

THE RISE AND FALL OF COVENTRY'S MACHINE TOOL INDUSTRY

**Profiles of four Companies whose products, in the 20th century, made the
City famous throughout the world. Based on talks given to the
Warwickshire Industrial Archaeology Society**

**by
Arthur Astrop**

FOREWORD

It is difficult to think of any manufactured item today which, at some stage or other in its journey from raw material to finished product, does not require the use of at least one machine tool. Yet it is the writer's experience that, outside the ranks of practising engineers, it is unusual to find any member of the public who can say with any certainty precisely what is meant by the term 'machine tool'. To paraphrase W Steeds, in the introduction to his classic *A History of Machine Tools 1700-1910*, "The elephant is difficult to describe but at least you know one when you see one. Attempts to define a machine tool often founder on both counts!" It was thought it might be helpful, therefore, to provide a few brief notes on the origins, history and development of machine tools as vital links in the chain of modern manufacturing processes.

Devices which are recognisable as early attempts to construct machine tools are dated by archaeologists as far back as 1500 BC, when something which looks very much like a crude lathe is recorded. And the bow-drill for making small holes was also known in pre-Christian times. But it was in the 18th and 19th centuries that the foundations for much of machine tool technology as we know it today were laid down. In Britain, the fundamental designs and basic principles of power-driven machine tools were established by such great engineers as Joseph Bramah (1748-1814), Marc Isambard Brunel (1769-1849), Henry Maudslay 1771-1831), Joseph Clement (1779-1844), Joseph Whitworth (1803-1887), and James Nasmyth (1808-1890), among others. Many of those principles remain effectively unchanged today, and it was on them that the machine tool makers of the late 19th and the 20th centuries subsequently built their reputations, their businesses, and their fortunes.

Why was it necessary to invent the machine tool in the first place? Initially, the prime mover was when Man in his restless passion for 'making things' (especially from metals), found that he was reaching the limits of both his manual skills and his muscle power. The human hand and eye imposed limits on the accuracy with which raw materials could be shaped, and even the most skilful craftsmen could not be relied upon to repeat a process consistently. Early machine tools, therefore, were aimed at solving this problem by allowing cutting tools to be guided mechanically with greater precision than was possible by hand alone, and at the same time increasing the power applied to the cutting process itself.

An analysis of the shapes which were most commonly required to be cut or formed on engineering components revealed that they were surprisingly few, and essentially were extremely simple. It turned out that initially only three basic types of machine tools were needed to produce the majority of these shapes accurately and consistently. They were, the planer, the lathe, and the drilling

machine. Respectively, these machines would accurately and consistently produce flat surfaces, cylindrical shapes (shafts, for example), and holes. They did so by controlling either: (a) the path taken by the cutting tool relative to the work, or (b) the work relative to the cutting tool. All machine tools are based on those two simple principles, and development over the years has been predominantly concentrated on increasing the efficiency and accuracy with which they perform either, or both, those two functions.

The planer is little used today, having been largely superseded by the milling machine, but once effective designs had been established for these three basic machines a major step forward had been made. It is no exaggeration to say that the designs of virtually all modern machine tools, however advanced and technologically complex they may appear to be (even those which are computer numerically-controlled), can in fact be traced back to the 'basic three' machines mentioned above.

But the ability of machine tools to produce components much more accurately and consistently than was hitherto possible by hand alone had an underlying significance which was not perhaps fully appreciated at the time. It laid the foundation on which the *interchangeability* of manufactured components, made anywhere at any time, was soon to rest. In fact, interchangeability results from a combination of the use of precision machine tools and the skill of draughtsmen in specifying dimensions, and placing the correct manufacturing tolerances on those dimensions, at the design stage. Interchangeability is a benefit which is now wholly taken for granted, and today it is difficult to imagine a world in which a replacement part for any mass-produced device will not slot neatly into its appointed place without the need for any adjustment whatsoever. But it was not always so, and universal interchangeability was certainly not attainable before the advent of the machine tool.

The next event which added impetus to the development of machine tools was the arrival of mass production techniques. One of the first examples of mass production appeared in Britain in the early 19th century, when Marc Isambard Brunel designed a plant for producing pulley blocks for the Men o' War of the Royal Navy. The machine tools required for this groundbreaking project were made to Brunel's designs by Henry Maudslay and installed at Portsmouth Dockyard. Admittedly, the blocks were made from wood, not metal, but the significance was that not only were they produced in very large quantities, by machines, but they were also all identical, and were thus interchangeable. The benefit of this to sailors in the midst of battle, when rigging was shot away, needs no emphasis.

Brunel's block-making plant was a one-off and somewhat before its time, but later in the 19th century it was once again war, and the armaments industry, which provided the next spur to machine tool development. In the American Civil War, for example, the Springfield Works, Illinois, USA, built a factory for the mass-production of infantry rifles. All the critical components for the rifles were made to such high levels of accuracy by machine tools that they were interchangeable in the field, and even under enemy fire if necessary. The Springfield factory, and its methods, was a milestone in the application on a large scale of machine tools, many of them semi-automatic.

By the turn of the century, and certainly by the outbreak of the First World War, interchangeability of components used in weaponry, and not just rifles, was fully established. Soon, with mass-production techniques being applied to cycles, motor cycles, motor cars, domestic appliances, and practically all other types of consumer goods, anything less than complete interchangeability of replacement parts was unthinkable. The machine tool had made itself indispensable.

One final point may perhaps be made about this strange creature 'the machine tool'. Unlike any other mechanical device invented by Man it possesses the unique ability to reproduce itself! Components for machine tools are, in turn, made by other machine tools, and as each generation of machines becomes more accurate so do its progeny. The thread on the leading screw for Henry Maudslay's first screw-cutting lathe, for example, was painstakingly cut by hand, by the Master himself. Once assembled to his lathe, however, a duplicate screw could then be cut *by that machine*. It could be argued, therefore, that all subsequent lead screws might be traced back to the original, so laboriously cut by hand by Maudslay. For those interested in this important step in machine tool development there is a magnificent example of a long hand-cut lead screw on display in the Birmingham Museum of Science and Industry, exhibited alongside the planing machine it once controlled.

It is now time to move from the general to the particular, and to look at the development of the machine tool industry in Coventry. Four of its most famous machine makers have been chosen to illustrate the growth of the industry in the City, but it should be explained that what follows does not pretend in any way to be a detailed or comprehensive history of each. Rather, the author's approach is to present a 'profile' and an 'impression' of each firm, with much of the material coming from his knowledge acquired during a working life in the machine tool industry, augmented with data from other sources to which due acknowledgement has been made.

Acknowledgement is also made to the Warwickshire Industrial Archaeology Society for inviting the author to give the talks on which this booklet is based, and especially to the Society's Chairman Lyndon Cave whose encouragement made sure that the project was completed!

MACHINE TOOL BUILDING IN COVENTRY

Coventry was an important centre for the development and production of machine tools for about 100 years, from approximately the 1880s to 1980s. In that time span, four companies rose to dominate the industry in the City, with a number of smaller companies surrounding them and backing them up. As an industry in its own right, machine tool manufacture in Coventry once provided employment for many thousands of workers, and its prestigious apprenticeship schemes turned out countless skilled engineers who served all over the world. Indeed, to have completed an apprenticeship with any of the Big Four Coventry machine tool makers was effectively to hold a 'passport' to a job in engineering virtually anywhere in the world.

But each of the Big Four gradually declined and fell, and today it is barely possible to discern that they ever existed in the City. Not one of their factories remains standing, and their workforces either scattered or were forced into early retirement. Worse, as each of the Companies in turn collapsed, some of their older and most highly skilled men were destined never to work again, and a priceless national resource was thus lost forever.

So who were Coventry's Big Four machine tool builders? At one time, even to ask such a question would have seemed quite superfluous, so great were their reputations. Today, however, it is sadly all too necessary, and so what follows is an attempt to record some of their achievements and to offer profiles both of the charismatic men who founded them and the firms they created. In chronological order of 'birth', the Big Four were Webster & Bennett Ltd, Alfred Herbert Ltd, Coventry Gauge & Tool Ltd (latterly known as Matrix Churchill Ltd), and A C Wickman Ltd. Each specialised in a particular branch of machine tool design and manufacture, and each earned an international reputation for the excellence of its products. Then each in turn declined and fell, sometimes spectacularly, and in so doing dealt Coventry a succession of blows which, like the loss of much of its motor car industry, reverberate to this day.

But Coventry was not alone in this misfortune. Today, the British machine tool industry as a whole no longer holds the dominant position in the world which it once enjoyed, and firms of equal eminence, situated in other parts of the UK, have also succumbed. Machine tool manufacture in Britain was once also centred in Birmingham, in Manchester, in Yorkshire (especially Halifax), and in the North-east, notably Newcastle. World famous machine tool makers in each of those areas also fell in the latter half of the 20th century, again with grievous losses of skilled men and experience. Some of the reasons for that failure will be touched on in the pages which follow. But the principal focus of this booklet is Coventry and its machine tool builders, and it must therefore start with Alfred Herbert Ltd, generally acknowledged to be the 'father' of the industry in the City, for many years the largest machine tool builder in Britain, and for a time the largest in Europe.

ALFRED HERBERT LTD

The early years

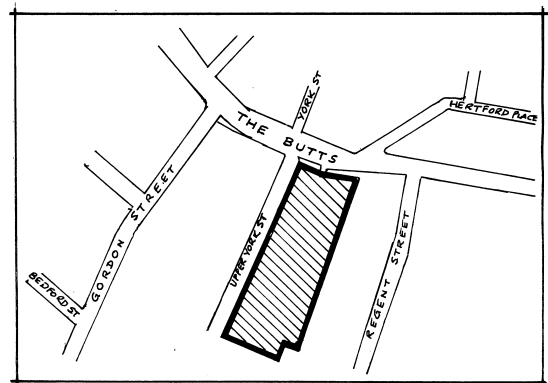
The son of a Leicester builder, contractor and land owner, who also had farming interests, Alfred Edward Herbert was born in 1866, educated at Stoneygate School and was subsequently enrolled as a Premium Apprentice to George Jessop & Sons in Leicester, makers of steam-driven hoists and cranes. In 1886, he left that firm (before he had completed his apprenticeship), to take up a position as manager with Coles & Matthews, engineers in Upper York St, The Butts, Coventry. His salary was £2.00 per week.

Three years later, in 1889, Herbert formed a partnership with William S Hubbard, a school friend and Jessop apprentice, and with financial help from their respective fathers they bought Coles & Matthews. They were now in business on their own accounts, as Herbert & Hubbard, and initially they took on general engineering work, and continued with some of the activities of Coles & Matthews, including the hire of steam ploughing tackle and steam rollers, the manufacture of pill-sorting machines, also machines for the ribbon trade, boiler work and general engineering. But their long-term aim was to design and manufacture machine tools, and their first real market for the latter was the cycle makers, already booming nationally and not least in Coventry. For the cycle makers they designed and built a range of relatively simple machine tools, including polishing lathes, drilling machines, rim-bending machines and spoke-screwing machines. In later life, when reflecting on those early days, Alfred Herbert acknowledged the contribution made by his partner William Hubbard, whom he recalled as 'a clever mechanic of considerable inventive ability, who designed a number of interesting machines'.

It is not unreasonable to assume that Herbert's contacts with, and work for, the cycle makers was assisted by the fact that his elder brother (William Herbert) was already well established in that industry in partnership with William Hillman (later of motor car fame), in a firm which eventually became the New Premier Cycle Co. William Herbert was also probably instrumental in introducing his brother Alfred to the President of a French company which had developed a new form of weldless steel tubing, ideally suited to making cycle frames. Alfred managed to obtain the selling agency for this tubing in the UK, and in the early years the income from such sales was to make a valuable contribution to the finances of his fledgling machine tool enterprise.

Initially, the types of machine tools Herbert & Hubbard made for the cycle industry were mostly designed to fulfil a specific purpose and therefore had limited applicability to other industries.

Some of these early machines are recorded in a unique collection of over 300 whole-plate photographic negatives, on glass, which was rescued from almost certain destruction by Mr Richard Bailey, at one time a leading industrial photographer in Coventry. In late 1999, these negatives were catalogued and individually identified by the author and were then deposited by Mr Bailey in the Coventry City Archives. They show machines made by Herberts in the years from approximately 1890 to about 1930, and many of those made by Herbert & Hubbard for the cycle industry are filed under the heading 'Miscellaneous and Special Purpose Machine Tools'.



The position of the factory owned by Coles & Matthews in Upper York St, Coventry, which Alfred Herbert joined as a manager in 1886 at a wage of £2.00 per week. In 1889 he bought Coles & Matthews and started Alfred Herbert Ltd. Parts of this building were still standing in the year 2000.

The cycle industry in fact added a significant impetus to machine tool development at the end of the 19th and the start of the 20th centuries. Cycling became a craze at that time, and cycles (unlike early motor cars), had to be priced within the reach of a mass market. Scores of cycle manufacturers sprang up, and not just in Coventry. Many failed after only a year or two of trading, but a few succeeded and some went on to become very large concerns indeed. But large or small the cycle makers all had one factor in common. They were making a range of standard machines to a modest price, and therefore needed to manufacture components for their cycles in large numbers, and make them quickly and cheaply. Machine tools were therefore needed for simple turning, drilling, milling and threading operations, also for bending and shaping tube and sheet metal to produce mudguards, frames and handle bars for example. It was this fast-growing need that Alfred Herbert was one of the first in Coventry to spot, and to fulfil. Significantly, some of the types of machine tools Herbert originally designed to meet the needs of the cycle industry were later to be modified, improved, and scaled-up to meet the needs of the mass-producing car makers, the next important industry to establish itself in Coventry. So Herbert had a head start in that respect as well.

