott & Hodgson, whose last steam engines were sent to India in 1927. Bolton had a particularly strong interest in the Bombay market for mill machinery and supplies. Dobson & Barlow, the manufacturers of spinning machinery, had developed their business with Bombay through Mehta, as had Joshua Kershaw & Sons, suppliers of roller skins, while several other Bolton firms were dependent on demand from Bombay. These firms included Jackson & Brother Ltd., calender bowl makers; William Ryder Ltd., spindle and flyer manufacturers; John Tayler & Sons, suppliers of cotton driving ropes; William Walker & Sons, tanners, curriers and leather belting manufacturers and William Edge &

Sons, suppliers of bleachers blue cloth softening, soluable grease and Edge's "Dolly" Blue. The majority of Mehta's clients were Lancashire firms and included Hacking & Co., of Bury, makers of weaving machinery; J. Hodgkinson & Son, Blackburn, suppliers of shuttles and Hardman Ingman & Dawson Ltd., Oldham, manufacturers of cotton ropes and bandings. But Mehta were also the agents for the Hurburger Gummiwaren Fabrik, a German supplier of rubber goods.[40]

Volkart Brothers had been founded when the Bombay cotton industry first developed and had played a leading role in opening the market in India to Continental manufacturers. By the 1920s, Volkart Brothers commanded a 'buying and selling organisation consisting of nine branches in India, Ceylon and the Straits, and 163 agencies working under them'. It had control over '13 cotton and coir yarn presses, 9 cotton ginning plants and 1 coffee factory', providing employment to over 2,600 employees and '5,150 day labourers and coolies'. Winterthur, Switzerland, was the firm's headquarters for many years, but in 1868 a branch office was opened in London. After the Great War branches were established in Bremen (1920), New York (1922), and Hamburg (1925), and at each one there was 'an extensive but close net of independent selling and buying agents'. In Japan, Volkart Brothers founded the Nichizui Trading Co. Ltd., Osaka (1919), which also controlled 'numerous agencies'. By the 1920s, Volkart Brothers were dealing 'in practically all the important products of India', but to the export of cotton 'they paid their first and foremost attention'. It's recent success here was evident from the way the firm, 'on various occasions, headed the list of exporters of this commodity in certain parts of the world'.[41]

Volkart Brothers had no hesitation in adding 'departments for power plants, electrical and textile machinery', so that by 1925 a wide range of Continental mill machinery and supplies were present in the Bombay market. The agency did not simply represent a loose collection of

Continental firms, whose interests complemented one another. Volkart Brothers were 'an effective combine... composed of specialists, each' producing 'his own set of machinery but all according to a common standard'. This combine, or Unionmatex as it was known, was made up of German specialists in the manufacture of textile machinery and was neither a price-fixing cartel, nor a market subverting trust. Following the war, German textile machinery makers had 'opened out Agencies in Bombay' in order to cater to the needs of the local market. Unionmatex was an expression of the German desire to produce the 'best machinery', while marketing it 'at the lowest cost'. Unionmatex was 'an alliance for purposes of consultation, co-ordination and sales', and Volkart Brothers of Bombay was the chosen agency for India. The combine was the means whereby internal competition was eliminated and standardisation of output attained through 'free and mutual consultations among the various staffs, experts and directors', to the extent that ranges of all textile machinery could 'be obtained as if all were made under one roof only'. In marketing their products abroad, the members of Unionmatex acted in unison through a 'central sales agency in Berlin'. Unionmatex could provide, via Volkart Brothers, cotton spinning machinery from the Deutsche Spinnereimaschenenbau A.G., Ingolstadt, Bavaria, or dyeing, bleaching and mercerising plant from Zittauer Maschinenfabrik A.G., Zittau, Saxony, that competed with the products of Dobson & Barlow and Mather & Platt. Of immediate concern to Hick Hargreaves was the association with Unionmatex of German engine and millwork builders, who were also represented by Volkart Brothers. This agency promoted the sale of diesel engines made by Machine Works Augsburg-Nuremberg Ltd. (M.A.N.), the turbines and electric machines of Brown Boveri & Co. Ltd., Baden, and the shafting and gearing of Eisenwerk Wulfel, Hannover.[42]

Volkart Brothers was 'one of the oldest of European houses in India', while one of the youngest was the Bombay office of Giacomo

Jucker, opened in 1922. This firm 'was incorporated in Europe in 1908 with the headquarters in Italy and branches in several parts of the world'. The Bombay branch were importers of 'textile and electrical machinery, humidifiers, card dust removing plants, silk plants and mill stores'. In these lines Giacomo Jucker represented Fratelli Marzoli & Co., of Palazzolo Sull'Oglio (Italy) for ring, doubling and spinning machinery; Webstuhl-und Webereimaschinenfabrik, Jagerndorf (Czecho-Slovakia) for weaving machinery and the Waggon-und Maschinenbau A.G., of Gorlitz (Germany) for finishing, dyeing and bleaching plant. As well as offering the products of several other textile machinery makers, Giacomo Jucker could provide the diesel engines of the Leobersdorf Machine Works Ltd., Leobersdorf (Vienna); the electric motors and generators of the Ganz Electric Co. Ltd., Budapest and the pumps and lighting sets of Ganz & Co., Danubius Ltd., also of Budapest.[43]

Foreign manufacturers were also represented by the British and Indian agencies in Bombay. Sorabji Shapurji promoted the millgearing manufactured by A.A. Van Acker of Ghent, while Brady & Co. were the agents for the Franklin Process Co., makers of dyeing machinery, and the Universal Winding Co., suppliers of 'Leesona Winding Machinery', both of Boston. Felber Jucker were the agents for "Etablissements" J. De Tayrae, Lille, makers of picking bands and chrome belting, while Marshall Sons & Co., represented the Continental Gin Co. of Alabama, builders of 'Saw Gins'. One British agency, Gannon Dunkerley, represented several British textile machinery and mill stores suppliers, but also acted in the interest of Continental firms. Stork Bros. of Hengelo, Netherlands, marketed their steam engines, turbines and boilers through Gannon Dunkerley, as did Dikkers of Hengelo, manufacturers of steam pumps and boiler fittings. In addition to those British manufacturers, such as Musgrave, Mather & Platt and Marshalls, who had established their own branch offices in Bombay, staffed by technical

experts of their choosing, there were several similar outlets representing the business of European companies. Two of these were the Swiss Locomotive & Machine Works Co., Winterthur, manufacturers of stationary and marine diesel engines for mill driving, and Sulzer Bruderer & Co., London. A British firm of agents, Duncan Stratton, represented Sulzer Bros., Winterthur, builders of steam and diesel engines.[44]

The demands of the textile industry in Bombay had attracted such a strong foreign presence that British firms were competing not only among themselves for textile orders, but with Continental companies. In the case of spinning machinery, firms like Howard & Bullough (Greaves Cotton), John Hetherington (Felber Jucker), Dobson & Barlow (Mehta & Co.), Tweedales & Smalley (Gannon Dunkerley) and Platt Bros. (Wadia & Sons) were in competition with the products of J.J. Rieter (Sulzer, Bruderer) and Unionmatex (Volkart Brothers). By 1925, Hick Hargreaves were exploiting the long established market for mill power by marketing diesel engines and steam turbines. According to Rutnagur's buyers' directory for steam engines, Hick Hargreaves were in competition with Yates & Thom, Musgrave, Carels Disel... Ltd., W.H. Allen, George Saxon and Belliss & Morcom, who boasted that they alone had installed over 140,000 h.p. in India. Belliss & Morcom were also manufacturers of geared turbines for mill driving and heavy oil engines. From the Continent, only Stork Bros. competed with the numerous British firms in the market for steam engines. Listed under 'Engineers & Millwrights', Hick Hargreaves were active alongside Hopkinson's Ltd., manufacturers of boiler mountings and John Musgrave, who, like Hick Hargreaves, were specialists in power transmission and gearing. Another competitor was Eisenwerk Wulfel, manufacturers of shafting and gearing, who were represented by Volkart Brothers. Rutnagur's buyers' guide also considered the suppliers of steam turbines and diesel engines, more

recent examples of power technology, where the foreign presence was pronounced. In the market for diesel engines, buyers could choose from the machines of Hick Hargreaves and W.H. Allen, or the products of the Leobersdorf Machine Works, Austria, the Swiss Locomotive & Machine Works Co., who built diesel engines up to 1,150 b.h.p., and M.A.N. of Nurnberg. The market for turbines was contended between W.H. Allen, Belliss & Morcom and Hick Hargreaves, and from the Continent, Stork Bros. and Brown Boveri of Baden.

The attraction for the many makers of textile machinery and power plant was a cotton industry which experienced 'two years of record prosperity in succession' between 1919-20. Thereafter, the industry's profit margins were squeezed and by 1922 it was recognised that the 'cycle of prosperity' created by the war and sustained by the Swadeshi campaign had ended. The demand derived from the cotton industry by the mill suppliers declined as the industry 'passed through an exceedingly trying time'. Beginning in the mid-Twenties there was a marked decline in the value of cotton textile machinery imported into India by comparison with the boom levels of the early Twenties. In Bombay, machinery imports declined from a peak of Rs. 659,49 ('000) in 1922-23 to a minimum of Rs. 132,05 ('000) in 1926-27, before finding stability at a level slightly above the minimum for the remainder of the decade. Nevertheless, the impression of widespread distress within the Bombay cotton industry has to be qualified. The dumping of Japanese goods did take place, while Manchester's cheap piecegoods were perceived as a principal cause of depression in the Bombay cloth trade. In truth, a reaction to the wartime boom in Indian output was inevitable and the response of the Bombay industry, rather than the cries of its owners, shows that adaptation, first displayed during the war, continued in the Twenties. For example, the peak level of Bombay yarn production in the postwar period was below that of the prewar peak reached in 1913. The

reason for that was a redirection of production away from the spinning of yarn and into the weaving of yarn into cloth. Bombay's experience during the war and into the mid-Twenties shows that the emphasis was placed on piecegoods rather than yarn. Between 1914 and 1918 Bombay's spindlage declined from 3.00m. to 2.88 m. spindles, while the number of looms rose from 48,845 to 59,162. In the years 1919-25, the number of spindles rose from 2.93 m. to 3.45 m. and looms increased from 60,778 to 72,266.[45]

In the war piecegood output in India boomed in the absence of Lancashire cloth and Indian exports of piecegoods increased almost three-fold between 1913 and 1917. Japanese penetration of the Indian market for yarn led to the overthrow of Lancashire's domination of this market, while an increase in imported Japanese piecegoods alongside a rise in Indian output filled the vacuum caused by the absence of Lancashire cloth. After the war, British sales recovered some of their prewar market at the same time as Japanese piecegoods retained their gains. However, British piecegoods did not recover their prewar hold on the market for piecegoods. The postwar composition of imports represented a reversal of that prewar, because yarn imports exhibited greater vigour than piecegoods and it was foreign piecegoods that had dominated the prewar cloth market in India. In the context of the Indian textile industry, postwar domestic yarn production had increased over prewar levels, but so had imported yarn, the Japanese share of imported yarn successfully challenging Britain's prewar supremacy. Imported piecegoods did not recovery their prewar levels, while domestic Indian mill production although it was erratic held up above prewar levels of output. Crucial to all suppliers of cotton goods was the strength of demand within the Indian market and piecegood consumption in the years 1918-19 to 1924-25 did not once come near to equalling prewar consumption.[46]

Indian piecegood producers may not have been squeezed out of existence by a combination of Japanese and British competition, but they were unable to retain their wartime gains. To the minds of Indian producers imported textiles intensified the problems of a domestic market in depression. The growth of imported Japanese textiles astonished contemporaries. Rutnagur noted the 'amazing rapidity with which her imports' had increased since 1914. In the postwar period, the heightened competition in the home market, particularly from Japanese mills, as well as 'other trade conditions', such as the collapse of Bombay's yarn trade with China, 'compelled Bombay millowners to look out for new markets and spin higher counts and weave a greater variety of cloth and otherwise improve their production by bleaching, finishing and dyeing'. Moreover, the 'old concerns which were working under a disadvantage for want of weaving and other machinery were also renovated with looms and finishing plants and other modern improvements and processes'. In the depressed postwar years some demand for textile machinery was present. What was the state of the market for power in Bombay?[47]

VI

The number of mills had reached a peak of 90 in 1913. In the years 1915-25 there were more mill closures (5) than new mills built (1), although total mill capacity increased. The one mill built was the Premier, promoted by Currimbhoy Ebrahim & Sons in 1921, and driven by electric generators and motors built by Mather & Platt. This was a departure from traditional mill design and reflected recent technological developments in the field of power generation. By 1925, the majority of Bombay's mills were using electrical power from the Tata Hydro-Electrical Power Supply Co., the first project for electrical generation in Bombay. This scheme was initiated in 1905 when a

syndicate of financiers was formed, who appointed a firm of consulting engineers. At this time, the use of electricity for factory power was considered a novelty 'and engineers in charge of the most successful of cotton mills in Bombay expressed themselves openly against the electric drive. The general ignorance of the subject on the part of millowners and managers and the rival interests of steam power, considerably prejudiced the prospects of the electrical energy'. Millowners, mindful of the capital sunk into mill engines and steam raising plant 'preferred to wait and watch the practical results of the electric drive in any of the local factories which chose to undertake the transformation'. Consequently, the Tata scheme proceeded slowly and in 1914 coal and steam still reigned supreme in the mills of Bombay.[48]

Among the power users, only Sir David Sassoon and Sir Shapurji Broacha were prepared 'to take up a substantial proportion of the energy' made available by the starting of the hydroelectric scheme. Their decision proved crucial to the project's success, because of the lukewarm response of the body of mill owners as a whole and other industrial concerns, such as the Port Trust, who 'were not prepared for electrification'. By 1911, contracts had been signed for the use of all the power, once it became available, and 26 cotton mills were among the potential H.E.P. users, with the Tata Company responsible for 'supplying and maintaining the driving plant'. The Bombay mills received H.E.P. from 1915 and a decade later, there was 'scarcely a cotton mill ... not using the electric current for driving its machinery'. But in 1913, before the current had even begun to flow, the 'numerous advantages of the electric drive, apart from its economy, brought further enquiries for power supply from the Bombay mill owners and other large consumers', and made extensions to the original scheme necessary.[49]

Before the outbreak of war, it was apparent that steam power had had its day as the sole source of power, although the absolute decline

of the mill engine seemed some years distant. Power generation was also available from the stationary oil engine and the steam turbine, which appeared to confer upon the power user the advantage of controlled supply on site in addition to the "clean" advantages of electric power. There was a market for diesel engines and electrical equipment well before the Tata scheme was realised. At the turn of the century, Bombay's mills were using electricity for lighting, while machine driving was the preserve of the steam engine. The use and acceptance of electricity by factory owners 'was facilitated by the Diesel Engines and Dynamo sets which were found compact and convenient, and one of the earliest to supply these were Messrs. Mirrlees Bickerton & Day'.[50] But it was not until the debate over the Tata project that Indian power users began to appreciate the advantages of electric power generated on site by steam or diesel engines. Then the market for electrical equipment blossomed at the expense of the total value of steam engines imported into India.

By the mid-Twenties several British electrical machinery firms were active in the Bombay market, including Metropolitan-Vickers, English Electric and Mather & Platt. But so were foreign companies, such as Brown Boveri and the Swedish General Electric Co., and foreign firms had fulfilled many of the contracts for the Tata scheme. Escher Wyss of Zurich had supplied the pipe lines, pen stocks and turbines, while the General Electric Co. of New York had fitted out the Receiving Station. In 1925, Hick Hargreaves was a supplier of conventional steam power plant for mechanical and electrical mill drives. Hick Hargreaves turbine was regarded by the directors as the successor to the steam engine. Why this should be so is apparent from an event that occurred a few years before, when the company tendered for a mill engine contract in the home market. The chief engineer to the mill company had recommended Hick Hargreaves tender to his directors and the company was

confident of winning a lucrative contract, notwithstanding a tender £600 higher than that submitted by Yates & Thom. The directors were also reassured by the knowledge that the Soho Foundry had built the engine to be replaced 'many years ago'. However, the bids of both Hick Hargreaves and Yates & Thom were declined, because the contract was awarded to Parsons 'for one of their Geared Turbines with a Rope Drive'. The chief engineer also reported that one of his directors 'would, in future, always instal a Turbine in place of a Slow Speed Reciprocating Engine for Mill Driving where the power required was 1,000 H.P. and upwards'. Madden interpreted this event 'as an indication of the trend of policy of Millowners for their Prime Movers' and recommended 'that it would be advisable for us to give careful consideration to the possibility of taking up the manufacture of small Turbines from 1000-3000 H.P. for Mill Driving'. This new line was approved by the Board and by October, 1924, the directors were able to inspect Hick Hargreaves first turbine 'running on the Works test bed'. A few months later, 'Madden reported that the Turbine was now running with Reduction Gear' and added 'that it was exactly two years since this development was first considered'. The 'total expense' incurred to date had been 'about £8,000'. In order to market their new product 'Madden informed the Board that we had written a personal letter to a number of people likely to be interested; he also proposed to do a little special advertising'.[51] This presumably included the advertisement that appeared in Rutnagur's guide to Bombay's cotton industry. Did Hick Hargreaves decision to develop and market a turbine come too late to preserve their leading position in the Bombay market for prime movers? Indeed, was there a position to preserve given the advanced state of centralised electric drive by 1925? The development of a turbine at the Soho Foundry as a replacement to the steam engine appears to have taken place when the market for power was fundamentally different from the one Hick Hargreaves turbine was developed to serve.

Judging by the engine orders received from India in the latter half of the Twenties, the marketing of a turbine was a success. Between 1923 and 1928 the company received only three engine contracts from India for condensing steam engines. But in the two years 1929-30, the Indian market provided Hick Hargreaves with eight engine jobs, that included orders for four turbines. Wadia & Sons were responsible for placing all but one of these jobs for steam engines and turbines. This was against the background of a waning demand for traditional power plant, a technology through which British firms had established British engineering paramountcy in India. Between 1914 and 1924, the value of plant and machinery installed in Bombay mills increased, not unexpectedly in view of the rise in cost structures caused by the wartime inflation and postwar boom, while mill capacity also increased in this period. In the case of the Bombay Dyeing and Manufacturing Co. Ltd., Wadia & Sons cotton enterprise, the Spring and Textile mills greatly increased their spindle and loom capacity. Recently built mills were already 'replete with the most up-to-date improvements', and long established concerns adapted to meet postwar trading conditions by renovating with new plant. Nevertheless, on the basis of figures presented by Rutnagur, the value of India imports of machinery and millwork exhibited a downward trend in the early Twenties. Rutnagur himself had no doubts about Britain's position in the market for capital goods. The total value of imported Generators, Alternators & Dynamos declined severely between 1922 and 1924, while the figure for Control & Switchgear more than doubled over the same period. The values for Prime Movers other than Electrical, appears to suggest a severe decline in the importing of Steam Engines & Parts, but an increase in the demand for Oil Engines. By 1925-6 trade through Bombay was in difficulty with 'a serious contraction of imported merchandise'. With only one exception, 'all the first ten principal articles of import' declined and this was

'most prominent' in cotton yarn, cotton manufactures and metals. In 1925-26 Bombay's market for machinery and millwork was depressed because of the 'continued depression of the cotton mill industry', and 'it was not likely that there should be any halt in the downward movement of this section of the import trade, which has been in progress for the last four years'. At this time Britain was still Bombay's largest supplier of machinery and millwork, but during the past year her share of the market 'again fell from 86.6 per cent to 83.9 per cent. The share of Germany, on the other hand, increased from 4.1 per cent to 5.5 per cent, while that of the United States... receded from 6.1 to 5.7 per cent'. The decline in Britain's share of the capital goods market in Bombay, reflected the strength of American and Continental manufacturers in the new forms of power plant. In the five years ending 1913-14, Britain's share of this market had been 92.3 per cent. Rutnagur noted that 'Swiss and German makers had not been able to compete with the British made compound condensing engines and Lancashire boilers but since the introduction of the diesel oil engine in India [c. 1905] several of them have been installed in the Bombay cotton mills, one of the largest suppliers being the Swiss Locomotive and Machine Works'.[52]

At the close of the decade the Indian market for power plant was still regarded by the directors as important to the company. The orders placed in 1929-30 gave evidence of the market's value at a time when jobs were difficult to win. However, the power requirements of the Bombay mills were met through the new technology of electrical power transmitted from supply stations. Of the 74 mill premises enumerated in detail by Rutnagur,[53] all but 22 were driven by electrical power from the Tata company and the associated scheme in the Andhra valley. The eleven mills controlled by E. D. Sassoon & Co. are typical of the majority of premises dependent upon Tata H.E.P. Most of the Sassoon mills possessed boilers, but there were only four steam engines within the group, one

each from J. & E. Wood and Musgrave and two by Hick Hargreaves. All but two of the mills were powered by Tata H.E.P. and all possessed electrical machinery. Some of this equipment had been manufactured in Britain by, for example, Mather & Platt, who had installed the generators in the aptly named Manchester mill, but a great deal was Swedish. Nine Sassoon mills were equipped with electrical motors that had been partly provided by British Westinghouse and Metropolitan-Vickers. Much more had been supplied by the Swedish General Electric Co. All the motors in five mills were provided by this firm alone and they were partly responsible for installing motors in the remaining four mills. Three of the four steam engines were installed in mills powered by Tata H.E.P. The engine built by J. & E. Wood at the Manchester mill was coupled to electric generators built by Mather & Platt, while Musgrave's engine at the Elphinstone mill had been provided with a set of electrical dynamos. Both mills were driven by Tata H.E.P. The two engines built by Hick Hargreaves were described as 'Not Working' in electrically powered mills. That engine built into the Jacob Sassoon mill dated from 1891 and at 2,800 I.H.P. was one of the most powerful of the steam engines to have emerged from the Soho Foundry. Both the engine and the boilers of Thomas Beeley & Sons, Hyde, had been superseded by Tata H.E.P. and machinery of more modern origin, in the shape of electric transformers by the British Electric Transformer Co. and motors by Swedish General Electric. The E. D. Sassoon mill, home of Hick Hargreaves second engine, was equipped with a fascinating array of power plant. In addition to Hick Hargreaves steam engine there was a diesel engine by Sulzer Bros. and Carrol. Both engines were 'Not Working', while the mill's machinery was driven by electric generators and motors supplied by British Westinghouse and Swedish General Electric respectively.

By 1925 electrical power had displaced steam as the premier source of motive power in the Bombay cotton industry. Much of the traditional power plant remained, but factory electrification was complete and there was hardly a mill site that did not possess electrical equipment of some kind. Hick Hargreaves presence in the power market appeared strong because they were responsible, either by themselves, or together with other makers, for equipping 27 of the 74 mill sites with steam engines and boilers. Of Bombay's 74 mill premises, 32 possessed a steam engine and of these 14 had emerged from the Soho Foundry. Next in importance as a manufacturer of steam engines was John Musgrave & Sons, who were responsible for 8 of Bombay's steam engines. The Soho Foundry was still building mill engines for India in 1930 when the company's commitment to the provision of traditional power supply on site remained strong. Only three years before Hick Hargreaves had concluded an agreement with a consulting engineer, formerly the Chief Engineer to Musgrave & Sons, for the use of his pressure governor over a period of 12 years. In 1930, the engineer was appointed Consultant Designer on uniflow steam engines. A royalty and fees were paid to him at a time when the company was seeking to recover profitability. The loss of profitability had culminated in the suggestion by the firm's bankers that the interests of the shareholders might be better served through amalgamation. The volume of works activity fell to such a low level that any opportunity was welcomed that covered overhead expenses. Writing to Madden in August, 1927, the company secretary reported that the firm had received a telegram from Towgood & Beckwith, who had experienced 'a "smash up" with their engine' and required replacement parts. Sykes was unable to 'state the extent of the damage, but from our point of view, trust it will be considerable'. A year later, Hick Hargreaves declined a job because they could not accept a contract price which allowed them no profit. Madden concurred in a decision taken in his absence: 'I quite

agree with the action taken ... it is no use our taking work at a hopelessly unremunerative price, however much we may want it'.[54]

* * * * *

In the trading environment of the Twenties Hick Hargreaves were made aware that a myopic preoccupation with the traditional lines of engineering did not offer a basis on which to sustain the company. Within certain financial constraints, Madden believed that it was possible for the business to adopt the Industrial Turbine for milldriving and he urged the Board to push and extend this superior source of factory power in the established markets for power. The market for power plant in India continued to offer a powerful attraction to Hick Hargreaves in the Thirties, when Wadia himself showed interest in ordering a large mill turbine. Not many years before, Colledge had convinced the Board that power plant could be marketed in India and he had returned to that market as the independent representative of Hick Hargreaves and other non-competing firms. But the market was not as buoyant as either Colledge or Wadia believed. Colledge's agreement with the firm lapsed and Wadia's agency met with financial difficulties. By March, 1929, Hick Hargreaves agency account with Wadia showed a loss of over £1,300. The agency arrangement with Wadia & Sons was highly valued by the firm. Indeed, at one point in the Board's numerous deliberations over the agency arrangements in India, they agreed 'that it would be in the highest degree undesirable to take any action which might lead to breaking our connection with Mr. Wadia'. That connection was broken in 1930 by the 'extraordinary low prices' arising from the keen competition for a limited volume of business. By contrast with the depressed state of the market in India, where quotations were so low that orders were 'going to Germany and other places', the home market was more rewarding. At the close of 1930, Madden was pleased to report that the firm's

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tender for the supply of Condensing Plant and Auxiliaries for the Barking Power Station had been accepted. The value of this order, together with a contract for the L.C.C. Tramways, Greenwich, amounted to over £100,000.[55] In the slump and recovery of the Thirties, Hick Hargreaves line in Condensing Plant was to fulfil a crucial role, as the company attempted to provide the shops with jobs through new lines in Rotary and Turbo Compressors.

The Epilogue

Slump and Recovery in the Thirties.

I

The post-1929 slump came at a time when Hick Hargreaves was readjusting itself to the basic decline in demand for traditional power plant. The company's trading results for the year ended March, 1929, showed such an improvement that the Board were able to recommend a dividend of 2%. 'Severe competition and low prices' continued to distinguish all sides of the business, but the company appeared to be well placed to benefit from any revival in trade. 'Notwithstanding this competition', noted the Directors' Report, 'the turnover ... has been considerably increased, and by exercising the most rigid economy a substantial increase in profit on trading has been earned'. A year later, the directors were 'pleased to be in a position to report a further improvement in the trading results'. Turnover had again increased, the value of contracts secured was greater than the previous year and the value of uncompleted work on the books was higher than at the outset of the year. Now the directors were able to award a dividend of 3% and transfer £10,000 to the General Reserve. Once the business of the shareholders meeting had been dealt with there was the customary vote of thanks to the chairman. This was followed by a departure from the precedure hitherto adopted when one of the directors 'stated that he had been requested by three of the largest Shareholders to convey to Mr. Madden their congratulations on the financial success attending the past year'.[1]

Unfortunately, the improvement in the company's performance could not be sustained as industrial production turned down and expectations were coloured by a widespread depression. Export collapse initiated

the slump in Britain and this was evident in the export industries from March, 1929. By December, Madden felt compelled to draw the Board's attention to a decline in the value of orders in hand by comparison with the two previous years. To directors already familiar with what Richardson has called the 'depressive trend' of the Twenties, the onset of a profound slump not only intensified existing difficulties, but called for a reappraisal of the company's policy. Investment in factory power in the highly valued Bombay market had contracted in the postwar decade at the same time as electrical drive superseded the transmission of power by mechanical plant. At home, excess capacity had been eliminated from the engine building trade before the onset of the world depression. What this did was compel an examination of Hick Hargreaves postwar policy and underscore decisions already arrived at in response to stagnant or contracting markets for traditional lines. Up to 1930, the directors of the company were striving to preserve the business in order that it might benefit from the anticipated improvement in trade. By February, 1931, Madden was justifying some economies in expenses 'in view of the abnormal times'. A year later, Madden remarked: 'I do not suppose there has ever been a more critical time in the history of this Company, or probably of most other Companies, than to-day. We have been through 15 months of extraordinarily bad trade'.[2] These comments came at the beginning of a Sales Conference convened to determine the policy of the company, a conference that paid especial attention to the Sales Policy to be pursued in the midst of a profound depression whose origins were perceived to lie in 1931. The recommendations arising from the conference and considered by the Board were based on decisions taken prior to the post-1929 depression when Hick Hargreaves had embarked upon a 'forward policy', namely the adoption of new manufacturing lines for new and bouyant markets.

