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PREFACE

Any progress made in industry ultimately has an effect upon American society. Thus, it becomes apparent that a tapered roller bearing, accepting simultaneously both thrust and radial loads, was a marked advance over previous bearing designs. The growth and development of The Timken Roller Bearing Company centers around the anti-friction bearing, alloy steels, seamless steel tubing, and detachable rock bits.

Behind the company's growth are the personalities of Henry Timken, the father, and his two sons, Henry H. (II) and William. Today two of Henry's (II) sons are leaders in the firm. As the story develops these people unfold their contributions. The slogan "Only in efficiency is there progress" proved its validity as the company expanded in size and production.
CHAPTER I

THE TIMKEN ROLLER BEARING COMPANY IS BORN
(1898-1918)

The slowly turning wagon wheels had not yet given way to the humming wheels of modern machinery when a great industrialist was born in St. Louis, Missouri, on April 19, 1868.\(^1\) Henry (II) was the son of Henry and Fredericka Heinzelmann Timken. At that time little did anyone realize that he would some day be instrumental in easing the load and increasing the efficiency in the widespread industrial development of a new century. His role in the uncovering of a new enterprise was to be in striking contrast to the occupation of his grandfather, Jacob Timken, a prosperous German farmer, who came to America from Bremen, Germany, in 1838 and settled near Sedalia, Missouri.\(^2\) This role did not portend so striking a difference, however, from the interest of Henry's father, for the latter was the first of the family to make the name "Timken" famous in industrial America.

The elder Timken was an inventor and builder of fine carriages and wagons who made a name for himself through his development of a new and revolutionary type of carriage spring. Beginning his trade as a blacksmith and expanding into carriage making, he built up an admirable business. He had suffered the loss of his carriage shop through fire and was operating in a new structure when

\(^1\)The Canton Repository, Oct. 14, 1940.
\(^2\)Ibid.
Henry(Ir) was born. An inherent unrest took the elder Timken to California where he engaged in lemon growing; he already held agricultural lands in Kansas. This new occupation proved too unexciting, as had his six months gold prospecting at Pike's Peak in 1860, so he returned to St. Louis and the carriage industry. A firm believer in efficiency and progress, he was among the first to equip carriages with bearings of any kind. Timkens(sons Henry and William joined their father in The Timken Carriage Company in 1895) first experimented with cup-and-cone ball bearings and annular ball bearings, but since alloy steels were comparatively undeveloped the bearings did not stand up well. Even ball bearings were a far cry from the plain bearings used in carriages, for the latter bearings were made of soft materials and soon allowed wagon wheels to rattle and chuck. The company worked to develop better alloy steel and eventually turned its attention to the tapered roller bearings which were tried first on carriages and then on trucks. Had the carriage makers of Cincinnati, the center of the industry, been able to envision the inevitability of the horseless carriage, as did the elder Timken, Detroit might never have become the hub of the automobile industry. This foresight, likewise

4Based upon information secured from L.M. Klinedinst, Vice-President-in-Charge-of-Sales, The Timken Roller Bearing Company.
5B.C. Forbes and O.D. Foster, Automotive Giants of America, 259.
entrenched in the younger Henry, coupled with his inventive spirit set the background for the story of the tapered roller bearing to which we now turn our attention.

The younger Henry was born during the boom period immediately following the Civil War. His early life was without incident. He attended the St. Louis public schools where records show that he was an apt pupil. When he was nine years old his father, who was his constant companion, gave to the nation his famous Timken spring. Much of the younger Henry's time after school and during vacation was spent in his father's carriage works where he observed at first hand the processes of manufacturing and where he had his first introduction to industrial efficiency. There he learned well the elder Timken's slogan, "Only in efficiency is there progress." After he was graduated from St. Louis High School, where he was an honor student, he enrolled in Washington University at St. Louis; but his work was cut short when the family moved westward to engage in citrus farming.

It was the expressed conviction of the father that the two sons, Henry and William, should map out their own careers, so they were sent to college and allowed to choose their own vocations. Henry, always a keen analyst, chose to study law because the weighing of facts and the careful balance of justice intrigued him far beyond the ordinary
routine of manufacturing as he knew it at the time. He was graduated from the University of California Law School with honors and was admitted to the bar, but later association with his father drew him inexorably toward the lines along which the elder Timken was working. The carriage works prospered and the father offered his lawyer son a position. The latter accepted because a childhood illness had led to partial deafness, an affliction which had begun to bother him in the courtroom. Although he set aside law for production, he never regretted his legal training. In fact, he believed that a legal education would be of value to every man who intended to enter large scale business. He frequently stated that law had taught him to think straight, to plan wisely, to see the adverse side, and to realize the obstacles to be faced.8

Henry(II) took an extended European trip during which he studied in considerable detail the progress being made by foreign inventors in anti-friction bearings. His findings fired his determination to perfect a bearing which would be superior to any other on the market. On his return from abroad he settled down with his father and brother to study the requirements of the wagon industry. He visualized more and more accurately the relation of a properly designed bearing to the transmission of power, and confidently balanced their efforts against the demands of modern machinery for better friction-reducing methods.

8Ibid.
Henry and his brother, William, took over the active management of their father's wholesale carriage business in St. Louis, but when they discovered how well the bearings were working in carriages, they began to think that the bearing business offered much better possibilities than the making of buggies and high-class carriages. Therefore, they decided to concentrate on the production of bearings. Their first intensified effort in the manufacture of bearings was realized in a twenty by thirty-five foot space on the crating floor of the carriage factory, where a half dozen men made and assembled roller bearings. It was small scale production, but, nevertheless, it was a real beginning. As early as 1897 the Timkens were incorporated at St. Louis as The Timken Roller Bearing and Axle Company. By 1898 the tapered roller bearing was developed and marketed as standard equipment on horse-drawn vehicles manufactured and sold by the Timken Carriage Works of St. Louis. The Timken brothers, like most pioneers, had plenty of discouragements, but their worst difficulty was to obtain steel. To overcome this obstacle they decided to move nearer to the steel source and market, and Canton, Ohio, was selected as a logical place where both raw materials, including natural gas for fuel, and bearing markets were readily accessible, and where they would have room for expansion.