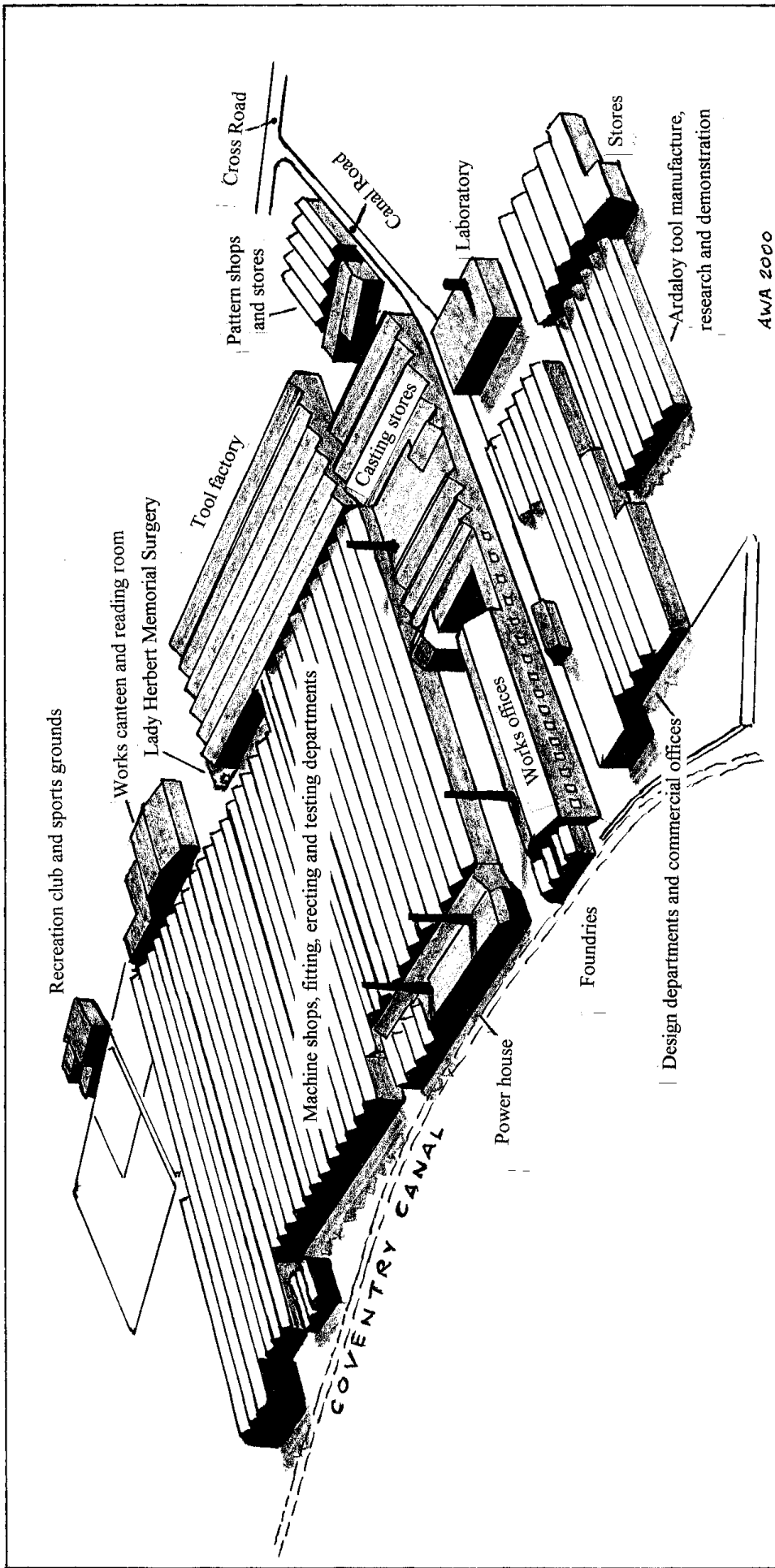
Herbert's partnership with his friend William Hubbard was obviously fruitful but it lasted a few years only and in commenting on its dissolution Herbert wrote "After a time Mr Hubbard and I came to the conclusion that, although our personal friendship was unimpaired, we were not suitable as partners. It was arranged that I buy his shares, which was done". No clues are given as to why the two felt they were 'unsuitable' as partners. After Hubbard withdrew from the scene Alfred held the majority of the shares, and members of his immediate family were prominent among those owning the remainder. In 1894, Alfred Herbert Ltd became a joint stock Company, and at age 28 years Alfred was a Director and Chairman of the Board, a dominant position he effectively maintained up to his death at the age of almost 91, in 1957. With the formation of the joint stock Company, Alfred was in sole command, indeed he often referred to himself as the Sole Managing Director, and was on his way to creating a firm whose name would become famous wherever machine tools of all types were used.

It is beyond doubt that Alfred Herbert was a superb entrepreneur, a very shrewd business man, and an outstanding leader of men, in whom he inspired a loyalty which came to be known as 'The Herbert Spirit'. But he was not a 'great' engineer in the same sense as those (mentioned above), who pioneered the design and development of early machine tools. On the other hand, he certainly had an uncanny ability to pick those who *were* first-class engineers, and then to persuade them to work for him.

THE ARRIVAL OF OSCAR HARMER

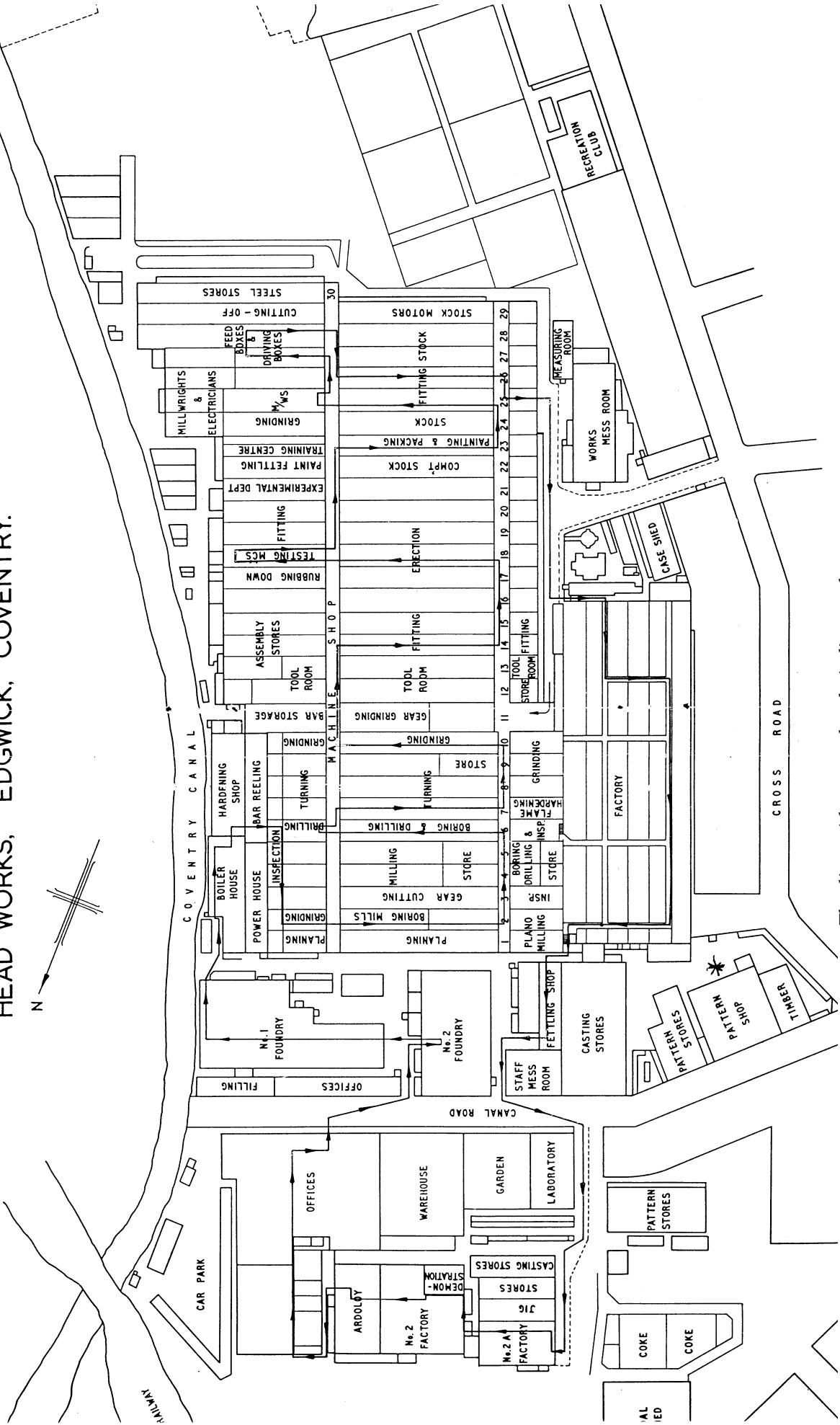
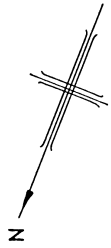
One of his early *coups* in that respect was the capture of Mr Oscar Harmer. Harmer was a charismatic character, an Irish-American who originally came to England to work for the Capewell Horse-Nail Co in Millwall, London. Later he joined Babcock & Wilcox to lay out and equip a new works in Renfrew, Scotland, and it was from that Company that Herbert managed to 'entice' him. Harmer had already gained some experience of designing and manufacturing machine tools, and his subsequent influence on, and contributions to, Herberts over very many years thereafter are difficult to exaggerate. When he joined Herberts in 1897, Harmer is reported to have commented, somewhat tersely, "There's a lot to do here".

That remark is thought to have had as much to do with what he considered poor working practice as anything else. The firm was still in Upper York St, The Butts, and in later years Harmer wrote: "It was a peculiar works for a machine tool factory, comprising a very small workshop with less than a dozen machines, some of which were making cycle rims and mudguards. There was a yard with a corrugated iron shed in which were built vertical steam boilers and wrought iron case hardening pots. (*used in heat-treatment processes. Ed*). The shafting in it was driven by a belt crossing the yard in the open air. The pattern shop was over the machine shop, and was reached by a chicken ladder". This description obviously suggests that while machine tool production was the primary aim of Alfred Herbert Ltd, in its early years it would contract for general engineering work of any type in order to keep the firm afloat.



The Edgwick Works, Coventry, of Alfred Herbert Ltd. This drawing was made from an undated aerial photograph probably taken either just before, or just after, the Second World War, but certainly at a time when development of the 40-acre site was virtually complete. The view looks across the works in a southwesterly direction with the Coventry Canal in the foreground, and shows how the extension of Canal Road as a private road divided the site into approximately one-third and two-thirds.

ALFRED HERBERT LTD.
 HEAD WORKS, EDGWICK, COVENTRY.



The line with arrow heads indicates the route normally followed by visitors.

There is no doubt that Harmer played a crucial part in the success of the Company, in a variety of capacities. He was its first general manager, a highly successful salesman for its products in its earlier years, he rose to become a Director, and he was the man who set the exacting standards throughout the Works which were to make the Company renowned for quality. He also introduced to the firm Mr P V Vernon who rose to become one of the most famous machine tool designers in the country and was responsible for many of the Company's most successful machines. Harmer had a reputation for long hours and immensely hard work, which he expected in equal measure from those whom he led.

He was also famous for his 'picturesque' language, being a merciless critic of any work which fell short of perfection. Legend has it that in moments of extreme provocation he could swear for 10 minutes without repeating himself and, in pursuit of perfection, would take a sledgehammer to any machine which he felt unworthy of being despatched to a customer. Larger than life as he was, Harmer was nevertheless a complementary personality to Alfred Herbert himself, for he stayed with the Company for the remainder of his working life, and was at his desk until only a few months before he died, in his 89th year, in 1939. In a tribute which he paid to Harmer immediately after his death, Sir Alfred wrote "His (personality) permeated the whole place, drawing office, works and commercial offices alike, and he left his mark on everything he touched".

It was Harmer, for example, who introduced a new sales approach to Herberts which is commonplace today but was considered innovatory in the early 20th century. He instituted the practice of visiting potential customers, making time studies of components they were producing, quoting for the supply of a new machine complete with all the necessary tooling and then guaranteeing an improved production rate. He was prepared to stand by such a guarantee, and he was rarely wrong. It was also Harmer who, in 1899, was delegated by Herbert to supervise the building of a new iron foundry at Edgwick, in the Foleshill district of Coventry. This foundry was, in fact, the very first building on the site which was ultimately destined to become the largest machine tool building factory in the UK, and possibly in Europe as well.

Known as Head Works, at its peak it had a covered area of over 30 acres on a 40-acre site between the Foleshill and Stoney Stanton Roads, Coventry, being bounded on the other two sides by the Coventry Canal and Cross Road. The main entrance was by way of Canal Road, a short residential street turning off Cross Road, but Canal Road was extended to run through the factory site. It thus formed a private road which stopped at the bank of the canal and effectively divided the area into approximately one-third and two-thirds. The drawing on page 6 of Head Works at its peak is based on an aerial view which is undated but was probably taken soon after the second world war, and the layout on page 7 of Head Works in its hey-day shows the functions of all the principal departments. This latter diagram was included in a 20-page booklet produced by the Company for visitors when, by arrangement, they took a guided tour through the plant. Printed in 1961, this booklet carries on its cover the claim "AH the largest machine-tool organisation in the world". The bold line with arrows in the diagram shows the route visitors would take on such a tour, and descriptions of the activities in each of the 30 main bays are given on p. 36.

One-third of the site housed among other facilities, the Directors' offices, the design and drawing offices, and included a private residential apartment for Alfred Herbert. The remaining two-thirds of the site housed all the main production and assembly bays, 30 in total with each measuring 30 ft wide by 420 ft long and served by 66 overhead gantry cranes with lifting capacities from 1 to 15 tons. In the years to come, the Company added other factories to its facilities but Head Works was to remain not only its headquarters but also the 'jewel in the crown' of Alfred Herbert Ltd. While Head Works was being built up, the Company maintained occupation of its original factory in Upper York St and did not finally dispose of those premises until the mid 1920s, when all its manufacturing operations were integrated into Head Works.

As has been mentioned, one of Herbert's most important customers in his very early years was the cycle industry, which included many small, or very small, concerns with extremely cautious and conservative outlooks. Most of these firms had very little capital to play with, and looked askance at Herbert's urgings that they should invest in new and more productive plant and equipment. It is recorded that on one occasion Herbert found a tiny cycle-making firm employing a youth to do a

particular job on a very primitive milling machine. He suggested to the proprietor that “a modern machine tool would do the same work in half the time”. To which the tart reply was “But what would I do with the lad for the rest of the time?”



The top floor of this building (still standing on the Head Works site in 1998) was a private apartment, built above the Director's offices and used by Sir Alfred when he travelled up to Coventry from his country estate in Hampshire. The initials AH are cut in the 'keystone' above the doorway. After the collapse of Herberts in 1983, the flat was occupied for a period by Project Aerospace Ltd, hence the temporary fascia board.

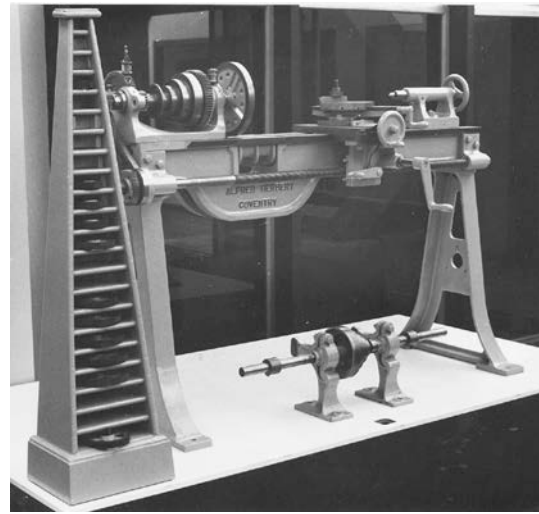
Dec 31 st 1888			
Land	1500 yards @ 6/-	90.00.0	
	2009 " " "	602.14.0	1052.14.0
Buildings as last year less 4%		311.00.0	
New Shop & floor cost 232 less 2 1/2%		226.4.0	
Iron Fencing & Fixing		12.0.0	549.14.0
Fitted Plant			641.19.4
Materials, Stock, Fixtures & Sundries			579.17.10 1/2
Loose Tools			94.11.1/2
Ploughing Tackle: last year		470.6.7	
est Labour on improving		64.0.0	
est New materials & ropes		69.0.0	
est New woodwork on watercarts		65.0.0	
		608.6.7	
10% depreciation		60.16.7	547.10.0
Road Roller - last year		280.0.0	
est Value Improvements		10.0.0	
		290.0.0	
10% depreciation		29.0.0	261.0.0
Patents - Coles as last year less 1/10%		14.0.0	
Pile Machine, cost £120		100.0.0	114.0.0
Brick Trolley (new steel)		18.0.0	
Saw Bench		5.0.0	23.0.0
Patterns, general 20/100, Pillon's 6/100			26.0.0
Assets Esco to Paris 10/100 - Stanley, Hunt 3/100			13.14.0
Sundry Debtors			468.14.10
Amount drawn by Partners during year			204.0.0
Cash in hand			6.4.9 1/2
Balance Loss			129.5.11
			£5041.6.8 1/2

A Balance Sheet of Coles & Matthews dated Dec 31st 1888. One year later, the firm was bought by Alfred Herbert and William Hubbard to design and make machine tools.

THE CAPSTAN LATHE

Of all the many types of machine tools which his Company eventually made, or were selling agents for, there is no doubt that turning machines (i.e. lathes in a variety of forms), were closest to Alfred Herbert's heart. Indeed, there is evidence to suggest that the first time he saw a lathe removing metal was pivotal to the rest of his career. When Alfred Herbert left Stoneygate School it was planned that he should go up to Oxford but before that move could be made he paid a visit to his school friend William Hubbard, then apprenticed to Jessop & Sons, Leicester. There he saw Hubbard working a small centre lathe and was 'spellbound to see the curly chips he was producing'. "Hubbard's achievements on the lathe" Herbert subsequently said "were too much for me, and I persuaded my father to let me follow his (Hubbard's) example". On such chance encounters are fateful decisions made.