At the close of 1928, the remaining shares in Vulcan Motors held by the company were sold and a nominal shareholding equal to the value of £10,000 realised a sum of £1,516. Williams Deacon's Bank had recently discussed Hick Hargreaves account with them, drawing attention to the Debenture Loan and raising the notion of an amalgamation as a means of strengthening the company. The initial response of the Board to the line adopted by the bank was hostile. Nonetheless, the Chairman, Robson, was soon reporting a conversation held with his friend, Col. Selby-Bigge, who was prepared to act as a third party for the purpose of arranging a suitable amalgamation. Robson felt 'that the present state of trade generally called for some action to be taken in this direction'. Indeed, the current volume of business available to engine builders had driven Hick Hargreaves to seek any work that promised to be remunerative. At the year end, the Soho Foundry was turning out X-L-A11 Ice Cream Making Machines for Messrs. Norman & Co. and was arranging to display 'one Hand Machine and one Electrically Driven Machine' at the forthcoming British Industries Fair (Food Section). The Board considered at length the desirability of associating the company name with such machines and agreed that the stand should only bear the name of Norman & Co. At the same time, the company was 'open to consider any proposition' that the backers of the Patent Tumbler Drying and Polishing Machine might offer. Through the agency of Col. Selby-Bigge there were negotiations with Clarke, Chapmen & Co. Ltd. and Yarrow & Co. Ltd. Madden's initial conversation with Yarrow's Chairman, Harold Yarrow, was 'of a very general character', but the meeting did prompt Madden to visit the Yarrow works where he and Yarrow explored the 'possibility of coming to an arrangement with a view to assisting each other in business'.[3] Useful though these discussions were, they did not answer the fundamental problem of weak demand for the company's traditional lines. Salvation apparently lay with the manufacture and

marketing of new goods which would restore profitability to a business whose current returns were barely adequate for wages and on-cost charges. The decline in profit rates could be attributed to the decline in demand for engine and millgearing work, the traditional lines of the company. These lines were considered worthy of retention in spite of the total lack of orders for new engines and 'cut' prices for gearing, because the directors believed that the old lines would someday revive. The new lines that they sought were additional, not replacement, lines of manufacture.

In the Autumn of 1931 additional economy was sought in order to meet what Madden referred to as the 'present financial and industrial crisis in the Country'. Hitherto, the directors response to the depression in the engineering trade had been to conserve the resources of the company and the need for economy had led to the periodic review of establishement charges, 'reductions of staff and reductions in wages'. In Madden's opinion, the enterprise was 'working as economically as possible'. But for the firm to continue to operate additional economies 'were essential and Mr. Madden suggested that the Board should consider the advisability of a general reduction in salaries and wages'. Madden was mindful of the meagre orders booked over the previous six months. In his opinion, the limited amount of work in hand was a 'danger signal of the difficulties' the firm would soon have to face and Madden 'was bound to anticipate another gap in our Works Production in say six months time'. As salaries and wages comprised the 'chief item of expenditure', Madden believed that economies should be sought in these payments. He had found that total money outlays on salaries and wages in 1931 were 60% greater than in 1914, but Madden 'did not consider the rates of wages paid at all excessive'. Indeed, he doubted whether 'he would have been prepared to say anything about reductions at all' if there had been plenty of work

on hand. Madden also invited the Board to consider the 'increased cost of living which would result from the Government's departure from the gold standard and the increase in income tax'. Madden 'felt strongly' that any decision for a reduction in wages and salaries 'should be imposed right through the Establishment' from the directors downwards and his recommendations were unanimously endorsed by the Board, who resolved 'that all Directors Fees, Staff salaries and wages without exception, be reduced 5%'. Over a full year the saving from these outlays would amount to £1,247.[4]

The 'General Position' of the firm was apparent once the Overhead Charges for the year ended December, 1931, were got out and read with the latest Monthly Report. This showed that 'orders booked during the 11 months covered by the Report' totalled £56,456 compared with the 'corresponding figures of the previous 3 years which were £157,966, £213,662, and £184,154'. Madden also reported that the value of unexecuted work had declined by comparison with the previous year, while the outlook for turnover in 1932 was 'worse than we have experienced for sometime'. Although he felt that it was reasonable to anticipate an improvement in trade, any improvement in the engineering industry was unlikely to occur before the Autumn. In the meantime, Madden believed that the 'policy of the company should be directed to the conservation of our financial resources as far as possible, but that all possible steps must be taken with a view to getting orders, and that expenditure for this purpose was necessary and essential'. Within a few months the auditors were advising the Board not to pay a dividend as the 'industrial depression remained acute, and all the resources of the Company should be conserved in view of a probable loss for the current year'.[5] It was against this background that the 'General Sales Policy' of the firm was determined at a conference of executive directors and head-office staff, who examined all the lines of the business and the

options they offered to Hick Hargreaves.

By the Summer of 1933 the liquidation of Galloway Ltd. was imminent and the question of their patterns and drawings was discussed. At this time Hick Hargreaves was still experiencing the consequences of 'deplorable ... trade both at Home and Abroad', a level of trade that had 'made it impossible to keep the Works employed at even half their capacity'. Madden admitted that Galloways fixtures 'were of little value in themselves'. Nonetheless, he believed that 'whoever has the reputation of holding these patterns and drawings will be in a position to secure the large majority of repairs which may be necessary to the Engines built'. Madden therefore recommended the purchase of the fixtures at a 'reasonable price' and within a short time the patterns, drawings and goodwill of W. & J. Galloway Ltd., 'including those of Messrs. John Musgrave & Sons and Messrs. J. & E. Wood', had been purchased for £3,000. The winding up of Scott & Hodgson soon afterwards presented the Board with an opportunity to revive the depressed sales of Hick Hargreaves industrial turbine by acquiring the small turbine business of Scott & Hodgson for pump and fan drives. A sum of £600 was bid for the small turbine fixtures of the late company, but an offer of £800 from Mirrlees, Watson was accepted. The old engine drawings of Scott & Hodgson, as well as the patterns and drawings for their main postwar lines - rolling mill drives and Ilgner flywheel sets - were considered worthy of acquisition. The Board may have been encouraged to secure these fixtures because of the business that had arisen from the purchase of Galloways patterns, drawings and goodwill. Over a period of eight months in 1933-34 orders for repairs to Galloways manufactures had been booked to the value of £4,700. Two years after the fixtures of Scott & Hodgson had been acquired orders amounting to £10,282 had been booked by the firm. Just how significant this work was to Hick Hargreaves can be gauged from the total value of contracts booked in

1933-34, a figure amounting to £85,000.

Welcome though engine repair work was to the turnover of the firm, the directors had to reconcile themselves to the fact that the engine and millgearing sections of the enterprise would never revive to their former value. Madden declared at the Sales Conference that 'Engine Work, as far as new engines are concerned, is practically dead, except for an occasional Uniflow Engine'. The experience of the 'general depression in the Engineering and Kindred Industries' had altered the expectations of the directors, who could no longer envisage a recovery in the old lines that the firm had been pursuing for almost a century. The sales policy formulated in 1932 recognised the degeneration of steam technology for factory power and determined the new business to be pursued. Until the onset of the slump, however, the directors had good reason for believing that the market for prime movers would recover. In 1928, Sir Ness Wadia invited the Board 'to consider building a 7,500 K.W. Turbine for the Indian Market'. This request for a tender evoked the 'serious consideration of the Board'. The next year Wadia arrived in England and held interviews with Madden in London and at the firm. Wadia outlined the turbine scheme envisaged for the Spring Mills and agreed to go fully into the matter with Arrowsmith, the chief engineer. At the same time, Madden was able to promote Wadia's desire to secure a boiler agency in India by securing him with an introduction to Harold Yarrow. In the Autumn of 1929, Wadia was instrumental in winning a contract for turbine plant required by the Heera Mills, Indore, at a price of £38,000, a contract won 'against very keen competition'. Orders for two uniflow jet condensing engines at a contract price of £9,501 were also placed with the firm through Wadia in 1930, when the question of price was again a 'very keen one'. Soon after the engine jobs for the Mafatlal and New Shorrock mills had been won, Madden brought to the Board's attention the low prices and

'exceedingly keen competition' met with in this market. Almost two years later, Madden was reporting that substantial sums remained outstanding against engine and millgearing purchasers in India. The Mafatlal Spinning & Weaving Co., for example, owed £500 to the company and complained at length that the engine supplied to them was unsound. In Madden's opinion 'it did not appear that there was much likelihood of our obtaining payment of the balance of our account'.[7]

The difficulties experienced in settling the outstanding accounts persuaded Madden and Arrowsmith to incur the expense involved in sending an engineer to India, who could specifically look after the firm's interests. In 1932, Sir Ness Wadia arrived in England to discuss plans for the installation of turbines at the Textile Mills, Bombay. Wadia was one of the shareholders present at the annual general meeting held in June and following discussions with the chief engineer, at which time Wadia's requirements were carefully gone through, the firm's tender was drawn up. Wadia was 'apparently anxious for us to carry out the work for him' and the directors were confident that the firm would secure the contract. A few months later, Wadia advised the firm that the decision had been taken to electrify the Textile Mills with electricity provided by the Tata Electric Supply Co. Consequently, 'it was not their intention to go any further into the Turbine Drive' and Hick Hargreaves could only hope that 'Sir Ness would be able to pass us the order for the necessary Gearing'. By the Summer of 1933 Sir Ness Wadia was disclosing to Madden that 'there was little or no business in India at the present time'. In South Africa, the demand for winding engines had led to many enquiries being received but not one order. In response, the firm 'had "cut" our prices only to find that we were still too high' and the question had now arisen of abandoning this business altogether in order to save the costs involved in the tendering. By January, 1934, a definite opinion had been formed and the Board were recommended to

'discontinue tendering for the Mechanical Portions of Electric Winders, but that we should continue to quote for Steam Winders which could be done in collaboration with Vickers-Armstrong'.[8]

II

The description of Hick Hargreaves in The Book of Bolton, 1929, recognised the firm's manufacture of prime movers for the driving of mills, mines and factories. The local guide also recognised that the firm had recently 'developed the design of Condensing Plant and Auxiliaries to work in conjunction with Steam Turbines for installation in the largest Electric Power Stations'. This plant, equipped with the 'well-known Hick-Breguet "Ejectair" or Air-extracting Apparatus', had bestowed upon Hick Hargreaves a 'considerable reputation by reason of its stability and ability to meet the present day exacting conditions specified by Electrical and Consulting Engineers'. Listed in the guide were the sets of Surface Condensing Plant that the firm had provided for such projects as the Hams Hall Super Power Station, Birmingham, and the London Power Co., Deptford. Madden was aware that Condensing Plant had 'been our mainstay since the war', a line that Hick Hargreaves had developed 'in every possible way, particularly as regards Auxiliaries', which he believed were of the utmost importance. By 1932 Condensing Plant Auxiliaries were the only products that the firm could 'get a decent price for' and the development of Condensing Plant and Auxiliaries to the fullest extent 'seemed to offer the most satisfactory return of any Section of our Work. At the present time', declared Madden, 'out of £102,000 worth of work 95% is for Condensing Plant'.[9]

The industrial turbine had been developed in the mid-Twenties as a replacement for the Slow Speed Steam Engine. Madden believed that Hick Hargreaves had been late in marketing an industrial turbine, but this had allowed the firm to benefit from 'other people's mistakes' and the

firm had 'avoided many pitfalls' in the development of a turbine which had acquired a 'good name for itself in a very short time'. However, the profits on turbine work were 'practically negligible' in 1932 and this line was 'not as satisfactory from a commercial point of view as the Condensing Plant'. Madden's general survey of the several sections of manufactures also considered the new lines adopted some two years earlier that were still at an early stage of development. In Madden's opinion Hick Hargreaves had 'adopted a forward policy throughout, and through some very difficult times, which policy has included the development of Condensing Plant and Auxiliaries'. The pursuit of a forward policy was responsible for the recent adoption of Turbo and Rotary Compressors. How this new work should be developed was one question that confronted the company, while another point requiring 'very careful consideration' was the appropriateness of the several lines pursued by the firm. In 1932 Madden asked 'whether we are trying to do too much'. He attempted to place the emergent policy of the firm within the context of the company's wealth, namely the internally generated finance available for development work. Madden stated:

> We have only got certain financial resources which are liquid and satisfactory and we are by no means out of the wood in the present commercial depression. We must be extremely careful how we spend these resources, bearing in mind that development is essential to success. What we have to do is strike a mien within the limits of our income in deciding upon the policy we shall adopt, particularly in relation to the development of new ideas and new things. It is often the case that owing to conditions which have arisen, however one may wish to do certain things, it is necessary to call a halt on the score of common prudence, to enable us to make a further

attempt later on. We have to consider how far we can proceed under present conditions with development, and when it is necessary to "draw in our horns" in this respect.

In order to impress the 'general situation' upon the conference, Madden remarked that orders booked in the previous 11 months (1930-31) came to £56,000, 'the previous 3 years being £158,000, £214,000 and £184,000, and if this Company is to carry on with anything like its full capacity of Staff and so forth, it should have a turnover of £200,000 or more'.[10]

Although the depressed state of trade had been reflected in the trading results for 1930-31, the company was able to achieve a profit and pay a dividend. In that year, the directors had adhered to 'their policy of keeping the products of the firm up-to-date' by seeking new business through 'a Department for the manufacture and sale of Turbo and Rotary Compressors, Blowers and Exhausters for Air and Gas'. By securing 'important patent rights and designs', the directors hoped to 'increase the scope' of the business in anticipation of 'an improvement in business generally'. The directors recognised the considerable difficulty attending the development of new lines under current trading conditions, but they believed that their importance could not be over-estimated. How did the new product lines arrive at the Soho Foundry? Minuted amongst the business of the Directors' Meeting held on December 31, 1929, there is a brief note on the report given by Madden on the correspondence with John Le Boutillier Ltd., 'regarding the manufacturing rights of a Turbo Compressor of German design'. The Board agreed that the firm should continue the attempt to secure manufacturing rights for the Turbo Compressors of the Gutehoffnungshuette Oberhausen A.G. At an earlier date a licence had been taken up by Browett & Lindley, but since that time a receiver had been appointed. Before the liquidation of Browett & Lindley one German-built machine had been

supplied to them for installation at a Yorkshire colliery. Arrowsmith had been 'favourably impressed' by this machine and the colliery engineer had 'spoken very highly of its design and performance'. Other reports favourable to the G.H.H. Turbo Compressor were provided by Hick Hargreaves South African agents, who had seen machines installed on the Rand by G.H.H. It was felt that manufacture of this Turbo Compressor 'was extremely suitable for our shops', while the particular design in mind was claimed by Boutillier to be equal to, if not better than, that of Daniel Adamson & Co., who 'were easily the most successful' of the several British makers.[11]

Hick Hargreaves approached Sollors, who was formerly the Chief Engineer to Browett & Lindley, hoping to employ him as the firm's Technical Selling Engineer. Sollors also thought highly of the G.H.H. machine and was willing at first to manage Hick Hargreaves Turbo Compressor business. However, Sollors entered into a syndicate formed to exploit 'provisional patents of his own in connection with small Rotary Air Compressors similar to those manufactured by the Swiss Locomotive Company'. Sollors believed that 'considerable business' might be made with small Rotary Compressors, a line which could be developed in conjunction with the large G.H.H. compressors at the Soho Foundry. This arrangement was quite different from the one originally envisaged by the directors, who had little choice but to acquiesce to Sollors' plan if they were to develop the Turbo Compressor. The hiring of Sollors' expertise was conditional on Hick Hargreaves entering into an agreement with the syndicate for the manufacture and sale of small compressors. However, the draft agreement received from Boutillier for the G.H.H. licence did not secure existing patent rights and contained terms unacceptable to the firm. At the outset of negotiations, therefore, Hick Hargreaves aimed to secure the G.H.H. licence, Sollors' services and a licence for his small compressors,

'provided suitable terms could be secured'.

Hick Hargreaves negotiations were conducted in the hands of a committee of the Board that included Madden and Arrrowsmith, and drew upon the services of Marks & Clerk, the company's patent agents, as well as the agents solicitors and the company's solicitors. By April, 1930, Madden was able to report 'that our negotiations had been successful' because Sollors had taken up a position with the company, while a conference had taken place at the G.H.H. works in Germany, attended by Sollors, the Board Committee, representatives of Marks & Clerk and Mr. Boutillier, when a Memorandum of Conditions had been drawn up. One difficulty that was resolved concerned the patents, which it was agreed could be assigned to the company. Whilst discussions with G.H.H. over the terms of the licence were in progress, the company discussed the terms of an agency agreement to cover the districts of Warwickshire, Worcestershire, Shropshire and South Staffordshire. However, it was to be some time before any agency could represent Hick Hargreaves for small Rotary Air Compressors. In the Summer, the directors received a report drawn up by Sollors 'on the prospects of our obtaining business in Turbo Blowers and Compressors'. This report and Hick Hargreaves experience of the compressor business down to September, 1930, cast doubt on the firm's ability to earn the minimum royalty of £1,000 provided by the licence and it was felt the minimum royalty should be reduced to £500. The recognition that the market for the Turbo Compressor was not as great as first imagined was bad enough, but far worse was the discovery of 'manufacturing difficulties inherent in the design' of Hick Hargreaves first Rotary Compressor. The difficulties compelled George Arrowsmith, the present-day Chief Engineer, and J.G. Hudson, the 82 year-old director and former Chief Engineer, to conduct a 'technical investigation' of the machine's design. At a time when the firm was

tendering for Rotary Compressor jobs, the failure of the design to provide the rated capacity meant that Hick Hargreaves could not guarantee the satisfactory execution of orders received. Sollors' opinion was that the existing compressor could meet the requirements of the enquiries received up to the present, while 'from a purely mechanical point of view he was satisfied with the machine'. Sollors' remarks did not commend him to the directors, two of whom 'impressed upon Sollors that the adjustments should be made as soon as possible, and tests carried out at the rated capacity of the machine'. When Sollors left the meeting Madden raised the matter of the option secured from Sollors syndicate, remarking that this would expire shortly 'and it was very necessary we have some definite information in regard to the performance of this Machine before we are called upon to make a decision in regard to exercising our Option'.[13]

An agreement covering the German Turbo Compressor and Blower was reached without difficulty at a meeting with representatives from G.H.H. and Boutillier Ltd., whereby sole manufacturing and selling rights for Britain and the Empire were vested in Hick Hargreaves. All the drawings and technical assistance required by the firm were to be provided by the Gutehoffnungshuette Oberhausen A.G. in return for a cash payment of £1,500. Another sum of £1,500 'by way of minimum commission over the first three years' was also to be paid and any royalties earned over this period were to be set off against the firm's maximum liability of £3,000. When Arrowsmith next reported on the small Rotary Compressor he remarked that slight alterations had resulted in an improved performance. However, he had discovered while re-measuring the compressor 'that it was not quite in line with the Swiss machine'. The capacity had been reduced by some 15% and Madden asked whether the modified size of Hick Hargreaves machine was now uncompetitive with the Swiss compressor for volumetric capacity, output and horsepower. He

also asked whether Sollors intended to bring the design into line with the Swiss make or to drop below it. By the close of 1930, the agreement with G.H.H. had been sealed and it was agreed by the Board 'that the matter had been satisfactorily concluded'. This was not true of the existing compressor business.[14]

At the turn of the year the first small compressor for stock was still incomplete and still subject to Arrowsmith's tests. Madden again wished to know whether our machine was 'in line with the Swiss Machine' that it would have to compete with in the market. In answer, Arrowsmith cautiously remarked that the latest test had revealed the output to be satisfactory. While the Chief Engineer was preoccupied with the painstaking investigation of the compressor's performance, Madden believed 'that we are at the present moment chiefly interested in ... the prices of these Machines, as it is imperative for us to get down to the market figure'. The first order for three Rotary Compressors had already been placed by the London Power Co. and tests had ceased on the stock machine as the decision had been taken to exhibit it at a forthcoming fair. The proceedings of the Board of Directors clearly show that Madden was keen to market this manufacture as quickly as possible. That Madden's commercial instincts were inconsistent with the findings of Arrowsmith's test programme became apparent in the deliberations of the Directors' Meeting held in February, 1931. A report on progress was opened by the Managing Director:

> Mr. Madden stated that reports from our Stand at the British Industries Fair are encouraging and as a result we had received a number of enquiries.
>
> Mr. Arrowsmith reported that during the last month we have not made very satisfactory progress on the two small machines which we have on order.

Tests on the larger machines had been interrupted by the exhibition, while those carried out by Arrowsmith on the small compressors 'had shown these machines were not up to duty and he had held up delivery to show the full duty before despatch'. Madden appeared to make light of the technical difficulties, referring to them as 'finer points of design', at the same time as he spoke of 'the other difficulty ... the question of selling price'. The possibility of marketing the small compressors at the same prices as the Swiss Locomotive Co. had been explored, but Madden reported that 'we should have great difficulty in doing so'. This reflected on the expensive nature of the Sollors' design. Madden went on: 'The matter for decision is whether we agree with Sollors, Green and Tarrant to manufacture to their design admittedly putting up the cost, or to advise them that we do not consider their patents are of sufficient value and it is impossible for us to work to them owing to the higher cost of production'. To this end, a visit had been made to the Swiss Locomotive Co. and discussions held on 'the possibility of entering into a working agreement ... with a view to eliminating competition'. A decision on this matter was left to Madden and Arrowsmith.[15]

Soon afterwards a patent was granted to Sollors' syndicate and this required the firm to either accept or reject the licence to manufacture. Madden's opinion was already formed when he pointed out that over the past twelve months 'we were disappointed with the amount of information given to us by Messrs. Sollors, Green & Tarrant and had had to carry out a good deal of experimental work and development ourselves'. The syndicate's patents had increased the cost of production, while in the opinion of the firm's patent agents the patents were of limited value. Madden suggested that the terms of the licence document were too high and should be modified. He sought the backing of the Board 'to come to a final arrangement' with the syndicate. They were prepared to allow

the firm to manufacture Rotary Compressors to other designs, but would not consent to a modification of the licence agreement. Before the Board discussed the company's response to the syndicate, Madden invited the directors to consider whether the firm should abandon the manufacture of Rotary Compressors, if not whether the firm could manufacture without the assistance of the syndicate and if the firm did part company with the syndicate whether they would be able to enter into an agreement with a competing firm with possibly hurtful consequences for the firm's business. Madden's opinion was already formed and he remarked that the business was worth pursuing, while Arrowsmith believed that the firm could pursue this line without the syndicate, who would have no difficulty inducing another firm to take up the manufacturing rights. Nonetheless, 'we retained the advantages of a year's start, a cheaper machine and no royalty. At the same time we did not want to create competition if it could be avoided on reasonable terms'. It was then disclosed by Madden that Sollors had written to the engineer of the London Power Co., 'with a view to inducing him to insist upon our building the Compressors to the Syndicate's design'. Madden had taken 'strong exception to their approaching our clients' and had complained to Sollors, the sole author of the letter.[16]

The Board found the syndicate's terms unacceptable and called upon them to submit modified terms otherwise the Board would have 'no alternative but to decline the Option'. Madden announced 'that negotiations between us are at an end' at the Directors' Meeting held in June, 1931. A month later he was reporting 'that Mr. Harman Hargreaves had received a letter from Mr. Fritz Haussener of Messrs. Weber & Schwab, Biel-Bienne, stating that these people were open to discuss the question of entering into an arrangement with a British Firm for the manufacture under license, of their make of Air Compressor'. The technical specifications and financial terms offered by this company

certainly warranted 'further investigation' and a short option on patents had already been secured, 'for the purpose of bringing the matter before the Meeting'. Madden explained that Weber & Schwab were manufacturers of a 'very good type of compressor', but only those above 600 minute litres were under consideration for the Soho Foundry and it was for these machines that the short option had been taken out. 'Harman Hargreaves, Arrowsmith and Madden expressed the opinion that we should secure the manufacturing rights for these larger Machines for Great Britain and the Colonies'. But a final agreement to manufacture under licence was subject to a satisfactory report of the patent agents. In the meantime, the Board resolved to continue negotiations and on the basis of the points discussed at the first visit to Weber & Schwab a draft agreement was prepared for discussion. The final form of an agreement appeared to be within reach when the patent agents report was received. This 'proved somewhat disappointing' because Weber & Schwab's patents were shown to be 'of somewhat doubtful validity on the grounds of lack of subject matter'.[17]

The difficulty over the patents did not prevent Hick Hargreaves from taking out a licence with the Swiss firm. At a meeting at the offices of Marks & Clerk, Weber and Schwab themselves failed to move the agents from their original opinion. 'Ultimately, however, an Agreement was reached with Weber & Schwab whereby the payment of £600 is regarded as to £300 in respect of Services, Drawings and Designs and £300 in respect of Patents'. Moreover, it was agreed that the agreement should contain a clause 'providing for a repayment of this latter sum should the Patents referred to, be found invalid within a period of five years'. The procedure adopted involved the purchase of one of Weber & Schwab's machines at a low price (actual cost plus 20% on cost charges) for examination and test by Hick Hargreaves, who intended to complete as soon as possible one portable unit and one stationary set.[401]

Preliminary tests of the experimental compressor revealed that it was mechanically sound and by January, 1932, Arrowsmith reported that full details of the firm's tests had been sent to Weber & Schwab 'for their comment and advice'. Arrowsmith's test results, together with the firm's method of estimating compresor efficiency, were validated by Weber & Schwab's expert. 'Their own figures', declared Arrowsmtih, 'from which they obtained the extremely high volumetric efficiency, have been proved by the same expert to be incorrect, but we ourselves have never accepted these extremely high figures when quoting'. A new machine was promised the firm capable of the efficiency expected of Weber & Schwab's design. In Madden's opinion, the loss of time incurred by appraising a machine of reduced efficiency required an extension to the period of payment of royalties. Events now began to mirror those experienced the year before with the syndicate's design of Rotary Compressor. Now, however, the decline in orders and work in hand, as well as the decline in turnover, underscored the company's dual policy of conserving financial resources while at the same time promoting orders until the downswing into depression was terminated and an improvement in trade was felt. At the commencement of the year, the former head of Daniel Adamson & Co.'s Turbine & Turbo Compressor business approached the firm and suggested that he might be of value to Hick Hargreaves in the same lines. Madden felt that this was an opportune moment to appoint an able and experienced salesman and McLean was given charge of the firm's Turbine, Turbo Compressor and Rotary Compressor Sales. Several months earlier an attempt had been made to secure the first order for a Turbo Compressor by quoting a 'cut' price based on wages and materials to the Sheldon Iron, Steel & Coal Co. In February, 1932, the firm was still hoping to secure its first order for one of these machines with a 'low price'. Madden remarked that the chief difficulty lay with the 'inability to show prospective clients a machine that we have made' and

unless an order was booked soon Madden felt that the Board might have to sanction the building of a machine for stock. However, the prospects for business seemed bright after a visit by McLean to G.H.H. and the discovery that an agreement between Adamson & G.H.H. had been cancelled. In the Spring of 1932 it appeared that the firm might benefit from Adamson's business. In the depths of the slump Hick Hargreaves were adapted to turning out steam turbines and Turbo Compresors, but not small Rotary Compressors, one of the new lines of business for which the Compressor Department had been established. The design acquired from Weber & Schwab proved to be as defective as that provided by the syndicate and the promotion of small compressors remained dogged by design faults beyond the turn of the year.[18]

III

At the Directors' Meeting held a week after the Sales Conference, Arrowsmith reported that tests on the new compressor from Switzerland showed that 'this machine was not efficient enough to be put on the market'. Arrowsmith was not even prepared to 'touch it' until Mr. Weber had visited the works. The Chief Engineer's opinion was consistent with the decision reached at the Conference and it came as no surprise when Madden declared that commercial development of the small compressor was at a halt. The conclusions of the Conference on the appropriate policy of the company were reported to the Board by Madden. Arrowsmith's report and the inadvisability of laying out a sum of £15,000, the sum deemed necessary to develop the compressor business to the fullest extent, permitted Madden to conclude that for the present the company proposed to concentrate on the Rotary Compressor and industrial turbine business. Was this policy wholly the outcome of the Sales Conference? Outwardly, it would appear that the Conference determined the option brought before the Board for endorsement by the directors. Amongst

those present at the Conference were Shaw, the London Agent, the directors Harman Hargreaves and Arrowsmith, the Works Manager, Aspinall, and sales personnel such as McLean. The opinion of those staff members present at the meeting carried some authority, because it was borne of the experience acquired in the several departments of engineering enterprise. Nonetheless, the person who stamped his personality upon the proceedings of the Conference was the Chairman, Wyndham D'Arcy Madden, and the outcome of the Sales Conference was to a large extent a distillation of notions brought to the meeting by Madden.[19]

Before the meeting was opened for discussion, Madden presented a lengthy introduction in which the idea for a conference was attributed to Shaw and McLean.[20] Madden remarked that the question of sales policy was indistinguishable from the policy of the company. Any recommendations arrived at by the Conference, Madden declared, would be submitted to the next meeting of directors and the recommendations would carry a great deal of weight with the directors if they were strongly supported. Madden also commented upon the current trading environment and said: 'The policy which we may, or may not adopt is bound to have a very serious effect indeed, for good or ill on the future prosperity of the Company, so that we have to consider very carefully indeed, exactly what we consider is the right thing to do, and the way to do it'. He felt that consideration of company policy fell into two sections. 'First of all we have got to consider what we believe to be the right Sales Policy... then we have got to consider the best means of carrying out that policy'. Under both headings a number of points had to be considered, while certain 'leading factors' were apparent from the five or six sections of the business. Traditional engine work was 'dead' and millgearing work had fallen into the hands of Gearing Specialists at 'cut' prices. The company's prices for millgearing had become very expensive 'and our methods have not allowed us to meet the competition

of the Gearing Specialist Firms'. Madden wondered whether the gearing side of the business was worth developing to a greater degree. The company's mainstay was the line in Condensing Plant. This business had meant 'life' to Hick Hargreaves since the Great War, while the small industrial turbine developed seven years earlier had proved successful in Lancashire and other places controlled from there as a successor to the Slow Speed Engine. Notwithstanding the turbines sound design the returns on this section were negligible, although it was a 'good job for the shops'. The new lines of manufacture - Turbo and Rotary Compressors both large and small - were still being developed and required a great deal of consideration within the context of what Madden termed the 'present commercial depression'.