9 Based upon information secured from the Timken Public Relations Office.
Canton, when the Timkens arrived in 1901, was a growing city of more than 30,000 population. Of this figure, 5,018 were immigrants, chiefly from Germany, Britain and Russia. The leading industry was represented by the Dueber-Hampden Watch Factory which since has been dissolved. Other local manufacturing establishments were two rolling mills, two rug plants, two rubber stamp factories, three saddlery and one safe and vault works, two livery stables, one pole and shaft plant, two pump and three drain tile factories, The Canton Drop Forging Company; and thirteen blacksmith shops. Three railroads served the city—The Baltimore and Ohio, The Wheeling and Lake Erie, and The Pennsylvania—all of utmost importance to the successful development of a manufacturing concern such as Timkens planned.

In 1901 a new seventy-five by one-hundred-fifty foot plant was erected at 20th Street and Dueber Avenue in Canton. There operations began for the newly organized Timken Axle Company, led to rapid expansion by the increasing demand for roller bearings. Only two years previously this new concern had been formed with Henry Timken as President; but it was the second Henry Timken, as General Plant Manager, and his brother, W.R. Timken, in charge of all office detail, who operated the Canton plant.

11 Total immigrant population was: 3/7, German; 1/8, British; 1/29, Russian; 1/35, Canadian; 1/33, Central European; 1/50 each, Italian and Scandinavian; and 1/8 from other countries. Abstract of the Twelfth Census, 1904.
12 The City of Canton Directory, 1904.
With 120,900 bearings manufactured at the end of their first year in Canton, and with production increasing, the firm decided to change its name in 1904 to The Timken Roller Bearing and Axle Company, indicative of the demand for bearing units as well as axles. Business flourished because the automobile was then coming into its own. The first applications of bearings in autos were on the front wheels, and Timken then made the steering knuckles, hubs, and bearings; continued increase in auto production suggested the manufacture of a complete front axle. By 1905 Timken was making automotive rear axles of the chain drive type, working later into the beveled gear type. 14

At this point it is well to note a few of the business principles upon which the firm worked. The Timkens, discreet in their transactions, avoided too rapid development; the concern was financed out of profit from its beginning, but good credit permitted them to borrow money as it was needed. 15 However, a company seldom forges to the front without some reversals, and the Timkens had theirs. Early in the company's career one of the large manufacturers asked the brothers to figure on supplying complete front and rear axles. They submitted their bid and secured the order; but upon rechecking the estimate it was found that they had omitted the cost of the wheels in making their

14 Information from L.M. Klinedinst, The Timken Co.
15 Forbes and Foster, op.cit., 261. Company officials state that no money was borrowed; the firm was financed entirely out of profit.
calculations, and that to fill the order on the original bid would involve a serious loss. The Timkens' resolute spirit in holding to their initial bargain won them not only future orders but also the respect of the industry.16

In 1909 it was decided to divorce the axle manufacture from the roller bearing business, and thus was formed The Timken-Detroit Axle Company, which assumed from the old concern all equipment, inventories, patents, sale contracts, good will, and other assets of the Axle Manufacturing Division.17 The Detroit plant then started making all kinds of passenger-car and truck axles equipped with Timken bearings, while the Canton plant made only roller bearings and roller bearing axles for horse-drawn vehicles. The Horse-Drawn Vehicle Division of the Canton plant continued until 1916 when it was sold to The Liggett Spring and Axle Company.18

Before 1909 all Timken bearings were made from bar stock purchased from various steel companies. Then it was found that money could be saved if seamless steel tubing were used. This tubing was purchased from two or three different sources. But when World War I started in Europe the demands on American steel manufacturers were so great that Timken found it quite difficult to secure the various sizes of tubing necessary for each size of bearing made. It finally reached the point where the steel companies stated that they would make for Timken only one size tubing for each series of bearing. Since the cost was high

16Forbes and Foster, op.cit.,263.
18L.M. Klinedinst.
and since it was extremely difficult to get the best quality of tubing, the company then established the Timken Steel and Tube Division in 1916. This consisted of a piercing mill, a re-rolling mill, and a cold drawing department. By 1918 this mill was expanded to include a number of electric furnaces and a twenty-two inch rolling mill, necessitated by the war and the consequent shortage of high grade piercing rounds.

From its inception in 1898 until the year 1918, The Timken Roller Bearing Company and its corporative predecessors confined activities to the development and sale of tapered roller bearings for carriage wheels and, as the automotive industry developed, for automobile wheels and axles. By 1918 the company had become a young industrial giant and was seeking additional outlets for a product which, even then, according to all available sources, had proved eminently successful. The trend in the use of tapered roller bearings in industrial fields seems to have spread from about 1909, when they were used in electric motors, grinder spindles, drive shafts in paper machines and street sweepers, and in worm and drum shafts in electric elevators in 1914. According to Timken records the drift in the industrial bearing field gained much momentum during the period 1915–17. This is more readily understood when we realize that during those years the tractor, a

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19 Ibid.
20 The Timken Public Relations Office.
logical outgrowth of the World War when horses were at a premium, was developed. The tractor was also a natural offshoot of the automobile which was relatively well developed at that time. The company has in its files a tractor drawing dated 1917, showing Timken Tapered Roller Bearings applied in all positions except steering knuckles. Therefore, it appears rather obvious that the tractor bearing business has remained a sizeable consideration as compared to all other industrial markets.