Very simple centre lathes were included in the early products of Alfred Herbert Ltd but major turning points in the firm's fortunes occurred when in 1895 it added capstan lathes to its catalogue, followed in 1897 by the combination turret lathe, and in 1903 by the single-spindle automatic lathe. The centre lathe requires a skilled operator, who has served a proper apprenticeship in all the arts of turning, and is not really suitable for even the most modest version of mass-production. The capstan lathe, on the other hand, can be worked by a semi-skilled (or even an unskilled) operator, and will produce repetition work quickly, consistently and accurately with minimum supervision. Admittedly, it requires a skilled man to 'set' it, but one experienced setter can look after a number of machines and thereafter a semi-skilled or unskilled operator can take over.



An early Herbert centre lathe.

The operator has merely to use the capstan wheel to apply the cutting tools in the correct order, and the distance travelled by each tool is controlled by stops, already adjusted by the setter. The implications of such a machine for raising the productivity of components for the cycle industry, which sorely needed such a benefit, were obvious to Herbert.

It must be pointed out that the capstan lathe was not Herbert's invention, albeit he played a very important part in developing it and improving it. There is some dispute as to the precise origins of this type of machine, but by general agreement it seems to have appeared first around 1840 in the USA, where it was known as the turret lathe. In Britain, there is a record of a capstan lathe made in 1884 by James Archdale & Co, machine tool builders in Birmingham, and Oscar Harmer was soon urging Herbert to enter the same field, advice which he obviously took to heart. Indeed, the capstan lathe, in all its many variations, was to be the bedrock on which the initial, and continuing, success of Alfred Herbert Ltd was built. It became a 'best seller', and so widely used in the engineering industry that it was reputed to be 'as well known as a bottle of Bass'.

But Herbert did not have it all his own way in the capstan lathe market for there was a formidable competitor just a few miles away in Birmingham, in the shape of H W Ward & Co Ltd. Herbert and Ward fought it out with competing ranges of capstan lathes, and its derivative the combination turret lathe. So powerful were both companies in this market that each attracted a sizeable 'brand loyalty'. It was not uncommon for Works Managers to speak of their lathe departments as either 'our Herbert shop' or 'our Ward shop', depending in which company they had placed their faith.

Herbert capstan lathes became the workhorses for much of the repetition engineering sector as far as a turned parts was concerned, and they could be used either as chucking or as bar-fed machines.

The capstan lathe was progressively developed so that it could undertake wider ranges of work, and improvements were steadily made to its ease of setting and operation. Indeed, so simple did it become to operate that in the first world war (and again in the second WW), thousands of women literally came direct from their kitchens into factories and, after only a week or so of training, were operating capstan and turret lathes and turning out munitions, especially shells.

The first two decades of the 20th century saw Alfred Herbert Ltd expand at a truly astonishing rate. Its ranges of machines grew, especially the single-spindle automatic turning machines which, as their name implies, required minimum supervision. All the functions of these machine were controlled by large-diameter rotating drums, with cams or trip dogs which could be set at different positions around their peripheries. A skilled setter was needed, of course, and setting the machine could take several hours, sometimes a whole working shift, but once the machine was set it could run continuously, day and night if needed, and required only to be supplied with raw material. At the same time, the Herbert product range now included various types of drilling machines, milling machines and grinding machines. By the outbreak of the first world war Herbert's payroll has been estimated at about 2,000, a far cry from the dozen or so employed when he started, and a striking illustration of the rate at which the Company had grown in about 20 years.

But the first decade of the 20th century saw another development masterminded by Herbert which was to prove of immense importance to the future success of his firm. In addition to building machine tools in his own right Herbert started to acquire the exclusive selling agencies for machines made by other firms, both at home and overseas. Only machines of established reputation and of the very highest quality, reliability and performance were chosen to be sold under the Herbert banner, and this side of the business was destined to grow rapidly and to prove extremely profitable. Known as the Factored Division, it also provided another important arrow in Herbert's quiver.

It enabled the Company to quote for what would today be called 'turn-key' projects, that is the equipping of entire factories with most, or all, the machine tools and ancillary equipment needed for making a specific product, even when Herberts could not supply all the required plant from its own works. For such projects, Herberts acted as the main contractor, and as an example of this practice there are records to show that in 1913 the Company shipped to Central Argentine Railways a number of machine tools, complete with all the necessary tooling, on what appears to have been a turn-key contract. Photographs show that some of the machines supplied were made by companies for whom Herbert held the selling agency in the UK, including the Le Blond Co, USA.

Another indication of the astonishing growth of Herberts from 1900 onwards was the fact that by 1913 it already had branch/sales offices in London, Birmingham, Manchester, Newcastle, Glasgow, Leeds and Bristol; while overseas it had similar facilities in Paris, Milan, Yokohama, Calcutta, Berlin and New York. It was now bidding to be the largest and most advanced machine tool building concern in Britain, and in 1914 it was in a very strong position to be able to respond to war time demands for machine tools, not least for armaments manufacture.

The vigour of the Company can also be measured in quite another way. In the years up to 1914, for example, over 60 patents concerned with the design of machine tools or cutting tools were granted to the firm, two in the sole name of Alfred Herbert and the remainder jointly either with Oscar Harmer or with P V Vernon. This practice of assiduously protecting the Company's intellectual property, which started in the late 1890s, continued virtually throughout its life.

THE FIRST WORLD WAR YEARS

It was not just the Company's machine building capacity which was to prove of crucial importance to Britain in war time. Less than a year after hostilities had begun the then Prime Minister Lloyd George asked Alfred Herbert to head the Machine Tool Department of the Ministry of Munitions, with virtually *carte blanche* to run it as he saw fit. He accepted, of course, because apart from his undoubted patriotism the opportunity to exercise his gifts as an entrepreneur must have been irresistible. The fact that Herbert had already co-authored what was described as 'a remarkably complete scheme for a central organisation to co-ordinate (the nation's) engineering resources', a document of which Lloyd George must have been aware, probably played a part in Herbert's

appointment to run this vital Ministerial Department. Nevertheless, here surely was a case of ‘the right man being in the right place, at the right time’.

As the war ground on and the Western Front became more and more static, fighting was increasingly centred on entrenchment and massive artillery barrages. It gradually became apparent that the supply of shells from Britain’s armaments factories was inadequate. The workforces in these factories, traditionally almost exclusively male, was steadily diminishing as more and more men were called to the front and eventually the need to use female labour became inescapable. This solution was proposed by Lloyd George and enthusiastically supported by Alfred Herbert, who campaigned vigorously on the idea. Initially there was stiff resistance from Trades Unions, who saw the use of women in engineering as ‘dilution of labour’ and a threat to their members. But gradually more and more women entered factories and the precedent was established. Herbert remained an enthusiastic supporter of female labour thereafter.

After the war Alfred Herbert’s work in the Ministry was recognised by the award of a knighthood (the KBE) He also received honours from France (the *Legion d’Honneur*), from Russia (the Order of St Stanilaus), and from Belgium (the Order of Leopold). Sir Alfred, his Company, and by association the City of Coventry, now stood in the very front rank of the world’s machine tool builders.

Alfred Herbert had indeed come a long way from his first rather ramshackle works in Upper York St, with its ‘chicken ladder leading to the pattern shop’. He had conferred with the Prime Minister, worked in the highest levels of Government, and now commanded what was tantamount to a ‘mini-empire’, with its centre on Head Works, Coventry, and ‘colonies’ around the world. He saw himself as the *paterfamilias* of a large ‘family of employees’ who, in turn, gave him exceptional loyalty. And that despite the fact that he made no secret of his implacable opposition to Trades Unions, and that he was renowned for often paying ‘under the going rate’. The idea that to work for his Company was ‘a reward in itself’ was one which, to say the least, Sir Alfred did not go out of his way to disown.

It is not surprising that myths began to gather around this charismatic man, few of which he discouraged and some of which he actively encouraged. It should be pointed out here that while the second work referred to in the List of Acknowledgements on p. 36 is a very valuable record of the history of Alfred Herbert Ltd, especially from a social standpoint, parts of it are deliberately aimed at dispelling these myths, and should perhaps be read with that aspect in mind. Admittedly, some of the myths surrounding Sir Alfred needed to be dispelled, but it cannot be denied that their existence very often contributed to the success of the Company and, certainly in Sir Alfred’s lifetime, to the benefit of its employees.

By today’s standards, Sir Alfred was undoubtedly an autocrat, and some of his industrial relations policies would today be considered unthinkable. But many of his employees would have happily added the adjective ‘benevolent’ to the word ‘autocrat’. As has been mentioned, he was prominent in calling for women to be employed by industry and his Company was famous both for long-service records and for employing successive generations of families. Fathers, sons and sometimes even grandsons, followed each other into Head Works, and there is written evidence from employees of the anxiety which Sir Alfred showed for them when they or their families were ill, or when he had to lay them off in hard times. In the first half of the 20th century at least, to succeed in gaining employment with Herberts was for many equivalent to securing a ‘job for life’. Sir Alfred and Lady Herbert were also generous benefactors to Coventry, and while today some of their actions and attitudes would perhaps be seen as patronising the end result was certainly to the overall benefit of Coventrians and their City.

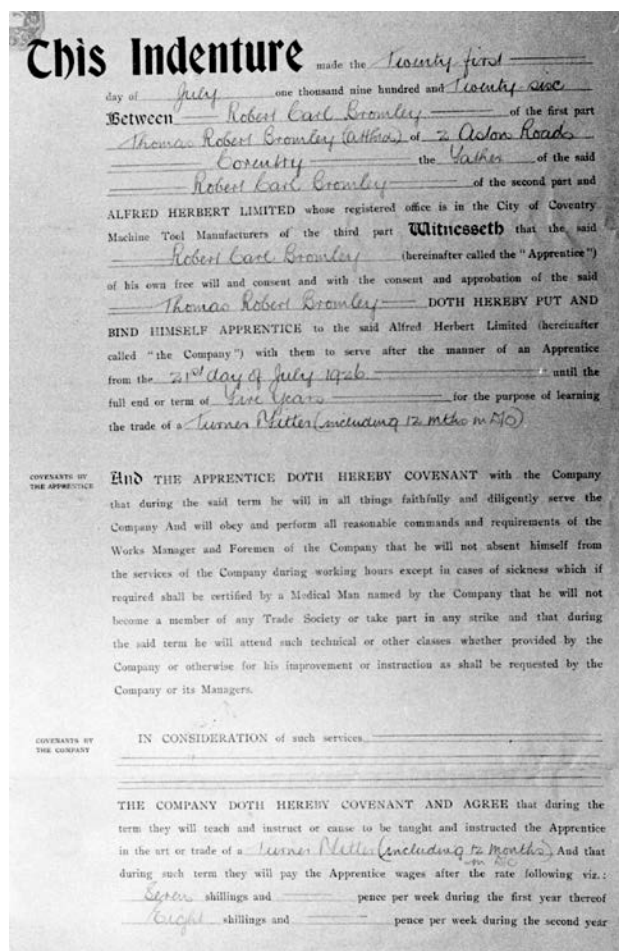
An apprenticeship with Herberts was highly prized, and initially meant signing-on for seven years. The agreement bound the Company to equip the apprentice to be a specific craftsman (a turner, miller, grinder, driller etc), but he would inevitably gain wider experience at the same time. An apprentice and his father (or guardian) were bound to the Company in ways which today seem quaint, if not onerous. On the 2nd of September 1896, for example, a Mr Thomas Robert Bromley of Conway Buildings, York St, Coventry, signed an agreement (a florid document in hand-written copper-plate script), with Alfred Herbert whereby his son (also named Thomas Robert Bromley),

was 'apprenticed to the Company for Seven Years to Learn the TRADE of a TURNER'. In so doing, Robert Bromley Senior also undertook to provide his son with 'sufficient food, drink, wearing apparel, lodging, drugs, medical attendance and all other necessities' for the whole of that 7-year period. What was covered by the word 'drugs' is not specified, but presumably at that time it meant nothing more than cough mixture and aspirin!

In his turn, young Thomas Robert Bromley Junior, made a solemn agreement that for the whole of those seven years he would 'Faithfully his Master to Serve, his Commands Gladly to Do, and his Secrets to Keep'. In addition, he undertook 'not to Waste his Master's Goods, or Lend them Unlawfully, nor Play at Gaming, nor Enter into Matrimony'. During the period of his apprenticeship, he would be paid four shillings a week (20p) in the first year, five shillings per week in the second year, and so on, rising annually to reach 10 shillings per week (50p) in the seventh, and final year.



Above: T R Bromley's Long Service Certificate



Right: R C Bromley's Indenture

Thomas Robert Bromley Junior duly completed his apprenticeship, stayed with the Company, and 37 years later received a Long Service Certificate in the form of an illuminated manuscript the borders of which were adorned with the photographs of no fewer than 10 Directors of the Company, together with a photo of Sir Alfred at the top. But well before reaching that milestone, Thomas Robert Bromley Junior had taken care to assure his own son's future as well. On the 21st July 1926, he arranged for his son Robert Carl Bromley to be apprenticed to Alfred Herbert Ltd to 'learn the Trade of Turner and Fitter, with 12 months in the Drawing Office'. This time the term of apprenticeship was only five years and obviously the hope was that in due course, having learned draughtsmanship, Robert Carl would be able to leave the factory floor and obtain a white-collar job.

Robert Carl Bromley's deed of apprenticeship was a type-written document, far less impressive than his father's, and the conditions attached were slightly less onerous. Nevertheless, he signed up

to obey his Master *Faithfully and Diligently*, and he also undertook *'to attend Technical Classes for his Improvement and Instruction'*. He also gave an assurance that he would not be *'a Member of a Trade Society* (i.e. a trade union), *nor take Part in any Strike'*. The year of this agreement (1926) probably had some bearing on the latter stricture. It was not until after Sir Alfred's death in 1957 that trades unions were officially recognised inside the Company, although there is evidence to show that before that many employees were in fact members of unions, but secretly.

It is interesting that Robert Carl Bromley's deed of apprenticeship, unlike his father's, carried the official seal of the City of Coventry and the Town Clerk's signature, an indication that by 1926 successful apprentices were automatically being made Freemen of the City. Robert Carl's wage in the last year of his apprenticeship in 1931 was 11 shillings (55p) per week, just one shilling per week more than his father earned on completing his apprenticeship 28 years earlier, in 1903! (To have been a Herbert apprentice was indeed a reward in itself!). But Carl Bromley went on to have a distinguished career with Herberts.

His progress in the firm is vividly described in a feature article by Keith Draper which appeared in *The Coventry Evening Telegraph* on July 15th 2000. In 1934, when Carl was a junior draughtsman at Head Works, Coventry, he was sent by Herberts to Calcutta, India, as their representative in the firm of Parry & Co, and to assist the latter in preparing quotations for the supply of Herbert machine tools. At the age of 25 he was in Madras, was a manager, had a Chevrolet car, and recalls that when Herbert lathes arrived at the dockside they were transported to customers by bullock cart.

During the second world war, Carl was assisting the controller of machine tools for the government of India but with the independence of India in 1947 life became more difficult and complicated. As the years passed, moreover, fewer Herbert machine tools were imported and more were made under licence by Indian companies with appropriate experience. By 1961, Carl Bromley found himself managing director of the Herbert operations in India, a post he held until 1968 when he retired and returned to England.

The Herbert apprenticeship scheme which Carl Bromley had joined in the 1920s grew steadily, becoming a large and extremely well-organised system, and by the middle of the 20th century the Company had a constant 400 to 500 youngsters in training at any one time. Nevertheless it appears there was a downside to the apprenticeship system. A correspondent with the author recalled that in the early days those who had just completed their apprenticeships with Herberts were expected either to transfer immediately to the nightshift, or to leave the Company to seek work and experience elsewhere for several years before re-applying for a post. The same correspondent also describes how at one time, in the sections where small tools were being made (i.e. chucks, die heads etc), there were 'group leaders' who had the power to hire and fire. These men received bulk payment for the work completed by their section and then distributed the money, as they saw fit, to the group members. Inevitably this meant that different members received different rates of pay, with 'favourites' benefiting more than others. This system is believed to have caused dissatisfaction when friends and relatives of the group leaders were seen to be getting the highest wages.