One of the questions posed by Madden was the degree to which the company could in the future rely on Condensing Plant 'to keep us going'. Shaw seized on this point and remarked that if this line could not be relied upon to provide the future mainstay of the company then some other line - turbines, compressors or blowers - would have to perform a similar role. Shaw was prepared to 'thrash out' this question, but Madden thought the 'most vital thing' was to consider the manufacture of Condensing Plant and Auxiliaries. Shaw, whose particular interests lay with Condensing Plant and Turbines, disagreed and argued that his specialist lines could not be set apart and considered individually. He would have wished to have discussed 'Turbines v. Condensing Plant', but Madden disallowed the suggestion. Shaw remarked: 'The Electricity Board are not going to let us sell Condensing Plant at B.E.A.M.A. prices and give Turbines away to the small Factories. They are going to make every effort to get these small Factories on to the Grid'. Madden believed that in the future such independent makers of Condensing Plant as Hick Hargreaves would find it difficult to secure contracts, because the

nature of orders would alter from plant of moderate size to a limited number of orders of large capacity, while there would be a tendency for these orders to fall into the hands of the Combined Builders. Madden cited the amalgamation of Metro-Vickers and British Thomson-Houston as a portent of the changes likely to occur in the market for Condensing Plant. Shaw again disagreed, remarking that the sales of large Condensing Plant for the Super Power Stations would 'generally be separate Contracts'. Madden was not as sanguine as Shaw over the future and the influence of policy decisions on future sales of large Condensing Plant. He offered two distinct probabilities for consideration. On the one hand, if it was felt 'that we can carry on with big Condensers it will cost us less money, with less worry, and less development work, and if we felt the future was satisfatory we could say well, there is not very much to worry about. On the other hand if we are going to have a fight for every job and are only going to get one big job in two years if we are lucky, then we have to face the fact that the Condensing Plant business is not going to provide us with bread and butter'. These comments prompted Shaw to remark: 'I can tell you now that big Condenser Contracts are not going to keep this Firm going'. The significance of Shaw's comment was not lost on Madden, who felt this was 'a revolutionary thing to say, because it means that we have got to look, in the future, to as big a difference in our business as the change from pre-war to peace'. Up to 1914 the firm's business was largely steam engines and millgearing, while after the Great War it became 'to all intents and purposes Condensing Plant and nothing else. If Engines, Gearing and Condensing Plant will no longer provide our business, we have got to provide a new business again, a very difficult thing'.

Shaw wondered whether a 'concentration on Condensing Plant Auxiliaries' would alleviate the distress felt by the absence of a

rewarding level of business. The discussion that ensued revealed that a power station auxiliary like the firm's heater could not easily be marketed as an industrial heater. A variant of a familiar manufacture that had proved successful in a customary application still had to overcome the marketing problems associated with a new product. One salesman present seemed prepared to grasp the nettle when he remarked: 'It seems to me it is a new market we want'. Madden again expressed the choice before the company: 'It may pay us better to find new markets for old products rather than new products and new markets at the same time'. He asked 'shall we develop new things or shall we extend the existing Manufactures'? But it was evidently 'easier to modify what we know all about and seek a new market for same, than to start off in a new field altogether'. Arrowsmith believed that once trade improved the recovery would be felt first in the market for industrial plant, not power station equipment. Shaw's experience of the market prompted him to remark that the two would 'run closely together'. Madden's interpretation of the 'sense of the meeting' on Condensing Plant was that the firm should continue to seek large Condenser contracts, while recognising that they would be difficult to secure and could no longer be relied upon to provide the main support of the firm in the future. The sale of small Condensing Plant Auxiliaries to industry was a field 'well worth exploring' and so, too, was the possibility of extending Condensing Plant into the marine field. Madden conceded that 'Shipbuilding is dead', but some ships were being built and the shipbuilding industry presented an opportunity for the firm to 'force our way' into a market for an existing product. The response of the sales personnel to this proposition was detached. Shaw remarked: 'There is only one man can sell to a Marine man, and that is a Marine man'. McLean declared: 'I tried years ago without success'. Madden had identified an opportunity for Hick Hargreaves to provide some of the

plant required for the electric drive of large ships. He had discovered that British Thomson-Houston were providing turbines, while Weirs were supplying the Condensing Plant of new vessels. 'Vicker's Engineering Shops are empty', Madden said, 'and all the work for the new Ships is coming from Rugby, with Condensing Plant from Weirs. It is ridiculous when you think of it - here are we who do more work than anyone else for B.T.H. on land, are passed by for Weirs when it comes to Plant for board ship. A land Firm has got in with the Steam end, but a land Firm cannot get in at the Condenser end - why not? is it an impossible task'. Shaw believed the scheme was not impossible given the 'right man'. Madden certainly saw in the marine end 'a field for extending our Condensing Plant'. But Shaw remarked: 'It is hopeless with our present organisation'. 'We are not considering the organisation', answered Madden, 'but the policy'. The meeting recognised that breaking into the marine market for turbines and Condensing Plant Auxiliaries would prove difficult, requiring the lengthy cultivation of those responsible for the placing of orders before the barrier to entry was overcome. Nevertheless, the attempt had to be made to secure marine jobs because, as Madden remarked, 'We have got to get more work, and there is one avenue which might provide it'.

Shaw raised the next point, the company's policy on industrial turbines, a line 'Linked up with the Condensing Plant problem'. Shaw was reluctant to interfere with the line in Condensing Plant because he recognised how crucial this business had been to the postwar survival of the company. Yet he was aware of a change in the market. Large Condensing Plants would continue to be ordered, but 'they are going to be let separately, and the Maker will not be chosen by the Turbine Builder. We are going to have to enter that field as a competitor for the Turbine'. Once again, Madden set the choice starkly before the meeting when he wondered whether the market for small industrial

Condensing Plant was 'leaving us - is it going to be of the same importance to us? Is it going to be worth while dropping our Turbine to keep the Condensing Plant end'? Shaw remarked that Hick Hargreaves small turbines were 'practically given away' and he could not see how the firm could retain such a business. Arrowsmith defended the turbine work, declaring that it was far better to take a turbine contract at a low figure than an order for Condensing Plant. In answer to Madden, Shaw had to admit that he could not hold up the turnover on Condensing Plant by dispensing with the line in turbines. No one believed that Hick Hargreaves should accommodate their friends in the Condensing Plant business, Fraser & Chalmers and B.T.H., by not marketing the industrial turbine. The benefits likely to accrue to the firm through such a policy were not worth considering Madden said. He remarked that Shaw 'would be just as happy and probably just as successful selling Turbines as Condensing Plant. Let us look at the matter from the point of view of success'. Madden did not accept that the winning of an industrial turbine would influence the attitude of B.T.H. and Fraser & Chalmers towards Hick Hargreaves and jeopardise the Condensing Plant contracts put before the firm by the large contractors for power station turbines and condensing plant. Shaw commented that 'They will certainly not handicap themselves to spite us'. When Madden proposed that 'we should adopt the policy of "going all out" for Industrial Turbines', the motion was seconded by Shaw and carried unanimously by the Conference.

The attitude of Madden to the market as a whole emerged clearly from the meeting. Irrespective of the article 'We have got to cater for the market we want to get into', he said. On the question of production, Madden believed 'that the thing to do is to get orders and try them out'. Here he stressed a point made by the Works Manager, who had argued that it was important to take one or two orders for a new line, such as very small turbines, 'at a price we can get for them, and

try the machine out, which is cheaper than developing to stock'. Hick Hargreaves already had a presence in the market for Gearing, but they were 'knocked out on price' and had lost ground to specialist firms. It was hoped to stimulate sales by standardising output and pricing Gearing at a level competitive with the specialists. Madden had earlier mentioned that contracts worth £10,000 and £15,000 had been lost in the past to the specialists and he now explained why it was necessary for the long-established Gearing side of the business to be developed by disclosing that Hick Hargreaves required to take 'between £50,000 and £60,000 above ... wages and material costs before we start to make a profit'. The depressed trading performance of the company compelled the business 'to make a bigger effort to get Gearing, to go all out for the small Industrial Turbine while keeping a strong hand on our Condensing Plant'.

In Madden's opinion, the development of the Compressor end of the business was probably the most difficult of the questions under consideration. There was the G.H.H. licence to be considered that had 'led directly to our taking up the Rotary Compressor with which we have made a beginning' and which possessed 'great possibilities'. There was the licence taken out for the small Weber & Schwab Rotary Compressor designed to satisfy demand in the market where the G.H.H. Rotary Compressor was not suitable because of its greater size and outputs. Madden remarked that the Weber compressor was 'in a preliminary stage, the Rotary is getting in to the market and Turbo Compressor we have not done anything with'. The line in Compressors represented an 'entirely new field' for the firm, with the potential to 'provide a very satisfactory turnover'. The point at issue was the extent to which this line could be developed in the midst of a very difficult period, when the company's resources were limited and the risk was present of spending so much on development that the business would be seriously

handicapped at a later date. The compressor line had already had a great deal spent on it and a 'great deal more' money was likely to be spent in the future on work that offered 'possibilities of considerable success'. Madden wished the Conference to consider these possibilities in the light of the anticipated development costs. He himself was convinced that the compressor end would 'have more far-reaching effects on the future of this Company' than any other manufacture.

Hick Hargreaves had made the greatest headway with large Rotary Compressors, selling a sufficient number of them for Madden to claim that the firm had acquired an idea of prices and knew that a market existed for these machines. The Works Manager was invited to comment on the outstanding development required and the costs involved before the Rotary Compressor could be placed on the market. Aspinall remarked that this machine would be a success possessing 'great possibilities' which could be realised without heavy expenditure. The existing plant was adequate for marketing to begin at once he said, 'but as the market develops we shall have to spend about £2,000 on Machinery'. He added that the firm could manage as it was until orders began to arrive quickly. The salesmen confirmed that the market for Rotary Compressors was strong, especially strong in the case of low pressure machines. Shaw remarked: 'There is a big market - they are very commonly used in Cinema's'. McLean concurred: '... there is a colossal market for it if it is handled properly, and of course, cost is the essence of the whole thing'. Madden was confident that the firm would do well in the market for Rotary Compressors. In Britain Hick Hargreaves were the only producers of a machine similar to that of the Swiss Locomotive Co. and he believed that 'they did £60,000 worth of work in this country some years ago. Owing to the fall in sterling we have got, to all intent and purposes, a monopoly on this particular machine'. Madden expressed the feeling of the meeting when he declared that the Rotary Compressor was

'worth pushing to the utmost extent' because of the 'very big market for it'. Shaw had not disagreed with the opinions of his colleagues, but he did display greater caution. At one point he remarked: 'I think we all feel that there is a big field for this Compressor if we can only get down to prices'.

The poor test results for the small Weber compressor had frustrated the aim of marketing this machine as both a stationary and a portable compressor. Neither output nor efficiency was equal to the results obtained in Switzerland Arrowsmith said. He also disclosed that it was the intention to develop one size of Weber machine of 100 cubic ft. 100 lbs. Shaw admitted that he was not familiar with the market for such a line, but the firm's Weber compressor seemed small to him. Compressors of '110 and 210 cubic ft. are pretty well standard in the London streets', Shaw said. Madden believed that at the size developed up to now 'This machine would not do' and he postponed commercial consideration of the Weber machine until the tests had been completed. McLean spoke for the meeting when he said, 'It is no good entering this market until we can meet it as far as capacity is concerned. It is useless confining ourselves to one size - we should tackle the full range'. But where did the responsibility lie for developing a marketable product? Harman Hargreaves felt that it was wrong for the firm to experiment and proper for Weber & Schwab 'to show us where we are wrong'. Arrowsmith appeared resigned to reality, commenting that 'all we ever get from a licensor is the first idea, and we have to develop it'.

To Madden's mind the 'biggest question' before the Conference was the Turbo Compressor with the Turbo Blower secured from G.H.H. The firm was in a 'more favourable position to develop that Machine', said Madden, because G.H.H. possessed all the designs. Moreover, the firm had secured the expertise of McLean, 'so that we are in a very strong

position to put that Machine on the market and develop it to the greatest extent'. Another point made by Madden was that the Turbo Compressor was 'an excellent thing for our shops. Every Turbo Compressor order brings with it a Turbine, a Compressor or Blower and a Condensing Plant. It is full of meat'. A problem was what Madden termed the 'selling position' of the machine, namely the depressed state of demand for power plant. An impression of the prices in the market for Turbo Compressors had been gauged from one or two tenders Madden said. Any orders secured at the present time would barely cover wages and materials, but Hick Hargreaves had yet to sell their first machine which would establish a presence in the market and to do so meant securing an order at a minimum price. 'For the first machine we should have to take the order at the prices which are being actually accepted by Adamsons or Bellises, which are roughly on a wages and material basis, so that if we can get orders, there is no possible hope at present, of making any profit out of them, in fact, of making any charges out of them'. It was likely that costs would be incurred in developing the machine and the cost of developing and marketing the Turbo Compressor was the point that required consideration. Madden recognised the 'possibility that later on prices will be maintained, and that there will be some attempt at co-operation between the different Manufacturers, which would be of inestimable benefit to everybody concerned, but until that day arrives we shall have to spend a lot in development ... and ... a lot on Plant'. Under these circumstances could the firm afford the expenditure necessary to market the Turbo Compressor, 'bearing in mind that we have already spent a great deal, and that we have a very strong position to break through to-day. Are we financially strong enough to undertake the risk of developing the machine to the fullest extent and entering that field'.

McLean was called upon first to give his experienced opinion of

this field and he believed that the firm should not delay in marketing the Turbo Compressor. 'We have already lost two years', McLean said, 'and my suggestion is that we put in hand a 10,000 cubic ft. machine, not to buy any new tools, but to do the best we can with the plant we have got'. Moreover, certain testing facilities should be acquired, such as a cooling tower, although he had no idea as to the expenditure involved. On one point McLean was confident: 'We can take it for granted that we should very soon find a customer for that type of Machine'. The Works Manager disagreed with McLean: 'We could not put a 10,000 cubic ft. machine down with our present plant and guarantee accuracy'. Together, the necessary testing plant and machine tools would require £15,000 the Works Manager said. 'How many years will it take us to recover that sum? And as prices are to-day, we should lose on every order we booked', remarked Madden. McLean reiterated his point that a market for Turbo Compressors existed. Madden did not share McLean's view. 'My own impression is that it is very doubtful whether we should be justified in proceeding with the manufacture of this Machine under present conditions, and whether we should not be well advised to consider the position in say six months time'. Madden added that he did not wish to 'press that view' upon the meeting. He invited Shaw to comment, who remarked that he had no first hand experience of the Turbo Compressor. But he had heard that Fraser & Chalmers lost on each machine built and 'that nobody can build a Turbo Compressor from drawings - the drawings do not contain the whole of the information required'. McLean replied by asserting that 'Adamsons would not have been in business today if it was not for Turbo Compressors', while their prices had fallen by some 30% since production commenced. 'They are still making money on Turbo Compressors, and if they are losing at all, it is not on this side'. Shaw was unmoved: 'It does seem to me that what money we have got would be better spent in developing the

small Rotary Compressor than the Turbo Compressor'. One salesman questioned the development of the Turbo Compressor end 'when we know very well that it is a bad market'. McLean did not accept that the market was so poor and he remarked that before his recent departure from Adamsons 'they made a good profit on every Turbo Compressor which was turned out'. It was largely as a result of McLean's 'excellent work', remarked Madden, that 'Adamsons have collared the whole market'.

Aspinall expressed the 'Works point of view' when he said he was 'very reluctant to spend. I think we have enough irons in the fire for the bad times, and I suggest we suspend the Turbo Blower for six months'. McLean's case did, however, generate some support. Halson believed that if it was the intention to go into the 'question in six months, we may as well start now', while Shaw was unable to share Aspinall's optimism for millgearing, promising to arrange a tour through one of the Gearing specialists for his benefit. On the crucial question of the Turbo Compressor work, Madden concurred with McLean that this business should be pushed. But was this the time to do so he asked. This was not a difficulty which had faced the firm two years earlier when the licence was acquired. 'Then we were doing quite well, and the prospects were good. I think we ought to be very careful before we launch out into a policy the end of which we cannot see. I think it would perhaps be a good thing if Mr. McLean devoted the whole of his time to pushing Turbines and the Rotary Compressor'. Madden had earlier explained that the firm was facing 'a very difficult period, for say certainly another 12 months', when prospects might improve. A sum of £2,000 had already been paid to G.H.H. out of a total liability of £3,000 and there was in addition the annual commission payment of £500. 'I do not see how we are right in suggesting an outlay of £15,000 in these days. Our bank balance is £60,000 but we must remember the state

of our order book. If we spend the money are we not taking very grave risks of crippling ourselves in say 6 months time, and ought we not to hang on to what we have got, and push the things which will cost least to develop'. Madden did not suggest an end to tendering, but he did suggest 'that we should hesitate before spending a lot of money. It is really disappointing to have to say this, but it is far better to conserve our resources than find ourselves in financial difficulties'. Madden's verdict on the Turbo Compressor business appeared the 'only practicable one under present conditions'. McLean was allowed to win an order for a Turbo Compressor at a low figure where the client approved the machine's manufacture 'without additional plant and without additional Testing Plant'. The firm was obliged to pay a royalty of £500 irrespective of orders and in Madden's opinion even an order 'at a very "cut" price' was preferable to no work at all. He declared that 'we should consider it secondary to securing orders for small Turbines'. Arrowsmith was content with this decision and remarked that in the meantime the firm would benefit from all the improvements made in Germany to the Turbo Compressor. 'Yes', said McLean, 'but we are losing time as against our competitors'.

In summing up, Madden recognised that Shaw and McLean dissented from the 'general policy' reached by the Conference. Madden declared that the firm's 'main energies should be directed to the Industrial Turbine', with the object of getting 'at least a dozen into the Shops within the next 6 months'. This 'general policy', Madden announced, 'would be far better for us in every way'. The doubts held by Shaw and McLean over the commitment to mill gearing did not reflect a major danger to the firm in Madden's opinion. The company was 'not risking anything there. If we find we can do nothing, we will give it up for ever, but if we find it is worthwhile we are prepared to spend money on

it'. What was the general sales policy that was arrived at for Hick Hargreaves in March, 1932? In Madden's words, the policy required the company to 'go all out' on Condensing Plant and Auxiliaries and to investigate the prospect of 'pushing this Plant on the Marine side'. The enterprise was to 'go all out' on the Industrial Turbine, 'with a view to getting a constant run of Machines through the Shops, to see what can be done with the smaller Turbine, and in addition ... to "try out" Millgearing work'. Indeed, the firm was understandably committed to 'all engine repair jobs and [all] odds and ends of work we can get hold of' in order to survive the peculiar difficulties of the engineering industry in the midst of a widespread slump. The new work that had arisen in recent years also had a clearly defined place in the sales policy to be pursued. 'We are going to push the Rotary Compressor of the Swiss Locomotive type, for all it is worth. We are going to go slow on the Turbo Compressor, and without spending money on Plant or on Stock Machines, we are trying to get an order if the opportunity should arise'. The small Rotary Compressor of Weber & Schwab did not merit commercial consideration at this time.

After arriving at the sales policy to be pursued, Madden believed that it was appropriate for the Conference to discuss the question of organisation for carrying out the policy. Sales Supervision from within the firm employed nine staff members at a cost of between £4,000 and £5,000 a year Madden declared. Outside the firm there was Shaw in London and two or three minor agencies in the country. Orders for the current year had a value of £50,000. In Madden's opinion: 'It is quite obvious that the selling organisation which we have today, is not only expensive, but it is not bringing in the work. We must consider whether our organisation should be completely revised and what is the right way to handle the business'. Madden reminded the Conference that

the firm had a 'very diversified business' comprising five distinct sections: Engines and Repairs; Millgearing; Turbines; Condensing Plant & Auxiliaries and Rotary Compressors. When Madden remarked that the firm had employed two salesmen before the war and three in 1920 Shaw interjected: 'But times are not comparable'. Madden agreed, but added that 'expenses are comparable, and the times are not as good, and from £700 then we are now spending about £5,000. We are very hard up and we have economised up to the hilt in every part of our business except at the Sales end. Now the time has come for us to consider a revision of our Sales organisation'.

The only proposal that Madden prompted came from McLean, who believed that first-class agents should be appointed in Newcastle, Glasgow and Sheffield, while sub-agents should also be appointed under the supervision of the local agent or representative. Madden felt that 'really good Agents' were hard to come by and 'In the whole of my experience I have only met two really valuable Agents - Mr. Shaw and Sir Ness Wadia in Bombay. A good man is 1 in 1000'. The one valuable salesman present believed that Madden's notion of sales policy was not well conceived. Shaw explained that if 'You want to wait until you get a lot of orders into the Shops before you reduce your prices - you will never do it. You have got to reduce your prices, and then your Shops will be full. In Condensing Plant and Auxiliaries I have no complaint but on all other things you are well on top. On Rotary Compressors it is price every time, and also on Turbines. You will never get production until you have given a price. I have had 3 enquiries from Unilever for Compressors. In one case your price was £1,200, purchase price £800, and there was a recent case of our £550 against purchase price of £400'. When Madden raised the question of sub-agents Shaw quickly brought the discussion of sales organisation to a close by again

drawing on experience. 'I do not think the Sub-Agent stunt is much use'. He went on: 'If you are an Agent you have got to give a matter personal attention. If you are an Agent for Hicks, and you send somebody else, the customer is not pleased. I think it is easy to over-do this Agency business. What you want to do is to find good men in the Main centres'. After Madden had interjected to say that he agreed with Shaw on these points, Shaw concluded his homily: 'If you get a good Agent in the big towns, where a man has not more than 3 lines besides your own, that is the best thing you can do'.

IV

The Sales Conference resolved that the commercial policy of the company should concentrate the selling effort on the promotion of Rotary Compressors and Industrial Turbines. The unsatisfactory Weber Compressor was at best a 'practical proposition', a design that in Arrowsmith's opinion did not warrant 'an extensive programme until we had gained further experience'. Madden was dissatisfied with the outcome of the agreement reached with Weber & Schwab, because the company found itself developing an unproven machine. He felt 'that ultimately the machine would be got right, but he could not lose sight of the fact that we have been presented with a half developed machine'. Madden argued that a strong letter of complaint ought to be written to Weber & Schwab. The Managing Director's resentment was understandable. When the annual accounts were considered soon afterwards the opinion of the auditors was that the payment of a dividend could not be recommended as the 'industrial depression remained acute, and all the resources of the Company should be conserved in view of a probable loss for the current year'. Madden remarked that the accounts revealed 'that the value of the Contracts taken during the past year, were no less than 71%

lower than in the previous year'. At this difficult time, the purchase of additional machine tools was a matter that required the careful consideration of Arrowsmith and Madden, as well as the endorsement of the Board, because the 'present was not a time to press for expenditure'. The shareholders derived little comfort from the report of the directors for the year to March, 1932, which declared that the past year was 'one of great difficulty'. Both turnover and trading profit had contracted further because of the 'severe depression in the Engineering and other Industries', while a more serious decline had occurred in the value of contracts secured. The struggle to secure work had already prompted McLean to visit G.H.H. in Germany and evaluate a new machine for dealing with slurry from coal washeries. Enquiries at home into the demand likely to arise for slurry drying plant on the coalfields led Madden to continue preliminary discussions for the manufacturing rights. At the same time as the search for work became more compelling, the terms of potential contracts became more onerous than hitherto. Two turbine enquiries received from paper mills at the close of 1932 were accompanied with requests for long credit terms. 'In one case, extended credit is asked for over five years, and the other over three years', reported Madden. The nature of these enquiries brought the matter of credit insurance before the Board and in view of the high cost of such insurance Madden 'suggested that we insure only for our net out-of-pocket cost of material and wages'.[21]

The correspondence with Weber & Schwab, strong or not, resulted in the delivery of an entirely new machine that was mechanically sound and efficient in performance. Madden did not hesitate to point out that 15 months had been lost through defects inherent in the machines sent from Switzerland. Only now was the firm able to consider a definite marketing programme for the Weber Compressor. Hick Hargreaves was able

to proceed with the manufacture of this machine from January, 1933. Nonetheless, the Weber Compressor remained subject to trials and development work. Indeed, by 1933 the company was experiencing serious difficulty with the contracts fulfilled earlier for the supply of large compressors, as it became apparent that the design was incapable of meeting the required performance. In August, 1932, Arrowsmith reported that 'satisfactory progress had been made with the Weber & Schwab Compressor' and the sales programme could be carried through by making the machine ourselves. Soon afterwards, Madden 'reported that we were still endeavouring to find satisfactory Agents, particularly for Rotary Compressors, in different parts of the country'. Before the end of the year some Home Agencies had been appointed for the collieries in the northern counties of England and the South Wales area. By November, Arrowsmith 'had been through the design' and an improved version of the Weber Compressor had been put through the shops at an approximate net cost for skilled wages and material of £100. The Chief Engineer could not report on the Compressor programme because he, McLean and Aspinall had left the country with representatives of three of the leading manufacturers of coal handling plant, together with two colliery engineers, bound for Germany and an inspection of the slurry drying plant in use. McLean's original report on the centrifuge machine built by G.H.H. and other firms had encouraged Hick Hargreaves to discuss manufacturing rights with G.H.H. McLean had approached 'some of his friends in the Colliery Districts with a view to securing an order for one of these Machines' and as a result Hick Hargreaves head of Turbine, Turbo Compressor and Rotary Compressor Sales had promoted the group visit to Germany.[22]

The performance of the centrifuge on German slurry proved satisfactory, but a sample of English slurry was not treated to the same

degree by the slurry drying plant. Although there were doubts over the applicability of this German machine for British collieries, Hick Hargreaves explored the market open to the centrifuge in Britain. At the same time as the firm attempted to generate any new business likely to generate returns, the 'abnormal times' required further economy measures, with outside services either terminated or retained at reduced fees. An agreement with Thompson & Pellatt, who had advised the firm on foundry practice was not renewed beyond March, 1933. An agreement reached with a firm of Cost Consultants was re-examined 'and it was decided that in view of the necessity for making every economy we can, their service be not renewed'. A year after the decisions reached at the Sales Conference, Madden was compelled to disclose that the marketing of Rotary Air Compressors was giving rise to anxiety. In the design of the Compressor Hick Hargreaves had based their figures on those of the Swiss Locomotive Co. In operation the high pressure machines that Hick Hargreaves had supplied had failed to conform to specification and tests had shown the machines to be well under duty for output. Various methods to overcome the problem had been tried and had failed to solve the difficulty of low output. In the case of the contract with the Frodingham Iron & Steel Co., the firm had had to concede a reduction in price in order to retain goodwill, while delivery in another contract was four weeks overdue and liable to incur a penalty. Madden believed that the only recourse open to the firm was to seek 'some assistance from experienced people. He said that we had already been approached from two sources, one a Mr. Wittig, who states that he is the son of the original inventor and patentee of the Rotary Machine'. A Committee of Directors made up of Harman Hargreaves, Madden and Arrowsmith was empowered to deal with the Compressor business and chose Wittig in preference to the other source of assistance, The British Burckhardt Compressors Ltd. Shortly before Madden's disclosure this company had

approached Hick Hargreaves, because they were anxious to negotiate a licence agreement with a firm in Britain for the manufacture of their products, that included Rotary Compressors similar to the firm's. A meeting had already been held with representatives of British Burckhardt and it had been felt that the minimum amount of royalty asked for was too great. Madden suggested that an interview with Wittig should be held to discuss his proposals. When the Committee of Directors next met British Burckhardt the Committee declared that the company's offer was unacceptably high and that it was not 'worthwhile making any counter offer'.[23]

The decision to end discussions with British Burckhardt may have been arrived at because of the impression created by Wittig, who had visited the works over a period of three days 'during which time we had been able to obtain some information from him'. Madden added: 'We are of the opinion that he has the information we require in connection with Rotary Compressors'. An offer of employment was made to Wittig pending Home Office approval for him to live and work in Britain. The proposed arrangement required Wittig to carry out his duties for a trial period of three months with the likelihood of an extension for three years if the trial proved satisfactory. On arrival at the Soho Foundry, Wittig and Arrowsmith began to design a Rotary Compressor that would conform to the guarantees of duty given to the Frodingham Iron & Steel Co. A year later, in the Spring of 1934, a settlement was finally reached with this company that preserved Hick Hargreaves goodwill notwithstanding 'all the circumstances' attending the contract. By safeguarding that intangible asset the firm was rewarded with an important contract from the steel company. Elsewhere, too, the legacy of the early Compressor sales endured for some considerable time. In 1930 three compressors had been put in hand for the Battersea Power Station of the London Power Co.