During the years 1917 to 1919 Timken actively solicited bearing business, and their drawings evidence the fact that tapered roller bearings were recommended for such diversified applications as a speed lathe, a sugar centrifugal, rail car axles, a milling machine, belt conveyor rolls, and a centrifugal pump. A service organization was deemed necessary to provide adequate attention to customer needs in repairs and replacements of bearings and in 1916 the Bearings Service Company was formed, with its principal office in Detroit. By 1918 the Bearings Service Company had set up main branches in thirty-three of the principal cities of the United States and Canada, and had authorized about one thousand distributors in the two nations. At the termination of World War I there were industrial bearing salesmen in the field, and by 1919 the Industrial Division became a definitely established part of the Timken Company.

21 L.M. Klinedinst.
22 Ibid.
23 Ibid. Annual Report, 1922.
Timken became established on the foreign market when in 1907 the first associate plant, British Timken, Ltd. (a subsidiary of Vickers, Ltd.), was activated at Birmingham, England. Serving foreign automobile and rail concerns on a growing basis, three additional factories were set up by British Timken during the first World War. The Societe de Mechanique de Gennevilliers at Paris, France, also became associated with Timken manufacturing during the first war. Through these affiliates Timken products were adopted by more than one hundred foreign concerns, and units for American, European, and British cars were distributed in Europe, Australia, South Africa, India, and other places, where service facilities were likewise provided. At that time The Timken Roller Bearing Company held no stock ownership in the foreign companies, but derived its income through royalties from the affiliates manufacturing under Timken patents.

24 L.M. Klinedinst.  
25 Annual Report, 1922.
CHAPTER II
TIMKEN DEVELOPMENT
(1918-1946)

Following the war, while the nation attempted to "return to normalcy," the Timken Company entered upon a modest program of expansion. To supply the additional production required by the widening of its markets into industrial and other fields, as well as in the automotive lines, it became necessary to construct a bearing plant at Columbus, Ohio, in 1919. This plant, erected for the manufacture of bearings, was equipped with machinery duplicating that at Canton; the raw materials for this unit, consisting of steel bars and tubes, have been supplied from the steel and tube plants at Canton, about one hundred miles distant from Columbus. Six main rail lines through Columbus gave it a distributing advantage over Canton for the finished bearings.

The nation witnessed a short postwar depression in 1921, but the company did not suffer markedly; in fact, the volume of its business during the following year was materially in excess of any previous year. In addition to new customers in the automotive field, it received increased business from old customers who not only had a larger output, but also used Timken bearings to a larger extent in their product. By the end of 1922 Timken had produced and sold a grand total of more than 78,000,000 roller bearings. By the latter part of the same year Timkens had purchased all the capital stock of the Bearings Service Company, and
had organized an Ohio corporation, The Timken Roller Bearing Service and Sales Company. In 1922 The Timken Company had no mortgage or funded indebtedness, a condition which continued throughout its history. During that fiscal year it spent over $400,000 for new machinery and equipment in addition to large expenditures for renewals and replacements.

Until that time, August, 1922, the stock of the company was held by members of the Timken family. Then a portion of the stockholdings was offered and sold to the public, and by December of the same year there were 3,295 stockholders.

In 1923 patents were purchased from John N. Willys, of the Willys-Overland Company, who had promoted the Wright Roller Bearing Company of Pennsylvania, producers of a competitive bearing. Another tube mill was added to the steel facilities in 1923 with the opening of a plant at Wooster, Ohio, boosting the total output to 25,219,487 bearings as compared with 120,900 in 1902.

Timken growth was indicative of the general prosperity of the nation as in 1925 it sold approximately ten thousand tons of electric furnace steel and added a fifth electric furnace to increase its capacity twenty-five percent. The company was currently firmly footed in electric furnace

1 Previously 50% was held by the Hyatt Roller Bearing Co., whom General Motors Corporation later absorbed. Annual Report, 1922.
2 Ibid.
3 The writer has been unable to find Wright design anywhere incorporated in Timken bearings; the purchase probably was made to halt competitive production. Letter, "Design Progress of Tapered Roller Bearings," Tyson Roller Bearing Co., Sept 1, 1929.
steel production and was capable of supplying high grade steel as well as alloy steels, spring steels, magnet steels, and so on, in any size or section to the general trade. Tube mills and bearing plants were similarly enhanced by additions of more modern and efficient machinery, enabling closer tolerances, better quality, and lower operating costs. In 1925 Timken purchased the Gilliam Manufacturing Company of Canton with all patents and assets, including a capital of $1,500,000, and added its customers to the Timken lists. That year was also a record year for the production of motor vehicles while sales to manufacturers of industrial equipment were more than double those of 1924. Added to the growing lists of tapered roller bearing users were producers of machine tools, industrial trucks and trailers, road building equipment, cranes and hoists, electrical machinery, wood-working machinery, clay machinery, milling equipment and farm and dairy machinery.