Finally, this correspondent also recalls a relative who was a machine tool fitter at Herberts and during the 1914-18 war was involved in installing the Company's machines in factories all over Britain, including as far afield as the Shetland Isles. Unfortunately, in 1926 and as a result of overwork, he suffered a nervous breakdown and while he was convalescing Lady Herbert would occasionally either send him, or bring him personally, a rabbit, a hare or a chicken.

THE 'HERBERT SPIRIT'

The existence of the phenomenon known as the 'Herbert Spirit' cannot be denied, and it appears to have rested principally on a strong *esprit de corps* and a fundamental belief in the beneficence of the Company as a whole, and of Sir Alfred in particular. Much of the myth and legend which grew up around the charismatic larger-than-life personality of Sir Alfred survives today only in anecdotal form, and subjective though that may be it nonetheless gives a flavour of the man. Sir Alfred always liked to present himself as a self-made man who rose from humble beginnings, thereby offering himself as an example to his employees of what they too could achieve if only they applied

themselves with the same diligence and single-mindedness to their daily work. In effect, his message was somewhat along the lines of 'in every private soldier's knapsack there is a Field Marshal's baton'. In fact, of course, Herbert came from a relatively wealthy background with its associated social, educational and financial advantages, and he certainly had a very different start in life from the vast majority of his employees. As has already been mentioned, his father and the father of his partner Hubbard each put up £2,000 to start the two young men in business, a not inconsiderable sum in the late 1800s.

Herbert's view of himself as the 'father' of a large and growing family of employees was undoubtedly sincere, and was often expressed in practical terms to any who fell on hard times through illness or other causes. A letter from Sir Alfred dated 22 December 1930 to an employee regrets that he is one of a number laid-off when, because of hard times, the night shift had to be discontinued. The letter included a voucher which could be cashed at a butcher's shop in Cross Cheaping, Coventry, 'for a little English beef', and must have been especially welcome just three days before Christmas. In fact, the employee concerned was laid-off for only 10 months before he was re-employed, and then went on to work for Herberts for a further 43 years!

This paternalistic attitude undoubtedly contributed to the growth of 'The Herbert Spirit'. But there is also some anecdotal evidence to counterbalance that view. Others have pointed out, for example, that Sir Alfred always preferred to be the bearer of good news (even when, like the letter referred to above, it was mitigating less good news), but was careful to distance himself from delivering actual bad news. For the bulk of his employees, their hiring, firing and disciplining was left to group leaders and foremen who were given exceptional, some have said almost dictatorial, powers in that respect.

Sir Alfred also liked to give the impression that he was a Coventrian, wedded to the City and to Head Works, and in the thick of industry with his 'family'. Admittedly for the first few years of his Company's existence he lived in Coventry, but by 1900 he had already moved out to Kenilworth, first in Fieldgate Lane and then in Upper Ladyes Hills. Thereafter for a short time he lived in Barford, but by as early as 1913 he had migrated well south to Dunley Manor, Whitchurch, Hampshire, a house with grounds, shooting, and a trout stream, and where he lived to the end of his life. Despite the distance, he travelled regularly to Coventry, often staying in a flat above the Directors' Offices in Head Works, which he had built specifically for that purpose.

THE INTER-WAR YEARS

The years immediately following the first world war presented many problems for Herberts. On the one hand, many of Britain's machine tools were simply worn out, as a result of being run day and night on war work, and in the national interest they should have been replaced by new equipment. On the other hand, the massive Government orders on which engineering firms had worked throughout the war virtually stopped overnight. At the same time, and to make matters worse, a glut of second-hand machine tools, previously used on war work, came on to the market at low prices, representing formidable competition to companies trying to sell new machines. Ingenuity and faith were required to keep machine tool building companies afloat, and to make the difficult transition from war time to peace time production. Many succumbed, but Alfred Herbert Ltd was among the survivors.

The position was to get even worse in the Depression of the late 1920s and early '30s, when some machine tool builders resorted to making products which had nothing to do with their usual line of business, except that engineering skills were required. One famous lathe maker in the south of England, for example, even turned to producing lawn mowers! They were superb products, designed and made along machine tool lines and were the 'Rolls-Royces' of their day, but they were so heavy, and so expensive, that relatively few were sold.

On the other hand, the presence of the swiftly-growing motor car industry in the Midlands was undoubtedly a blessing for the region's machine tool builders, Alfred Herbert Ltd included, and helped them to survive in the inter-war years. It must be pointed out, however, that the car makers at that time rather tended to favour American-built machine tools because machine designers in that

country had a greater understanding and experience of really large-scale mass-production techniques. Indeed, the preponderance of American machine tools on the factory floors of leading car makers Morris and Austin was a continuous irritant to many British machine tool companies at the time.

But as the 1930s wore on the threat of war appeared once more, and in due course the Government's re-armament programme was launched and slowly began to gather speed. Included in that programme was the building of numerous so-called 'shadow factories', located well away from the country's established industrial areas, most of which had been assiduously mapped from the air by German civil airline pilots. Some of these shadow factories were 'disguised' to look like large innocuous civilian buildings, and in fact in 1939 the author worked in one the frontage of which was mock-Elizabethan half-timbered, to give an impression quite at odds with what was actually going on inside.

Just before the outbreak of the second world war, Herberts built a new factory at Exhall, Coventry, for the production of small tools (taps, dies and threading equipment). It was around the same time that a shadow factory at Lutterworth was leased to Alfred Herbert Ltd by the Government, the plan being to transfer some of the production of its machine tools, especially lathes, well away from the centre of Coventry. That city, with its high density of engineering industries, was considered a priority target for bombing, as indeed proved to be the case. After the war, Herberts purchased the Lutterworth factory from the Government and the plant was to play an important part in the subsequent growth of the Company, as will be explained later. In 1946, the Company also bought a large part of the Rover works in Red Lane, Coventry, which was then developed into its Factored Division, principally displaying and demonstrating the machines for which it was selling agent, but also used for re-building and reconditioning machine tools.

1945 - AND THE BOOM YEARS TO FOLLOW

In the second world war, the output of machine tools of all types from Herbert factories was even greater than in the 1914-18 conflict. Between September 1939 and November 1944 no fewer than 65,000 machines of all types were shipped, the overwhelming majority of which were for war work. In 1945, the Allies took the opportunity to despatch teams of experts to tour Germany and comb through its factories looking for signs of technological advances and developments which might usefully be retrieved as 'spoils of war'. Sir Alfred was a member of one British Commission which in 1945/46 toured German machine tool factories, what was left of them, with permission to appropriate any designs and drawings of particular interest to its members' industries.

In the post-war period, all British machine tool builders (including Alfred Herbert Ltd) found themselves in a position of commercial power and market dominance which, it subsequently transpired, they were never quite to occupy again. In the inter-war years, the principal machine tool building countries in the world were the USA, Britain and Germany, with France not too far behind and Switzerland occupying a small, but highly-specialised, position. But immediately post-1945, German machine tool builders were obviously no longer able to pose a serious threat, and the strength of the French machine tool industry was severely depleted.

Although pre-1939 Japan had a small machine tool industry its products were not rated highly in the West, being considered 'light-weight' and little more than copies. (This was a judgement on Japan's machine tool industry which was to need radical reappraisal in due course, but that rude awakening lay many years ahead). But post-1945, Japan was obviously out of the picture, and so for quite a few years the world had to look principally to the USA and to Britain for its machine tools. Machine makers in those two countries virtually had the market to themselves, and in Britain Alfred Herbert Ltd was in a commandingly dominant position.

Soon after the war ended, and at the urging of Sir John Black who was then heading Standard Motors in Coventry, Alfred Herbert secured the selling agency in the UK for the prestigious range of high-precision boring and milling machines made by the DeVlieg Co, USA. These machines were ranked for precision second only to the jig borers produced by SIP (Société de Gènevoise d'Instruments de Physique) in Geneva, Switzerland. In due course, Herbert also negotiated the licence to build DeVlieg machines in Britain. This licence was to prove immensely valuable in terms

of profit and reputation to Alfred Herbert Ltd in later years, when it turned over the Lutterworth factory to that work, also to the manufacture of the associated Microbore range of precision boring tools. The original Lutterworth shadow factory had a site area of 15 acres and the factory itself comprised only five 30-ft wide bays, but steady expansion by Herberts meant that by the 1960s nearly 106,000 sq ft of floor area was being used and the workforce stood at 500.

In the years immediately after the second world war, one of the Company's greatest strengths lay in the fact that when the variety of machine tools for which it was an agent was added to those being built in-house, Herberts could offer probably the most extensive product range of the time. The Company could justifiably claim that from within its own resources it could supply virtually any type of machine tool or complete manufacturing process required by any branch of the engineering industry, at home or abroad. Consequently, its order books were full, delivery times were lengthening, and the future looked entirely rosy. But, as seasoned observers of the machine tool industry have since commented, hidden in that very success probably lay seeds of complacency, some have even said illusions of invincibility, which would ultimately contribute to bringing the Company down. That calamity, however, still lay many years ahead.

When the second world war ended, Sir Alfred was 79 years of age but was still very much in command of his Company's affairs. He was indisputably the elder statesman of the British machine tool industry, his comments either in print or in public speeches carried weight, and on the Stock Exchange the share price for Alfred Herbert Ltd was permanently resident in the prestigious 'Blue Chip' section. Sir Alfred was undoubtedly wearing the mantle of elder statesman when, in 1948, he had privately printed a book entitled *Shots at the Truth*, with a foreword by Admiral Sir Reginald Bacon KCB, KCVO, DSO. Its pages contain 51 of Sir Alfred's articles or speeches written or delivered between 1939 and 1947, the almost unvarying burden of which is an exhortation to his readers (and especially to the young), to work harder, to practice thrift, to cultivate a sturdy self-reliance, and to recognise the evils of Socialism and Trades Unionism. To modern eyes its pages may appear to be the *credo* of a mid-20th century Samuel Smiles. But it is also a fascinating insight into the thoughts and personal philosophy of a highly successful entrepreneur and leader of men who brought work and prosperity to countless Coventrians, and international fame to their City.

The 1950s were good years for machine tool builders, with war (Korea 1950-53) playing a part in re-armament programmes in the West. By 1960, Herberts had four factories, five subsidiary companies, and its total floor area was 1,427,700 sq ft. On its payroll at that time were nearly 7,500 employees and it had more than 3,350 machine tools in operation. It controlled eight branches in Great Britain, had associate companies in Australia, India, France and Italy, and had agents in no fewer than 57 other countries. Its position as the largest and most powerful machine tool company in the UK, if not in Europe as well, was apparently unassailable.

But profound changes in the technology and design of all types of machine tools were already on the horizon. Many British machine tool builders were either totally unprepared for these changes, or simply did not take them seriously enough, early enough. In the author's opinion, Alfred Herbert Ltd must sadly be counted among that number.

A MISSED OPPORTUNITY?

There was, for example, growing concern in Government in the 1960s that Britain's engineering sector was falling behind the rest of the industrialised world in terms of productivity, particularly in output per man employed compared with competitor countries. Soon the Government was urging Britain's manufacturing industry to apply what was termed 'low-cost automation', especially to machine tools which were still predominantly reliant on operator supervision. The capstan lathe, for example, could be operated by semi-skilled (or even unskilled) labour, but it still required one operator per machine. And all that operator really did was to perform the same sequence of manual movements repeatedly, hour after hour, throughout the working shift. There were thousands of capstan lathes in use, each one of which required the constant attention of its operator. It was obvious that these machines were prime candidates for being 'automated', and British industry was ready to install them.

By rights, either Alfred Herbert Ltd or H W Ward Ltd, both of whom considered themselves the leading experts in capstan lathe technology, should undoubtedly have been the first to rise to the challenge. Instead, it was a relatively unknown engineer (Ian Nickols), running a sub-contracting works in Surrey, who grew tired of watching his dozens of capstan lathe operators endlessly repeating the same monotonous sequence of movements, day in day out, week in week out. He decided to do something about it, and by using standard air cylinders and valves, and mechanical stepping relays of the type used in telephone exchanges, he automated all the capstan lathes in his small factory. He was thus able to run groups of them completely unattended, with just a few setter/operators to supervise them.

The productivity per man employed in his Company soared but although this innovation was widely publicised, in technical journals and elsewhere, established machine tool builders in Britain were neither impressed by, nor particularly interested in, what they considered to be 'freak machines'. Undaunted, Nickols's next step was to offer his invention as a complete 'DIY conversion kit', which any user of a Herbert or a Ward capstan lathe could buy and fit to his machines himself. Nickols soon had a thriving subsidiary business making and selling these kits, and countless manual capstan lathes, some of them quite elderly, were automated before the established machine tool builders like Herbert and Ward took any notice, and decided to design automated capstan lathes of their own.

But barely had this step in the automation of machine tools been digested before another even greater innovation in technology appeared. The first news of the development of 'numerical control for machine tools' began to break. Originating in the Massachusetts Institute of Technology, USA, numerical control was to prove the single most important advance in machine tool technology since the work of the early pioneers of the 19th century. Unlike their American counterparts, however, British machine tool builders were slow to appreciate the importance of numerical control and then, when they somewhat reluctantly appreciated its worth, were equally slow to adopt it. Initially numerical control was rather scornfully dismissed by many British machine tool builders at that time as merely the 'brain child of university-based electronics boffins, working in ivory towers', none of whom 'would know a real machine tool if they tripped over one'. But by this time there was a growing feeling in British industry that, compared with their competitors overseas, our own machine tool makers had become somewhat complacent, were resting on their laurels, and that their products were becoming technologically old-fashioned.

Alfred Herbert Ltd itself was not immune to those criticisms, but with its order books still reasonably full it was not, at that time, unduly troubled. In due course, the Company introduced its own limited range of NC machine tools, but made the mistake of developing its own numerical control system when it was already being recognised that such equipment was properly the province of the electronics engineer and not the mechanical engineer. But other events were now conspiring to focus the spotlight on the shortcomings of our machine tool makers. In 1960, Professor Melman of Columbia University USA had made a fact-finding tour of the world's leading machine tool companies and on his return he published a devastating criticism of them, including the assertion that machine builders in the West (and thus by implication Britain), 'were only playing at the business'.

COMPETITION INTENSIFIES

British machine tool makers were highly indignant at this criticism, especially as it came from an American academic, but they nevertheless responded by hastily forming a Research and Development Organisation for their industry, a resource which it had signally lacked in the past. But the late 1960s saw the British machine tool industry as a whole increasingly in trouble, especially from the emergence of aggressive and innovatory machine tool builders in foreign countries, including some in the Far East. Machine tools equal in performance, and sometimes in advance of their British counterparts, were being offered at competitive prices by European countries which hitherto had no machine tool industries at all. To make matters worse, machine tools from Japan were now making their presence felt as well, and machines from Taiwan, Korea and even China were waiting in the wings. The world's manufacturing industries quickly realised they were no longer

dependent principally on Britain and the USA for their machine tools. They now had a much wider market place in which to shop around, and some of the advanced machine tools they found there had price tags which were extremely attractive when compared with British products.

The Government then decided that the faltering British machine tool industry was weak compared with its competitors because it was too fragmented, and on the basis that 'big is beautiful' it forced a number of companies into mergers, some of which proved to be unhappy marriages. Alfred Herbert Ltd was involved in that drive, taking over Churchill Grinders of Altrincham and BSA Tools of Birmingham, neither of whom ever truly integrated into the giant Herbert empire because each struggled to maintain its original identity. Herberts was now perhaps growing close to being too big and too unwieldy for its time, and was also showing some signs of financial distress. However, because it was still regarded as the undisputed flagship of the British machine tool industry its troubles could not possibly be ignored by the Government, which came to its aid firstly with money from the new Ministry of Technology and later from the National Enterprise Board.