Over four years later 'it was arranged that the Machines should be taken out and that we would allow them one half their value, they retaining the Motors'. The Board agreed that this was 'a satisfactory settlement, particularly since our friendly relationship with these clients remained satisfactory'.[24]

At the same Meeting that the critical moment in the Rotary Compressor line was disclosed in March, 1933, Madden also announced that the firm had received an enquiry for a Turbo Compressor. Here was a 'good opportunity of getting a machine into' the shops and to that end a 'very low price' was quoted, showing 'only a small return in charges'. The enquiry was not translated into an order. Several months later another enquiry for Turbo Compressors was received from the Amalgamated Anthracite Co. and Madden remarked that in the past British Thomson-Houston had supplied the whole of the plant for this company. He added: 'It was evident to us that if we quoted in competition with them they would regard it as an unfriendly act. This matter had been considered by us, and we have decided, in view of the exceptional circumstances, to quote a losing price'. Madden took the opportunity to mention 'the position in regard to the Turbine and Turbo Compressor Departments'. At the Sales Conference held well over a year before, Madden had described a Turbo Compressor order as one 'full of meat' for the firm, while it had been decided to obtain a 'constant run' of industrial Turbines through the works by winning contracts for at least twelve turbines within the next six months. A tacit understanding had marked the deliberations of the Sales Conference, the awareness that in spite of the present-day difficulties confronting Hick Hargreaves the business was fundamentally sound and capable of prospering given the appropriate policy. Madden's message in the Summer of 1933 was that the crisis facing Hick Hargreaves had not relented. In truth, the crisis

was worse. Up to the present the firm had not booked an order for a Turbo Compressor, 'neither had we booked an order for a Turbine during the past two years'. It was agreed by the Board that 'we should adopt a waiting policy in respect of both Departments, and reconsider the matter towards the end of the year'. The implicit truth of this decision was that the conference policy had failed. At the same Meeting of the directors, the decision was taken to purchase the fixtures of Galloways, thereby implementing another aspect of the sales policy: '... to do all engine repair jobs and odds and ends of work we can get hold of'.[25]

In 1932, the shareholders had been told of a serious decline in the value of contracts secured over the previous year. A year later, the state of trade was again deplorable, the works were employed at half their capacity and what work there was in the shops had been 'secured only at highly competitive and unremunerative prices'. Once again, the order books were weaker than they had been at the commencement of the year. This was a wretched time to celebrate the centenary of the enterprise, with the business equipped and organised to deal efficiently with demands which had either disappeared or diminished. The Directors' Report for the year to March, 1933, acknowledged the centenary of the firm with a statement: 'From its inception the policy of the Proprietors, and subsequently the Directors, has been to keep the Works and the Manufactures of the Company in line with the latest practice of the day. After 100 years the reputation and goodwill of the Company never stood higher than today, and with an improvement in world trading conditions, the Directors look confidently to improvement and success in the future'.[26] In the Summer of 1933, the directors were clearly awaiting events, because their sales initiative had failed to compensate for the falling off in demand and limited expectations in the engineering sector associated with the slump. In order simply to survive expenses had to

be reduced and costs of production lowered and it was this response which preserved the enterprise. The economy's recovery from the slump had already begun at the turn of 1932, a cyclical upswing that was to reach a peak in 1937 and bring relief to those traditional sectors of the industrial sector that had encountered fundamental problems of world industrial development at the outset of the interwar period. By September, 1933, a recovery in business activity was being felt at the Soho Foundry, but the firm's recovery was a halting one down to 1937 and was largely dependent on a well-established line.

V

In 1932, the company's trading performance had resulted in a net profit of £580, the followng year's results showed a net loss of £4,409. Remunerative work remained elusive. In July, 1933, Madden announced that the Willow Bank Mill Co. had invited the firm to repair their turbine. The mill company's finances had been strained in the past and Hick Hargreaves ranked as unsecured creditors to the extent of almost £250. The approach for repairs led the firm to make the 'fullest enquiries' and discuss matters with the mill directors, who 'informed us that their position was much better than previously. We had, however, suggested to these people that we were prepared to undertake the work for them provided they would let us have cheque for £300 with the order. This proposal had been turned down by the Willow Bank directors so that we were not carrying out the repairs for them'. Subsequently, the mill directors 'sent for us' and consented to the firm's terms. When Weber & Schwab disclosed that they intended to cease manufacture of Rotary Compressors in Switzerland, the whole question of the firm's experiments with the Weber design, as well as the agreement with Weber & Schwab, was thoroughly discussed by the Board. After hearing a report from

Arrowsmith, the Board agreed to discontinue experiments and terminate the agreement. Only the small Weber Compressor had developed into a marketable product Arrowsmith said. Weber Compressors of a larger size or higher compression had required 'prolonged experiments' and were 'not sufficiently commercial to justify our continuing'. Arrowsmith conceded that in principle the Weber machine was 'quite good' and that the Wittig Compressor of the single stage type 'will never do the high compressions that the Weber Compressor will do'. Nevertheless, the Weber design had failed to become a 'business proposition'.[27]

One other new line that had failed to blossom into a business proposition was the Turbine & Turbo Compressor business. In September, 1933, Madden drew the Board's attention to the inadequacy of the existing testing plant which hindered negotiations, owing to the inability to run certain sizes of machine. 'As this Turbo Compressor business is becoming more important, he suggested we should ask Mr. Arrowsmith to give a report'. A month later Madden reported that progress in the Turbine & Turbo Compressor Department 'was disappointing and suggested that Mr. Arrowsmith and he should consider the matter with a view to suggesting what steps we could take to improve the position'. At a later meeting Madden remarked that this was the 'only Section of the business which, for sometime, has not been progressing or showing signs of improvement'. The inadequacy of the testing plant was only one aspect of the 'difficulties under which the Dept. had to work', an area of business which also required 'our very serious consideration both from the point of view of design and sales'. By contrast, the performance of the firm's Condensing Plant business had matched the expectations held out for this line at the Conference. Condensing Plant returns from B.E.A.M.A. for the year ending September, 1933, revealed that Hick Hargreaves 'had kept our position in respect of orders

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received for Condensing Plant; Vickers-Armstrong head the list, Metropolitan Vickers being second, and ourselves third'. The expectation that recovery would be promoted by the new line in Rotary Air Compressors received a blow when the company was compelled to deny that their Compressors were an inferior product. A tender for Compressors placed by the Johannesburg Municipality was lost when it had been understood that Hick Hargreaves tender would be 'very favourably considered'. The company was advised by their South African agents that the City Engineer of Johannesburg 'being friendly with Mr. Whitehead of the Birmingham Tame & Rea Drainage Board, cabled the latter asking his opinion regarding Rotary Compressor, to which Mr. Whitehead had replied advising them to have nothing to do with this type of Compressor'. In response, Madden consulted the firm's solicitors and Wittig and Lawson, the firm's agent in Birmingham, visited the Drainage Board, where two of the firm's machines had been installed. The clients acknowledged that Hick Hargreaves Compressors were 'running excellently' and had provided 'every satisfaction. These people have also agreed to give a satisfactory reference to anyone asking them for an opinion of the Rotary Compressors supplied by us'. Madden subsequently wrote to Whitehead, the Engineer of the Birmingham Tame & Rea Drainage Board, 'with a view to fixing up an appointment with him'. A 'long discussion' with Whitehead in Birmingham 'cleared up' the matter.[28]

The value of orders booked for the year ending March, 1934, stood at £85,000. Although this figure 'left a great deal to be desired', Madden felt that the value of orders received in 1933-34 was a considerable improvement on the strength of orders for the two previous years. When the time came for the Board to consider the annual accounts, the question of a dividend was fully discussed by the directors, who believed they could recommend the payment of a dividend of half of

one per cent. The directors had already sanctioned several items of capital expenditure. At the close of 1933, capital expenditure of £2,000 had been approved to replace the decrepit steam hammers in the Smithy originally installed before the turn of the century. The Works Manager had guaranteed an annual saving of £400 if new hammers were acquired. In 1934, the purchase of a large lathe from the auctioneers of Scott & Hodgson for £200 was approved and the acquisition of a Screw Cutter from the same source and a Radial Drill from Galloways was also endorsed at a total cost of £235. The tempo of work had obviously risen by the Summer of 1934 when Madden disclosed 'that owing to the increased amount of work passing through the Drawing Office, it had been necessary to increase the Staff' by engaging two additional draughtsmen. The Directors' Report for the year to March, 1934, reflected a mixed performance, with a trading loss of £217 that translated into a net loss of almost £6,800. Provision for depreciation, debenture interest and income tax was met by means of a transfer of £7,000 from the Reserve Fund, which also absorbed the £1,200 paid to shareholders as a dividend of 1/2%. The past year had 'again been one of extreme difficulty, the turnover being the lowest recorded in the post war period'. But the report recognised a 'substantial increase in the value of the contracts secured during the year'. Moreover, the directors could also report that 'the outlook has definitely improved since the commencement of 1934'. Perhaps the perceived improvement in the outlook for trade permitted the directors to allow a dividend award paid for out of past profits. What is significant is that the revival in the company's performance had little, if anything, to do with the new lines. They were to remain a disappointment well into the recovery from the slump.[29]

Several years before Hick Hargreaves had supplied the 50,000 K. W. Condensing Plant for the Ironbridge power station of the West Midlands Joint Electricity Authority. This station had been ceremonially opened

in 1932 by the Minister of Transport and 'whilst there we had met several influential people'. The company also won a subsequent order for additional machinery at Ironbridge and in September, 1934, the value of Orders Booked 'showed a great improvement ... due to our obtaining the Ironbridge Contract'. At the October Meeting of the Board Madden drew the directors' attention to the orders booked in the Monthly Report and remarked that this value 'did not include the Northampton Condenser'. He added that the 'general position was very much improved' by comparison with the figures for orders in hand a year before. When the directors next considered the Monthly Report, Madden disclosed that the 'greater portion of Orders booked was in connection with the Condenser Department' and following the confirmation of the order for Condensing Plant from Northampton, valued at £32,100, and another order for Evaporating Plant required at the Victoria Falls, Madden felt able to declare that 'prospects for the immediate future were satisfactory'. At the same time as the line in Condensing Plant was sustaining the business, the question of improving sales of Rotary Compressors in the London District was resolved by the appointment of an additional salesman, working out of Shaw's office. The directors also considered the licence agreement with G.H.H. as requested by that firm. Madden stated 'that after giving much thought to this subject he had come to conclusion that our interests would be best served in discontinuing our activities in connection with the G.H.H. Turbo Compressors'. Arrowsmith commented 'that he could not see any reasonable prospect of our obtaining orders, and in his opinion the only thing to do was to allow our License to lapse'. Hick Hargreaves failure to win a first order for a Turbo Compressor and the decision to withdraw from this line required the termination of McLean's appointment. Soon after resolving to discontinue operations with the Turbo Compressor and allowing the licence agreement to fall, as well as dispensing with McLean, an

outstanding tender for a Turbo Compressor 'developed very considerably'.

The directors of J. & J. Charlesworth, a firm of colliery proprietors in Wakefield, had visited both G.H.H. and Hick Hargreaves 'and were now anxious to discuss the matter with us'. Madden and Arrowsmith were authorised by the Board to secure 'this order providing it could be obtained at anything like a reasonable price' and early in December a meeting was held which resulted in Charlesworth placing an order for a Turbo Compressor at a price of £5,900. The Managing Director's Monthly Report for December, 1934, provided an opportunity for Madden to review the past twelve months. He noted: '1934 has been a year of recovery in the British Engineering Industry, after the unprecendently severe depression which began in 1931. In this recovery we have had our share, and it has been for us a period of consolidation and steady progress'. At the end of 1934 Hick Hargreaves must have emerged from depression if only because of the somnific quality of the Managing Director's current report. However, Madden did refer to three orders that each marked a 'new departure in the development of the business', orders that would 'have their effect in increasing our scope and output in the future'. The purchase of Scott & Hodgson's engine patterns and drawings had been undertaken 'with a view to strengthening the Engine Department by adding the manufacture of Rolling Mill Drives and High Speed Flywheel Sets'. The order subsequently placed by Guest, Keen & Baldwins for the first Storage Flywheel of their new Rolling Mill in South Wales confirmed the wisdom of the fixtures purchase. Yet this act of industrial cannibalism was an impulsive measure, even a desperate one, aimed at providing some work for a department dependent on a 'dead' line in engines. The second noteworthy order in Madden's report was the contract for a Rolling Mill Drive destined for Lysaght's new mills in Australia, which was also acquired as a result of the closure of Scott &

Hodgson. Only the third order, the Charlesworth Turbo Compressor, could be ascribed to the carefully considered policy of the company arrived at two years before. The improvement in business activity had been felt by Hick Hargreaves 'about halfway through 1934' when the value of orders booked became 'satisfactory'. Improved prices and the prospect of a good many contracts becoming available were features of current activity discernible to Madden early the following year. The long awaited improvement in trading conditions was in progress.[31]

Hick Hargreaves had undoubtedly recovered some strength in 1934. At the close of that year the total value of uncompleted work was £95,058 and this compared with a value of £43,986 at the close of 1933. The number of men employed in the works had risen from 255 to 328, while the value of orders obtained in the course of the year had also risen from £64,443 in 1933 to £153,500 in 1934. At the end of September, 1934, certain salesmen were receiving a small bonus in recognition of the contracts they had secured. Madden was encouraged to say that provided trade continued to improve the outlook for 1935 was promising. The recovery in the firm's performance evident to Madden cannot be attributed to a forward policy founded on the marketing of new lines. Although such a policy was launched the inability to generate new sales and the continued reliance on Condensing Plant, the only satisfactory sector of the business, forced a waiting policy upon the directors. As they waited for the depression to turn the corner, the survival of the enterprise was ensured by an assiduous preoccupation with the 'financial resources' of the business. Well into 1930 the directors had dealt with the Monthly Accounts in a perfunctory manner, examining the gross and net accounts for payments and signing salary cheques. The consideration shown to the accounts altered appreciably at the close of 1930 when the Secretary began to lay upon the table a list of cheques signed but not

issued, a bank statement, an analysis of petty cash and a summary of orders received. Madden had identified as inadequate the 'Monthly Report as submitted', citing as deficient the list of accounts and pressing for more detailed accounts for payment. Madden also asked to know why some cheques already passed and signed were subsequently cancelled. At his insistence the Board agreed that henceforth all cancelled cheques should be brought to meetings for destruction. By the close of 1930, the Secretary produced the accounts and cheques for examination by the Board, but he also 'laid on the table the following documents:

> List of Cheques signed at previous Meetings but not issued.
> Bank Statement.
> Analysis of Petty Cash - expenditure during month.
> Summary of Orders in Hand.
> List of Debtors at Dec., 28th/30.
> List of Invoices received up to and including Nov. 30/30, which had been held up owing to dispute or waiting delivery of the material invoiced.

As the slump deepened, the Secretary was called upon at Madden's insistence to provide directors with a list showing how the value for doubtful debts was arrived at. From March, 1931, the Secretary also laid before the Board an up-to-date List of Doubtful Debts in addition to the List of Debtors.[32]

It should be borne in mind that the new line in Turbo Compressors was dispensed with in the latter half of 1934, so dismal did the prospects of obtaining orders appear. One contract, the first awarded the firm, was responsible for the Board rescinding the original decision and at the commencement of 1935 Arrowsmith, Aspinall and Wittig visited

G.H.H. where they 'obtained all the information we required, and discussed with them in detail, the design of their Turbo Compressors, also their methods of manufacture'. The new lines became valuable to Hick Hargreaves once the recovery had acquired some momentum in other sectors of the economy, thereby stimulating demand for the new capital goods. The firm's survival in depression was a consequence of the enduring strength of demand for Condensing Plant and the company's role as a Condenser maker, a point recognised by Madden in March, 1935, when 'He emphasized the fact that the Condenser Section of our business continued to over-shadow the other Departments'. This work can be attributed to the activities of the Central Electricity Board created in 1926 to promote an electricity supply industry adapted to national rather local requirements. In the grid Britain acquired a power network superior to any distribution system elsewhere in the world and one built with speed. The rapid interwar growth of a reorganised and rational supply industry 'provided the electrical engineering industry with a viable and expanding market for domestic and industrial goods'. This industry's growth was not 'without serious fluctuations', while underlying all economic activity was the Government's restrictive economic policy. Nonetheless, once the effects of the General Strike had passed the electrical engineering industry 'experienced almost uninterrupted expansion' that continued throughout 1928 and beyond. The 'output of the electrical engineering industry was much less seriously affected by the slump of 1929-32 than were other industries'. The cyclical downswing of 1930-31 coincided with a peak 'in the number of consumers connected to the supply system' and from 1931 the industry remained prosperous because of the 'growing number of electricity consumers and the rapidly rising real domestic expenditure on electrical goods'.[33]

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Electrical generation proved beneficial to established engineering firms in traditional lines, because they could provide the heavy plant required of efficient generating stations and transmission lines. 'Electrical machinery, like electrical engineering as a whole, appears to have fared badly in the early 1920's, but from 1924 the Census data indicates a fairly strong upswing with gross output increasing by about 64 per cent between 1924 and 1935'. In the heavy sector of electrical engineering, the Associated Manufacturers of Electric Traction Equipment was established in 1935 'for the pooling of large electrification orders'. This company's shareholders were British Thomson-Houston, English Electric, General Electric, Metropolitan Vickers, Crompton Parkinson and Allen West and Co. Trade associations were likely to be formed among electrical engineering firms because the products were homogeneous and the market relatively inelastic, while the objects of such associations were clearly perceived by potential members. These aims included the projection of a common voice for the benefit of the interests of the trade as a whole, the avoidance of wasteful duplication of effort and the generation of revenues without an unnecessary degree of competition. The British and Allied Manufacturers' Association was formed in 1911 'in the belief that voluntary co-operative action by the various firms would go far to meet the economic difficulties which at that time were handicapping the development of electrical and allied engineering in Britain'. The basic principle of this association was 'co-operation without sacrifice of individual initiative' and by 1933 the British Electrical and Allied Manufacturers Association 'could claim that its members manufactured 97 per cent of the total value of electrical machinery and apparatus produced' at home. Moreover, the association could claim to have promoted the standardisation of designs and conditions of sale, as well as extending the export market. As a member of B.E.A.M.A. Hick Hargreaves participated in such agreements as

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those formulated by the Small Turbine Makers for the maintenance of turbine prices. The particulars of the firm's membership of this association disclosed by Madden at Directors' Meetings, reveal that Madden was appointed to the Tariffs Committee of the B.E.A.M.A. in the Autumn of 1931. Early the next year Hick Hargreaves was appointed to the Council of the Association and shortly afterwards the company was invited to become a member of the Turbine and Turbo Compressor Agreements on royalties, not price maintenance. Arrangements for the maintenance of prices in depression did not require the guidance of the Association. In 1933, the firm attended 'a conference with The Mirrlees Watson Company and Worthington Simpson, in regard to Condenser prices'. For a trial period of six months the prices of Condenser Plant were agreed to be increased, the increase to be shared between the unsuccessful tenderers.[34]

Hick Hargreaves survival through the slump was due to the supply of Condensing Plant for use in power stations, a line specifically organised to meet the demands of the grid well before the slump. In April, 1928, Madden 'explained the present tendency for Evaporators to be required in conjunction with large Condensing Plant Installations and that it would be advantageous to us to manufacture them instead of purchasing from another Maker as at present'. Madden's proposal was approved and the manufacture of a trial plant of Arrowsmith's design was sanctioned at a cost of £400. The importance of the Condenser business can be judged from Madden's concern at the negotiations then in progress between British Thomson-Houston and Metropolitan Vickers. A new arrangement was likely to emerge whereby the latter company 'would take up the manufacture of all Condensing Plants required by the B.T.H.'. In the latter half of 1928, Hick Hargreaves were preoccupied with the supply of Condensing Plant to the site of the Hams Hall Power Station, a

contract placed by Fraser & Chalmers. At the October Meeting of the directors, Madden again raised the reported amalgamation of Metropolitan Vickers and B.T.H. 'He stated that the merging of these two Companies was being carefully watched and that up to the present there is no indication of this fusion affecting us to any great extent'. At that meeting, Madden produced a 'list of orders for Condensers which had been notified through the B.E.A.M.A.' and he reported that the firm had secured the order for Battersea Corporation. In 1928 Madden attended meetings of the B.E.A.M.A. 'in connection with the proposed new Condenser and Turbine Agreements' and the weight he gave to these reports was in proportion to the lines' importance to the business. At the close of 1928 he drew the Board's attention 'to the list of Surface Condensing Plants he had had compiled, showing that during the year we had booked fifteen orders representing seventeen plants'. Madden added that 1928 was the 'third best year for the Condenser side of our business, the best year being 1920 ... and the second best 1927', a year that included the 'large Hams Hall Contract for the Birmingham Corporation'.[35]

The importance of the Condenser business to the firm's recovery in 1934-35 was marked at the time. Further evidence of this was presented by Madden in his consideration of the Monthly Report in May, 1935. 'Sales' in April had amounted to £131,709 compared with £182,296 in April of the previous year, while 'Orders Received' totalled £210,130 compared with £89,581 in April, 1934. 'The Turnover this year is disappointing, but the year had been a good one from an "Orders Booked" point of view', said Madden. Two orders for Condensing Plant, amounting to £2,387, had recently been placed by Fraser & Chalmers destined for paper mills and Madden 'pointed out that very shortly Fraser & Chalmers would approach us in connection with another contract for Condensing

Plant, approximately £3,000, for A. E. Reed & Company'. At this time Hick Hargreaves were experiencing some difficulty with the tenders submitted for industrial turbines. Madden 'explained that we are frequently in competition with Fraser & Chalmers and in many cases had been requested not to compete, in view of the large amount of Condenser business they have placed with us in the past'. Few, if any, difficulties attended the line in Condensing Plant. In February, 1932, the seal of the company had been fixed to the contract with the County of London Electric Supply Co. Ltd., for the supply and erection of central evaporating plant at the Barking Power Station. A new Barking Contract was being discussed by Hick Hargreaves and B.T.H. at the beginning of 1935 when the point at issue was the commission on the contract previously agreed between the Turbine Builders and the Condenser Makers. Hick Hargreaves successfully contracted for the supply of Condensing Plant for the Barking Power Station and exercised the option available to the firm for a second set. By June, Madden was reporting that the 'orders booked this month had been exceedingly good, the most important being the Turbo Compressor for the Manchester Collieries and the ... Strainers for Edinburgh Corporation'. Water Strainers were one of the Condensing Plant Auxiliaries.

When the directors came to present their report for the year to March, 1935, they could justify a dividend of 1 1/4%. After three successive years 'of unparalleled industrial depression', the trading performance had improved considerably. 'The Turnover for the year, while still below the average, has increased by 25% over the previous year. The value of the Contracts obtained during the year is more than doubled, and the value of the uncompleted work on the books is over four times that at the commencement of the year'. The report to shareholders acknowledged the search, acquisition and development of new lines that

the directors had promoted over the previous sixteen years. 'This work has been successfully carried through despite the many difficulties encountered during the years of depression, and today the Company is in the position of having completely changed its products and brought them into line with present day requirements. The results of this policy are now being realised in increasing demand for the Company's manufactures in every department'. The perspective afforded the directors by the firm's recovery permitted this coloured interpretation of the recent past. In truth, those new lines that had been sought out had either proved ineffective as generators of returns or had become fruitful innovations with the revival of economic activity sometime after the recovery had begun in 1932. The strong and remunerative demand for the company's manufactures was limited to Condensing Plant, the only satisfactory section of the business both before and during the slump. Neither Turbo Compressors nor Industrial Turbines enjoyed a market in the circumstances of the post-1929 depression. Hick Hargreaves commitment to traditional products, such as millgearing, had not been curtailed, but was sustained as part of a carefully thought-out Sales Policy. Far from shaping the enterprise and bringing the business 'into line with present day requirements', the directors had been compelled to passively endure the slump because of the failure of the policy to recover the prosperity of the firm. Passivity was forced upon the directors as the engineering industry was confronted by a cyclical downturn at the same time as structural adjustment remained a pressing problem.

In the trading year 1935-36 Condensing work remained at a vigorous level. In August, 1935, the firm contracted to supply and erect Evaporating Plant for the County Borough of Newport at a price of £3,152. The next month the Contract Document for the supply of

Condensing Plant in connection with the Barking Power Station Extension set was sealed. The Contract Document with the Victoria Falls & Transvaal Power Co. was also sealed, for the supply of Central Evaporating Plant to the Klip Generating Station 1933 Extensions. In the Summer of 1935 there was an inconclusive enquiry for a Turbo Compressor from the Hulton Collieries. When the firm's representative called on the colliery people he was informed that the scheme was too expensive for the Hulton Collieries and that they had decided to buy a second-hand plant. Well into the recovery of 1932-37 the Condenser business remained the company's mainstay, one that called for a stout defence against encroachment. Late in 1935, the firm tendered for a third duplicate Condensing Plant required by the London Passenger Transport Board at the Greenwich Power Station. When the Board applied for the necessary advance from the Government this was granted 'on condition that the contract ... is placed in the North-Eastern Special Area, and which meant that the order would go to Richardson Westgarth & Company'. Madden viewed the possible loss of this Condenser contract 'very seriously' and made representations to both Members of Parliament for Bolton, who raised the case with Lord Ashfield. Within a month of first bringing the matter before a meeting of directors, Madden had raised the case 'before the Bolton Engineering Employers' Association who, in turn, had sent a Memorandum to the Manchester Regional Committee; the Bolton Chamber of Commerce had also taken up the matter with the Ad Hoc Committee of the Manchester Chamber of Commerce as well as with the Lancashire Industrial Development Committee'. Madden had also attended 'interviews with the Secretary of the Lancashire Industrial Development Committee, Mr. Ramsay of the National Engineering Employers' Federation, the B.E.A.M.A. and the British Engineers' Association. Mr. Ramsay had been good enough to ring up Sir Thomas Phillips, the Permanent Secretary to the Ministry of Labour'. The

Minister himself 'had visited Sir John Haslam in Bolton and our Members are now asking for an official appointment with the Minister of Labour'.[37]

Hick Hargreaves clearly mounted a strong defence of their interests on the issue of the diversion of contracts to the Special Areas. A meeting with the Minister of Labour was arranged and although he was 'very sympathetic' to the case presented on behalf of the firm, he 'explained that it was not practicable to make any alteration to the wording of the agreements, or to the definition of the "Special Areas". He intimated however, that the Preference Clause in question is worded sufficiently elastically to allow the merits of the question to be dealt with in an administrative manner'. Several months later the Extensions Contract for the Greenwich Power Station was placed with Richardson Westgarth. The Condenser business was evidently essential to the company. At the turn of 1935 Hick Hargreaves had quoted for a duplicate Condensing Plant for the Southern Railway and similar plant for the Norwich Corporation, while tenders were being prepared for Condensing Plant required at Cape Town, Johannesburg, Coventry, Hackney, Sheffield and Portsmouth. In the meantime, J. & J. Charlesworth were pressing for the delivery of the firm's first Turbo Compressor. Completion of this contract was overdue and was likely to incur a penalty. Once the Turbo Compressor was completed at the turn of the year 'various clients from different Collieries' were invited to see the machine running at the works prior to dismantling. But tests were still being carried out on the machine several months into 1936, when G.H.H. provided one of their erectors and the necessary information 'to enable us to go into the question of control'. At the time of supply of Hick Hargreaves first order for a Turbo Compressor, the difficulties inherent in a new design remained outstanding.[38]

Madden's preoccupation with the contracts for Condensing Plant may have stemmed from the variable nature of the recovery experienced by the firm. Early in 1936, Madden was drawing the Board's notice 'to the amount of orders booked as compared with last year, which showed a definite falling off. He assured the Board that we were fully alive to the position, and were doing everything possible to book further work'. Only a month later, Madden could report that orders booked were 'very satisfactory' and 'compared favourably' with the comparable period the previous year. That current work consisted largely of contracts for Condensing Plant is reflected in the detailed consideration given on several occasions to Condensing Plant Tenders Outstanding. In the recovery from the slump Hick Hargreaves business was essentially the manufacture and erection of Condensing Plant at electrical generating stations. Only one enquiry for an Industrial Turbine was brought before the Board in these years of recovery because of the strong likelihood of a contract being placed. The purchase of the fixtures and goodwill of firms such as Scott & Hodgson did allow the Soho Foundry to undertake remunerative repair and replacement work on engines set down by defunct mill-engine builders. The total value of orders booked as a result of these purchases was noted earlier. Orders booked in response to the adoption of new lines failed to meet the expectations held out for them at the outset. The first Turbo Compressor contracted for towards the close of 1934 was not followed by a second order. The Charlesworth machine was delivered and erected in April, 1936, and further tests were carried out on site that raised difficulties of a 'practical rather than a theoretical' nature. Nonetheless, the difficulties required the attention of one of G.H.H.'s 'expert fitters' to make the 'few slight adjustments' necessary to render the machine 'mechanically perfect'. Further alteration to the last two stages of the Turbo Compressor was needed, however, for the machine to work at the low limits Hick

Hargreaves had guaranteed and again the firm was dependent on G.H.H. for the additional alterations. At the September Meeting, Arrowsmith reported that the performance of the Charlesworth machine was much improved after the refitting of component parts, while the remaining difficulty had been referred to G.H.H. 'In other respects the Machine is doing extremely well', said Arrowsmith. Soon afterwards he reported that the test on the Turbo Compressor intended for the Manchester Collieries 'had been very satisfactory, the performance being 5% better than our guarantee'. The successful marketing of this new line had now reached fruition, many more years later than had originally been envisaged. Clearly, the belated winning of a first order was not the final step toward the profitable take up of Turbo Compressors, as the firm had still to acquire the necessary manufacturing expertise once the order was placed. J. & J. Charlesworth were subsequently encouraged to contract for the installation of two more Turbo Compressors from the Soho Foundry. Hick Hargreaves line in Rotary Air Compressors had been beset with difficulty from the beginning and at the close of 1936 R.S. Wittig resigned from the company in order to promote a business of his own. The firm attempted to frustrate Witting's venture by making 'strong representations to the Home Secretary in respect of ... a permit being granted to Mr. Wittig to work in this country'. Wittig's departure also deprived Hick Hargreaves of the services of an Assistant Foreman, who took up an appointment with Wittig.[39]

The company's trading performance in 1935-36 showed a 'further and substantial improvement'. A trading profit of £37,000 permitted a dividend award of 5%, the placement of £9,000 to General Reserve and the allocation of £3,000 to a special depreciation account. The Directors' Report revealed that the sum of £9,000 placed to reserve raised the Reserve Fund to a level of £10,000. Over the year to March, 1936,

turnover had risen by more than 50% on the previous year and a 'satisfactory increase in profit on trading' had been earned. At the close of the trading year, the value of both contracts won and uncompleted work on the books of the business were the same as at the commencement of the year. When the directors came to report Hick Hargreaves' performance in 1937, they disclosed another satisfactory year's trading. An interim and final dividend raised the dividend for the year to 5% and there was a bonus award of 1%. The Report declared that the 'improved trading results reported a year ago, have been maintained, and the results are very similar to those of the year 1935-36'. A noteworthy disclosure concerned the successful application made in January, 1937, 'to the Share and Loan Department of the London Stock Exchange, for permission to deal in the Shares of the Company'. At the end of 1936, the principal shareholders had negotiated for the conversion of the enterprise into a Public Limited Liability Company. Not only the legal status of the company had changed by the beginning of 1937. Discussions involving the business with the Government's re-armaments programme had begun at the start of the previous year and were to become more significant as the decade advanced. An alteration in the complexion of the directorate had also worked through by 1937, with the reduction of the family connection on the Board of Directors. At the commencement of 1937, William Hargreaves' grandson, Harman Hargreaves, was the sole descendent of William Hargreaves on the Board of Hick Hargreaves Co. Ltd.[40]

Conclusion

The background to Benjamin Hick's role in engineering and his motives for settling in Bolton will be thrown into sharper relief through further research. New facts already reveal that this pioneering engineer was the son of a tinsmith in Holbeck and we can surmise that Hick's training in one of the schools of engineering was a natural step for him to take. Factory-based spinning in Bolton offered opportunities for gainful employment to a man skilled in the design and manufacture of machines, and Hick possessed the knowledge to satisfy the demand for machine technology. We can also imagine that his participation in the partnership at the Union Foundry taught Hick the techniques of management, a necessary complement to his abilities as a practical engineer. As the superintending partner of Rothwell, Hick & Rothwell, an enterprise that attracted more than one pioneer machine maker from Yorkshire, Hick gained the expertise that was crucial to the success of his entrepreneurial role from 1833. Then the several functions of risk-taker, financier, innovator, as well as that of superintendent of engineering affairs, reposed within the person of the Respected Master. At this early date, the nature of demand for factory power and the monopolistic control enjoyed by early engineering enterprises placed a premium on skills of design and build, although not all entrepreneurs in engineering could stand or fall on the basis of their expertise alone (witness the fate of Richard Roberts). Nonetheless, the bespoke demand for mill engines presented an opportunity for Hick to differentiate his machines from those of his competitors and trade upon a reputation for excellence of build. Hick's reputation for offering a superior superintendence of engine jobs was established at the Union Foundry and Hick undoubtedly planned to trade on this goodwill from the commencement of his enterprise.