During this period of the company's history it was realized that its sales representatives should be a combination engineer and salesman, since the Timken product was not sold over the counter but was engineered into a machine before the bearings were ordered. The Industrial Division was headed by L.M. Klinedinst, now Vice-President-in-Charge-of-Sales, when it was decided that a Timken

5 Gilliam allied with an inventor of roller bearing designs when he left Timken employ, and they produced their own bearing prior to 1924. City of Canton Directory, 1924, 1925; information from the Canton Chamber of Commerce.
6 Annual Report, 1925.
industrial representative should be a young graduate engineer, thoroughly trained to understand the design, manufacture, engineering and servicing of the bearings in all types of machinery. Early applications pertained chiefly to wheels, but as new fields opened the company amassed considerable knowledge and experience in applying bearings to industrial machines. In order to impart this information to prospective sales-engineers it was deemed advisable that they engage in a two-year training program, during which time they should learn the business in its entirety. Having completed his preliminary training, the sales-engineer was sent to one of the eighteen industrial offices in the United States or Canada where he was associated with the expert District Manager. This program has proved successful through the years, and today these men devote their efforts to the new applications of Timken bearings so their factories may be kept busy throughout the year. 7

The year 1927 drew out of Timken mills the new Graphitic Steel which soon became one of the better special steels. Graphite contained in the steel has great ability to retain lubricant, making it ideally suited to tool and die steel as well as to numerous commercial applications in gauges and machine parts. Five leading varieties were worked out, each with a suffix in the name designating the important extra ingredients fitting it for a particular

7The State of the Company, No.8, May 12, 1946.
use; thus appeared Graph-Mo, Graph-Tung, Graph-Sil, Graph-Al, and Graph-MNS, generally characterized by excellent abrasion resistance and wearing qualities. The low alloy content later was to prove even more beneficial than anticipated.8

With industrial activity at a low ebb at the beginning of the world-wide depression in 1929, a new market for steel was looked upon with particular favor. To diversify its market the company explored new fields of endeavor, several of which gave it renewed strength against the gathering force of the depression and enabled it to operate two days a week while many concerns were compelled to shut down. One of the more enterprising of the new developments was the detachable rock bit, the preliminary designs and experimentation for which were begun in 1929 at the Gambrinus plant of the Canton factories and in near-by quarries. However, actual sales of the rock bits did not begin until all tests were completed in 1932, with the first experimental sale being made in Canton.9 Sales climbed, and a new plant was erected at Mt. Vernon, Ohio, in 1935 for the exclusive production of rock bits. This market had not been explored to any marked extent before 1929. The daily sharpening of 1,150,000 pieces of hollow drill steel showed

8Graphitic Steel was developed by F.R. Bonte, a Timken engineer. Low alloy content became important in World War II. Edward Hungerford, Timken At War, 53–54.
9L.M. Klinedinst. -16-
the needs of industry for mass production of high-carbon steel bits, with potential sales of about one million bits a day. 10 Markets in metal mines, quarries, building contracting, railroads and industrial plants prove today that foresight in the early days of the depression gave the company new life than and an increasing market in years following.

It was also in 1929–30 that Timken concentrated upon building up a market in the railroad industry with the construction of a completely equipped roller bearing locomotive. This put bearings for rail service on a wider demonstrative basis, but the results were not to become obvious for about three years. Prior to 1932 the Navy had always used a plain Kingsbury bearing to carry the propellant thrust on its ships, but at that time Timken prevailed upon the Navy to test its bearing. Selected for the test was one of four 24,000 horse power screws of a large cruiser; the results of this performance, again, were not immediately helpful to Timken. 11 Despite these attempts to diversify its markets and stave off the effects of the depression, the company, for the first time in its history, lost money in 1932. 12 In that year the normal three-year periodic slump in motor vehicle

11 The State of the Company, No. 6, April 28, 1946.
12 L.M. Elinedinst.
purchases and a decrease of forty-four percent under 1931 in the foreign market probably affected Timken sales for the period. It was, perhaps, no coincidence, but an underlying factor, that steel workers rose in that year to assert themselves noticeably for the first time on a nation-wide basis, a situation which seems to have involved Timken, as did the passage of the Norris LaGuardia Act of 1932 and the National Industrial Recovery Act of 1933. The former act, approved by Herbert Hoover as an anti-injunction law, was generally hailed as the most important victory in the history of the organized labor movement. The short-lived N.R.A. gave labor the right to organize and bargain collectively, and established maximum hours and minimum rates of pay. Several minor strikes at Timken from 1932 on showed labor's efforts to enhance its position on the strength of the foregoing legislation.

The year 1935 saw an increased production of automobiles and trucks, a substantial gain over 1934; also, in November of 1935, three months ahead of schedule, the 1936 models of pleasure cars appeared on the market. This gave the Timken Company a better than average year, aided by increased operations in farming, mining, milling and contracting equipment. Sales efforts in the early part of the depression were now being realized in the

development of additional points of installation in industrial machinery made possible by essential industrial improvement. A Timken sideline sprang up in 1937 when Fuel Injection Equipment was produced to help satisfy a rising market in fitting fuel oil burning engines with high speed fuel pumps.

The New Deal program had given special favors to organized labor, but by 1935 the Supreme Court had declared unconstitutional nearly all of the N.R.A.; in the same year Congress passed the National Labor Relations Act making collective bargaining generally mandatory on employers and employees. The National Labor Relations Board was created to help enforce the act, while various other congressional acts tightened the hold of organized labor on the processes of industrial bargaining.

When Franklin D. Roosevelt was inaugurated for the second term on January 20, 1936 - the date as fixed by the Twentieth Amendment - the depression was by no means mastered, for national business was still far below the peak of 1928. Since the growth of the Timken Company paralleled that of general industry one would not expect the firm to make great strides during this period. In September of 1937 another crisis overtook the country, despite domestic

15 Extremely fine machining produced tolerance limits of fifty millionths of an inch and pressures up to 10,000 pounds per square inch. A Trip Through the Timken Plants.
pump-priming. This time unemployment increased with unprecedented swiftness, relief rolls expanded and the national debt mounted.\textsuperscript{17} By 1938 Europe was engulfed in war, and the President, expressing the opinion that the dangers of war were drawing closer to the United States, called upon Congress for an extra appropriation for the Navy.\textsuperscript{18} Timken bearings had been accepted by the Navy as standard equipment by this time.\textsuperscript{19}