It was by then also obvious that Herberts needed to do something drastic about its machine designs which were increasingly being seen as rather old-fashioned, not just in appearance but, more importantly, in terms of technology as well. Mere tinkering was insufficient and the aim had to be not just to 'catch up' with the competition but to leapfrog over it. A bold decision was made to launch a whole new generation of Herbert machines at the 1968 International Machine Tool Exhibition, to be held at Olympia, London. There, the Company vowed, the world would see that Herberts was not just level with the competition but was way ahead of it.

Six completely new machine tools were developed, at considerable cost in terms of Research and Development, the most revolutionary of which was a 'turning centre'. This massive machine broke new ground in that it not only enabled all the usual turning operations to be performed but also a wide range of other operations not normally undertaken on a lathe to be carried out on a component *without removing it from the machine*. Moreover, all the many different types of cutting tools needed were carried in a magazine on the machine itself and could be changed automatically without involving the operator. It was indeed a quantum leap, but it transpired to be a leap too far. Industry was not ready for such an advance, and only a few machines were sold. The irony was that a decade or so later the 'turning centre', once considered to be so revolutionary, had become almost a standard machine tool, and large numbers built in the Far East were being imported into Britain. Few recalled, however, that the pioneering work on this type of machine tool had been done in Coventry by Alfred Herbert Ltd.

THE HERBERT-INGERSOLL VENTURE

As another part of its bid to re-assert its dominance, Herberts also announced that it would design the most advanced machine tool building factory in the world, on a greenfield site near Daventry. This bold project was made in collaboration with the giant Ingersoll Milling Machine Co of Illinois, USA, which had 49 per cent of the equity to Herbert's 51 per cent. It was opened in 1968 and boasted a 102,000 sq ft factory designed from scratch to build machine tools by methods which were far ahead of any employed at that time, anywhere in the world. For example, to avoid diurnal temperature variations, inimical to maintaining the highest standards of accuracy in building precision machine tools, the building was windowless, insulated and temperature-controlled. In the absence of any natural light, the factory was lit by over 400 mercury lamps, each rated at 1,000W and providing 100 lumens per square foot of illumination.

Trading as Herbert-Ingersoll Ltd, the plant also featured industrial robots and driverless wire-guided computer-controlled trucks which were constantly on the move carrying components around the various machining and assembly sections. The plant had a workforce of around 500 and its aim was to design and build the most technically-advanced and highly-automated machines required by the world's mass-production motor car makers. Its potential for added-value per man employed was far above that at Head Works, Coventry, and its first major contract was for a massive transfer machine for producing cylinder blocks, to be supplied to the Stoke factory of Chrysler Ltd in Coventry. But the timing of this ground-breaking new factory was unpropitious. Almost as

Herbert-Ingersoll Ltd opened for business the world's car makers began to slide into a serious recession, and after only about four years of operation the brave new Daventry plant was forced to close its doors. The £4.1-million pound investment was lost, and Herberts suffered yet another blow to its financial position and its reputation.

THE FINAL YEARS

Throughout the 1970s, more money was poured into Herberts by the National Enterprise Board, an organisation created by Government under the Industrial Strategy Act to serve as a channel through which ailing industries could be supported and new industries could be encouraged. But despite vicious cost cutting and successive rounds of redundancies Herberts continued on what now appeared to be a slow and inexorable decline. Evidence of the need to make economies, however small, is shown by the fact that in January 1970 the Board even decided to cease publication of the *Herbert News*, the Company's house journal which had appeared for 43 years without a break and was greatly valued by the work force. Since *Herbert News* was only an 8-page publication, this move must be seen as 'every little helps'. It is also indicative of the pressure the Company was under from competitors that in the final issue of *Herbert News* Mr K Norman, the then Deputy Managing Director, warned employees "With world competition fiercer than ever it is becoming increasingly important to deliver on time and to pay attention to detail. The overseas customer wants (his) machine to arrive on the day we say it will arrive, and to work perfectly first time when he presses the button". The underlying message was all too obvious.

As is so often the case when Government intervenes in industry it is always difficult to discover precisely how much financial assistance was actually provided to Herberts from public funds, but a figure of at least £57 million is generally agreed to have been invested in the Company by the NEB in an effort to save it. Eventually Herberts was in effect 'nationalised', because the Government (through the NEB) finally owned more than 90 per cent of the equity. Ultimately, even the NEB had had enough and in 1981 Alfred Herbert Ltd was put on the open market and sold, at a price never reliably disclosed (but rumoured to be in single figure millions), to a medium-size engineering group in the Midlands.

The new owners ordered even more redundancies and drastic cost cutting, launched new machines, and pulled the company's manufacturing facilities back into a smaller area of the Head Works. The workforce, severely reduced in number, remained as loyal as ever, but it was to no avail. Two years later the unthinkable happened. The new owners conceded defeat, Receivers were appointed, and in October 1983 a 5-day sale held in Bay 26 of Head Works saw everything, from high-value machine tools to office wastepaper baskets, go under the auctioneer's hammer. By the end of that week, Herberts had been knocked down, out, and into the history books. The auction sale is thought to have made little more than a paltry £750,000.

The reasons for the slow decline and ultimate demise of Alfred Herbert Ltd are many and various, and this booklet is not the place to investigate them. But the part played by foreign competition, notably from the Far East, was beyond doubt one of the major factors. In the 1970s, the author made several fact-finding tours of machine tool companies in Japan, Taiwan and Korea, and on his return each time published a series of articles warning of the threat they posed to British machine builders. Sadly, that threat was not taken seriously at the time, in fact by some it was not even believed. Eventually, of course, it could not be ignored, but by then it was too late for a sizeable portion of the British machine tool industry, including Herberts.

As far as the author knows a comprehensive history of Alfred Herbert Ltd has never been written, but certain printed matter exists (listed under Acknowledgements) which can be recommended for further reading. There is, for example, an excellent PhD thesis by John Davies, a copy of which is held in the Library of the University of Warwick, but it covers only the first 34 years of the Company, from 1888 to 1922, and mainly from a social relations standpoint. In addition, there are bound volumes of Herbert's in-house publications, namely the *Herbert Machine Tool Review* and the *Herbert News*. The *Herbert Machine Tool Review* was published regularly for the Company's agents and for the engineering industry in general and, as already mentioned, the *Herbert News* was

produced for circulation among its employees, current and retired. Both can be found in Coventry City Library, lodged in the Coventry and Warwickshire Collection, but neither is a complete set.

When Herberts finally closed, some of its smaller activities were bought from the Receivers and the famous name therefore continues to survive in Coventry, through firms such as Herbert Group in Bayton Rd, Exhall, and Herbert & Cridan Machine Tools on the Alliance Business Park in Nuneaton. Parts of the Herbert range of NC lathes, the advanced models the Company produced in its final years and in which much hope was invested for a recovery, were acquired by TI-Matrix Churchill, formerly Coventry Gauge & Tool Co Ltd, to which reference is made later.

A C WICKMAN LTD

There is an important similarity between the rise to international fame of A C Wickman and that of Alfred Herbert Ltd. The similarity is that both companies rose through the enormous energies, innovation, flair and business acumen of the men who founded them. Each had a presence and a charisma which made them stand out from the otherwise rather grey body of mechanical engineers in general. And it must be admitted that, as a result, both companies also suffered some reduction in success and impact when, by death or by retirement, their original leaders were no longer at the helm.

Axel Charles Wickman was born in 1894, in Hammersmith, London, of middle European stock. In actual fact, his baptismal name was Axel Herbert Carl Friedrich von Wichmann-Sobieski. So it is perhaps not surprising that even before he became really successful he was already known widely simply as 'Wickie'. His father died when Wickie was just 2 years old, and his mother then removed him to Germany where his early education was taken at Weisbaden and at Aix-la-Chapelle (better known today as Aachen). By 1908, however, mother and son were back in England once more, and at 14 years old Wickie was attending Brighton, Hove and Sussex Grammar School. He appears to have been a lively pupil, and certainly one with advanced ideas for his age and his time.

In 1911, for example, in a school debate with the rather pompous title "*That this House believes profit sharing would be no remedy for the present labour troubles*", Wickie, who was only 17 at the time, took precisely the opposite view. In that debate, the school magazine records, he insisted that making a workman a shareholder in a business was of the first importance, because it meant that he would, in time, obtain an income on which he could retire. That was a rather radical opinion for the time, especially from one who was still carrying the undeniably foreign name A C von Wichmann.

Wickie also wrote an article for the school magazine in which he foresaw the importance of 'the flying machine'. In his view, the monoplane was the only design worth talking about, and he went on to predict that the monoplane would "cause every point on the surface of the earth to be brought within reach and, with the consequent disappearance of frontiers between nations, the prospect of international peace would move appreciably nearer". Well, he was certainly right about the monoplane, but rather far off the mark in his belief that it would bring international peace.

On leaving school, Wickie joined an engineering company in Brighton called Lambourne, where he took up a position as a junior draughtsman. The owner of this company, Albert Lambourne, was the designer of an early motor car named the Lonsdale, and he subsequently made another known as the Old Mill, after the name of the factory in which it was built. This latter car had a novel feature for the time, namely a self-starter. These days it would surely be quite a challenge to promote a motor car rejoicing in the name 'The Old Mill'.

THE MOVE TO COVENTRY

While at Lambournes, Wickie attended Brighton Technical College, and he soon made his first mark by designing a screw thread gauge. His employer patented this device, and subsequently sold the patent to Wickie, who promptly took a model of the gauge up to Alfred Herbert in Coventry. There, Wickie proposed that Herbert should make this device, and market it as the Wickman Screw Gauge. This idea did not appeal to the proud Sir Alfred, whose counter proposal was that Wickie should join Herberts as an employee and promote and sell his screw thread gauge on a commission basis. Wickie reluctantly agreed, and it was at this point that he turned his back on Brighton and came to Coventry, where he was eventually destined to become one of the largest machine tool manufacturers in the City, and one of the most famous in the world.

By the time he came to Coventry, Wickie had changed his name by deed poll to Axel C Wickman, with the C standing for Charles and not for Carl. It is possibly significant that he did this in January 1917, because a German-sounding name for an ambitious young man, intent on prospering in England, was probably not such a great idea at that time. When he joined Alfred Herbert, Wickie moved his family from Brighton to the Midlands, firstly to a house called *The Gables* at Eathorpe, which stands to this day. He made further house moves to 17 Avenue Road, Leamington Spa (now an Old Peoples' Home), then to *Mount Vernon*, in Northumberland Road, Leamington Spa, and finally he resided at No 3 Euston Place in the same town. The arrangement Wickie had with Herberts for commission on sales of his patented thread gauge was never a really satisfactory one, and anyway Sir Alfred had always wanted it to be called the Coventry Screw Gauge, in line with the use of the word 'Coventry' in front of many Herbert products. But Wickie continued to insist it should bear his name.

This position seemed to be irreconcilable and matters came to a head when Sir Alfred arbitrarily informed Wickie that he proposed to cut his commission on each screw gauge sold. At that time, Wickie had limited funds to play with, and with which to fight Sir Alfred. If he lost, he was ruined. But he won, and at that point he decided to leave Herberts and 'go it alone'. He had already developed various other types of gauges, so he felt he had something to work with, and in fact one of those gauge designs was already being manufactured by Harry Harley (later Sir Harry), of Coventry Gauge and Tool, of which company more later. It is interesting to wonder whether Sir Alfred ever regretted trying to cut young Wickie's sales commission, and thus losing him as an employee, for he would subsequently have had far less business competition from him inside Herberts than he did from outside!

So it was that in November 1925 Wickie took the plunge and founded A C Wickman Ltd, renting space in the factory of James J Guest and Co, located in Charterhouse Works, Northfield Road, off Charterhouse Road, Coventry. James Guest is listed in the Kelly's Directory of the time simply as a 'mechanical engineer', but other records show that his company made grinding machines, transport equipment and special tools. The building survives today and is currently used as a distribution centre for a company supplying fasteners (screws, nuts, bolts etc), to the automotive industry. To reach it, enter Gulson Road from the London Road end, turn right into Charterhouse Road, and after 200 yards there is a sharp left turn, where Charterhouse Road becomes Northfield Road. A right turn at this junction, however, is the start of a short *cul de sac* in which, at the time of writing (2000), Charterhouse Works still stands.

The building has a number of northlight bays, and the rather fancy brick gable ends remain to this day. The front elevation has been altered and inside the bays modern steelwork has been installed to carry overhead gantry cranes. But above the steelwork the original wooden roof trusses, with steel tensioning bars, can still be seen.

Wickie's first *coup* in business on his own was to obtain the selling agency in the UK for the well-established range of machine tools (multi-spindle automatic lathes), made by Schutte, in Germany. And to do that, he had to persuade Schutte to take the selling agency away from Alfred Herbert! Doubtless Wickie's grasp of fluent German played a part in this long-established German company entrusting the sale of its machines to such a virtually unknown young man. Indeed, so impressed were Schutte by Wickie that they did more, much more.

They actually gave Wickie a loan of 50,000 Reichmarks to get him going and, of even greater importance in the long run, they arranged for him to have an introduction to the giant Alfred Krupp organisation in Germany. Now Wickie had already seen demonstrations of a revolutionary new cutting tool material offered by Krupp, and he wanted the agency for that product as well. This new tool material, known as Krupp Widia, was tungsten carbide, and getting the sales agency for it was ultimately to become one of the two principal pillars on which Wickie's future career, the success of A C Wickman, and his considerable personal fortune were to stand.

Securing the agency for Krupp Widia tungsten carbide was very important. The first cutters used on machine tools were made from simple carbon steel. They worked well enough but their edges soon became blunt. Later, a new tool material known as high-speed steel was developed which was a big advance on carbon steel, and allowed more components to be made before a tool needed to be sharpened. But a tool made from tungsten carbide could cut hundreds of components before it became blunt. The advantages to engineers were obvious.

Krupp was a massive German organisation, involved in heavy engineering, and one account has it that it was a boffin in its metallurgy department who developed tungsten carbide. Another account holds that tungsten carbide was actually developed by a firm called Ozram and that Krupp bought the patent from that Company. Whichever account is true it is certain that Axel Charles Wickman was quick to see the immense significance of the new material and was determined to be the first to bring it to the UK.

It is recorded that when Wickie went to negotiate with Krupp the German company obviously thought he was green and asked him rather patronisingly "Do you think you could possibly sell £5000 worth of tungsten carbide a month in your country?" When Wickie replied "I can guarantee it", Krupp got him to sign on the dotted line quickly, before he could change his mind. They thought they had Wickie across a barrel. On the contrary, precisely the reverse was the case, and by giving him the selling agency for Widia carbide Krupp had just made sure that Wickie was on his way to eventually becoming a millionaire. Krupp Widia tungsten carbide cutting tools, sold exclusively from 1925 by Wickie, were thus introduced for the first time into Britain, and they went on to revolutionise the metal cutting industry in this country.

When Wickie acquired the agency for Schutte multi-spindle lathes, his Company consisted of two people, himself and a lady secretary, and in selling Schutte machine tools he had to overcome considerable anti-German prejudice in this country, residual from the Great War. His apparently limitless energy and enthusiasm soon proved greater than the prejudice, and the performance of the Schutte machines often clinched the deal. For example, an engineering company at that time was making cast iron pistons for Morris motor car engines, and it was having severe production problems. When Wickie told this company that a Schutte machine would give them a guaranteed 250 pistons per hour, day in, day out, they were tempted. But they were also cautious, because they knew their present cutting tools needed to be sharpened every hour and a production rate of 250/hour therefore seemed nothing more than fanciful salesman's talk. So, 'prove it', they said to Wickie, and 'if you can't you must take the machine back and give us a 100 per cent refund'.

What they probably didn't know was that Wickie had the Krupp tungsten carbide tooling up his sleeve. He therefore proposed that his customer should send a batch of 1,000 of its pistons to the Schutte works in Germany and then go over to see them being produced at the rate of 250 per hour, continuously for several hours. Needless to say, Wickie duly came home with the order in his pocket. In some ways, that incident was totally characteristic of Wickie's methods, and was one of the secrets of his success. In dealing with prospective customers he was always supremely confident of success, but that confidence was based on sound practical engineering knowledge and on having 'done his home-work'.