The Soho Foundry was quickly built on an extensive site, equipped with the finest machine tools that Hick and James Nasmyth could devise. The rapid appearance of an outstanding engineering enterprise appears to testify to the high profits of machine making before 1833, when booms in mill construction rewarded those engineers who could meet the demand for mill power. The intense competition and cut margins that regularly occurred within the cotton industry were a spur to further investment in new capacity on the part of firms who enjoyed no control over price and sought to maximise production to cover the high share of fixed costs in total costs. The cost structures in engineering were quite different, because a large proportion of the added value was attributable to craft labour. Here lay the strategic goal of those entrepreneurs in engineering, who were alert to the rewards of labour-saving machinery and wished to innovate in self-acting machine tools. By building the skilled handwork of millwrights into machine tools and organising manufacture within machine shops, Hick was striving to satisfy the existing demand for powered machinery, while extending the market for power by minimising his costs. The control and ownership of the Soho Foundry by the Hick family did not long outlive Benjamin Hick. The new proprietor of the enterprise, John Hick, was a capable engineer, who readily supported applied research that had the potential to radically alter the heat engine. Siemens experiments at the Soho Foundry failed to yield a practical product, but the Corliss engine - an example of foreign technical leadership as the springboard of Britain's industrial growth - was a commercial success. The Corliss valve mechanism gave rise to a new type of steam engine, one that an enterprise with a reputation for supplying efficient and reliable mill power could exploit to the full. This awareness of the technical evolution of the steam engine and the implications of new mechanical arrangements for the marketing of power, is a theme that recurs throughout the history of

Hick Hargreaves. The perfection of the uniflow engine by Johann Stumpf in 1908 offered a more economical mill and blowing engine than the long established compound engine. In response, several British firms took out manufacturing licences, including Hick Hargreaves, for whom the uniflow steam engine became a speciality. The same was true of compound mill engines fitted with drop valves. The preoccupation with economy led Sulzer of Switzerland to innovate with the drop-piston valve engine. This type of engine was regarded as a Continental design in the early years of the 20th century. Nonetheless, the last major development in valve design gave satisfactory performance with the use of superheated steam, a practice that raised engine economy in the 1890s. By adopting both superheat and Continental valve gear, Hick Hargreaves catered to the requirements of power users by supplying stationary engines of the latest practice that continued to offer reliability and economy.

The Diesel oil engine became another speciality of Hick Hargreaves on the eve of the Great War. In the opinion of one historian this was a significant addition to the firm's range of stationary engines, because of the laggardly response shown by the engine building trade as a whole to the appearance of the Diesel engine. Hick Hargreaves and the Diesel oil engine is a subject that requires a more considered treatment than was possible in this dissertation, as the subject touches upon such major themes as backwardness in leading trades and the diffusion of new technology within a long established industrial sector, with well established manufacturing and marketing notions. We can say here that the directors of Hick Hargreaves accepted that the Diesel engine had a place in the market for motive power and marketed the internal combustion engine as an economical prime mover that in certain applications was competitive with the steam engine. The other new prime mover of the late steam age was the steam turbine and under Madden's

management this engine was adopted as a line in industrial power plant, one suited to the firm's experience with boiler and condensing plant. The steam turbine was perceived as the successor to the slow speed reciprocating steam engine and the development of an impulse turbine at the Soho Foundry for the generation of power and heat was the culmination of a century of innovation that aimed to provide efficient, reliable and economical prime movers in the market for power.

Before 1870, the application of steam-powered machinery within the economy extended to a limited number of industries, while several important industries remained untouched by steam power. The small metals' trades, for example, provided opportunities for manufacturers of compact gas and oil engines, where the established steam engine was inappropriate for the limited and irregular power requirements of some industrial processes. The restricted market for steam power in those trades where large-scale mechanical power had been applied down to 1870, followed by the adoption of small, flexible prime movers in industries hitherto untouched by mechanisation, tended to reinforce the specialisation of well-established engineering firms in lines determined by the specialist needs of the regionally based industries that they served. Hick Hargreaves had turned out marine engines and steam locomotives in addition to mill engines during the first thirty years of the firm's existence, because the power-driven machine tools the firm possessed could be applied to a variety of jobs which presented a common duty. Once the requirements of certain products became more demanding and specialist suppliers appeared, catering to the needs of adjacent mechanised industries, the market for power no longer remained a homogeneous one open to all enterprises in engineering. Shipbuilding is a case in point, where a craft was transformed into a heavy engineering industry as a result of innovations in steam and iron. The structure

that emerged in this heavy industry had one distinctive feature, with shipbuilders buying engines and boilers from works organised to supply these components at keen prices. At one date it had proved mutually rewarding for Alexander Denny's yard at Dumbarton to contract for marine engines from the Soho Foundry in Bolton. Once specialist marine engineers appeared close to the yards themselves a specialist market arose with connections and arrangements that excluded remote engineering enterprises through prices. In the shipbuilding regions, the builders and marine engineers operated in a market which betrayed a pattern of inter-related firms, where risk and capital requirements were spread between the yards and their specialist suppliers. Once the nature of shipbuilding had been altered by the pioneers of a new industry, marine engine building was no longer an option open to all engineering enterprises. From the 1860s, Hick Hargreaves was preoccupied by the power needs of the textile industry and those customers in the market for power whose needs were complementary to those of mill owners. Specialisation by customer accounts for the manufacture of steam engines at the Soho Foundry destined for the driving of cotton, woollen, jute and flax mills, paper and cement-making machinery, and steel and tinplate mills, while the firm also met the power needs of mines and provided for the generation of electricity.

Down to the 1920s the power needs of several industries with equivalent requirements were satisfied by the firm paying particular regard to the best practice expected of suppliers of prime movers and related installations. This tradition was established by Benjamin Hick, continued by his son, John, and maintained by William Hargreaves and his sons, who hired the expertise of Robert Luthy, William Inglis and John George Hudson, that not only assured the excellence of mill engine design at the Soho Foundry, but allowed the enterprise to exploit new

fields of enterprise in steel-making plant and cold-air machines. John Hick's retirement from the business prompted the sole remaining partner to place the engineering management of the enterprise in capable hands, while retaining the olympian functions of entrepreneurship. Inglis's reward, according to his obituary, was his elevation from engineering manager to partner in the Soho Foundry, although there is no primary evidence to suggest that a new partnership with William Hargreaves existed after 1867. It seems likely that Inglis was the technically competent manager, whose reward for managing the works successfully was a share of the dividends on the small capital that Inglis may or may not have sunk in the business as an affirmation of his good faith. The particulars of Profit and Loss Account show that commission payments were made to first Inglis and then Hudson, evidence of the reward available to those engineers who fulfilled a crucial role in the management of a family business. At an earlier date Benjamin Hick had found it useful to rely upon lesser managerial personnel in order to free himself from the monotonous aspects of his direction and management of the business. The Temperley brothers had acted as the cashier and draughtsman to Hick and their reward permitted a second generation Temperley to become a noted architect, the designer of several mills and commercial buildings in Bolton at the close of the 19th century.

The opportunities and rewards offered by Hick's enterprise in engineering clearly extended beyond the family of the founder. But it is with the Hick and Hargreaves families that we are primarily concerned. They determined the destiny of the business by the decisions they took. By 1842 Hick was enjoying a way of life that denoted the acquisition of wealth through inventiveness and industriousness. He enjoyed a home in the country beyond the insalubrious industrial town where Hick, as the managing partner of the Union Foundry, had once

lived. Blackhorse Street was vacated for Highfield, where Hick had the freedom to spend the money made in business on paintings, building up a large collection that included a work attributed to Rubens. The collection was sold at auction the year after Hick's death. Outside the home, Hick was active in the whole fabric of town life, as, for example, a Trustee for the Township of Great Bolton, a patron of the Bolton Savings Bank and a director of the Waterworks Company. The aspiration for wealth on the part of entrepreneurs in Bolton compelled a public role in order to properly direct and shape the swelling town, so that society outside the factory gates was as ordered as the machine shops within. Exemplification was not enough, thrift and industry needed to be encouraged, the town improved for the welfare of all through the good management of the Corporation and leisure time held up as an opportunity for cultural enrichment. John Hick continued the work and influence begun by his father by leading the life of an engineer, Town Councillor and Member of Parliament, complementing his political activity in movements for the spread of culture and art. He shared his father's enjoyment for paintings and collected a number of fine works that he was able to display in retirement at Mytton Hall, Whalley. The point to be noted in this consideration of overlapping industrial values is that John Hick ended the partnership with William Hargreaves on his election to Parliament, choosing not to pursue two demanding roles, one in business and one in politics.

Through qualities of steadiness, economy, sobriety and perseverance Benjamin Hick had acquired industrial wealth and ranked as an exemplar to others. William Hargreaves probably possessed similar traits which accounted for his success in commerce. His role as an industrial capitalist was not rooted in any form of practical schooling as an engineer, but was dependent upon the expertise of his partner and that

of Hicks's nephew, Benjamin Hick III, who entered the business in 1862. When he died at the age of 37 in 1883, the interest of the Hick family in the enterprise also died and Hargreaves was dependent for engineering knowledge on subordinate managers drawn from outside the family. From the 1880s, the managerial class of engineers was responsible for Hick Hargreaves notable place in the engine building trade. Whatever qualities William Hargreaves brought to the business seem to have been taken for granted by contemporaries. His capital in the business had been brought to the partnership by his brother and in the absence of any clear evidence to the contrary, William Hargreaves would seem to have introduced certain commercial skills to the firm that allowed John Hick to preoccupy himself with technical matters. Hargreaves role as the sole proprietor stemmed from an attitude of mind that equated the profitable direction of an industrial enterprise with the financial organisation of the private partnership. Hargreaves fulsome obituary testified to the splendid machinery turned out by the Soho Foundry and Hargreaves role as a Town Councillor, Tory Party man, churchwarden, temperance leader, Justice of the Peace, supporter of the Volunteers' and the beneficient defender of church day schools. Hargreaves the influential gentleman could not be overlooked, whereas Hargreaves the manufacturer required only a nod of recognition for the 'keen interest' and 'earnestness' he brought to the direction of the Soho Foundry. At the Bolton Iron and Steel works Hargreaves again had an opportunity of displaying his 'exceptional business ability, veracity and energy'.

A Smilesian interpretation of William Hargreaves' life would emphasise the entrepreneurial vigour shown by this proprietor of two major firms. Under such an interpretation, Hargreaves humble origins by comparison with Benjamin and John Hick would underscore his natural gift for directing industrial firms within the market environment of a

familiar cyclical pattern that periodically tested the decisions of the risk taker. John Henry and Francis Hargreaves were Chairmen of Hick Hargreaves & Co. Ltd. between 1892 and 1919 and like their father they were engineers by style only. Incorporation had been sought by the sons of William Hargreaves in order to promote the financing of replacement investment compatible with the retention of private ownership. According to the review of the company that appeared in Diamond Jubilee year, John Henry Hargreaves, the first Managing Director of the company, was a 'practical engineer', for whom the entire administration of the works received his personal superintendence. Among the other directors J. G. Hudson exercised management over the engineering department. However, Hudson's responsibilities were greater than the review admitted. Hudson had been the Chief Engineer for over a year prior to incorporation and was a director from the conversion, when an earlier agreement made with Hudson, the General Manager, was confirmed. Given the practical nature of the expertise possessed by Hargreaves' sons, they acted properly in hiring Hudson and heeding his advice. Hudson contended that the firm should continue to market compound engines in preference to triple expansion engines, on the grounds that a good and reliable design was preferable to one of higher first cost and questionable economy. Higher boiler pressures and the use of superheated steam confirmed Hudson's opinion that the needs of power users could be met by compound mill engines. The marketing of a complete range of durable, efficient and economical engines, built to standard designs, shows an attention to the economies of scale offered by what the firm termed 'progressive' specifications. When De Jersey & Co. were provided with engine dimension sheets and prices in 1896, they were also acquainted with the advantage that an order based on existing designs and patterns would bring to both client and supplier. De Jersey & Co. were requested to 'first try and work' their requirements into the existing designs 'and

only have recourse to the lists, when you fail to find an engine suited to your requirements'. At the close of the 19th century the benefits of standardisation and interchangeability were understood by the firm. Weaning the clients from traditional expectations of bespoke manufacture required care, if the market were not to renounce the firm in favour of the other builders of mill engines, who claimed a similar tradition of excellence of design and perfection of skilled workmanship.

The supply of mill power was big business at the turn of the 19th century, with over a score of firms competing for contracts. Firms such as J. & E. Wood had works as large as the Soho Foundry and boasted just as loudly of their modern machinery. In 1889, the Wood brothers claimed to have machine tools that in terms of power and capacity had 'no superiors in England'. The large shops of the Victoria Foundry were furnished with powerful travellers, while a system of tramways eased communications between the large shops and the works yard. Engines from 3 to 3,000 h.p. were capable of being manufactured for rolling mills, winding and pumping houses, electric stations, mills and factories. The Victoria Foundry's many specialities included Corliss-valve engines and the Wood brothers claimed to enjoy 'influential connections' in home and foreign markets. Moreover, the firm of J. & E. Wood benefited from the presence of a designer responsible for several specialities. In a market where the assumptions of perfect competition were present to a high degree, the claims made by builders for their products were a rational attempt to differentiate their lines. Any move on the part of Hick Hargreaves that sought to persuade the market to accept supply to a standard scale of engine powers, dimensions and prices was fraught with difficulty, as the clients might reject their treatment as customers and contract elsewhere. The remodelling of the Soho Foundry in the 1890s improved the departments of the enterprise in order that the firm could

turn out engines of the highest powers. Specialisation in the market for mill engines was directed to the supply of the higher-power steam engines and a marked break of trend in the size of engines is evident from the 1890s. The decisions taken by the directors had their reward in the dividend record in the years up to 1914. There is evidence that the initial vigour displayed by the directors did not diminish. Once the decision was taken to manufacture Diesel oil engines, the directors approved the purchase of the Limit Gauges necessary 'for the purpose of making the different parts interchangeable'. At the same time, the directors reached agreement with Georges Tabourin, a Belgian engineer, for the manufacture of his patent system of piston valves and exhaust valves in steam engines. Up to the Great War, the directors were adding new lines to the firm's specialities and enhancing those lines that the firm already possessed.

Several engine builders closed down before 1914, as the market for power proved insufficient for the smaller builders of steam engines. For those firms whose market for power extended abroad and included several industries, the building of prime movers continued to offer opportunities for reward. By 1914, the relative advantages of gas plants, steam engines, steam turbines and diesel engines for mill driving had been fully discussed in the technical journals, where comparisons had appeared of the costs of each source of machine drive. The capital and running costs of traditional rope drive from a condensing engine had been set against the outlays and costs of electrical drive from a condensing engine connected to a turbo-alternator. The self-styled practical men, who constituted the market for mill power, were also aware of the considerations that the intended use of power from an outside electrical supply company required of them. In 1919 the widespread industrial use of power on site

appeared to be assured, notwithstanding the competitive pressure from the public supply of electricity. The directors of Hick Hargreaves imagined that the power requirements of industry could continue to be met by efficient mechanical systems of power transmission, or electric systems on site, that employed new prime movers. The Hick-Diesel Oil Engine was marketed in sizes from 80 to 680 b.h.p., for power generation at electrical supply stations and factory premises. The steam turbine that the firm developed in the 1920s was meant to offer power users a prime mover that in terms of simplicity of operation and economy represented an advance on earlier plants. Hick Hargreaves steam turbine offered mill owners a choice between traditional rope drive or motor drive via an alternator. Turbines arranged for geared electric drives and pass-out turbines for industrial processes dependent upon low-pressure steam were also offered to power users. Yet the turbine plant developed by the firm was clearly envisaged as new and replacement mill driving plant for the textile industry, a sector in decline from the close of the postwar boom. The Bombay market, too, presented difficulties to Hick Hargreaves in the postwar years, a period distinguished at the outset by an outstanding liability for Excess Profits Duty and a rash venture in petrol engines that together gave rise to a cash-flow crisis. The response of the new Managing Director to the difficulties confronting the firm was to operate the business as economically as possible and organise the marketing side of the enterprise in anticipation of the revival in trade.

Madden's decision to hire an overseas representative to examine the markets and agents abroad was an understandable response to the scarcity of orders. However, the perception that the stagnant market for power was not simply a temporary phenomenon, but a feature of a fundamental adjustment to the structure of the economy, was not grasped until the

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onset of the post-1929 slump. Then the adoption of new and profitable lines became the subject of a major managerial enquiry that extended to the sales policy of the company. Once the decision had been taken to manufacture and market Turbo and Rotary Compressors, the problem of achieving that object remained for the managers to overcome and was, as we saw, an arduous undertaking. The activity that pulled Hick Hargreaves through the slump was the speciality in Condensing Plant for power stations. This line had developed out of the capacity to supply small industrial Condensing Plant compatible with the small turbine. The circumstances may have been fortuitous, nonetheless the fixed capital demands of the electricity supply industry brought some benefit to that traditional engineering sector deprived of replacement investment in mechanical drive, as a result of the adoption of electrical power in industry.

Hick Hargreaves dividend record between the wars reflects the difficulties of these years, but the value placed on the company's shares illustrates the collapse in the worth of the business in the Twenties, before an equally dramatic recovery in the domestic boom of the Thirties. As a private limited company the price of shares was arrived at through private negotiation, a point the company secretary frequently had to make clear to the executors of deceased shareholders. Sales of shares in the company only took place by negotiation and to the best of the secretary's knowledge there was little or no market for them. The only guide he had to their value was the price at which shares changed hands in the open market. The secretary also explained that the shares were held in the few hands of the Hargreaves family and as a private company the shares were not quoted on the Stock Exchange. But shares were transferred and among the purchasers were members of staff, who were persuaded to identify themselves closely with the

interests of the firm by becoming shareholders. When Percy Hargreaves sold over 3,000 shares to members of staff in 1923, the price struck was at par value of 20/-. In 1936, a lengthy correspondence took place between a former member of staff, anxious to realise his interest in the business at par, and the secretary, who explained that shares had recently changed hands at a price of 3/6. Nine years before a share transaction between Harman Hargreaves and N. N. Wadia had established an open market price of 12/6 per share. In May, 1931, the secretary answered an enquiry into the value of the shares by stating that an open market sale in February, 1929, had taken place at 5/- per share. Indeed, at the close of 1929, the secretary was writing of the open market price of 10/- established in 1927 and pointing to the recent sharp decline in all shares in the engineering sector that made such a price unlikely. In the Summer of 1932, the secretary disputed the valuation of 2/6 per share that a local firm of stockbrokers had arrived at by referring to the price of the last transfer of shares. As late as April, 1934, the secretary was advising that 5/- was the open market price of shares, when an offer of 1/3 had been made by a potential buyer.

The difficulties involved with share transfers in a private company became apparent as original shareholdings passed into new hands with the decease of family members. At one point, the secretary was accused of malpractice by a beneficiary of J. G. Hudson, who had sold her inheritance in the firm early in 1935 at a price 3/6 per share. By February, 1937, shares in Hick Hargreaves were quoted at 23/- and the beneficiary believed that she had been the victim of insider dealing, particularly as the wife of a director had purchased her shares. Madden's reply to the beneficiary presented the price of several transfers in the period 1934-35 and explained that the price she

received conformed with the low figure expected of a company in loss at the time of a severe depression. Madden also noted that two years before in 1935

> this Company was a private one, and all the transfers were the result of individual negotiations, since dealings on the Stock Exchange were not authorised. The only part taken by the Secretary... was to advise Shareholders when informed, that shares were for disposal, and to pass on the price offered to those desiring to sell.
>
> Neither the Secretary or anyone else connected with this Company could, at that time, foresee the improvement in trade which has subsequently taken place.

The recovery in the value of the shares associated with the successful reorientation of the business within domestic economic activity was probably a stronger motive for Hick Hargreaves conversion into a public company, with a listing on the Stock Exchange, than the difficulties posed by share transfers in a private company.

Barely ten years earlier, the firm's bank had wondered whether it was advisable for an enterprise to continue trading in the absence of profit. Indeed, Britain's industrial progress might have been better served by the transfer of resources from such a traditional enterprise to new industries, where the returns on capital were higher. Within a normative concept of resource allocation, higher returns on capital and the higher prices offered to factors of production in new sectors ought to have eliminated Hick Hargreaves. But the firm survived and adapted, whereas similar long established enterprises in the engine building trade failed. Hick Hargreaves existence might have ended between the wars had the new industries not become concentrated in the South-East

and Midlands. Cuts in salaries and wages only proved effective because of the depressed state of the region that coloured pay bargaining. When the De Havilland aircraft company established a site in Bolton in 1935 one of the directors was prompted to ask what impact their arrival had had on the men and wages at the Soho Foundry. Another underlying reason for Hick Hargreaves continued existence was the determination of the directors to keep the business alive. An outside appointee such as Madden came to possess shares in the company and was thereby assimilated into the family outlook on business, while staff members were persuaded of the wisdom of acquiring a greater involvement in the affairs of the firm by purchasing shares. The buyers from Percy Hargreaves in 1923 included Shaw, the London agent, Arthur Hewson Anderson, an engineers' foreman and Wyndham Monson Madden, the Managing Director's father. Arguably the strength of purpose of the Hargreaves family contributed in some measure to the continuation of operations through the worst of times, while the family interest in the management of the enterprise evident in the 19th century continued into the 20th. In the centenary year 1933, Gilbert Francis Fenton Davies, the great grandson of William Hargreaves and the son of a recently deceased director, entered the business by taking up duties in the Drawing Office, at the conclusion of his apprenticeship in Barrow.

Notes to Chapter 1

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2. Edward Baines, History, Directory and Gazetteer of the County Palatine of Lancaster (Liverpool 1824), v.1 p. 534.

3. J. Aikin, A Description of the County from Thirty to Forty Miles round Manchester (London 1795), p. 260.

4. Gilbert J. French, The Life and Times of Samuel Crompton (Manchester 1862), p. 57.

5. Phyllis Deane, The First Industrial Revolution (Cambridge 1969), p. 87.

6. Holden's Triennial Directory, 4th Edition, for 1805, 1806, 1807 (London 1805), p. 31.

7. Baines, op. cit. p. 529.

8. J.C. Scholes, History of Bolton (Bolton 1892), p. 513, quoting Baines History (1868 ed.) v.1 p. 556.

9. P.A. Whittle, Bolton-le-Moors .., An Historical, Statistical, Civil and Moral Account ... (Bolton 1857), p. 33.

10. Drake's Commercial Directory of Bolton (Sheffield 1861), p. 3.

11. The Commercial Directory for 1814-15 (Manchester), p. 13.

12. Bolton Commercial Directory (1889), 'Dobson & Barlow, Cotton Spinning Machinists'; Bolton's Rise & Progress (Manchester), p. 38; Evening News Guide to Bolton (1907); The Bolton Directory for 1818 (Manchester 1818).

13. Gilbert J. French, op. cit. p. 6; J. Aikin, op. cit. pp. 158, 260-264; P.A. Whittle, op. cit. p. 64.

14. G.W. Daniels, The Early English Cotton Industry (Manchester, 1920), pp. 36-39, 56-58.

15. P.A. Whittle, op. cit. p. 33.

16. Gilbert J. French, op. cit. pp. 4-7.

17. Ibid. Preface.

18. Michael E. Rose, 'Samuel Crompton (1753-1827), Inventor of the Spinning Mule: A Reconsideration', Trans. of the Lanc. & Cheshire Antiquarian Soc., Vols 75-76, 1965-66, p. 13.

19. Gilbert J. French, op. cit. pp. 49, 54.

20. Michael E. Rose, op. cit. p. 26.

21. P.A. Whittle, op. cit. p. 46; Gilbert J. French, op. cit. pp. 134-135; Evening News Guide to Bolton (1907), p. 88.

22. Bolton's Rise & Progress, pp. 43-44. According to another local source the purpose of the Prosecution Club was to 'support financially the apprehension, taking and prosecution of those committing offences against their property'.

23. Gilbert J. French, op. cit. pp. 72-73, notes 77, 78; P.A. Whittle, op. cit. p. 34; Gilbert J. French, op. cit. p. 84.

24. P.A. Whittle, op. cit. pp. 62, 422 and 222.

25. A.E. Musson, 'The Engineering Industry', Roy Church (ed), The Dynamics of Victorian Business (London 1980), pp. 88, 95, 93.

26. Bolton Commercial Directory (1889), 'Dobson & Barlow', op. cit.; Bolton's Rise & Progress, op. cit.; E.C. Smith, 'Joshua Field's Diary of a Tour in 1821 through the Provinces', Part II, Trans. of the Newcomen Society, Vol. XIII, 1932-33, p. 31.

27. Bolton Commercial Directory (1889), op. cit. Edward Barlow died in 1868. The proprietors of Dobson & Barlow in 1888 were T.H. Rushton, the son of a local banker (Hardcastle, Cross, Rushton & Ormrod) and B.A. Dobson, nephew of Benjamin Dobson, who was the nephew of Isaac Dobson. Between the death of Peter Rothwell in 1816 and the entry of Edward Barlow in 1851, the firm of textile machinists was variously known as Isaac & Benjamin Dobson, the Executors of the late Benjamin Dobson and Dobson & Metcalfe. See Bolton's Rise & Progress.