Every branch of economy – agriculture, industry, and labor – were affected by the European war as the Allies requested more and more aid from Uncle Sam. Then came the Japanese attack at Pearl Harbor on December 7, 1941. Nearly every manufacturing plant which was adaptable to war production was wholly or partially shifted from the making of civilian goods to the production of war materials. Billions of dollars were expended in the construction of gigantic new plants, and millions of men were transferred from all kinds of occupations to war industries or other work deemed essential to war efforts. The United States became the "arsenal of the democracies" as Roosevelt phrased it. This global war, in which American private industry played such a great part, made World War I look like an episode. It is true that the battlefields in American industry were never so stirring as those overseas, but sometimes they were

\textsuperscript{17}Ibid., 460.
\textsuperscript{18}Ibid., 465.
\textsuperscript{19}\textit{The State of the Company}, No. 6, April 28, 1946.
equally as difficult. The spirit and enthusiasm of the men and women behind the lathes, the presses, and the cranes showed a remarkable patriotic fervor for the American way of life. Timken at war is a story not only of machines and of materials, but even more—of men and women and their achievements.

As early as August, 1939, the Timken Company, foreseeing the subsequent demand for its products, planned a three-shift, four-crew system to keep its factories operating twenty-four hours a day, seven days a week. As one department after another went on the full-time schedule, the concern inaugurated an expansion program under which more than seven million dollars were spent during 1938 and 1939 at the company's plants at five Ohio communities. This helped to supply the constantly mounting demand for anti-friction bearings required in the operation of machine tools, steel mill machinery, guns, tanks, and airplanes. At the same time the company's electric furnace steel-making capacity had been doubled, with the output going to a wide variety of defense industries. In addition to this outright expansion program, Timken boosted its capacity for war production by the conversion of machinery formerly used to supply peacetime customers, particularly the automobile industry which, in normal times, according to a Standard and Poor's Corporation estimate, accounted for fifty-five percent of the company's sales.20

Except in its office staff and in its inspection forces Timken had not employed women since World War I; but by the end of 1939 they again were sought eagerly, being put to work on many machines which did not require heavy manual effort, but swiftness and accuracy. Women also went to work as blueprint operators and photostaters. Canton, with its 125,000 population, had other large plants such as Republic Steel, Hercules Motors, Hoover Sweeper, and Diebold Safe and Lock competing with Timken for labor. Therefore, it became necessary to turn to former employees, men in the sixties and seventies, many of whom had retired but who now responded loyally. Jobs were given according to physical capabilities. By 1940 military conscription had become the law of the land and Timken had begun to lose its younger men. The Selective Service Acts of 1940, 1941, and 1942 provided for armed forces numbering two or three times the four million men raised for the War of 1917–18. "Before the close of 1943 approximately 8,700,000 men had been enlisted—withdrawn from farms, industries, shops, mines, offices, college halls, and from all the professions—deranging the course of economy and social practices."²¹ Doctors were taken into the service and as a consequence many hospitals and communities were left without adequate medical services. Thousands of teachers left their school-rooms to join the service or engage in war production.

²¹Beard, op. cit., 473.
In order to release more men to the fighting fronts and to aid in the military and naval administration thousands of women were given disciplinary instruction and sent overseas to render various services under military order. Before 1944 ended 5,268 Timken men had joined the services, and of this number fifty-one lost their lives. Also by this time the hiring of women as replacements was accelerated.

Timken's plant at Columbus, Ohio, had some twenty-five hundred employees. It lacked a steel mill of its own, but it made roller bearings from raw materials to finished units. The plant was expanded at government expense by taking over the empty lot on Cleveland Avenue. The government not only built the new Timken shop, but also tooled it. Both plants were then operated as one, and another twenty-five hundred men and women were employed, although it was not until October, 1943, that this second plant was put into full operation. In 1941 the output of steel billets at the Wooster tube mill was doubled by the installation of a new rotary-hearth furnace. The furnace proved its worth to the extent that the Timken Gambrinus plant was equipped with a larger model than the fifteen tons-an-hour one at Wooster. Not only did these installations raise the quality of steel and the production speeds, but each furnace required only one operator instead of the six needed to operate the old furnace.

22Hungerford, op.cit., 13.
Near Canton was the huge plant at Gambrinus which had been erected by H.H. Timken about ten years prior to his death in 1940, when he found the Canton factory too small for operations. Prior to the war the company had three hundred acres of land available at Gambrinus, and upon these they had begun the construction of a modern plant, the further development of which at the outbreak of the war was somewhat hampered by the war-imposed labor shortage in Canton; consequently workers from a thirty to forty mile radius commuted daily to keep production going. The Experimental Department was replaced in October, 1943, by a new Division of Research and Development. This was announced only recently, having been kept secret during the war. All work of the division is fully tested as to productivity, tolerance, rates of production and other factors before being accepted as part of the regular plant production. Also, final checks and tests on new methods of producing bearings at lower costs are made at the temporarily installed plant at the little village of Zoarville in Tuscarawas County, Ohio. Primarily interested in bearing development, the division also conducts tests for Timken steel mills.