In the early years of his company Wickie occupied various premises in Coventry, and in addition to those in Charterhouse Works had others in Upper York St; and substantial facilities in the Meteor Works in Queen Victoria Rd previously occupied by the Rover Car company. He had his personal offices in the National Provincial Bank Buildings in Broadgate, a prestigious location carefully chosen to impress potential customers from both home and overseas. By the late 1920s, the company was prospering both through the sales of machine tools of various types for which it had

the agency, and the tooling to go with them. Much of that tooling was Krupp Widia tungsten carbide. But there was trouble ahead.

THE DEPRESSION OF THE 1930's

The depression which hit the UK in 1930s, coupled with the government's decision to leave the Gold Standard and at the same time to impose tariffs on imports, dealt Wickie's company a severe blow. In the autumn of 1931 Wickie found the exchange rate of the German mark had suddenly changed from over 20 to the £-sterling to little more than 12 to the pound. Almost overnight, and because his company was so heavily reliant on the sale of imported machines and tools, its competitive edge was severely blunted. Indeed, its very survival was threatened. That, in fact, could have been the end of Wickmans.

But Wickie's reaction was swift. He immediately made deals with some of his foreign partners to manufacture their machines under licence in the UK, an arrangement they welcomed because, they too, were losing business in the UK through our heavy tariffs on imports. In Coventry, he arranged for Covmac to make Wagner & Forst machines, and for Webster & Bennett to build Monforts turning machines. Webster & Bennett was one of the first machine tool companies to be founded in Coventry, and the life-line Wickie threw it in 1930 probably saved the Company from going under during the Depression. Curiously enough, Wickman was to save Webster & Bennett again, some 50 years later, as will be explained in due course.

This turn in international affairs, which at one time seemed likely to be disastrous for Wickmans, was in fact the start of a new chapter in its history, and one in which it would prosper far more than if it had remained merely a selling agent for machine tools made in other countries. The impetus for Wickmans to make the manufacture of machine tools a major rather than a minor part of its operations was already present. For some time, Wickie's fertile brain had seen how improvements could be made to the machines he was importing, and he was regularly bombarding their manufacturers with ideas, urging them to make changes to their designs.

These ideas were not always well received, since most of the companies were long established, had international reputations, and whilst they appreciated Wickie's success as a salesman of their machines they rather resented this cocky young man telling them how to 'improve their products'. In particular, Wickie had ideas for improvements to the design of multi-spindle automatic lathes, the sales of which were the principal income for his company.

Such machines were in demand in the 1930s by the fast-growing motor car industry, which was burgeoning in Coventry where Morris, Triumph, Jaguar, Riley, Armstrong Siddeley and Rover all had factories. Impatient with the lack of response from his principals overseas to his suggestions for design changes, especially from Schutte in Germany, Wickie was already experimenting with a multi-spindle automatic lathe of his own. The depression of the late 1920s/early-1930s accelerated such developments, which were eventually to lead not only to the world-famous range of Wickman multi-spindle automatics but to promoting his company to the very forefront of that technology.

Running parallel with all that was Wickie's continued interest in tungsten carbide for making tooling and other products. The process for making components from tungsten carbide by high-pressure compaction and then high-temperature sintering is known as powder metallurgy, a technology which was then in its infancy. Nevertheless, it was in 1932 that a sizeable area of land on the south side of Tile Hill Lane, at the point where it joins Fletchamstead Highway, was acquired for £2,854 by the Wickman Manufacturing Co Ltd, and was eventually to house Powderloys Ltd, Hard Metal Tools Ltd, and the Wimet Division, (all companies concerned with powder metallurgy), also a Research and Development Department for Wickman Machine Tools.

But Wickie's restless mind and interests were by no means confined to machine tools and tungsten carbide tooling. He was also a motoring enthusiast and in the 1930s he became fascinated by the idea of automatic transmissions for cars. He made the acquaintance of a Swedish engineer, a Mr Ljungstrom, who had designed such a transmission, and Wickie invited him to Coventry where he proposed to help him to develop it. This transmission was known as the Spontan (I don't know why!), and although Wickie did not see it through to completion the system was eventually launched, very

successfully, as the Laycock automatic transmission for private and commercial vehicles. Wickie also developed other ideas for cars, including translucent number plates, self-illuminated number plates, and the use of ball joints to couple pistons to connecting rods in place of traditional gudgeon pins.

THE FIRST WICKMAN MULTI-SPINDLE MACHINE

It was during the mid to late 1930s that Wickmans as a manufacturer of machine tools, as distinct from being an agent for them, really took off. The prototype of the first Wickman multi-spindle automatic, the 1 5/8 inch 5-spindle machine, appeared in late 1935, and its manufacture was initially sub-contracted to John Lang & Sons, a long-established Scottish machine tool company. This firm was already famous as a maker of centre lathes, so Wickie could trust it with his 'baby' both for quality of manufacture and for performance.

The Wickman 5-spindle automatic machine was an immediate success, despite formidable competition from German and American companies, and was the launch pad for the future. That future was to see Wickman finally emerge as one of the Big Four in Coventry, and to lead to it leaving the Queen Victoria Rd works and to the erection of a model factory built from scratch on a 100-acre green-field site off Banner Lane, Coventry.

That factory was to play an important part in the second world war, producing no fewer than 3,500 Wickman machine tools of all types, 150 of them, incidentally, shipped to the USSR, which at that time was, of course, our ally. These machines included (in addition to Wickman multi- and single-spindle automatics), optical profile grinders, tool grinders, wing spar milling machines for the aircraft industry, thread milling machines, thread grinders, and heavy-duty grinders.

On the outbreak of war, of course, the supply of tungsten carbide tooling from Germany ceased abruptly and the engineering industry in UK, not least munitions manufacturers, was consequently faced with a critical situation. Wickman had already been experimenting with producing tungsten carbide tooling of its own, named Wickman Wimet, and in fact one week before war was declared had purchased a factory in Torrington Avenue for what was termed its Small Tools Division.

The Government willingly supported Wickmans in an effort to produce tungsten carbide tooling of its own, and as a consequence a secret research department was set up in Haseley Manor, on the outskirts of Warwick. There a team of hastily-recruited scientists, industrial chemists and technicians set about cracking the deeper secrets of powder metallurgy and deciding what was needed for large-scale production. They succeeded, and by the time the war was over in excess of 1 million tools and 2 million tungsten carbide tips had been produced by Wickman Wimet for the production of artillery shells alone.

When the war had ended, Wickman was established as a company of national and international importance, both in terms of the manufacture of machine tools and tungsten carbide cutting tools. Wickman was by then, in fact, probably the largest producer of multi-spindle automatics in Europe, and Wickman Wimet was the largest producer of tungsten carbide tooling in the UK, a position it held until, in 1973, Wickman Wimet was acquired by the Swedish company Sandvik.

THE BANNER LANE FACTORY

The erection in 1938/early 1939 of Wickman's Banner Lane works was prompted by the growing realisation that war was near, and that if hostilities started then any manufacturing facilities in the centre of Coventry would be far too vulnerable to bombing. In his career up to this point, Wickie had had plenty of opportunity to see machine tool manufacturing plants in many different countries, and most of them were more advanced than those in Britain. He determined therefore to use the best ideas from all of them and to build a factory which would be both efficient in its layout, agreeable to look at, and pleasant to work in. The Banner Lane plant, in fact, was a model of a modern facility for the manufacture and demonstration of machine tools, and was far in advance of any other in Britain at that time.

Its position in open countryside also lent itself to landscaping, and the approaches to the plant were about as far removed from the conventional idea of a heavy engineering factory as could be imagined. Teams of gardeners kept the areas surrounding the factory itself in immaculate condition, and the working conditions inside the plant and in the offices and showroom were exemplary. By comparison, the Herbert factory at Edgwick, which prided itself on being up-to-date, looked positively old-fashioned and even slightly 'Victorian'.

Initially the Banner Lane factory had an area of 42,000 sq ft but by 1947 it had been expanded by a factor of three to 126,000 sq ft. Its design was light and airy, some said more in keeping with a food processing plant than an engineering factory, and because of its location on the outskirts of the City there was a fleet of company buses to bring workers in and get them home again. Another innovation for its time was the provision of shower facilities for workers to use before they left at the end of a shift. Wickie believed that if blue-collar workers could arrive in decent clothing, and leave likewise at the end of a shift, then they could feel they were indistinguishable from the white-collar staff in the offices. Those who worked there, however, have told the writer that there was rarely time between the end of the shift and the arrival of the homeward-bound buses for advantage to be taken of this Utopian facility!

The Banner Lane plant, and the Wickman empire, which by then had overseas subsidiaries, flourished mightily through the 1950s and early 60's, employing several thousands at its peak. But then the British machine tool industry as a whole started to encounter difficult times. Foreign competition was one important factor, but the fact that few British machine tool builders had invested sufficiently in new plant and equipment nor, crucially as it was to turn out, had invested sufficiently in research and development, was of even greater importance. A Government enquiry into the failure of the British machine tool industry to be competitive decided, as has already been mentioned, that it was 'too fragmented'.

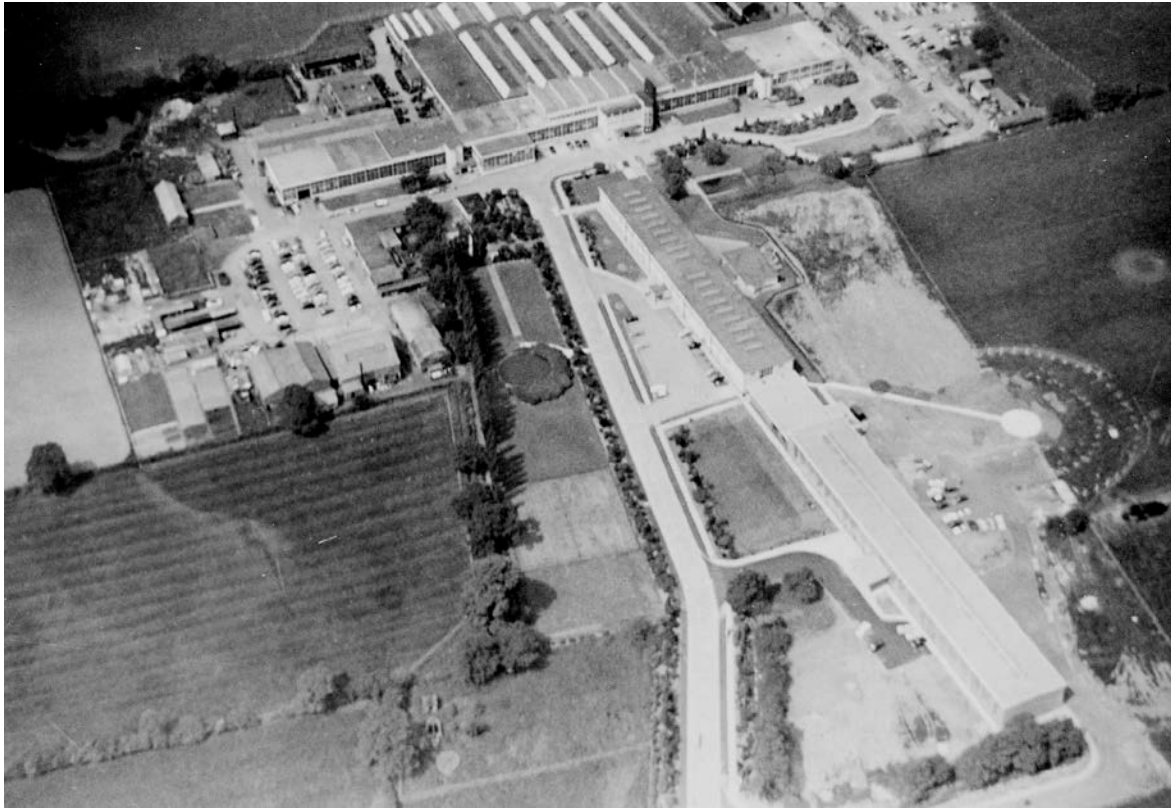
Various large UK firms, most of them with little (or even nil) knowledge of machine tools, were encouraged to 'take over' machine manufacturers, weld them into larger units, thin them down, make them lean and hungry, and teach them 'marketing'. Since 1948, Wickman had in fact been an autonomous company within the massive John Brown Group, which had certainly been generous in its support of the Coventry company, especially in its development of new machines and in its progressive acquisition of the selling agencies for machines by other prestigious makers. But gradually, as trading conditions toughened, John Brown expected more and more contribution financially from Wickman. Around that time, the oldest Coventry machine tool builder, Webster & Bennett Ltd, (also for many years a member of the John Brown Group) found itself in financial difficulties. Founded in West Orchard in 1883, and later having its main plant in Northey Rd, Webster & Bennett was therefore moved by the John Brown Group out of its Northey Rd factory and was consolidated into Wickman's Banner Lane plant. But this integration was not an easy one and the 'marriage' was not entirely successful.

THE CHALLENGE OF ADVANCING TECHNOLOGY

By now advancing technology, and especially the advent of numerically-controlled machines, was threatening to make Wickman's principal product, the multi-spindle automatic, out of date. And it was also becoming obvious that in outward design many Wickman machines had changed little since their introduction in the 1930s. By this time also, as has already been mentioned, all Wickman's interests in tungsten carbide tooling had been sold to Sandvik of Sweden, and Axel Wickman had retired to the USA where, in 1970, he died.

In an effort to upgrade its products technologically, an attempt was made by the Banner Lane works to develop a range of advanced numerically-controlled turning machines, firstly to complement and eventually perhaps to replace its multi-spindle machines. The multi-spindle machines, the foundation and backbone of the Company, were not exactly neglected but service and spares support to the many thousands of these machines already in the field at home and overseas was not always maintained at the high level of earlier years. As a result, a number of small firms sprang up to offer the service and spares at more competitive prices, some of them run by Wickman

employees who had by then been made redundant. The Company thereby lost part of what had once been a very lucrative source of income, and there are some who believe that, in the long run, this loss was to prove to be critical.