28. Min. Proc. I.C.E. v.2 1842/3 p. 12.

29. E.C. Smith, op. cit. p. 32

30. Holden's Triennial Directory (1805-7); the Commercial Directory for 1814-15 and 1816-17; The Bolton Directory for 1818; Dissolution of Partnerships from London Gazette 26 March, 1814 and 15 November, 1822.

31. E.C. Smith, op. cit. p. 37.

32. B.T. Barton, Historical Gleanings of Bolton & District 1881 1st series, p. 139. See index for further references.

33. Aikin, op. cit. p. 264; David Buxton, 'On The Rise Of The Manufacturing Towns of Lancashire And Cheshire', Trans. of the Historic Society of Lancashire & Cheshire, Vol. VIII, 1855-56, p. 206; V.I. Tomlinson, 'The Manchester, Bolton & Bury Canal

Navigation & Railway Company, 1790-1845', Trans. of the Lanc. & Cheshire Antiquarian Soc., Vols 75-76, 1965-66, p. 238. Subsequent references in this section drawn from Tomlinson and Aikin.

34. A.E. Musson, The Growth of British Industry (London 1978), p. 112.

35. H.W. Dickinson, 'The Steam Engine to 1830', Charles Singer et. al. (eds), A History of Technology (Oxford 1958), Vol IV, p. 175.

36. A.E. Musson, 'The Engineering Industry', op. cit. p. 88.

37. H.W. Dickinson, 'The Steam Engine to 1830', op. cit. p. 186.

38. A.E. Musson, The Growth of British Industry, op. cit. p. 116.

39. H.W. Dickinson, 'The Steam Engine to 1830', op. cit. pp. 186-187, 194; L.T.C. Rolt, Victorian Engineering (London 1970), pp. 74, 133; Roger Burt, John Taylor, Mining Entrepreneur and Engineer, 1779-1863 (Buxton 1977), pp. 30, 75, 74.

40. L.T.C. Rolt, op. cit. p. 64; H.W. Dickinson, A Short History of the Steam Engine (Cambridge 1938), p. 136; A. Stowers, 'The Stationary Steam-Engine, 1830-1900', Charles Singer et. al. (eds), op. cit. Vol V, p. 131; 'List of "E" Numbers' Book, Engine Jobs undertaken by Hick Hargreaves, 1871-1930; A.E. Musson, 'The Engineering Industry', op. cit. pp. 88, 92, 94. See also E. Kilburn Scott (ed), Matthew Murray. Pioneer Engineer. Records From 1765 to 1826 (1928) and E.A. Forward, 'Simon Goodrich and his work as an Engineer', Trans. of the Newcomen Society, Part I, Vol. III, 1922-23 and Part II, Vol. XVIII, 1937-38; Robert Buchanan, Practical Essays on Mill Work (John Weale London 1841), B. Hick & Son's Planing, Bolt Screwing, Radial Drilling and Vertical Boring

machines, as well as 'Mr. Hick's Mandril For Expanding Rings'; James Nasmyth to J. Bramah Esq., London, 13 April 1838. Nasmyth Collection, Eccles Public Library.

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42. Min. Proc. I.C.E., op cit.; E. Kilburn Scott (ed), Matthew Murray. Pioneer Engineer, op. cit. pp. 9, 50; H.W. Dickinson, A Short History of the Steam Engine, op. cit. pp. 108, 112, 113-14; H.W. Dickinson, 'The Steam Engine to 1830', op. cit. p. 186; E.L. Ahrons, Short Histories of Famous Firms VI, 'Hick Hargreaves & Co.', The Engineer, 25 June 1920.

43. Min. Proc. I.C.E., op. cit.; The Bolton Directory for 1818; Baines, op. cit. p. 551; E.C. Smith, Joshua Field's Diary .., op. cit. pp. 29-33.

44. Pigot & Co.'s National Commercial Directory (1834); Bolton's Rise & Progress, op. cit. pp. 43-44; V.I. Tomlinson, op. cit. p. 246; P.A. Whittle, op. cit. p. 202; John Marshall, A Biographical Dictionary of Railway Engineers (Newton Abbot 1978).

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1. William C. Molyneux to B. Hick, 26 July 1833; James W. Lowe, British Steam Locomotive Builders (Cambridge 1975), pp. 325-330; Joyce H.M. Bankes, 'Records of Mining in Winstanley & Orrell ..', Trans. of the Lanc. & Cheshire Antiquarian Soc., 1939, pp. 57-60; Minutes of Great Bolton Trustees, TGB/1/2 3 March 1824, p. 429. Bolton Central Reference Library; Lois Basnett, 'The History of the Bolton & Leigh Railway based on the Hulton Papers', Trans. of the Lancs. & Cheshire Antiquarian Soc., 1950-51, p. 163.

2. Minutes of Great Bolton Trustees; Bolton (Enclosure) Improvement Act, 32 Geo. III c.71; James Hardcastle to William Hulton, n.d., Lanc. Record Office, 6 Bolton and Leigh Railway, DD Hu 6/1.

3. 6 Geo. IV c.18, 31 March 1825; Lois Basnett, op. cit. p. 164; TGB/1/2 2 March 1825, p. 453, 6 April 1825, p. 455, 1 March 1826, p. 475 and 4 June 1828, p. 509.

4. C.E. Stretton, The History of the Bolton and Leigh, and the Kenyon and Leigh Junction Railways (Leeds 1902), p. 8; C.F. Dendy Marshall, Centenary History of the Liverpool and Manchester Railway (1930), p. 114; Bolton's Rise and Progress (Manchester), p. 43; John Marshall, Forgotten Railways: North West England (London 1981), p. 8 et seqq. George Piggot to William Hulton, 20 November 1824, L.R.O., op, cit. DD Hu 6/1 (5); Lois Basnett, op. cit. p. 160; Hunter Davies, George Stephenson (London 1975), p. 154.

5. Lois Basnett, op. cit. pp. 161-163.

6. 6 Geo. IV c.18; G.O. Holt, A Regional History of the Railways of Great Britain, Vol. X, p. 183; 7 Will. IV & I Vict. c.121, 15 July

1837; John Moss To William Hulton, 10 September 1825, L.R.O., op. cit. DD Hu 6/15; R.H.G. Thomas, The Liverpool & Manchester Railway (London 1980), p. 28. George and John Rennie were appointed engineers to the Liverpool railway following Stephenson's dismissal. As surveyor, the Rennie brothers hired Charles Vignoles; Lois Basnett, op. cit. p. 160.

7. Lois Basnett, op. cit. pp. 166, 167, 168.

8. 10 Geo. IV c.36, 14 May 1829; C.E. Stretton, op. cit. p. 10; 'Particulars of carriage of goods between Bolton & Liverpool', n.d., L.R.O. DD Hu 6/10. See also Lois Basnett, op. cit. p. 163; 'Abstract of Estimate of the probable expense of the ... Rail Road', n.d. L.R.O. DD Hu 6/6; The five locomotives employed were 'Salamander' and 'Veteran' (Crook & Dean, Little Bolton), 'Union' (Rothwell, Hick & Rothwell), 'Lancashire Witch' (Stephenson) and 'Sans Pareil' (Hackworth); James Hardcastle to William Hulton, op. cit.

9. 'Estimate of the probable expense of the Railroad ...' by George Stephenson, 26 January 1825, L.R.O., op. cit. DD Hu 6/12; 9 Geo. IV c.8, 26 March 1828. The Act of Incorporation made lawful the issue of shares of £100 each and conferred the power 'to borrow any Part' of the original sum of £44,000 not subscribed before the Act's passage by the issue of Promissory Notes. See 6 Geo. IV c.18, s. xlviii; 'A Statement of Amount Expended ... Estimate of the probable expense ..', 24 July 1826, L.R.O., DD Hu 6/17.

10. 1 & 2 Will. IV c.11, 30 July 1831; 6 & 7 Will. IV c.52, 20 May 1836; 8 & 9 Vict. c.198, 8 August 1845.

11. C.E. Stretton, op. cit.; 'Instructions for the opening of the Bolton and Leigh Railway', 1 August 1828, L.R.O., op. cit. DD Hu 6/21.

12. 'Instructions for the opening ..', op. cit. The instructions stated that 'Mr Robert Stephenson Senior or Junior will take charge of the Locomotive Engine assisted by the Engineer from Newcastle'; R.H.G. Thomas, op. cit. pp. 32, 50-54, 64, 63, 56; Hunter Davies, op. cit. pp. 167-170.

13. 'Instructions for the opening ..', op. cit.; C.E. Stretton, op. cit.; Lois Basnett, op. cit. pp. 173-74.

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17. R.H.G. Thomas, op. cit. p. 102; G.O. Holt, op. cit. p. 23; Pigot & Co.'s National Commercial Directory, 1834, 1838; Williams

Directory, 1845; TGB/I/3 7 May 1834, p. 68; James Clegg, Annals of Bolton; Death of William Hargreaves, Bolton Chronicle, 5 October 1889; John Marshall, A Biographical Dictionary of Railway Engineers (David & Charles 1978).

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23. Josiah Kearsley, Locomotive Superintendent, MCR, to John Hick, January-February 1841.

24. Kearsley to John Hick, 22 August 1841.

25. Kearsley to B. Hick & Son, 26 August 1841.

26. Kearsley, 8 September 1841.

27. P.C. Dewhurst, '"Norris" Locomotives in England, 1838-1342', Trans. of the Newcomen Society, Vol. XXVI, 1947-48 and 1948-49. See Capt. W.S. Moorsom, 'Experiments on Locomotive Engines manufactured by Mr. Norris', Proc. I.C.E., 1840, p. 45.

28. P.C. Dewhurst, op. cit. Appendix V.

29. J. Craig, Birmingham, to Hick & Son, February-March 1841.

30. William Burgess, Secretary, B & G R, to B. Hick & Son, April-June 1841.

31. P.C. Dewhurst, op. cit. pp. 31-33.

32. Jack Simmons, op. cit. pp. 168, 175; E.L. Ahrons, Short Histories of Famous Firms V, 'Messrs. Rothwell and Co., Bolton', The Engineer, 11 June 1920; S. B. Saul, 'The Engineering Industry', in D.H. Aldcroft (ed.), The Development of British Industry and Foreign Competition 1875-1914 (London 1968), p. 196.

Notes to Chapter 3

1. Cristobal Garcia Montoro (Universidad de Malaga), 'La Fortuna De Manuel Agustin Heredia. Contribucion Al Estudio De Los Niveles De Riqueza De La Alta Burguesia Malaguena Del Siglo XIX', Andalucia Contemporanea (Siglos XIX y XX), Tomo I, Actas Del I Congreso De Historia De Andalucia, Diciembre De 1976 (Publicaciones Del Monte De Piedad y Caja De Ahorros De Cordoba 1979), pp. 386, 374, 369.

   ..., 'The Fortunes of Manual Agustin Heredia. A Contribution to the Research into the Levels of Wealth of Malaga's Top Line Bourgeoisie in the Nineteenth Century'. Contemporary Andalusia (in the 19th & 20th Centuries) Vol. I, Minutes of the First Congress on The History of Andalusia December, 1976. (A Publication of the Monte De Piedad y Caja De Ahorros 1979).

2. Cristobal Garcia Montoro, Malaga en los comienzos de la industrializacion: Manuel Agustin Heredia, 1786-1846. Cordoba, 1978, Instituto de Historia de Andalucia, p. 64.

   ..., Malaga at the beginning of the industrial era: Manuel Agustin Heredia, 1786-1846. Cordoba, 1978, History Institute of Andalusia; Richard Ford, Handbook for Travellers in Spain (Third Edition London 1855), Part I, pp. 127-29.

3. Jordi Nadal, 'The Failure of the Industrial Revolution in Spain 1830-1914', Carlo M. Cipolla (ed.), The Fontana Economic History of Europe (1973), pp. 609, 603, 615, 600, 620; Cristobal Garcia Montoro, 'La Fortuna De Manuel Agustin Heredia ..', op. cit. p. 373.

4. Mary Fitton, Malaga. The Biography of a City (London 1971), p. 186; Jordi Nadal, op. cit. p. 600; Fitton, op. cit. pp. 184-5. Serafin Esteban Calderon was a journalist who, 'under the entirely inappropriate pseudonym of El Solitario, was also an Arabic scholar, military historian, essayist, playwright and accomplished man of the world'. Salamanca 'made his first fortune in five years out of salt and railways and negotiated loans for the Government to make possible the continuation of war with the Carlists. Ruined by a quarrel ... he was a millionaire again shortly afterwards, and survived three tremendous bankruptcies ...'. See Prosper Merimee, Correspondance Generale, edited by Maurice Parturier, Divan, Paris, 1941, for some colourful references to Calderon and Salamanca.

5. See Jaime Vicen Vives, An Economic History of Spain (Princeton University Press 1969), pp. 599, 532, 673, 650, 580; J.H. Parry, The Spanish Seaborne Empire (London 1966), pp. 338, 345-46, 358; Raymond Carr, Spain 1808-1939 (Oxford 1966), p. 275.

6. Cristobal Garcia Montoro, 'La Fortuna De Manuel Agustin Heredia ..', op. cit. p. 368 et seqq. In common with other members of Malaga's business community, Heredia advanced cash to farm workers, taking their crops as security having beforehand established mortgages on their premises. However, Montoro has established that some of Heredia's real property in land was purchased.

7. Cristobal Garcia Montoro, Malaga en los commienzos de la industrializacion, op. cit. pp. 79-81 et seqq; 'Plan of a 14 h.p. Engine & 2 blowing cylinders & apparatus ... sent out by Messrs. Rothwell, Hick & Rothwell for the Adra Lead Works', 1827. Bolton Central Reference Library, Hick Hargreaves collection, ZHH/3.

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Heredia later built a 'high tower' for the manufacture of round lead shot.

8. Jordi Nadal, op. cit. pp. 595, 602; Cristobal Garcia Montoro, Malaga en los comienzos de la industrializacion, op. cit. p. 58 et seqq. Unless otherwise stated this section is based on Montoro's study.

9. David S. Landes, The Unbound Prometheus (Cambridge 1969), pp. 88-91, 175.

10. Cristobal Garcia Montoro, Malaga en los comienzos de la industrializacion, Capitulo IV El Primer Empresario De La Peninsula (1833-1840). The First Entrepreneur on the Peninsula, p. 69 et seqq. section V is largely based on the above chapter by Montoro.

11. David S. Landes, op. cit. p. 91.

12. Cristobal Garcia Montoro, Malaga en los comienzos de la industrializacion, 1 Los problemas de la siderurgia malaguena. 1. The Problems of Malaga's Iron & Steel Industry, pp. 101-104. The close of Section V and Section VI are based on Montoro's work.

13. Jordi Nadal, op. cit. p. 590.

14. Cristobal Garcia Montoro, Malaga en los comienzos de la industrializacion, 3. Proyecto de un Banco en Malaga; 4. La Sociedad de Vapores; 5. Las fabricas de productos quimicos y de hilados y tejidos. 3. Blueprint For a Bank at Malaga; 4. The Steamship Company; 5. The Chemicals Factory, Spinning and Woven Fabric Mills, pp. 107-113. Section VI is largely based on the above.

15. Jordi Nadal, op. cit. pp. 614-16.

16. Jordi Nadal, op. cit. pp. 601-02, 616; Joseph Harrison, An Economic History of Modern Spain (New York 1978), pp. 33-34.

17. Bolton Central Reference Library, Hick Hargreaves collection, ZHH/3.

18. M.A. Heredia to Messrs. Benjamin Hick & Sons, 26 January 1841.

19. Manuel de Heredia to Messrs. Benjamin Hick & Sons, 31 May 1841.

20. Ibid. 30 June 1841.

21. Ibid. 18 August 1841. Both Martin Larios and Manuel Agustin Heredia came from Logrono. See Mary Fitton, Malaga. The Biography of a City (London 1971), p. 186.

22. Ibid. 25 August 1841.

23. Ibid. 4 September 1841.

24. Ibid. 13 September 1841.

25. Ibid. 14 September 1841.

26. Ibid. 28 December 1841.

Notes to Chapter 4

1. R.A. Buchanan & George Watkins, The Industrial Archaeology of the Stationary Steam Engine (London 1976), pp. 92, 100, 78; H.W. Dickinson, A Short History of the Steam Engine (Cambridge 1938), p. 153; Abbatt's Commercial Directory, 1874.

2. Min. Proc. I.C.E. v.2 1842/3 p. 12; Correspondence to Hick & Son, 1841.

3. Ibid. In the course of 1841, Hick & Son built and installed the engines required for Marshall & Co.'s flax mill, Leeds. This engine job was supervised by William Hick, a 'Fitter' at the Soho Foundry since 1837. In 1834 William Hick had bound himself to serve his father as an apprentice 'Millwright Engineer etc. etc.'. William Hick's Indentures were delivered early in 1844, nine months before his death; Men's Names Book, B. Hick & Son (1833-1864); Sidney Pollard, The Genesis of Modern Management (London 1965), p. 139.

4. Hick Hargreaves & Co. Ltd., Old Deeds & Documents Relating to Land on North & South Sides of Crook Street; Benjamin Hick's will, dated 11 January 1841. Hick died of Disease of the Heart on 9 September 1842; William Hick, last will and testament, 14 September 1844. L.R.O. Hicks, Wm, Gt. Bolton, engineer, W. MAR 1847. William Hick did 'appoint my said brothers John Hick and Benjamin Hick Executors'. William Hick died of Consumption on 23 November 1844, at High Field House, Great Bolton. See the will of Benjamin Hick, L.R.O. W. Jan 1843 and document on Hicks, Benjamin, Liverpool, gent A. Jan 1847 (see 1891). Benjamin Hick Jnr., late of Liverpool and deceased of Chester, died intestate on 20 November 1845. The

amount left by Hick was £20,000. His wife, Robina Augusta Hick, of Green Mount Place, Harpurhey, Manchester, took hold of £10,000.

5. Memoirs of Thomas Lever Rushton, Esq., J.P. (Bolton 1885), pp. 37, 2. Bolton Central Reference Library.

6. Ibid; P.A. Whittle, Bolton-le-Moors (1857), p. 159. John Hick and John Hargreaves Jnr. subscribed £100 each to the Bolton Church Educational Institution. Hick also presented a 'gorgeous window' to the Institution 'by the celebrated Wade of London'. The principal figures in the four lights represented history, astronomy, painting and the mechanical arts. Hick became one of the Honorary Secretaries of the Institution, whose object was 'to provide a classical and commercial education, combined with religious and moral instruction, in conformity with the fundamental principles of the Church of England'.

7. Memoirs, op. cit.

8. 'A Bolton Banking Partnership', Three Banks Review, No. 25, March 1955, pp. 31, 34; Memoirs, op. cit.; 'Dear Father', Three Banks Review, No. 81, March 1969, p. 44. See also 'Two Bankers: A Study in Character', Three Banks Review, No. 56, December 1962.

9. 'A Bolton Banking Partnership', op. cit. pp. 35, 36, 37; 'Dear Father', op. cit. pp. 52-53; F. Stuart Jones, 'First Joint Stock Banks in Manchester, 1828-36', South African Journal of Economics (1975), pp. 21, 17-18, 20, 26-27, 35.

10. 'A Bolton Banking Partnership', op. cit. pp. 36, 38-39; 'Dear Father', op. cit. pp. 46, 49, 50, 52.

11. T.R. Gourvish, Railways and the British Economy 1830-1914 (Economic History Society 1980), p. 27; R.H.G. Thomas, The Liverpool & Manchester Railway (London 1980), pp. 106-107; 8 & 9 Vict. c.198, 8 August 1845; 6 & 7 Will. IV c.52, 20 May 1826; John Marshall, A Biographical Dictionary of Railway Engineers (Newton Abbot 1978); Memoirs, op. cit. p. 31.

12. William Ashworth, An Economic History of England 1870-1939 (London 1969), p. 90. 'In 1850 a factory or works which employed more than 200 people was outstandingly large and even in 1870 ... it was above the average for all but a very few industries'. In 1870-71, the average number of employees in machine-making factories was only 85.

13. Release of Premises at Sweet Green Bolton ... James Spencer and his Trustee to Benjamin Hick and his Trustee, 27 April 1833.

14. Lease of Land in Crook Street ... for 4,900 years at the yearly rent of £3 : 5 : 3. Trustees of Great Bolton to Ben. Hick, 4 October 1837; Conveyance in fee of two plots of land ... The Trustees of Great Bolton to Mr. Hick, 4 September 1839; Demise of a Plot of Land at Great Bolton ... for the term of 999 years subject to the yearly rent of £20 .., Jeremiah Crook to Benjamin Hick, 10 December 1834; Conveyance of Land .., Jeremiah Crook to Benjamin Hick, 26 September 1835.

15. Abstract of the Title of certain Lands and Premises in Great Bolton ... belonging to the Trustees of the Lecturer of the Parish Church of Bolton, 2 January 1790; 32 Geo. III c.71; Minutes of Great Bolton Trustees, Bolton Central Reference Library; Lease of Premises in Great Bolton ... for 99 years (10,694 yards 1d. per yard), The Trustees of the Lecturers Closes to Benjamin Hick, 28

June 1833; Lease of Premises in Great Bolton ... for 99 years (16,826 yards 1d. a yard), The Trustees of the Lecturers charity to Benjamin Hick, 29 June 1833.

16. Lease of Premises ...(10,694 yards ...) ... 28 June 1833, op. cit.; Lease of Premises ...(16,826 yards ...) ... 29 June 1833, op. cit.; Abstract of the Title of certain Lands .., op. cit.

17. Conveyance of certain freehold and leasehold hereditaments and premises .., Messrs. Hick, Barlow & Rushton to Mr. Armitstead In Trust for Mr. Hick & Mr. Hargreaves, 6 March 1847 and Reconveyance from Mr. Armitstead to Mr. Hick and Mr. Hargreaves, 8 March 1847; Assignment of certain Letters Patent .., Messrs. Hick, Barlow & Rushton to Mr. Armitstead In Trust for Mr. Hick & Mr. Hargreaves, 6 March 1847, and Reassignment from Mr. Armitstead to Mr. Hick & Mr. Hargreaves, 8 March 1847.

18. Ibid; Assignment of interest in patents & agreements as to patents, John Hargreaves Esq., to Messrs. John Hick & William Hargreaves, 22 March 1851.

19. Conveyance of Mr. John Hargreaves share in certain freehold and leasehold lands buildings and other hereditaments and premises .., John Hargreaves Esq. to Messrs. John Hick & Wm. Hargreaves, 22 March 1851.

20. Ibid.

21. Assignment of credits, covenants of Indemnity and Release of Claims under the partnership of Benjamin Hick and Son, John Hargreaves Esq. to Messrs. John Hick & Wm. Hargreaves, 22 March 1851.

22. Ibid.

23. Ibid.

24. Ibid.

25. Mortgage of divers plots of land freehold & leasehold ... with the workshops & Buildings thereon ... & also of certain machinery & effects for securing £30,000 and interest, Messrs. Hick and Hargreaves to John Hargreaves Esq., 24 March 1851. Reconveyance endorsed 23 May 1856.

26. Ibid.

27. Men's Names Book, B. Hick & Son (1833-1864); William Ashworth, op. cit. p. 90; Mortgage of divers plots .., op. cit. Particulars of Fixed Machinery Tools & Fixtues.

28. Ibid.

29. Ibid.

30. Ibid; William Fairbairn, Treatise on Mills and Millwork (London 1878), pp. 501-02; Lockwood's Dictionary of Mechanical Engineering Terms, Joseph G. Horner (ed.) (London 1913); Roderick Floud, The British Machine Tool Industry 1850-1914 (Cambridge 1976), pp. 10-12.

Notes to Chapter 5

1. Mortgage of divers plots of land freehold & leasehold ... with the workshops & Buildings thereon ... & also of certain machinery & effects for securing £30,000 and interest, Messrs. Hick and Hargreaves to John Hargreaves Esq., 24 March 1851. Reconveyance endorsed 23 May 1856.

2. Bolton Chronicle, 5 October 1889, Death of William Hargreaves; Bennet Woodcroft, Alphabetical Index of Patentees of Inventions 1617 to 1852 (London 1854. Reprinted 1969). William Hargreaves was the joint patentee of several improvements to engine and boiler details with John Hick in the period 1858-89; Bolton Evening News, 3 November 1933, Century of Engineering; Min. Proc. I.C.E., Vol CXVII, 1894, p. 379. See another obituary of John Hick in Min. Proc. I.M.E., 1894, Parts 1-2, p. 161.

3 John Marshall, A Biographical Dictionary of Railway Engineers (Newton Abbot 1978); The Hargreaves of Hart Common, Westhoughton, genealogical evidence gathered by Frank D. Smith; Pigot & Son's Directory of Manchester & Salford, 1838; The Sans Parreil, one of the locomotives of the Bolton & Leigh Railway, was employed by John Hargreaves and remained in use until 1844, when 'it then worked until 1863 as a pumping and winding engine at Coppull Colliery near Chorley, and the following year John Hick ... presented it to the South Kensington Museum'. R.H.G. Thomas, The Liverpool & Manchester Railway (London 1980), p. 152; P.L. Payne, British Entrepreneurship in the Nineteenth Century (Economic History Society 1974), p. 17.

4. Derek H. Aldcroft & Harry W. Richardson, The British Economy 1870-1939 (London 1969), pp. 159, 143. See P.L. Payne, op. cit. p. 30; Bolton Evening News, 3 November 1933, op. cit.; Post Office Directory 1888; Bolton (Illustrated), Up-to-date. Hick Hargreaves & Co. Ltd. (Bolton 1897), p. 40; Min. Proc. I.M.E., 1884.

5. Ibid; Bolton Central Reference Library, Hick Hargreaves collection, ZHH/3. The Memoir of Luthy notes that he collaborated with Hick in a 'series of experiments on the friction of leather collars used in hydraulic presses', with the result that Luthy was 'mentioned as an authority on this subject by Rankine'. See William J.M. Rankine, A Manual of Machinery & Millwork, Sixth Edition (London 1887), p. 399.

6. Min. Proc. I.C.E., 1890; R.A. Buchanan & George Watkins, The Industrial Archaeology of the Stationary Steam Engine (London 1976), p. 53.

7. Min. Proc. I.C.E., 1890; A. Stowers, 'The Stationary Steam-Engine, 1830-1900', pp. 131-32. Charles Singer et al. (eds.), A History of Technology, Vol. 5 (Oxford 1958); H.W. Dickinson, A Short History of the Steam Engine (Cambridge 1938), pp. 137-38; G. Hayes, A Guide to Stationary Steam Engines (Ashbourne 1981), p. 64; R.A. Buchanan & George Watkins op. cit. pp. 186, footnote 3, 92:

8. Min. Proc. I.C.E., 1890; A. Stowers, op. cit. p. 132; William Inglis, 'On the Corliss Expansion Valve-Gear for Stationary Engines', Proc. I.M.E., 1868, pp. 191, 181. The paper by Inglis allowed the Corliss engine built by Hick Hargreaves to be discussed in detail by J.A. Ewing, 'Steam-Engines & other Heat Engines'. The Encyclopaedia Britannica, Ninth Edition, Vol. XXII (Edinburgh 1887), p. 507; W.H. Uhland, trans. by Anatole Tolhausen, Corliss

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Engines and Allied Steam-Motors ... With Special Reference to the Steam-Engines of the Paris International Exhibition of 1878 (London 1879), p. 39 et seqq. See also J. Frederick Spencer's variable automatic Expansion-gear, p. 49; R.A. Buchanan & George Watkins, op. cit. p. 91; W.H. Uhland, op. cit. pp. 43, 4. Engines working with the Spencer and Inglis Valve-gear. Messrs. Hick Hargreaves & Co., Engineers, Bolton; Min. Proc. I.C.E., 1890.

9. R.A. Buchanan & George Watkins, op. cit. pp. 28, 79; G. Hayes, op. cit.; H.W. Dickinson, op. cit. p. 154; Roderick Floud, The British Machine Tool Industry, 1850-1914 (Cambridge 1976), p. 109; W.H. Uhland, op. cit., preface.

10. William Pole, The Life of Sir William Siemens (London 1888), p. 67 et seqq.; Howard G. Roepke, Movements of the British Iron & Steel Industry 1720 to 1951 (Urbana, 1956), p. 59; Alan Birch, The Economic History of the British Iron & Steel Industry 1784-1879 (London 1967), p. 372; J.A. Ewing, The Steam-Engine & Other Heat Engines (Cambridge 1889), p. 1.

11. William Pole, op. cit. pp. 67, 69, 72, 90-91; H.W. Dickinson, op. cit. p. 177. See also D.S.L. Cardwell, Technology, Science and History (London 1972) and references to Carnot and Joule; L.T.C. Rolt, Victorian Engineering (London 1970), p. 152.

12. William Siemens to Hick & Son, 3 February 1854. Bolton Central Reference Library ZHH/4/417; Ibid. 23 February 1854; Ibid. 16 March 1854; Ibid. 9 March 1854; Ibid. 18 April 1854.