Timken kept in close contact with the Army and the Navy during the war. Immediately following the Pearl Harbor disaster the War Department contacted the Timken Company on the subject of bearings urgently needed for the 90 millimeter anti-aircraft and dual purpose guns. It seems that Timken

<ref>The Timken Trading Post, May, 1946.</ref>
sales-engineers had previously tried to sell tapered roller bearings to the Army Ordnance Department, but the war came before a transaction could be consummated. Not having time to convert to the use of roller bearings, the Army concentrated on increasing the production of ball bearings and approached Timken on that basis. Since the Canton plant required little retooling a contract was let by which priority machinery and parts could be obtained by direct association with the Washington Ordnance Department and the Watertown Arsenal. Nine days after Pearl Harbor work was begun, work requiring great exactness and close tolerances to meet Army standards. Timken developed a steel cage to replace the less sturdy bronze ones in use, for bronze was then a scarce alloy. Peak production reached two hundred fifty ball bearing sets a month, but when defensive war became offensive war the Army cancelled the contract — after 1,845 sets had rolled off the assembly lines. The Army then needed other materiel and again Timken began retooling.24

The company officers conferred frequently with Colonel H.J. Reedal, commanding the field office of the Army's Ordnance Department at Cleveland and whose jurisdiction extended over Canton. In 1941 Colonel Reedal was eager to secure small shot immediately, and Timken found it possible to re-open a small plant for that purpose on Savannah Avenue in Canton. Light machines were installed and women were employed to operate the plant. A section of the seamless tube

24Hungerford, op.cit., 84-85,87.
plant was converted to the manufacture of gun barrels, a wholly new method which easily passed Army tests and speeded up that type of ordnance production. These seamless tubing barrels, suggested to skeptical ordnance personnel by Timken, were proof tested at Camp Perry, Ohio, where they held true for seven thousand rounds instead of the normal few hundred. 25 By April 1, 1942, the firm had a plant capable of making six thousand gun barrels a month in the 37-, 40-, and 75mm. sizes from seamless tubing at a rate one thirty-sixth of the old forging method. The government paid Timken a little more than thirty cents per barrel. Before the two year contract expired in April, 1944, some 80,000 gun barrels had been produced and the firm had collected a fee of $27,000 from the entire transaction. There was an additional contract made in the spring of 1945 which raised this total to over 100,000 barrels. Another special order put Timken to work on fifty by sixty inch thrust bearings for the 240mm. howitzer, one of the largest Timken bearings. Beginning at twelve sets a month, additional demand necessitated continuous production rates of thirty-five sets a month. 26 This was a big part of Timken's contribution to the winning of the war.

Timken's piercing mill at Wooster and rock bit plant at Mt. Vernon proved to company officials the high degree of efficiency in workers in those small communities and rural

25 Ibid., 16-19.
26 Ibid., 100.
areas, a leading factor in the wartime erection of finishing plants at Newton Falls and Zanesville, Ohio. The former, on the Baltimore and Ohio Railroad main line and the Cleveland branch of the Pennsylvania road, a quiet little town of about three thousand people, held an unused steel mill which Timken put into operation on a full time schedule, employing five or six hundred men to finish materials sent from the Canton plant. Zanesville, on the Muskingum River, was primarily a pottery-making city. Three local garages were pressed into operation as Timken units where seven hundred and fifty men and women, many of whom had once worked at a declining and non-essential pottery industry, now worked eight hour shifts through the week. 27

In the summer of 1944 serious trouble developed in the B-29; the tremendous vibration generated and the excessive heat developed by the B-29 flying at high speed burned off a certain small part of its mechanism. Because the metal used in that part could not withstand the heat and vibration thirty-five of the planes were grounded. Army engineers secured, in an unhoped-for short time of nine days, the urgently needed small order of seamless steel tubing which Timken was able to produce on such short notice. 28

In 1940 experiments were begun by a former flier in the Kaiser's World War I air force, Martin Fleischmann, now a brilliant young metallurgist developing an entirely new
type of steel in the Timken laboratories. Containing a mere fifty percent of iron, the new alloy steel was able to withstand successfully tremendous speeds and temperatures to 1,500 degrees Fahrenheit without losing its form or strength. These qualities were ideal for use in high-speed turbine wheels of airplane superchargers and gas turbine engines, whereby altitudes exceeding 40,000 feet became common in World War II air battles. The recently developed Super Steel, as it was named, was produced at a rate of over a half million pounds a month for the manufacture of 14,000 supercharger wheels each month. Although this Super Steel came at the right moment for the aerial warfare, it has its peacetime uses in gas turbine engines on railroads, highways, airways, and waterways, reducing space-consuming engines to a few fan-like wheels driving propeller shafts.29

A valuable ally in Timken's war production was the modern Graphitic Steel, the development of which in 1927 we mentioned previously. With its non-scoring, non-scuffing properties, strong wear resistance and low alloy content made Graphitic Steel of great worth in the general war effort. It went directly into the manufacture of gun parts, such as breech block cams for 37mm. pieces, cam rollers for the 75mm. and locating cams for the 50mm. guns. Still another Timken alloy steel, known merely as SAE 52100, proved its worth during the war as a leading material sold to the manufacturers of ball bearings, a rather strange, but profitable, 29Ibid., 37-50.
diversion for the large roller bearing producer.

To meet the wartime emergency for annealing facilities it became necessary for Timken to turn to the United States Quarry and Tile Company near East Sparta, Ohio. After a little planning, the tunnel ceramic furnaces, many of which had been standing idle, were utilized in annealing steel for Timken as early as June, 1942. By the following year U. S. Quarry had turned out 3,800 tons a month for the Canton plant, while by mid-summer of 1944 its total was well over 75,000 tons. Double benefits were wrought in this instance, for the small East Sparta plant had aided in saving time and Timken had not found it essential to expend money for more new furnaces. 30

Due to the type of alloy steels which Timken was producing for wartime needs, much of the scrap obtainable from nationwide scrap drives was not usable. Nearly 80,000 tons of ingot and sheet bar steel were purchased from May 14, 1942, to October 28, 1943, from the Empire Sheet and Tin Plate Company of Mansfield, Ohio, for more than a million dollars more than scrap of that kind would have cost during prewar days.