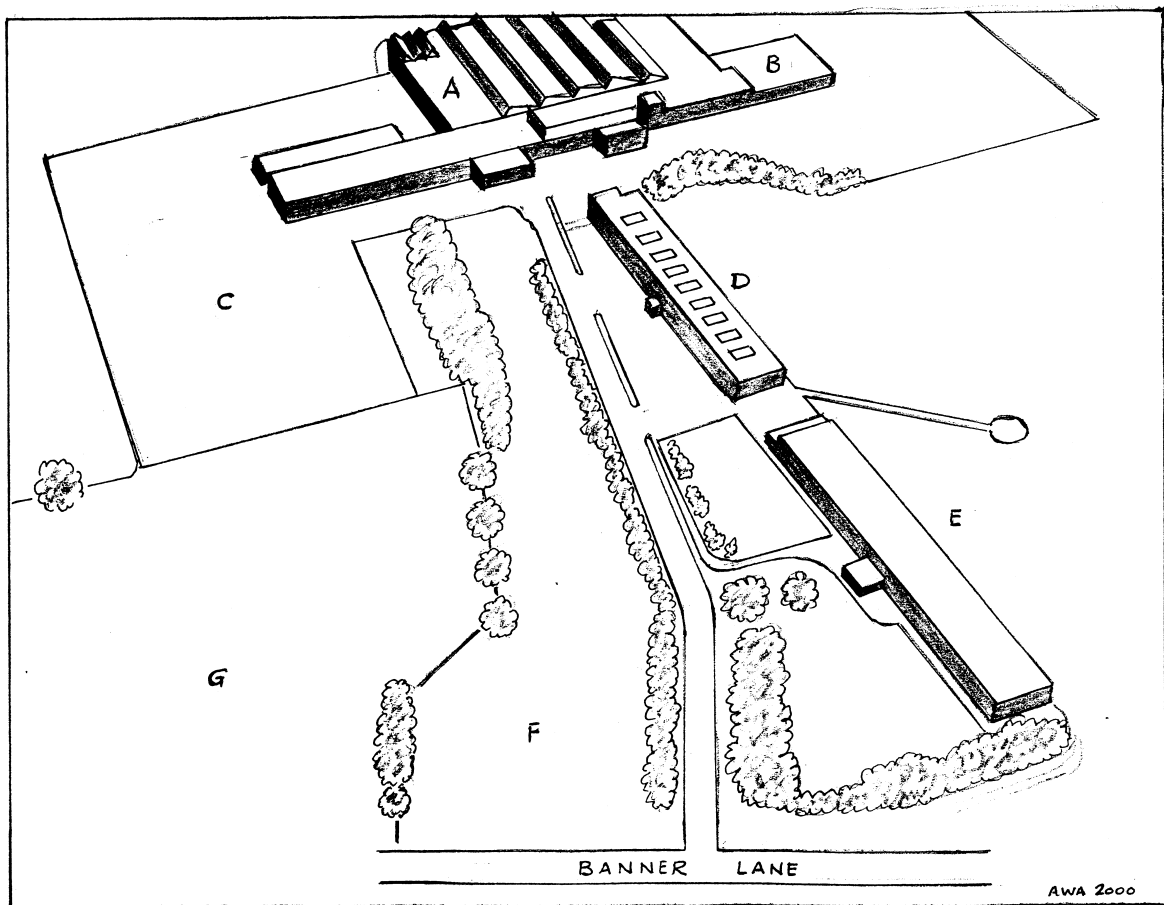


An aerial photograph of the Banner Lane site of Wickman Ltd in its hey day, probably taken in the mid to late 1960s. (Banner Lane is just out of shot at the foot of the picture, running left to right). The Company's helipad is seen at the right, and the long building, to which the path from the helipad leads, is in two parts.

The section nearer the camera, with the lighter-coloured roof, was a large showroom in which Wickman machines, also those by other makers for whom the company was a selling agent in the UK, could be demonstrated to potential customers. The other section of this building, with the darker-coloured roof, housed all the administrative offices, also the directors' offices and Board Room. At the top of the picture are seen the main machine shops and assembly bays in which Wickman machine tools were built.

The new Wickman numerically-controlled machines were not a success, and after about five years, and the expenditure of large sums on research and development, many of them were sold off at ridiculously low prices merely in order to claw back much-needed cash. By that time, of course, the market share the company once held as a leading supplier of multi-spindle machines had also become depleted. The John Brown Group then arranged to put control of Wickmans into a group headed by Leesona, a large textile machinery manufacturer based in the USA. This was to prove an unhappy situation also for, to the dismay of the workforce, control had now passed to the other side of the Atlantic and one of Leesona's decisions was to order the Banner Lane plant to concentrate on building Wickman machines only and to close down the agency side of the business. In due course, Leesona decided to 'abandon ship' entirely, and the company and its Banner Lane facility was sold to Ketlon, a firm based in Kent which was a major user of Wickman machines.

Control was now at least back with a UK company, and Ketlon, under the leadership of a man called Ben Simon, tried its very best to pull things round, but after a few years Ketlon also decided it could do no more. Nothing could now be done to save Wickmans, which was forced into closure



In the mid 1990s the Banner Lane site was bought by a developer, who razed the entire plant to the ground. For a brief period, the possibility of a huge modern colliery being opened up close to the **Key:**

- A. All the manufacturing facilities were located at the rear of the site, and provided light to heavy machining, assembly and final testing of machines.
- B. The Production Control Department, also various laboratories.
- C. In this area were various stores, garages, ancillary buildings and the carpenters 'shop'.
- D. The Administration Block, which included the Sales and Factored Divisions.
- E. Showroom, also demonstration areas for Factored Machines and a cinema.
- F. Tennis courts.
- G. Farmland.

Banner Lane site gave the developers hope of a 'scoop', but in the end that plan for a super-mine came to nothing.

And so Wickman's plant had vanished, the once magnificent landscaped site stood derelict, and its future remained unresolved. In late 1999, however, planning permission was at last granted for redevelopment of the site to provide 11 industrial units and a housing estate. This plan was initially opposed by Coventry City Council, who wanted the entire site to be devoted to industry, but its

objections were over-ruled by the Department of Trade & Industry in favour of a mixed development. It is estimated that the new industrial units on the Banner Lane site could eventually create more than 500 new jobs for the City.

The Wickman name survives, however, in Wickman (Coventry) Ltd, a company which in 1999 expanded into new premises with 18,500 sq ft of production space for rebuilding, and servicing the estimated 15,000 Wickman machines still in use throughout the world.

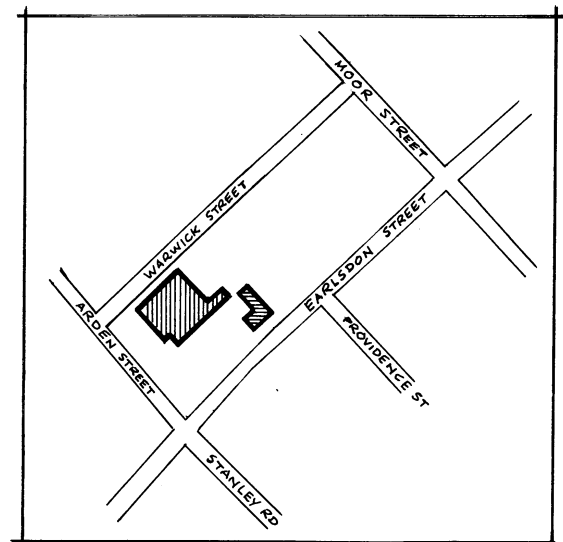
COVENTRY GAUGE & TOOL CO LTD

If the founder of Wickmans had an obsession with multi-spindle automatics and tungsten carbide tooling then Harry Harley, the founder of Coventry Gauge & Tool Co Ltd, was obsessed with 'accuracy and precision'. The young Harry Harley was among the first indentured apprentices to be taken on by Alfred Herbert, joining that company in 1892. On completion of his apprenticeship, he stayed with Herberts, being made Under-foreman of the toolroom in 1904, and full Foreman in 1905. In Alfred Herbert's terms this was a meteoric career rise and is indicative not only of his high opinion of the young man but also of Harley's skills as a precision engineer.

It is to the toolroom of any engineering company, and machine tool manufacture is certainly no exception, that those capable of achieving the most exacting standards of precision workmanship inevitably gravitate. In the toolroom are made the jigs, fixtures and gauges used to control the accuracy of components produced elsewhere in the works and, by thus maintaining their consistency and precision, ensure that they are interchangeable. As a relatively young man, therefore, Harry Harley was largely responsible for maintaining that level of precision throughout the entire Herbert works. But the time came when Harley decided that he wanted to go it alone, and in 1913 he founded the firm which was ultimately to become The Coventry Gauge & Tool Co Ltd.

Harley's fledgling Company was started in conjunction with his wife's brother Walter Tatlow, and began life in space rented in premises owned by the latter in Warwick St, Earlsdon. There is reason to believe that the premises were originally used as a weaving mill. An entry in Kellys Directory for the year 1900 lists a company known as Harris & Tatlow, cycle manufacturers of 16 Spon St, and presumably it flourished sufficiently for it to transfer to Earlsdon, by which time Harris seems to have left the stage. Harley's venture began trading as Walter Tatlow Ltd, but by that time Tatlow, it seems, had abandoned making complete cycles and was making a living nickel- and chromium-plating bits and pieces for them. Tatlow's premises occupied space in the area between the parallel roads Earlsdon Street and Warwick Street, bounded on one side by Arden Street and on the other by Moor Street. Its postal address was Warwick Street. Between the end of the mill buildings and Earlsdon Street stood a private residence known as Earlsdon House, of which more later.

At some point in his early days with Tatlow, Harley designed and produced jigs, fixtures and tools (especially broaches), which cut the complicated shapes in Yale-type cylinder locks and keys, made by a company named H & T Vaughan. To this day, some front doors on houses in Coventry have a lock stamped with the letters HTV which, of course, stand for H & T Vaughan.



The site of the former weaving mill in Earlsdon, Coventry, where Stanley Harley in partnership with Walter Tatlow started the firm which eventually became The Coventry Gauge & Tool Co Ltd.

The smaller building, a large detached house fronting onto Earlsdon Street, was taken over as the Head Office of Coventry Gauge & Tool, and remained so until the firm's large factory on the Fletchamstead Highway was built in 1938/9.

Both buildings were still standing in the year 2000.

Harry Harley was a man who not only had an obsession with accuracy and precision but who also knew exactly how to achieve it, and he was very strict with any employee who failed to attain it. There was never any doubt as to who was 'boss' in his part of the firm, and who gave the orders.

Unfortunately, it appears that Walter Tatlow had a somewhat similar philosophy. Almost from the outset there was a clash of personalities between the two men, indeed at times it was almost case of an irresistible force meeting an immovable mass. Inevitably, the eventual result was a head-on collision. Tatlow appeared to be in the more powerful position, because of course he owned the premises, and so he simply gave Harley his marching orders. But Harley counter-punched. With financial assistance from friends he succeeded in raising enough money to buy Tatlow out, and from that point onwards there was only one boss.

One year after Harley had started in business on his own the First World War broke out, and the demand for jigs, fixtures, gauges and cutting tools, not least from the armaments industry, quickly soared to hitherto unimaginable levels. On the outbreak of war in August 1914 Harley had fewer than 20 employees, but very swiftly that number quadrupled to 80, and in 1916 he changed the name of his firm to the more appropriate Coventry Gauge & Small Tool Co Ltd. More production space and more employees were needed, and so Harley took over the machine shop of Frank Guyver, a motor mechanic operating in Stratford-upon-Avon.

The problem of transporting materials and components backwards and forwards between the works in Earlsdon and Stratford on the roads of those days was obviously a difficult one. Rail services were infrequent and public transport virtually non-existent. Eventually, the problem was solved when Harley bought a second-hand Model T Ford van, and this gallant and often cruelly overloaded Tin Lizzie plied between the two factories daily and often, with its lamps feebly flickering, through the night as well.

By the end of World War I in 1918, Harley had over 120 on his payroll and a customer list in excess of 300 companies. His firm was reasonably well established, but with the sudden cessation of Government war orders, and a general slump in world trade, hard times lay ahead for the next few years. Nevertheless, Harley's determination made sure the firm survived. In fact he took the risk of expanding by purchasing the premises of the watch and clock makers Joseph White & Son, at 58a Earlsdon Street. Today, the ground floor of that property is occupied by a retail pharmacy and the first floor, No 58a, is now a residential flat. Next, Harley acquired the much more substantial nearby residential property already mentioned facing on to Earlsdon Street.

Known as Earlsdon House, it had been the home of Mr Alex Craig, one time managing director of the Maudsley Motor Co. and its large back garden extended right through to Warwick St. To the elegant front of this private house Harley added a rather inelegant extension, which presumably absorbed the front garden. The house, plus the extension, was then used to hold the offices and headquarters of Coventry Gauge & Small Tool, and it continued to do so until, many years later, the large modern factory for Coventry Gauge & Tool was built on the Fletchamstead Highway.

By 1928, such was the reputation of the company for the precision and excellence of its products, and such was the volume of orders it was receiving, that a public flotation was considered prudent. The issue was immediately over-subscribed and Coventry Gauge & Tool (1928) Ltd was formed, with a substantial number of shares being taken up by its employees. By this time the company's trade name Matrix was well established; it was also offering a Universal Measuring Machine of unparalleled accuracy for its time (the first of which had been designed to order for Alfred Herbert); and the Wickman Thread Gauge (mentioned earlier) was also in steady production.

It is interesting to note that Harley, as advertisements of the time show, always marketed the latter as the Wickman thread gauge, something Sir Alfred had resolutely refused to do. Also in development by then was Harley's next very important step, the introduction of machine tools. The first of these was the Matrix thread grinder, the beginning of a family of machines which was destined to become world famous and to represent a pinnacle of accuracy in the finish grinding of high-precision screw threads of all types.

Harley's choice of the word Matrix as a trade mark is interesting. Matrix is, in fact, a word with very many meanings. The Oxford English Dictionary lists at least seven, and the word is used in many different disciplines. It appears in mathematics, in medicine, zoology, photography,

computing, broadcasting, and in printing. There seems to be no record of Harley's thinking behind the choice of the word Matrix for his trade mark, but perhaps he had printing in mind, and in particular the art of typography. In that profession, in the days of hot-metal type-casting, the matrix was the master form from which each letter in a complete fount of type was cast. As such it needs to be made to the very highest standards of precision. It is only speculation, but it seems to fit the Harley philosophy.

In the early 1930s Harley had a hand in various other branches of engineering innovation and manufacturing. For example, his company was involved with the cinema industry in making equipment for projecting the first talking pictures. In collaboration with British Thomson Houston, Coventry Gauge & Tool produced talkie apparatus which was tried out for the very first time at the Globe Cinema in Coventry. His company also produced early versions of the Kango electric hammer and the Lansing electric industrial truck. Other ventures in which Harley was involved included electrically-operated distant control equipment for railways; precision parts for aircraft and aero engines; an experimental 4-cylinder water-cooled 2-stroke petrol engine; and all the tooling (included the broaches) for producing the Yale-type cylinder locks mentioned earlier.

It might be thought that this widening variety of work suggested Harley was wandering away from his core business of designing and manufacturing tools and gauges made to the highest possible levels of precision. In fact, all the work he undertook was of a type which demanded high precision and, in addition, he was almost certainly doing no more than many other engineering companies were forced to do in the inter-war years, namely diversifying and thus finding enough work to keep his Company and his band of highly-skilled precision engineers together.

THE FLETCHAMSTEAD HIGHWAY WORKS

When the news broke that the Rover car company had decided to move all its production facilities from Coventry to Birmingham, it was obvious that the Meteor Works in Coventry would become vacant. In their entirety these works were too large for Harley but he seized the chance and took over five departments. These he used for the manufacture of slip gauges, broaches, hobs, components for aero engines and aero engine pumps. But as the '30s wore on, and the first signs of a possible second world war began to appear, with all its implications for precision engineering, use of part of the Meteor Works was increasingly seen as being only a temporary expedient. What the Company obviously needed was a much larger works, with all its operations under one roof. In fact, that need was becoming imperative.

At about this time the major arterial road linking Ryton on the London Rd to Allesley on the Birmingham Rd (now known as the A45 by-passing Coventry), was under construction. An ideal green field site of 16 acres flanking part of this new road (Fletchamstead Highway), and lying between Torrington Avenue and Standard Rd, was acquired, building was begun, and on 28 March 1936 the stone-laying ceremony was performed by Oscar Harmer, right-hand man to Sir Alfred Herbert. Many civic dignitaries were present, and Harmer was accompanied by Harry Harley and his son Stanley Harley. Both Harry and Stanley were to be knighted in the fullness of time, and Sir Stanley eventually succeeded as head of the company when his father died in 1951.

The Fletchamstead Highway works started off with a covered area of 250,000 sq ft and barely had it gone into full production when the Government announced a rearmament programme, a move which was to ensure unlimited work for Coventry Gauge & Tool for at least the next 10 years. In the second world war the Company's workforce rose to 6,000 men and women employed in Coventry, and in order to increase output 21 smaller satellite factories, scattered in towns and villages around the country, were opened. During the war, the Company produced three-quarters of all gauges required by the armaments industry and it also played a vital part, in collaboration with British Thomson-Houston, in the evolution of the Whittle jet engine. For example, it designed and built the first machine for grinding the fir-tree root forms on gas turbine rotor blades.

It is a measure of the standing the company held in the field of precision engineering that in 1940 the National Physical Laboratory (no less), the ultimate arbiter of the nation's standards and of all types of precision measurement in the UK, opened a Resident Branch inside the Fletchamstead

Highway factory. The NPL took this step because it considered the equipment and practices at Coventry Gauge & Tool to be the equal of its own at its headquarters in Teddington, Middlesex. By this move, the NPL provided British industry with a more readily accessible National Standards Bureau in the very centre of the country, and no higher accolade could have been conferred on the work of Harley and the men and women serving him.