13. Ibid. 13 February 1854; Ibid. 8 March 1854; Ibid. 13 March 1854; Ibid. 16 March 1854.

14. Ibid. 18 April 1854; Ibid. 6 June 1854; William Pole, op. cit. p. 88; William Siemens to Hick & Son, 21 October 1854; Ibid. 2 November 1854; Ibid. 6 December 1854; Ibid. 16 December 1854.

15. William Pole, op. cit. pp. 91, 97.

16. Alan Birch, op. cit. pp. 372-37; L.T.C. Rolt, op. cit. pp. 188, 196; W.H. Uhland, op. cit. p. 43; See the remarks of John G. Hudson, Michael Longridge, 'Breakdowns of Stationary Steam-Engines', Min. Proc. I.M.E., Parts 3-4, 1896. Hudson attributed the elimination of crank-shaft failure in engines built by Hick Hargreaves to the adoption of Siemens-Martin steel by the firm 'some ten to twelve years ago'. Hudson added that 'Their Siemens-Martin steel shafts have almost without exception been forged at the Bolton Iron and Steel Works'; W.M. Lord. 'The Development of the Bessemer Process in Lancashire, 1856-1900'. Trans. Newcomen Society, Vol. XXV, 1945-47, p. 169.

17. Alan Birch, op. cit. p. 193 et seqq., 317, 327; F. Crouzet, The Victorian Economy (London 1982), pp. 229-30; P.J. Riden, 'The Iron Industry', R.A. Church (ed.), The Dynamics of Victorian Business (London 1980), pp. 74-75; Bolton Central Reference Library, Hick Hargreaves collection, ZHH/3.

18. Alan Birch, op. cit. p. 339; W.H. Chaloner, 'John Galloway (1804-1894), Engineer .., Trans. of the Lancashire & Cheshire Antiquarian Society, 1954, p. 113.

19. Alan Birch, op. cit. pp. 336, 138, 144, 341; P.J. Riden, op. cit. p. 66; Howard G. Roepke, op. cit. pp. 72 et seqq., 88; Bolton Evening News, 3 November 1933.

20. Alan Birch, op. cit. pp. 327, 195; W.M. Lord, op. cit. pp. 170, 168, 169; R.A. Buchanan & George Watkins, op. cit. p. 113; W.H. Chaloner, op. cit. p. 114.

21. H.W. Dickinson, op. cit. pp. 159-60, 149, 151; R.A. Buchanan & George Watkins, op. cit. pp. 82, 77.

22. H.W. Dickinson, op. cit. pp. 121, 158, 160; W.M. Lord, op. cit. p. 170; R.A. Buchanan & George Watkins, op. cit. p. 115; Sidney Pollard & Paul Robertson, The British Shipbuilding Industry 1870-1914 (Harvard University Press 1979), pp. 13, 14, 49, 55, 5, 67; The Engineer, 8 September 1865.

23. W.M. Lord, op. cit. pp. 171, 164; Alan Birch, op. cit. pp. 321, 373.

24. Alan Birch, op. cit. pp. 341, 343, 339-40; W.M. Lord, op. cit. pp. 172, 173; The Engineer, op. cit.

25. Ernest F. Lang, 'The Old Lancashire Steel Company', Memoirs and Proc. of the Manchester Lit. and Phil. Soc., Vol. 82, 1937. Unless otherwise stated the references in the following passage are drawn from this work.

26. Alan Birch, op. cit. pp. 159-60.

27. Ibid.

28. Ibid.

29. P.L. Cottrell, Industrial Finance 1830-1914 (London 1980), pp. 104-06; Derek H. Aldcroft & Peter Fearon (eds.), British Economic Fluctuations (London 1972), p. 89.

30. B.L. Anderson & Alan M. Hoe, 'Company Promotion and the Accountancy Profession in Nineteenth Century Sheffield', Accounting and Business Research, Winter, 1979, p. 60.

31. Ibid. pp. 60-61.

32. Sidney Pollard & Paul Robertson, op. cit. pp. 70, 73, 76, 90, 100-01; P.L. Cottrell, op. cit. p. 127.

33. P.L. Cottrell, op. cit. p. 153; Commercial Directory (1889), p. 67; Memoirs of Thomas Lever Rushton (Bolton 1885), pp. 4-5;

34. Memoirs of ... Rushton, op. cit. p. 5; Commercial Directory, op. cit.; Memorandum And Articles of Association of the Bolton Iron & Steel Co. Ltd., Incorporated June 9 1876; P.L. Cottrell, op. cit. pp. 88, 86, 87.

35. P.L. Cottrell, op. cit. pp. 113, 59-64, 114, 123-24, 118.

36. Ibid. pp. 123-24, 128, 132, 136, 137-38, 223, 132; Alan Birch, op. cit. p. 343.

37. Ibid. pp. 115, 116, 117, 127, 124, 125; W.M. Lord, op. cit. p. 174; Memorandum and Articles of Association .., op. cit.

38. P.L. Cottrell, op. cit. pp. 140, 128, 141; Alan Birch, op. cit. p. 208.

Notes to Chapter 6

1. P.L. Cottrell, Industrial Finance 1870-1914 (London 1980), pp. 248, 25.

2. Ibid. pp. 211, 212, 219, 221, 228, 196, 197, 236, 237, 238.

3. Memoirs of Thomas Lever Rushton (Bolton 1885), p. 7; Memorandum and Articles of Association of Hick Hargreaves & Co, Ltd.

4. P.L. Cottrell, op. cit. pp. 268, 248; P.L. Payne, British Entrepreneurship in the Nineteenth Century (Studies in Economic History 1974), p. 42; Sidney Pollard, The Genesis of Modern Management (London 1965), p. 245; S.B. Saul, The Myth of the Great Depression 1873-1896 (Studies in Economic History 1972), pp. 11, 28; Derek H. Aldcroft & Peter Fearon (eds.), British Economic Fluctuations 1790-1939 (London 1972), pp. 77, 19; James Clegg, Annals of Bolton (1888); Sidney Pollard, op. cit. pp. 234-35.

5. Sidney Pollard, op. cit. pp. 235, 233, 236, 237; Roy Church 'Problems and Perspectives', Roy Church (ed.), The Dynamics of Victorian Business (London 1980), pp. 39-40.

6. Sidney Pollard, op. cit. p. 236.

7. Sheila Marriner, 'Company Financial Statements as Source Materials for Business Historians', Business History, Vol. XXII, No. 2 July 1980. In the passages that follow the references are largely based on this paper.

8. S.B. Saul, op. cit. pp. 14, 15; P.L. Cottrell, op. cit. p. 136; Sheila Marriner, op. cit. pp. 216, 218, 219.

9. Derek H. Aldcroft & Peter Fearon (eds.), op. cit. p. 89; List of 'E' Numbers book, 1871-1930.

10. S.B. Saul, 'The Market and the Development of the Mechanical Engineering Industries in Britain, 1860-1914', Economic History Review, XX (1967), p. 118; List of 'E' Numbers book, op. cit.

11. Carlo M. Cipolla (ed), The Fontana Economic History of Europe, 4 Part 2 (London 1973). National Accounts Table I. Statistical Appendix.

12. Minute Book of the Board of Directors, 1892-1911; Memorandum And Articles of Association .., op. cit.; Letter of appreciation from the Board of Directors, 1931, and obituary of John George Hudson M. Inst. C.E. Hudson appears to have enjoyed a full life. He was a 'keen amateur photographer' and took up motoring in his sixties, designing a 'very efficient carburettor' for his own cars, which 'never came into general use owing to the conservative outlook of manufacturers'; Economy Tests of some Compound Mill Engines Built by Hick Hargreaves ... (Soho Iron Works, Bolton, 1905); H.W. Dickinson, A Short History of the Steam Engine (Cambridge 1938), p. 172.

13. Bolton (Illustrated), Up-to-date ... (Bolton 1897). In the Memorandum of Association John Henry and Percy Hargreaves were described as engineers, while Francis Hargreaves was styled 'Steel Manufacturer' because of his management of the Bolton Iron & Steel Co. Ltd.; Roderick Floud, The British Machine Tool Industry, 1850-1914 (Cambridge University Press 1976), p. 68 et seqq.; S.B. Saul, op. cit. p. 120.

14. Mortgage and Deed of Trust of certain freehold and leasehold plots of land ... to secure £60,000 and interest, 16 July 1892; Provisional Prospectus. Hick Hargreaves & Co. Ltd., Bolton, 21 March 1892; The general correspondence of the 'Rough Minute Book' 1892-1903; Two files, 'Transfer of Shares' and 'Transfer of Shares & Debentures'; P.L. Cottrell, op. cit. pp. 81, 84; Memorandum And Articles of Association .., op. cit.

15. Provisional Prospectus, op. cit.; Mortgage and Deed of Trust, op. cit.; P.L. Cottrell, op. cit. p. 165.

16. Provisional Prospectus, op. cit.; Memorandum And Articles of Association .., op. cit.; Mortgage and Deed of Trust, op. cit.; 'Rough Minute Book', the correspondence of Fullagar & Hulton and P. & J. Kevan. The account of P. & J. Kevan for attending conferences, submitting proposals, perusing draft articles of association, interviewing other employers and preparing draft prospectuses over a period of 5 months came to £40; Minute Book of the first Board, op. cit.; List of 'E' Numbers book, op. cit.

17. Bolton (Illustrated), Up-to-date .., op. cit.; David S. Landes, The Unbound Prometheus (Cambridge University Press 1969), p. 288.

18. Bolton (Illustrated), Up-to-date .., op. cit.

19. David S. Landes, op. cit. p. 297; Robert S. Woodbury, 'Machine Tools', Charles Singer et. al. (eds.), A History of Technology, Vol. VII, Part Two, p. 1036; Roderick Floud, op. cit. pp. 68, 71, 73; K.R. Gilbert, 'Machine-Tools', Charles Singer et. al. (eds.), op. cit. Vol. IV p. 438.

20. Roderick Floud, op. cit. pp. 75, 80-81, 101, 103 et seqq., 107-08, 109-10; S.B. Saul, op. cit. pp. 122-23, 125.

21. David S. Landes, op. cit. pp. 300-02, 304; Inventory. Messrs. Hick Hargreaves & Co. Ltd. Soho Ironworks, Bolton, Three Volumes, 30 September 1900.

22. David S. Landes, op. cit. pp. 305-07; Hick Hargreaves catalogue of Power Mechanical Transmission; James B. Jefferys, The Story of the Engineers (London 1946), pp. 125, 136, 137, 139, 141, 142, 143.

23. Ibid. p. 120; David S. Landes, op. cit. p. 307; S.B. Saul, op. cit. pp. 117-18; Hick Hargreaves & Co. Ltd. List of [Engine] Dimensions and Prices c. 1898.

24. Economy Tests .., op. cit.

Notes to Chapter 7

1. Hick Hargreaves & Co. Ltd. List of Engine Dimensions and Prices c. 1898.

2. Roderick Floud, The British Machine Tool Industry, 1850-1914 (Cambridge University Press 1976), pp. 122-26.

3. Ibid. pp. 127, 129.

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5. Unless stated to the contrary, the references that follow are drawn from an examination of Hick Hargreaves financial statements: 'Particulars of Profit & Loss Account', 1869-1891; and an untitled, rearranged statement for 1892-1920. See Appendices.

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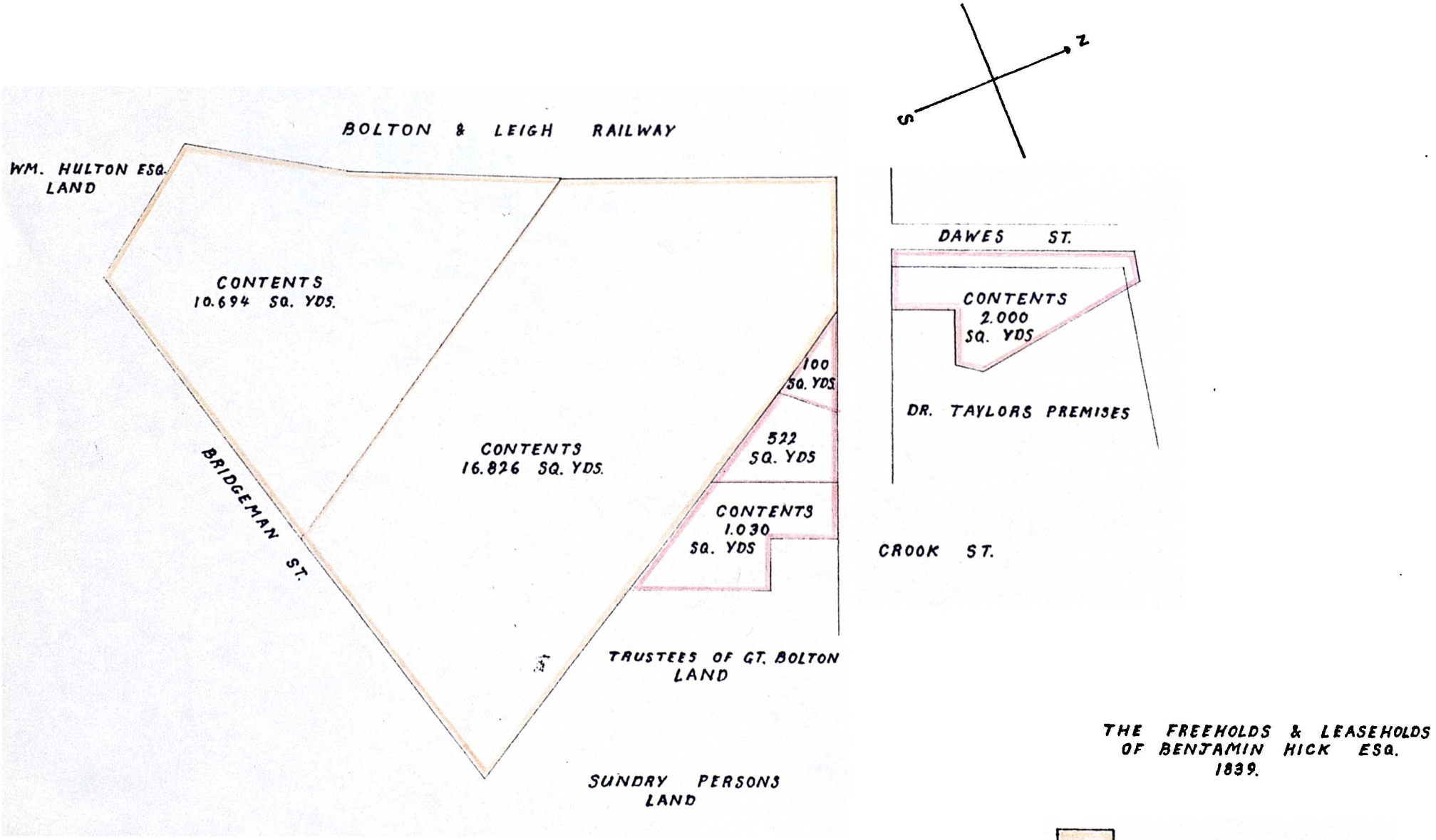
TABLE SHOWING THE NUMBER OF TRADESMEN HIRED AND EMPLOYED BY BENJAMIN HICK DURING THE INITIAL PERIOD OF THE FIRMS LIFE

	Hired Jan. 1833 - April 1834	Employed April 1834
Cashier	1	1
Draughtsman	1	1
Foremen of Smiths	1	1
Foremen of Turners	1	1
Foremen over Boiler Makers	2	2
Foremen	2	2
Piece Master	1	1
Engineers	12	11
Millwrights	27	22
Fitters	4	3
Turners	8	7
'Planing Machine'(Operator)	1	1
Screwer	1	1
Filers	9	9
Strikers	17	11
Smiths	11	10
Engine Tenters	3	1
Pattern Makers	16	12
Pipe Pattern Makers	3	3
Moulders	14	14
Brass Moulder	1	1
Pipe Moulders	2	2
Loam Moulders	4	4
Loam Sand Mixer	1	1
Dresser	1	1
Joiners	2	2
Metal Melters	6	6

Time Keeper	1	1
Watchmen	3	2
Warehouse Man	1	1
Hostler	1	1
Carter	1	1
Labourers	19	16
Not Specified	1	1
Total	179	154


BOLTON & LEIGH RAILWAY
WM. HULTON ESQ. LAND
CONTENTS 10.694 SQ. YDS.
CONTENTS 16.826 SQ. YDS.
BRIDGEMAN ST.
100 SQ. YDS.
522 SQ. YDS
CONTENTS 1.030 SQ. YDS
TRUSTEES OF GT. BOLTON LAND
SUNDRY PERSONS LAND
N
S
DAWES ST.
CONTENTS 2.000 SQ. YDS
DR. TAYLORS PREMISES
CROOK ST.
THE FREEHOLDS & LEASEHOLDS OF BENJAMIN HICK ESQ. 1839.
LEASEHOLD PLOTS
FREEHOLD PLOTS

Soho Ironworks in Crook St., Bolton.

Freeholds.

100 sq. yds.	A Freehold Plot of land at Sweet Green, Bolton, Conveyed by James Spencer, machine maker, and his Trustee, Benjamin Dobson, to Benjamin Hick and his Trustee, Ralph Boardman, by Release dated April 27, 1833.
522 & 1,030 sq.yds.	Two Freehold Plots on the south side of Crook St. conveyed by the Trustees of Great Bolton to Benjamin Hick by Indenture dated Sept. 4, 1839.
2,000 sq. yds.	A Freehold Plot of land situate *and* abutting on the north side of Crook St. purchased from Jeremiah Crook and conveyed by Indentures of Lease and Release dated respectively Sept. 25 and 26, 1835.

Leaseholds.

10,694 sq. yds.	A Leasehold plot situate and abutting on the north west side of Bridgeman St. demised by the Trustees of the Lecturers Closes by Indenture of Lease dated June 28, 1833.
16,826 sq. yds.	A Leasehold Plot of land situate on the north west side of Bridgeman St. and adjoining the easterly side of the last mentioned plot of land demised by the Trustees of the Lecturer's Charity by Indenture of Lease dated June 29, 1833.

MESSRS HICK HARGREAVES & Co. PARTICULARS OF PROFIT & LOSS ACCOUNT.

DATE	CAPITAL £ s d	GROSS PROFIT £ s d	SALARIES & DONATIONS £ s d	DEPRECIATION £ s d	INTEREST ON CAPITAL £ s d	COMMISSION TO Mr INGLIS £ s d	NET PROFIT OR LOSS £ s d	OUTLAYS ON BUILDINGS, MACHINERY & FIXTURES £ s d	CAPITAL LESS NET PROFIT OF THE PREVIOUS YEAR
YEAR ENDING DEC.31 1869	129.005 18 3	29.231 0 10	4.250 · ·	1.688 18 ·	6.216 14 1	552 5 ·	10.346 3 9	196 6 ·	
2 YEARS ENDING D° 1871	131.946 15 8	63.242 7 11	8.199 · ·	3.546 1 9	11.745 11 7	1.957 3 6	36.794 11 1	2.592 5 ·	
YEAR ENDING D° 1872	156.575 0 9	48.275 2 3	4.194 · ·	1.693 16 10	6.058 10 7	1.591 7 2	29.737 7 8	162 10	
YEAR ENDING D° 1873	132.862 18 6	49.354 2 10	3.403 · ·	1.495 13 9	7.577 19 1	1.846 17 ·	35.090 19 -	873 2 7	£ 103.125
2 YEARS ENDING D° 1875	231.000 6 4	196.969 19 6	8.770 · ·	2.874 1 6	11.400 17 7	5.666 5 ·	107.658 15 5	460 · ·	
YEAR ENDING D° 1876	234.367 19 2	44.696 13 10	4.500 · ·	1.968 1 6	10.669 17 "	1.407 18 9	26.750 16 7	1.081 9 8	
YEAR ENDING D° 1877	241.346 2 3	32.444 1 8	4.250 · ·	1.368 5 ·	11.329 5 3	1.122 16 5	21.373 15 ·	1.934 8 2	214.596
YEAR ENDING D° 1878	240.761 18 7	29.191 14 7	4.000 · ·	1.395 8 6	10.836 12 6	648 · ·	12.311 13 7	· · ·	219.388
YEAR ENDING D° 1879	241.894 13 4	17.170 13 7	4.000 · ·	1.335 3 10	11.971 18 11	· · ·	196 9 2	1.521 10 ·	229.583
YEAR ENDING D° 1880	245.443 13 10	21.489 7 6	4.200 · ·	1.703 16 9	12.089 14 1	536 8 ·	2.959 8 7	11.941 17 4	245.448
YEAR ENDING D° 1881	244.719 3 10	38.829 4 9	8.995 3 3	1.765 1 6	10.948 11 3	856 · ·	16.264 8 9	6.812 2 5	241.754
YEAR ENDING D° 1882	250.721 17 2	32.969 15 10	5.412 10 ·	1.829 1 ·	11.654 6 3	673 14 ·	13.800 4 7	1.531 19 2	234.487
YEAR ENDING D° 1883	273.386 6 1	27.849 18 1	3.960 · ·	1.821 9 6	11.999 2 3	503 9 2	9.565 17 2	766 15 ·	260.886
YEAR ENDING D° 1884	269.711 5 9	25.509 0 10	3.850 · ·	1.783 2 ·	12.784 8 11	954 11 2	6.796 18 9	10.739 8 3	254.146
YEAR ENDING D° 1885	240.378 2 8	31.602 14 9	4.300 · ·	1.785 2 ·	13.099 13 4	629 14 ·	11.850 6 8	2.045 18 9	239.642
YEAR ENDING D° 1886	245.999 12 3	22.198 9 10	4.700 · ·	2.970 4 ·	12.197 9 7	143 11 ·	2.727 5 3	1.364 2 4	234.089
YEAR ENDING D° 1887	250.427 8 4	18.271 15 6	4.900 · ·	2.529 15 ·	13.869 18 9	· · ·	1.227 15 3	· · ·	247.700
YEAR ENDING D° 1888	275.544 0 10	36.529 7 7	3.700 · ·	2.233 4 ·	12.811 14 11	888 18 5	16.889 10 3	4.181 17 11	275.544
YEAR ENDING D° 1889	195.778 3 10	26.935 16 5	3.335 · ·	2.333 16 ·	13.751 17 11	479 3 7	8.045 18 11	812 · ·	178.889
YEAR ENDING D° 1890	201.125 4 9	37.849 8 8	1.872 5 6	2.298 · ·	8.976 1 6	150 14 6 Mr HUDSON	24.552 7 2	9.712 19 4	193.080
YEAR ENDING D° 1891	220.148 7 2	29.605 18 9	2.314 7 8	2.328 8 ·	9.822 0 3	418 19 4	8.722 9 6	2.265 19 3	195.596
23 YEARS	£ 4.626.058 19 5	787.930 15 5	96.495 6 5	41.203 10 5	229.796 1 7	20.421 16 ·	401.978 5 5	60.496 11 2	
						LESS	1364 4 5		
							400.614 1 ·		
AVERAGE PER ANNUM	£ 220.288 10 5	34.257 17 2	4.195 9 ·	1.791 9 2	9.991 2 8	887 18 1	17.391 18 4	2.630 5 8	

YEAR	TURNOVER	GROSS PROFITS	% OF TURN'R	DEPRECIATION	NET PROFITS	EPD	AVAILABLE FOR DIVIDENDS	NET DIVIDEND PAID		CARRIED FORWARD	PROFITS IN RESERVE FUND	GROSS UNDISTRIBUTED PROFITS	
1892	188.733	10.634	5·6	5 256	1.776		1.776	——		1.776	— —	1.776	
-93	162.873	13.343	8·2	5.028	4.898		6.674	——		6.674	— —	6.674	
-94	156145	8.670	5·5	4 908	271		6.946	6.480	= 3%	466	— —	466	
-95	142.343	4121	2·9	4 749	-3.238		-2.772	——		-2.772	— —	-2.772	
-96	199.218	32.343	16·2	4 659	24.873		21.349	16.200	= 7½%	5.149	——	5.149	
-97	118.837	-6963	—	4 561	-14.134		-8.935	——		-8.985	— —	-8.985	
-98	173.674	34.759	20	4.445	26.775		17.790	15.120	= 7%	2.670	——	2.670	
-99	210.261	40.165	19	4.555	31.615		34.386	21.600	= 10%	9.314	3.372	12.686	
1900	158.150	25.190	16	—	21.730		31.044	19.200	= 10%	6.884	8.372	15.216	
Ⓐ-01	71.574	9398	13	2.000	5.932		12.777	7.680	= 4%	5.097	8.372	13.469	Ⓐ 6 MONTHS PERIOD
-02	151.650	7.722	5	4.000	1.137		6.234	11.520	= 6%	——	3.087	3.087	
-03	188.679	27.644	15	4.000	19.942		21.355	13.440	= 7%	2.629	8.372	11.001	
-04	184.981	18.444	10	4.000	11.290		13.919	11.520	= 6%	2.399	8.372	10.771	
-05	172.937	33.289	19·2	4.000	25.463		27.863	19.200	= 10%	3.663	13.372	17.035	
-06	179.952	31.295	17·4	4.000	23.549		27.212	19.200	= 10%	3.012	18.372	21.384	
-07	247.588	40.405	16·3	4.000	32.246		35.259	19.200	= 10%	6.059	28.372	34.431	
-08	189.623	27.400	14·5	4.000	19.713		25.773	19.200	= 10%	6.573	28.372	34.945	
-09	130.910	14.581	11·1	4.000	7.407		13.980	9.600	= 5%	4.380	28.372	32.752	
-10	93.407	10.589	11·3	4.000	3.602		7.982	9.600	= 5%	——	26.755	26.755	
-11	119.521	391	0·74	4.000	-5.951		-5.951	4.800	= 2½%	2.632	13.372	16.004	
-12	81.499	1.911	2·3	4.000	-4.931		-2.299	——		-2.299	13.372	11.073	
-13	145.037	11318	7·8	4.000	5.014		2.715	3.840	= 3%	3.875	8.372	12.247	
-14	128850	-1.875	—	4.000	-8.389		-4.515	——		486	3.372	3.858	
-15	144.696	24.847	17·2	4.000	18.054	2.316	16.224	8.700	= 5%	7.524	3.372	10.896	
-16	229109	29.375	12·8	6.000	21.008	9.578	18.954	11.880	= 7½	7.074	3.372	10.446	
-17	382556	45.612	11·9	18.000	24.840	27.448	4.446	14.400	= 10%	-9.934	3.372	-6.562	
-18	660.727	83.293	12·6	18.000	62.776	50.842	1.990	14.160	= 10%	12.070	3.372	-8.798	
-19	579472	106.637	18·4	18.000	84.410	30.003	34.104	13.440	= 10%	20.664	3.372	24.036	
Ⓐ-20	205.817	44515	21·6	9.000	33.262	5.000	37.900	13.440	= 10%	24.500	3.372	27.872	Ⓑ 9 MONTHS PERIOD
	5.798.819	729.553	331·54	165.161	474.940	125.187	404.131	303.420					
AVERAGE	202.000	25.200	11·4%	5.700	349 753 Ⓒ 16 400 Ⓓ 12.060	4.300	13.900	10.450	= 5·75%				

Ⓒ EXCLUDING EPD

Ⓓ INCLUDING EPD

Gross Profit as a percentage of Capital and of Capital less Net Profit of the previous year.

Year	G.P. as a % of Capital	G.P. as a % of Capital less N.P. of the previous year
1869	18.90	
1872	27.70	
1873	37.17	48.07
1876	19.08	
1877	16.36	18.38
1878	12.12	13.31
1879	7.10	7.47
1880	8.75	8.75+
1881	15.87	16.07
1882	12.91	13.81
1883	10.19	10.69
1884	9.68	10.04
1885	13.15	13.53
1886	9.00	9.46
1887	7.29	7.38
1888	13.26	13.26+
1889	13.77	15.06
1890	18.83	19.60
1891	10.72	12.07

+ Loss affected year.

Depreciation as a percentage of Capital and of Capital less Net Profit of the previous year.

Year	Dep. as a % of Capital	Dep. as a % of Capital less N.P. of the previous year
1869	1.34	
1872	1.08	
1873	1.08	1.41
1876	.58	
1877	.56	.65
1878	.57	.63
1879	.55*	.58
1880	.69	.69+
1881	.72	.73
1882	.72	.78
1883	.66	.69
1884	.66	.70
1885	.72	.74
1886	.96	1.01
1887	1.00*	1.02
1888	.81	.81+
1889	1.19	1.30
1890	1.14	1.19
1891	1.05	1.19

* Loss year.

+ Loss affected year.

Interest on Capital as a percentage of Capital and of Capital less Net Profit of the previous year.

Year	Interest on Capital as a % of Capital	Interest on Capital as a % of Capital less N.P. of the previous year
1869	5.05	
1872	3.86	
1873	5.70	7.34
1876	4.55	
1877	4.69	5.27
1878	4.49	4.93
1879	4.95*	5.21
1880	4.92	4.92+
1881	4.47	4.52
1882	4.64	4.97
1883	4.38	4.60
1884	4.84	5.03
1885	5.44	5.60
1886	4.96	5.21
1887	5.14*	5.19
1888	4.65	4.65+
1889	6.51	7.13
1890	4.46	4.64
1891	4.46	5.02

* Loss year.