The British office of Timken was approached one month before Pearl Harbor by the Rolls Royce Company and requested to produce ten thousand new tapered roller bearings for Rotol Air Screws, Ltd., of Gloucester. The following January American Timken received a contract not from Rolls

30Ibid., 71.
Royce but from Wright Field and the Army Air Forces to produce a like number of bearings at $65 per unit. After producing 2,922 bearings at that price the company was able to reduce the price to $45 on the remaining units, thereby saving the government $141,560. When the original contract was completed in October, 1943, a second order was placed by the Treasury Department for Rolls Royce for 20,000 bearings at the rate of three hundred sets a week. However, British Timken was in a better position to make more of the bearings, and 5,000 were turned over to them by the American plant. A saving of $225,000 to the government this time showed that Timken, as well as most American private industries, had adjusted itself to changing conditions. 31

Timken's other foreign associate, the French Timken Company of Paris, established in the days of the first World War, was unproductive for the Allies after the fall of Paris in 1940. However, in 1945 the plant was returned with only a very few machines sabotaged, and in good physical and financial condition. The most recent addition to Timken's foreign representatives is the plant almost completed at St. Thomas, Ontario, Canada, which should begin production in the late summer of 1946. This is the second Canadian plant; the first was established at Walkerville, Ontario, in 1922. These plants serve a three-fold purpose in serving Canadian trade, saving duties on trans-border shipments, 31

Ibid., 93-94.

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and furthering Canadian patriotism.\textsuperscript{32}

The Timken Company Management, as early as September of 1940, decided that its service department should initiate a program to educate Army personnel in the application, maintenance, and repair of equipment fitted with anti-friction bearings. Several of the firm's executives went to Fort Knox, Kentucky, where they conferred with the chief officers of the Armored Forces Board concerning their plan. It was decided that service engineers from the Canton plant would publish a service manual of bearings and participate in Army Service School programs to that end. With this educational program in full swing by 1941, it was soon suggested that material on charts and lantern slides would better serve the program in the form of a motion picture. Temporary studios were erected in Canton where many of the assembly and disassembly processes were filmed under supervision of the General Broadcasting Company and six Timken service engineers. When all the units had been photographed the combined staff moved to Fort Knox where open air shots were taken of army vehicles at work. This forty-five minute sound picture entitled "Keep 'Em Rolling," after being cut into a series of short films, received distribution among army camps and schools.\textsuperscript{33}

As resources were mobilized in the battle for democracy during World War II, it was demonstrated that America

\textsuperscript{32}Annual Report, 1922; L.M. Klinedinst.\textsuperscript{33}Hungerford, \textit{op.cit.}, 105-109.
was a nation on wheels. The Timken Roller Bearing Company has emphasized through its slogan, "Wherever wheels and shafts turn," the widespread uses for its bearings. The firm for some time has maintained an active advertising department which conducts extensive campaigns through practically all advertising outlets—national magazines, trade and technical papers, direct mail, and outdoor advertising. The company has spent about $40,000,000 in order to make the trademark "Timken" a familiar household word throughout the world. Timken estimates that hundreds of thousands of reader impressions lead to sales of all kinds of products in which Timken bearings, alloy steels and seamless steel tubing are used. Besides advertising in leading national magazines, such as The Saturday Evening Post, Newsweek, Nation's Business, Holiday, United States News, Business Week, Wall Street Journal, Chicago Journal of Commerce, and the Detroit Athletic Club News, their schedule includes two hundred and two trade and technical publications.

On January 17, 1946, representatives of French and British steel plants visited the Timken Canton bearing plant and steel mill to observe the vast amount of machinery and the methods used for handling steel and bearings. Executives of British Timken, Ltd., the association which

34L.M. Klinedinst.
35Based upon information from Timken Public Relations Office.
handles Timken interests in England, visited the Canton plant in May, 1946, to study new production methods and exchange ideas with the Ohio personnel on technological advances during the past few years. 36 During the visit, J.P. Moriarty, only Timken veteran to be blinded in the war, demonstrated the electronic sound gauge which was developed by company engineers and made public only one year before. 37 During the summer of 1946 seven Latin-American highway directors and chief engineers visited the bearing factory. Nations represented were Guatemala, El Salvador, Costa Rica, and Bolivia. These exchange visits between America and other countries of the world tend to familiarize other countries with our methods and improvements as well as to give our industrialists and engineers an idea of current foreign developments.

The most recent item of interest concerning the Timken Company is a United States cartel suit against the firm. The company has been accused of entering into a cartel agreement to control world markets in bearings. Similar civil suits have been filed against SKF Industries, Incorporated; Aktiebolaget Svenska Kullagerfabriken of Gothenberg, Sweden; and Norma-Hoffman Bearings Corporation of Stamford, Connecticut. Wendell Berge, assistant attorney general in charge of the anti-trust division, said the complaint against Timken "Charges a conspiracy with

36The Trading Post, Feb., 1946.
37Ibid., June, 1946.
British Timken, Ltd., of Birmingham, England, and Société Anonyme Francaise Timken of Paris, France, to divide world markets and fix prices." As the result of an agreement the American company has been forbidden to export to territories allocated to British and French companies except at prices about sixty-five percent higher than the regular export prices. The effect of the cartel has prevented Timken from exporting bearings despite the demand for lower priced American-made bearings. It is necessary to put an end to these cartel restrictions which limit American production and employment and also deprive the rest of the world of America's cheaper mass-produced bearings.38 At the completion of this manuscript the cartel case had not been settled.