Possibly because of its position on the outskirts of the city, the Fletchamstead Highway factory escaped the two devastating mass bombing raids on Coventry, although on one occasion a lone German aircraft made attacks on the factory on two successive days and dropped bombs which killed two workers and seriously damaged the heat treatment department and some houses nearby.

At its height, Coventry Gauge & Tool had a subsidiary company in Australia and additional factories in the UK located in Scotland, Leicester and Madely (in Shropshire). The 20 years following the second world war saw the company reach its summit. In 1965, for example, it secured a single order from the USSR for no fewer than 600 machine tools. These were predominantly high-precision thread grinders, with a total value well in excess of £1 million, which was regarded as a very substantial figure at that time.

In fact, between 70 and 80 per cent of the entire output of the Fletchamstead factory was going for export at that time, and the Company was as internationally famous for its range of precision machine tools as it was for its cutters, broaches, gauges and measuring equipment. Its trade mark Matrix stood for a level of accuracy and excellence which was recognised worldwide, and to have worked for the Coventry Gauge & Tool, and especially to have served an apprenticeship there, was virtually a passport to getting a job anywhere in the world. Almost from the start, the Company placed great emphasis on training its young employees, and had a well organised apprentice school. In the early 1960s, this school had as many as 230 in training in a number of different grades, ranging from craft through to graduate status.

But in the late 60s/early 70s things started to go wrong. Competition from foreign-built machine tools, not least those coming in from Japan, was ferocious and in 1969 the Company was taken over by the giant TI (Tube Investments) Group. This group had already acquired another famous UK machine tool manufacturer, Charles Churchill Ltd, and it then inexplicably renamed the Fletchamstead Highway factory 'TI-Churchill'.

Thus, overnight both the name Coventry Gauge & Tool and its internationally-recognised trade mark Matrix vanished from the scene, a loss viewed by many as marketing blunder of the first magnitude. Indeed, far from re-invigorating the company, the change of name was considered by many to be counter-productive, especially overseas where every engineer knew the word Matrix, and what it stood for, and certainly did not associate it with Tube Investments. The declining situation continued, and was exacerbated by the introduction of numerical control for machine tools, a form of technology which the Company was somewhat slow to adopt.

Belatedly it recognised that fact, and tried to make up some ground by taking over companies already in the field of numerical control. For example, indexing turret drills by Vero were made at the Fletchamstead Highway works and when Alfred Herbert collapsed in 1983 the designs of some of its NC machines were bought from the Receiver. The company name was then changed yet again, this time to TI Matrix Churchill, which at least brought the internationally-recognised word Matrix back into circulation. But it was still an uphill struggle. Eventually the TI Group had had enough, buyers were sought for the company, and it fell into the hands of a consortium of Middle Eastern business men. Its final phase had begun.

There followed an ignominious sequence of events in which, through an inglorious mix-up between the Department of Trade and Industry and Customs and Excise (with MI5 lurking somewhere in the background), the Company was accused of breaking a Government embargo on the sale of machines overseas which, it was claimed, could be used for armament manufacture.

This miserable affair is not really a subject for this booklet save perhaps to say that it remains an example of how buck-passing and duplicity at Government and Civil Service level can contribute to bringing a famous Company to its knees, and throwing hundreds of highly skilled, irreplaceable, men and women on to the scrap heap. When the remains of the company were eventually absorbed into BSA Tools Ltd, Birmingham, the Fletchamstead Highway factory was abandoned and stood empty

and echoing for several years. At one period, some of the bays were used for car boot sales, and hideously garish posters were hung on the railings outside the building to advertise the bargains for sale within.

Eventually, these car boot sales were mercifully stopped, and the factory subsided once more into a gaunt and echoing silence. But its humiliation was not yet complete, for inevitably the local vandals then took over. Graffiti and damage grew and eventually a fire gutted the plant, leaving only the walls standing. The site was then razed and today nothing physical remains to bear witness that the Coventry Gauge & Tool Co Ltd, a firm which started with humble beginnings in a weaving mill in Earlsdon, went on to employ many thousands, and eventually became one of the most famous machine tool companies in the world, had ever existed.

WEBSTER & BENNETT LTD

From the standpoints of facilities and numbers employed, but certainly not from reputation, the smallest of the four machine tool builders being reviewed in this booklet was Webster & Bennett Ltd. This firm started its life in January 1887 in the West Orchard area of the City, on a site which has long since been redeveloped. The firm was originally known as Webster & Howarth and was founded to design and make a range of machine tools, also to operate an iron foundry supplying castings to the general trade. In 1895, Mr A E Bennett joined the Company, which was then renamed Webster, Howarth & Bennett and in 1906, when Mr Howarth withdrew from the business, there was another name change to Webster & Bennett Ltd. Mr Webster died in 1911, and Mr Bennett's son P J Bennett joined the company in 1918. Mr A E Bennett died prematurely in 1920, to be succeeded as managing director by Mr W H Day, formerly Company Secretary. In 1921, P J's brother D W Bennett also joined the Company.

By the early 1900s the Company had a payroll of 70 and the decision had been taken to specialise in one specific type of machine tool, namely the vertical turning and boring mill. Basically this type of machine is a vertical lathe and is intended for operations on components which are too large in diameter, or too heavy, or both, to be handled safely and efficiently by a conventional horizontal lathe. On a vertical turning and boring mill, for example, components up to 12 ft or more in diameter, and as 'high' as 6ft can handled, much larger than would be possible to handle conveniently and economically on a conventional horizontal lathe. Such components include: forged steel pressure vessels, tall slim castings for large electric motors, dies and moulds for large tyres, railway wheels, and ultimately the turbine disks and casings for large aero engines. Over the years a variety of different designs of vertical turning and boring mills was developed by Webster & Bennett, including those with single and double work tables, and single- and double-column main frame construction.



The main entrance to Webster & Bennett Ltd when it occupied a site off Northey Rd, Coventry. The gates stood at the end of Northey Rd, where it turns sharp right, and the approach never seemed to be in keeping

with the prestige of the Company. The site is now occupied by private housing.

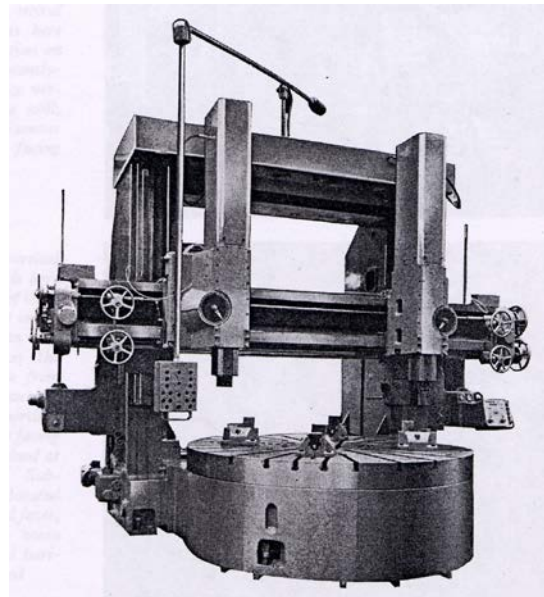
The Company soon outgrew its West Orchard site and in 1912 finally moved to another off Northey Rd, Coventry, where it steadily expanded its facilities and product ranges. By the outbreak of the first world war, the Company was also acting as agent in the UK for other machine tool makers, including German-built Union horizontal boring machines, and was on the approved list of the Admiralty and the War Office. By the late 1920s, the Company was building larger and more advanced turning and boring mills, and by increasing the power of the driving motors was among the first to exploit the heavy metal-removal capabilities of the new tungsten carbide cutting tools introduced to the UK, as mentioned above, by Axel Wickman.

Like all other machine tool builders in the City, Webster & Bennett suffered badly in the Depression in the inter-war years and it is recorded that at one time it had around 80 newly-built high-value machines in stock, with no sign of any buyers. But the middle 1930s saw a resurgence of capital investment by manufacturing industry, and in fact in 1934 it was possible to institute an expansion programme on the 4-acre Northey Rd site, with extensions to the machine shops, the fitting shops and the erection of a new suite of offices.

By this time, P J Bennett was Chairman of Directors, his brother (D W) was Works Director, and in 1940 P J Bennett became Managing Director as well as Chairman. The Northey Rd site escaped serious damage in the Coventry blitzes, but at one time a large batch of machines destined for work on producing the legendary Rolls-Royce Merlin aero engines were hastily despatched to their customers before any further enemy action could imperil them.

In the 1950s concern over the fact that the Company was still a privately-owned firm, and therefore vulnerable to very heavy death duties if a major shareholder should die, led to negotiations being opened with the John Brown Group. These negotiations were completed satisfactorily and ownership was transferred. A link with A C Wickman was made at the same time, by arranging for Mr Marsh, managing director of Wickman Ltd, to join the Board of W & B Ltd.

The firm continued to flourish, and in the mid 1950s its payroll was 380 and its turnover was £850,000. It resolutely stayed with its speciality the vertical turning and boring mill, and was soon introducing firstly electronic copying on its machines and then, in 1964, numerical control systems. But by the 1970s, in common with the other Coventry machine tool companies, Webster & Bennett was already beginning to feel the effects of increasingly fierce overseas competition, firstly from Germany and Italy and later from the Far East. In an effort to cut costs, production of machines was transferred from Northey Rd to Wickman's Banner Lane site, that Company also being a part of the John Brown Group. A new Company, Wickman-Bennett Ltd, was formed led by Mr Iain Exeter, and the historic Northey Rd site was sold for development as residential housing.



Typical Webster & Bennett double-column turning and boring mill.

Wickman-Bennett Ltd settled on the Banner Lane site, but when Wickman itself was closed it looked as if the end had come. In fact, Webster & Bennett lives on and has a modern manufacturing unit in Dutton Rd, Coventry, on the Aldermans Green Industrial Estate.

Grateful acknowledgement is made to the following for permission to include quotations from their various works.

Coventry City Archives for access to documents deposited there on each of the four Companies covered in this booklet.

Coventry Environmental Education Project, City Development Directorate, Coventry City Council and its publication *Alfred Herbert Ltd - A Coventry Firm 1888-1983*.

A History of Machine Tools, Ian Bradley, Model and Allied Publications Ltd, Hemel Hempstead, Herts. 1972.

Social Relations in an Engineering Factory - Alfred Herbert Ltd 1888 to 1922. John Davies PhD, Warwick University Library.

A C Wickman - A Life Diary Private publication by Lexa Dudley and Reg Kimber. Obtainable from MSP (Machine Tools) Ltd, Unit 10, Roman Way, Coleshill, Birmingham.

Precision par Excellence - A Story of Forty Years Consistent Effort in the Advancement of Engineering Practice, published by Coventry Gauge & Tool Co Ltd, Coventry, 1953 and loaned to the author by Mrs Trunkfield of Ashow.

Alfred Herbert Ltd, Head Works, Coventry. P.A Sidders. *Machinery*, Vol 99, 25 October 1961, page 963, Findlay Publications Ltd, Franks Hall, Dartford, Kent.

Alfred Herbert Ltd, Lutterworth Works. P.A.Sidders. *Machinery*, Vol 100, 14 March 1962, Findlay Publications Ltd, Franks Hall, Dartford, Kent.

Coventry Gauge & Tool Co Ltd. P.A. Sidders. *Machinery*, Vol 100, 6 June 1962, page 1279, Findlay Publications Ltd, Franks Hall, Dartford, Kent.

Webster & Bennett Ltd. A.W.Astrop. *Machinery* Vol 103, 6 November 1963, page 1047, Findlay Publications Ltd, Franks Hall, Dartford, Kent.

Wickman Machine Tool Manufacturing Co Ltd. A.W.Astrop. *Machinery* Vol 105, 25 November 1964, page 1245, Findlay Publications Ltd, Franks Hall, Dartford, Kent.

APPENDIX

DETAILS OF THE ACTIVITIES IN THE 30 PRODUCTION BAYS AND OTHER BUILDINGS AT THE 'HEAD WORKS' OF ALFRED HERBERT LTD AT ITS PEAK

No 1 FOUNDRY - Cupola capacity 6 tons/hour, maximum output approximately 70 tons/week. Maximum cast weight: normal 3 tons, special 5 to 6 tons.

No 2 FOUNDRY - Output 55 tons/week of castings up to 2 cwt each on a mechanised track system.

MACHINE SHOPS - 9 ½ acres under one roof, comprising 30 bays each approximately 30 ft wide by 420 ft long and served by 66 overhead cranes of 1 to 15 tons capacity. The various bays were used as follows:-

BAY 1 - Planing machines. Slave tables allow one batch of components to be set-up while another batch is in progress on a machine.

BAY 2 - Lumsden heavy-duty surface grinding machines for rough machining joint faces on large castings. (**BAYS 1** and **2** also contained large plano-milling machines, vertical turning and boring machines, vertical turret lathes and duplex milling machines).

BAY 3 - Gear cutting and thread milling machines.
BAY 4 - Large milling machines, vertical and horizontal.
BAY 5 - Drilling and milling machines.
BAY 6 - Horizontal boring machines of two basic types, namely the conventional using jigs and fixtures, and DeVlieg Jigmils where the accuracy of positioning is such that no jigs or fixtures are needed.
BAY 7 - Turning machines, chucking type.
BAY 8 - Combination turret lathes and slideway grinding machines.
BAY 9 - Turning machines, bar-type, and copy-turning lathes.
BAYS 10 and 11 - Grinding machines, external, internal, thread-, and gear grinding.
BAYS 12 and 13 - Toolrooms.
BAYS 14 and 15 - Fitting departments where lathe headstocks were assembled and tested before being fitted to their machines.
BAYS 16 and 17 - Erection departments where capstan and turret lathes were built in batches and alignment tests were carried out.
BAY 18 - Electric wiring and testing.
BAY 19, 20 and 21 - Erection departments where capstan lathes, single-spindle automatic lathes and vertical milling machines were assembled and tested for alignment.
BAY 23 - Training Centre, final inspection and export packing. Total number of boys in training (in the early 1960s) was between 400 and 500).
BAY 24 - Special grinding machines and stocks of components awaiting assembly.
BAY 25 - Erection and testing of heavy-duty turret lathes in small batches.
BAY 26 - Component stores.
BAYS 27 and 28 - Manufacture and assembly of gearboxes and Atritor dryer/pulverisers.
BAY 29 - Material cutting-off department.
BAY 30 - Steel stores.

The manner in which Head Works was laid out was entirely typical for the first quarter of the 20th century; that is, its machine tools were predominantly grouped according to type. Thus, there were completely separate sections for turning, milling, drilling, boring and grinding operations etc and components had to be transported in batches from one section to another in order to have a progressive series of operations performed on them. With this arrangement, components often needed to travel long distances between one section and another and therefore spent as much, if not more, time being moved around the factory as they did actually being worked on by machines. As a result, throughput times (i.e. the time between the raw material for a component being issued and the time when it was completed and ready for assembly), were long. Later, more modern practice saw machine tools laid out in so-called 'production cells', where the variety of different machines required to complete a batch of components were grouped together and components therefore needed to travel only relatively short distances between them. Throughput times were thereby reduced considerably.

OTHER DEPARTMENTS IN HEAD WORKS ON THE EDGWICK SITE

A SELF-CONTAINED FACTORY for the manufacture of lathe tools, chucks, adjustable reamers and the unit assembly of Herbert drilling machines.

THE ARDALOY SHOP, where cutter bodies and tungsten carbide tips were made and assembled.

THE No 2 FACTORY, a self-contained plant for producing Coventry die heads, Multigrip clutches and coolant pumps.

THE DEMONSTRATION DEPARTMENT, where the range of the latest Herbert machines, equipped with Ardaloy carbide and other types of tooling, were seen working and where customers could obtain advice on the best tooling for their particular needs.