+ Loss affected year.

Fig. 1 No of Engines Built 1871 – 1913.

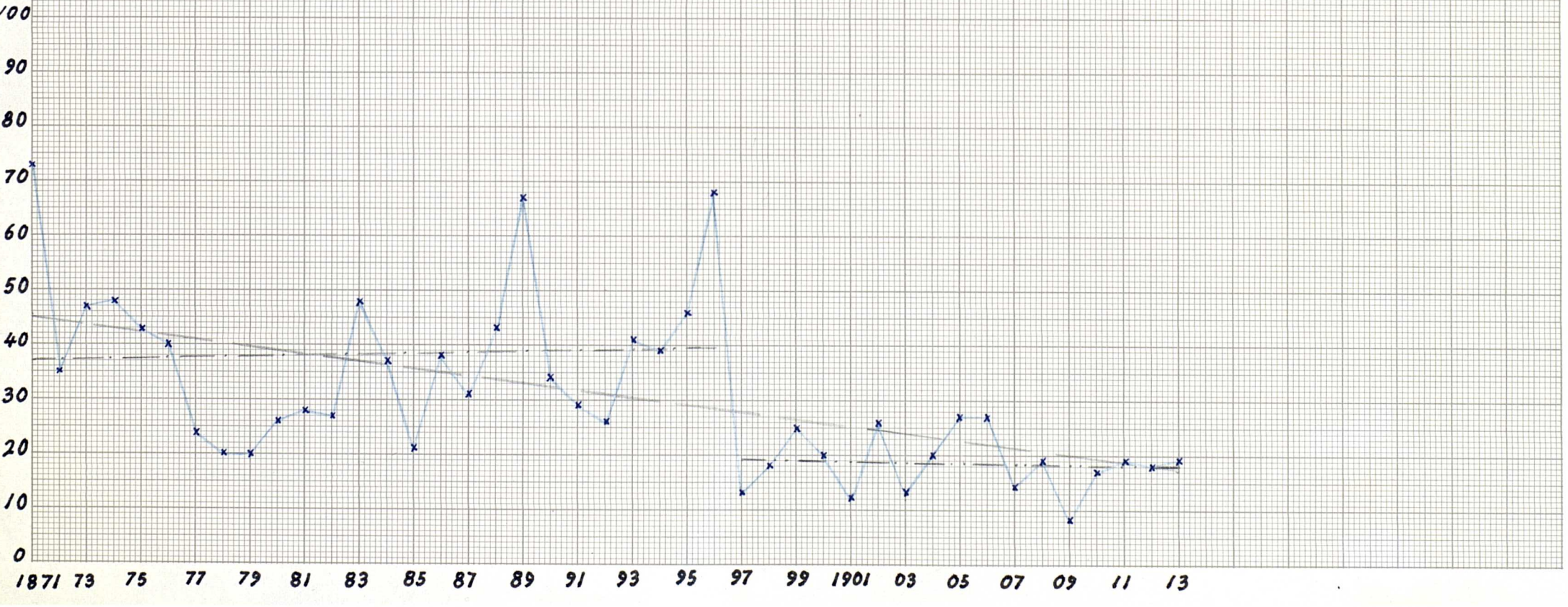


Fig. 2 No. of Engines Built 1871 - 1913

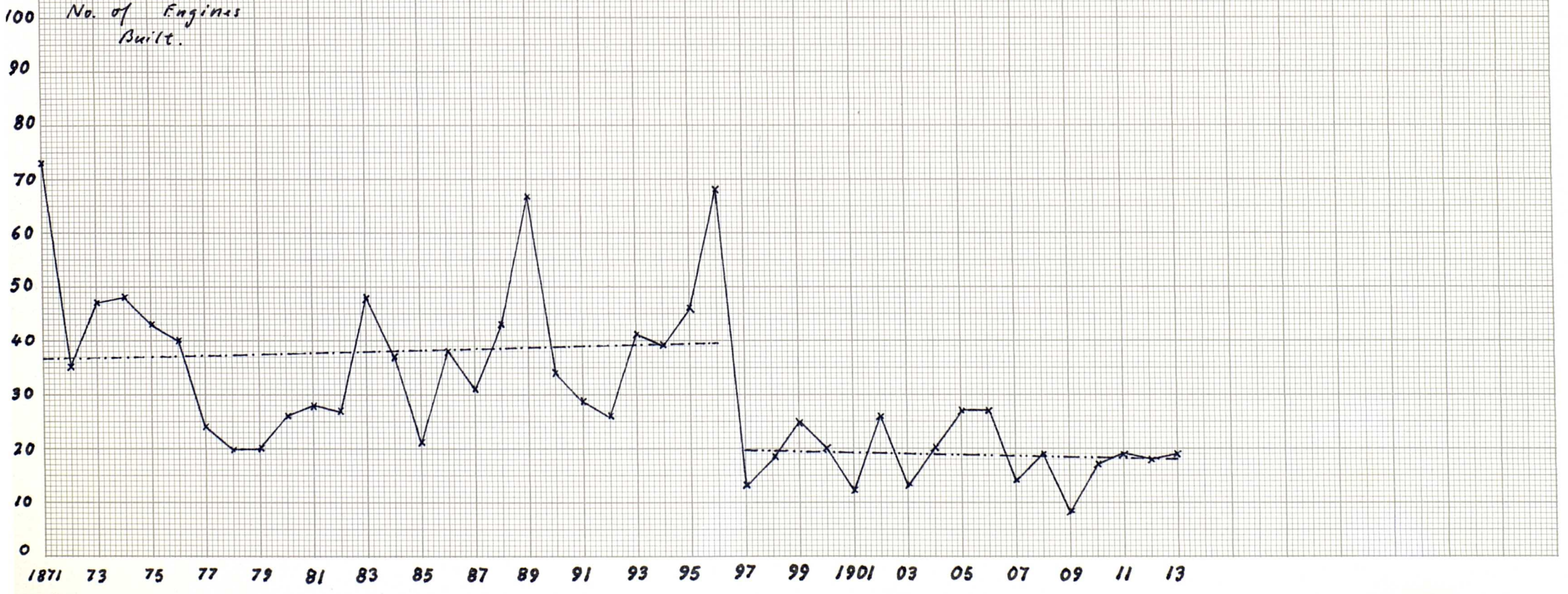
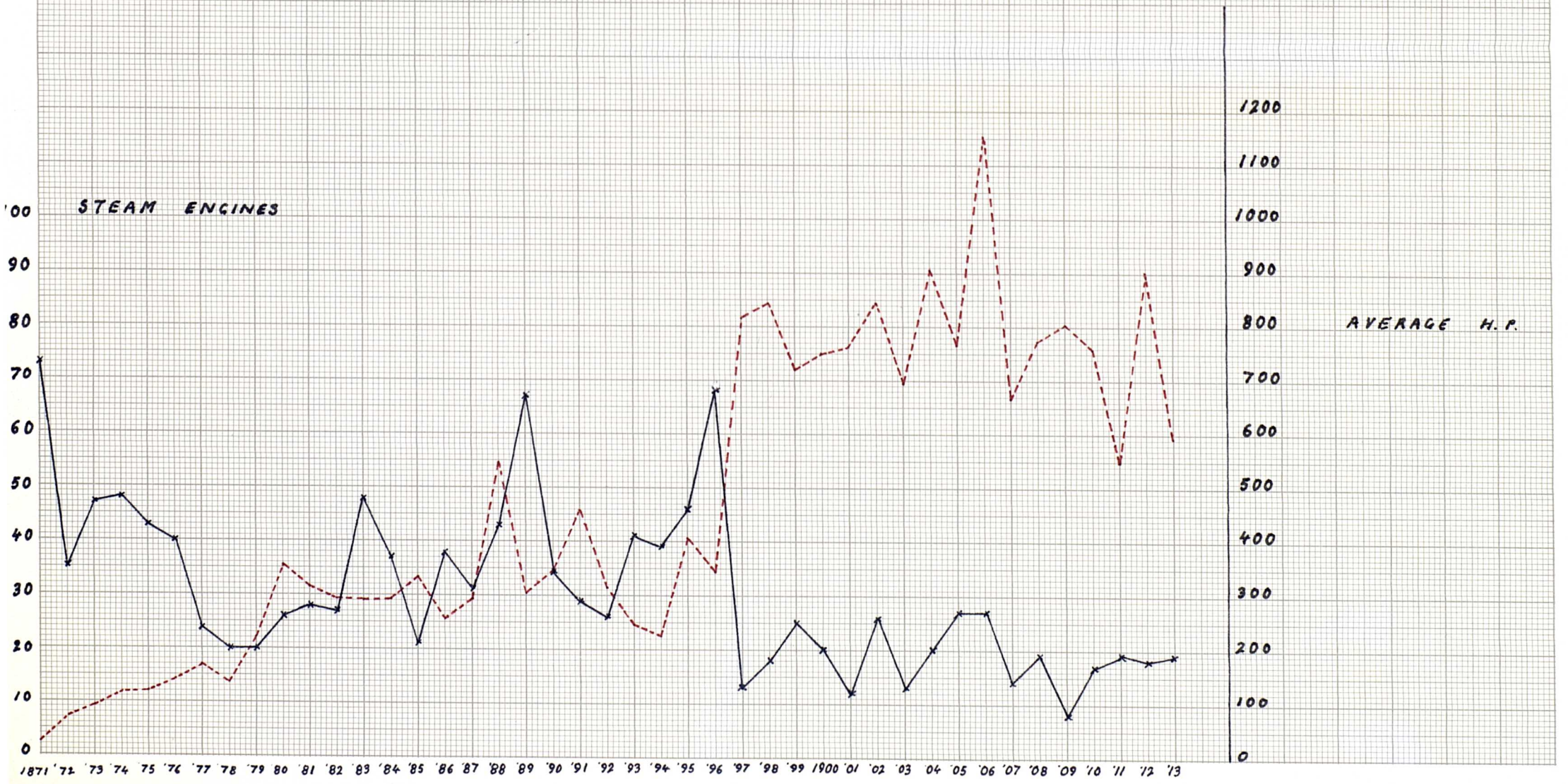
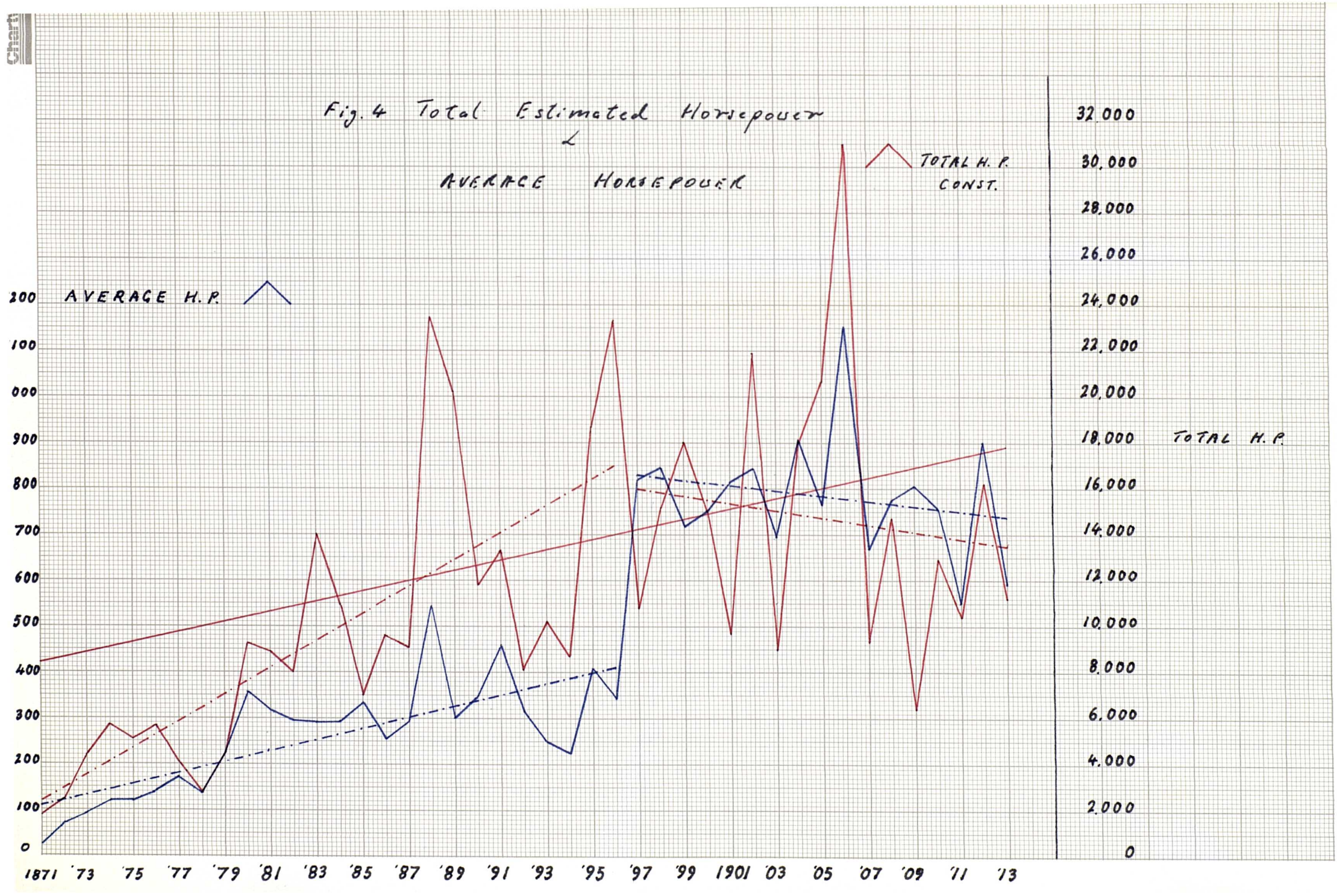


Fig. 3 Annual Production of Steam Engines & Average Horsepower



Chart

Fig. 4 Total Estimated Horsepower & Average Horsepower



The Number of Steam Engines Built by Hick Hargreaves, 1871-1913, and the Economical Indicated Horse-Power.

Year	No. of Engines Built	Total I.H.P.	Average Engine I.H.P.
1871	73	590 (24)	24.58
1872	35	640 (9)	71.11
1873	47	1,030 (11)	93.63
1874	48	2,982 (25)	119.28
1875	43	3,000 (25)	120.00
1876	40	2,700 (19)	142.10
1877	24	1,870 (11)	170.00
1878	20	1,520 (11)	138.18
1879	20*	1,560 (7)	222.85
1880	26	2,490 (7)	355.71
	Total 376	18,382 (149)	Decadal Av. 123.36

* Including one engine built for HH.

Average I.H.P. based on entries for ( ) engines.

1881	28*	8,290 (26)	318.84
1882	27	6,230 (21)	296.66
1883	48	9,340 (32)	291.87
1884	37	6,210 (21)	295.71
1885	21	5,340 (16)	333.75
1886	38	7,365 (29)	253.96
1887	31	7,340 (25)	293.60
1888	43	21,810 (40)	545.25
1889	67	19,920 (66)	301.81
1890	34*	10,480 (30)	349.33
	Total 374	102,325 (306)	" " 334.39

* Including one engine built for HH.

Year	No. of Engines Built	Total I.H.P.	Average Engine I.H.P.
1891	29	13,327 (29)	459.55
1892	26*	7,210 (23)	313.47
1893	41	10,235 (41)	249.63
1894	39	7,855 (35)	224.42
1895	46	17,115 (42)	407.50
1896	68	22,668 (66)	343.45
1897	13	9,817 (12)	818.08
1898	18	12,665 (15)	844.33
1899	25	18,005 (25)	720.20
1900	20	14,259 (19)	750.47
Total	325	133,156 (307)	Decadal Av. 433.73

* Including two rebuilds.

1901	12	9,753 (12)	812.75
1902	26	14,320 (17)	842.35
1903	13	6,865 (10)	696.50
1904	20	16,308 (18)	906.00
1905	27	20,740 (27)	768.14
1906	27	29,926 (26)	1,151.00
1907	14	9,376 (14)	669.71
1908	19*	14,711 (19)	774.26
1909	8	6,430 (8)	803.75
1910	17	12,917 (17)	759.82
Total	183	141,447 (168)	" " 841.94

* Including one engine built for HH.

1911	19[inc. 7 Diesel]	10,456 (19)	550.31
1912	18[inc. 2 Diesel]	16,228 (18)	901.55
1913	19[inc. 10 Diesel]	11,250 (19)	592.10

Private. *Provisional Prospectus.*

HICK, HARGREAVES & CO. LIMITED,

BOLTON.

Incorporated under the Companies' Acts, 1862 to 1890.

Capital £240,000 - - in 24,000 Shares of £10 each.

5000 Shares are offered for Subscription.

£1 per Share payable on Application.
£4 „ „ „ Allotment, and
£4 „ „ „ one month after Allotment.

Making £9 per Share paid up.

Directors:

J. H. HARGREAVES, Esq., BOLTON, ENGINEER.
FRANCIS HARGREAVES, Esq., do. STEEL MANUFACTURER.
PERCY HARGREAVES, Esq., do. ENGINEER.
JOHN G. HUDSON, Esq., do. do.
ROBERT HARWOOD, Esq., do. do.

Bankers:

WILLIAMS DEACON AND MANCHESTER AND SALFORD BANK LIMITED, BOLTON.

Solicitors:

MESSRS. FULLAGAR AND HULTON, BOLTON.

Auditors:

MESSRS. P. & J. KEVAN, BOLTON.

Brokers:

MESSRS. LAWSON AND ORMROD, BOLTON AND MANCHESTER.

Secretary:

MR. E. J. BROWN, SOHO IRONWORKS, BOLTON.

Registered Office:

SOHO IRONWORKS, BOLTON.

The Company has been formed for the purpose of acquiring and working the old established and Valuable Engineering, Boiler Making, and Millwright business of Messrs. Hick, Hargreaves & Co., as carried on at Soho Ironworks and Phœnix Boiler Works, Bolton.

The business has been carried on since the death of Mr. William Hargreaves under the immediate supervision and management of Mr. J. H. Hargreaves, who will, subject to the Board of Directors, continue the control of the business as Managing Director.

The Purchase Money of the properties to be acquired is £276,000 which is made up as follows :—

SOHO IRONWORKS.—Freehold and Leasehold Land, Buildings, Motive Power, Gearing, Pipes, Plant and Machinery, Trade Fixtures, Loose Plant and Utensils, Office Furniture and Fittings, Horses and Carts, and Patterns and Drawings as per Valuation by Messrs. Wheatley Kirk, Price & Goulty, of Manchester and London, dated October, 1890	£123,915	7	0
PHŒNIX BOILER WORKS.—Leasehold Land, Buildings, Motive Power, Gearing and Pipes, Plant and Machinery, Trade Fixtures, Loose Plant, Office Furniture, and Patterns and Drawings as per Valuation by Messrs. Wheatley Kirk, Price, & Goulty, dated December 23rd, 1891	£8,578	8	0
	£132,493	15	0
Materials and Work in progress	54,573	8	6
Accounts owing to the Firm	40,413	0	3
Cash at Bankers and in Hand	18,334	10	8
Patent Rights and Goodwill	49,312	17	5
	295,127	11	10
Less Accounts owing by the Firm	19,127	11	10
	£276,000	0	0

The Purchase Money will be paid or provided for as follows:—

	£	s.	d.
By Issue and Allotment of Debentures at 4½ per cent., secured by a Debenture Trust Deed....	60,000	0	0
,, Allotment of 19,000 £10 Shares as £9 each paid-up....	171,000	0	0
And the Balance in Cash	45,000	0	0
	£276,000	0	0

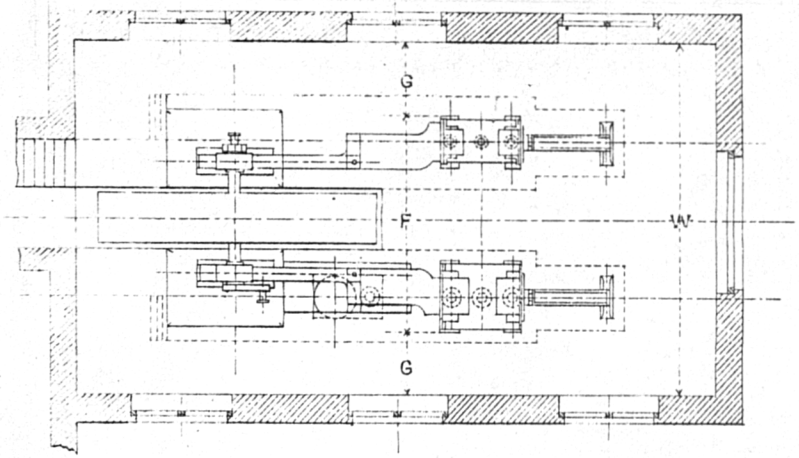
It is intended that the Company shall take over the business as a going concern as from 31st December, 1891, on which date the usual Annual Stock-taking has been made. An agreement between the Vendors of the one part, and Mr. Peter Kevan for the intended Company of the other part, referred to in the Memorandum and Articles of Association of the Company, will be entered into to carry out the arrangement.

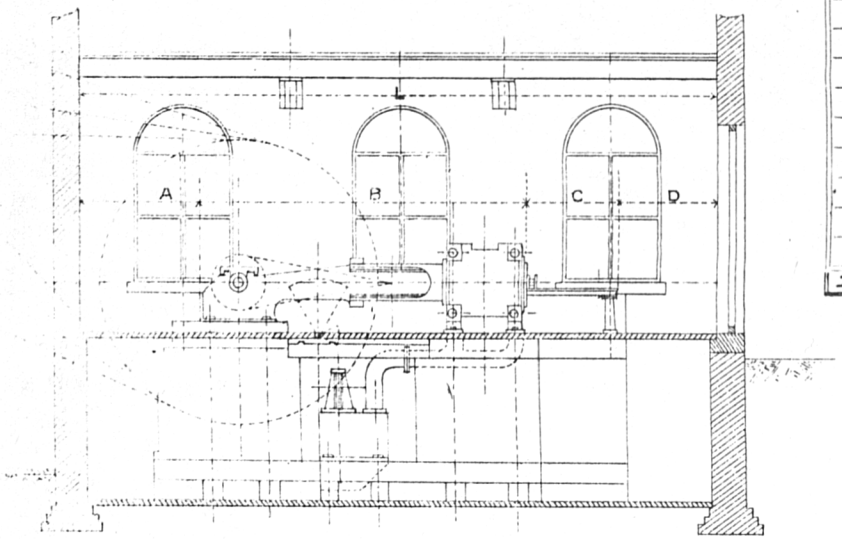
Application for Shares should be made upon the accompanying Form and forwarded to the Bankers of the Company, together with the amount payable on Application. If no Allotment is made the deposit will be returned without deduction and where the number of Shares allotted is less than the number applied for, the surplus will be credited in reduction of the amount payable on allotment.

Copies of the Memorandum and Articles of the Company and of the Agreement above-mentioned may be inspected at the Office of the Company's Solicitors.

BOLTON,

March 21st, 1892.





List No.		A.	B.	C.	D.	F.	G.	L.	W.
1	100		15'6"			10'6"			
2	150		15'6"	5'0"		11'6"			
3	170		15'9"			11'6"			
4	200		20'0"			14'0"			
5	250		20'6"	7'6"		13'6"			
6	300		20'3"	6'0"		13'6"			
7	350		20'3"	6'0"		14'0"			
8	400		20'6"	6'0"		15'0"			
9	450		20'6"	6'0"		15'6"			
10	500		21'0"	6'6"		15'6"			
11	550		25'3"	7'6"		16'9"			
12	600		21'0"	6'6"		15'6"			
13	650		21'0"	7'6"		16'9"			
14	700		21'6"	8'0"		17'0"			
15	750		25'5"	8'3"		19'0"			
16	800		26'6"	11'0"		21'0"			
17	900		26'3"	9'0"		22'0"			
18	1000		26'3"	7'0"		22'0"			
19	1100		26'3"	9'3"		22'0"			
20	1200		26'6"	8'9"		22'6"			
21	1300		31'3"	11'6"		25'6"			
22	1400		30'9"	10'0"		27'0"			
23	1500		31'6"	10'6"		28'6"			
24			31'6"	12'3"		29'0"			

LIST OF DIMENSIONS

OF

Horizontal Compound Engines,

WITH FLY WHEEL IN CENTRE.

~~SEE NOTES ON PAGE~~

These Sizes are Approximate only, and are subject to Alteration

Note re-dimensions

A Depends on diameter of Flywheel

D.C.L.W. May be fixed by Purchasers to suit his own Convenience

HORIZONTAL SIDE by SIDE COMPOUND JET CONDENSING ENGINES WITH FLY-WHEEL CENTRAL

REFERENCE NUMBER	I.H.P.	CYLINDERS H.P.	CYLINDERS L.P.	STEAM PRESS. LBS.	STROKE	REVS.	WEIGHTS GROSS TONS	WEIGHTS NET TONS	FLY-WHEEL DIAM.	FLY-WHEEL No OF ROPES	FLY-WHEEL WEIGHTS GROSS TONS	FLY-WHEEL WEIGHTS NET TONS	PRICE £	CODE WORDS
1	140	12	21	100	3.0	80	18	16	16.0	5	9	8	1125	ECHADILLO
2	160	13	22	110	3.0	80	20	18	16.0	6	10	9	1230	ECHADORES
3	200	13	24	125	3.0	80	22	20	16.0	7	11	10	1345	ECHADURA
4	335	18	30	100	4.0	70	36	33	20.0	11	19	17	1900	ECHALASSAT
5	4..	18	32	125	4.0	70	41	37	20.0	12	20	18	2100	ECHALIERS
6	430	20	34	100	4.0	70	41	37	20.0	12	20	18	2075	ECHAMPELEE
7	445	16	33	130	4.0	70	40	36	20.0	13	20½	18½	2175	ECHAMPIRA
8	540	22	38	100	4.0	70	50	46	20.0	16	24	22	2275	ECHANDOLE
9	575	21	38	120	4.0	70	53	48	20.0	18	27½	25	2435	ECHANGEONS
10	600	24	40	100	4.0	70	57	52	20.0	18	27½	25	2435	ECHANGERAS
11	640	22	40	100	5.0	60	55	50	24.0	18	34	31	2745	ECHANGEURS
12	650	22	40	125	4.0	70	58	52	20.0	18	27½	25	2540	ECHANGISTE
13	685	20	40	140	4.0	70	60	54	20.0	20	30	27½	2650	ECHANLATE
14	770	24	44	120	4.0	70	72	65	20.0	22	33	30	2775	ECHANTILLE
15	845	24	44	125	5.0	60	77	70	24.0	22	39½	36	3350	ECHAPOTANT
16	1085	29	50	125	5.0	60	98	90	24.0	26	48½	44	3820	ECHAPOTAS
17	1310	25	52	160	5.0	60	110	100	24.0	32	56	51	4220	ECHAPOTER
18	1330	27	54	140	6.0	60	110	100	24.0	32	56	51	4175	ECHAPOTONS
19	1340	30	56	120	5.0	60	112	102	24.0	34	59½	54	4200	ECHAPPADE
20	1410	26	54	160	5.0	60	128	115	24.0	36	64	58	4480	ECHARBOT
21	1570	28	56	150	6.0	53	144	130	28.0	40	88	80	5640	ECHARDONNE
22	1700	32	60	130	6.0	53	150	135	28.0	44	100	91	5950	ECHARNAGE
23	2000	35	65	130	6.0	53	170	155	28.0	50	115½	105	6500	ECHARNAIT
24	21..	3..	64	160	6.0	53	182	165	28.0	54	126	115	7000	FACESSERE

N.B. NOTES AT FOOT OF TANDEM LIST APPLY TO THIS LIST ALSO.

The Dividend Record of Hick Hargreaves compared with that of Greenwood & Batley, 1889-1914.

Year	Greenwood & Batley*	Hick Hargreaves+
1889	10	
1890	10	
1891	Nil	
1892	Nil	Nil
1893	Nil	Nil
1894	Nil	3 (2.7)
1895	Nil	Nil
1896	Nil	7.5 (6.75)
1897	2.5	Nil
1898	Nil	7 (6.29)
1899	3	10 (9.00)
1900	2.5	10 (8.00)
1901	5	4 (3.2)
1902	5	6 (4.80)
1903	4	7 (5.6)
1904	5	6 (4.8)
1905	6	10 (8.00)
1906	5	10 (8.00)
1907	4	10 (8.00)
1908	4	10 (8.00)
1909	Nil	5 (4.00)
1910	Nil	5 (4.00)
1911	Nil	2.5 (2.00)
1912	Nil	Nil
1913	Nil	2 (1.60)
1914	5	Nil

See next leaf for notes.

* Dividend payments on the share capital expressed as a % of the nominal value of the shares (£10 ordinary shares).
Source: Roderick Floud, The British Machine-Tool Industry 1850-1914 (Cambridge 1977) Table 5.1 p. 128.

+ Dividend payments of Hick Hargreaves expressed as a % of the paid-up capital of £192,000 (24,000 £8 partly-paid shares). Figures in brackets are Net Dividends expressed as % of the Nominal Capital of £240,000.