38 The Canton Repository, July 31, 1946.
CHAPTER III

THE TECHNICAL BACKGROUND OF TIMKEN DEVELOPMENT

No really comprehensive view can be obtained of any manufacturing concern without some understanding of the technical aspects of its product; the concrete picture of a firm's success lies in the necessity for and the function of its product, together with the resultant design and the test of performance. Timken's role in the development of modern anti-friction bearings centers around its leading achievement, the tapered roller bearing. First, however, we should note that anti-friction bearings are to be differentiated from "plain" bearings which are merely cylinders of metal different in composition (usually of softer material) from that of the shafts which they support.\(^1\) Historically, the first radial bearings were found on ox carts with solid wooden wheels. When war became big business and horse-drawn chariots came into use, metal lined bearings became necessary. This was about 1100 B.C., at the time of the Trojan War; during the Middle Ages there was a set-back in bearing development to wooden bearings, but about the beginning of the Fifteenth Century there came a renewed development in engineering with the result that iron plain bearings and very crude roller bearings appeared on the scene.\(^2\) Man first felt the effectiveness

\(^{1}\) Anti-Friction Bearings, 4.

\(^{2}\) William M. Corse, Bearing Metals and Bearings, 13.
of the anti-friction devices in force when he began using a machine which he personally powered, instead of the animal or fuel which heretofore had supplied the motivation. It was the advent of the bicycle in the 1890's which brought home to man the real need for good bearings to reduce the effort required to roll wheels and axles. So the bicycle bearings were readily accepted at face value by many; then came the roller skating pastime in that same time period which played its part in accelerating the progress of the anti-friction bearing. And so it was that bearings of the anti-friction type were fast gaining approval when the automobile gave man his real chance to apply the new bearing devices extensively. ³

Anti-friction bearings consist of a circular group of steel rollers or balls revolving between two circular raceways. Today there are five leading types of anti-friction bearings (shown in Figure 1): (1) tapered roller bearings, (2) straight roller bearings, (3) cup-and-cone ball bearings, (4) annular ball bearings, and (5) ball thrust bearings. ⁴ Such bearings commonly have four principal parts, illustrated here. The final test of performance of any anti-friction bearing depends upon the way in which the principal elements are designed and assembled. The inventors of the Timken bearing found, through their experimentation

³ Anti-Friction Bearing Manufacturers' Association, pamphlet, Jan. 1, 1936.
⁴ Anti-Friction Bearings, 4.
FIGURE 1.

Cup-and-Cone Ball Bearing

Annular Ball Bearing

Ball Thrust Bearing

Straight Roller Bearing

Tapered Roller Bearing

Cup

Cage

Cone

Rollers

Four Principal Parts of the Tapered Roller Bearing
and research, that many of the existing bearings were of a single purpose variety. This meant that the bearings were designed to support either radial (vertical) loads or thrust loads (loads from the side), but that they were incapable of carrying the two loads simultaneously.

These facts gave the Timken inventors their goal: a bearing of dual capacity; for, in actual everyday work, the loads are seldom wholly radial or wholly thrust, but an ever-varying combination of the two, called an "angular" load. Two bearings, one for thrust and one for radial loads would suffice, but would be more expensive, more complicated, and have more parts subject to wear than would a single dual-purpose bearing. In the course of development the straight roller bearing came into use, with thrust washers to carry the thrust load. However, careful investigation proved that the average force is applied at a slanting angle and cannot be taken equitably by either straight rollers or thrust washers. The Timken Company evolved a tapered roller bearing which would sustain loads imposed from varying directions. Figure 2 graphically illustrates the design principle and comparative resistance to normal forces of competitive bearings. This constitutes one of the Timken sales-engineers' leading arguments. Beginning with a bearing adapted to carriage axles, the Timkens improved upon their original design many times, a synopsis of which will

5Ibid., 6-7.
FIGURE 2.

DESIGN PRINCIPLES of the Timken Tapered Roller Bearing

How "true rolling motion" is obtained.

Two point contact of rollers with cone.

COMPARATIVE LOAD RESISTANCE OF VARIOUS TYPES OF BEARINGS

A tapered roller bearing can take a thrust load; -

A straight roller bearing cannot take a thrust load.

A tapered roller bearing can take a full radial load: -

Cup-and-cone ball bearings can take both radial and thrust loads, but the radial load is lessened to give thrust support.

A tapered roller bearing can take a full thrust load:

Annular ball bearings take full radial load but a small thrust load.

Resultants of all load forces meet at center of tapered roll:

Ball thrust bearings take thrust loads only.
be given later. During the process of development Timken engineers found that to meet the needs of industry for a rugged bearing the steel going into its manufacture must be minutely analyzed previously and the metallurgical structure carefully controlled during processes of machining and assembly. Tests further proved that bearing cups, cones and rollers require a hardened outer surface over a tough elastic core. On these premises the Timken Company erected its first electric furnace in 1915 to control to a greater extent the quality of its steel as well as to assure it a steady flow of bearing material.

The story of the Timken Roller Bearing follows generally the sketch given here. As has been stated before, early bearings were designed for the wagon and carriage trade and, consequently, did not have to withstand the sudden impacts, high speeds, and long periods of operation which later confronted bearing designers. In Figure 3 note that the bearing consisted merely of rollers with no cage or retainer to hold them in constant alignment. The alignment of rollers was accomplished by two grooves cut into the rollers, engaged by mating ridges on the cone. This bearing was mounted in the hubs of horse-drawn vehicles. Another early design for carriage wheels is pictured in Figure 4. Here the ridges on the cone are

6 Ibid., 14.
7 42 Years of Engineering Development and Experience, 9.
spread farther apart and increased in size. Rollers had pintles on each end to prevent skewing of the rollers. Two sizes of rollers were used, the larger to carry the load and the smaller to separate the larger rollers. The cup for this bearing was formed in the wheel hub.\(^8\)

A built-up cage with end rings distinguished the next bearing, Figure 5, from those before. Outside cups or raceways were first introduced on this bearing, heralding its adoption in the new horseless carriage. Contact of the roller ends with the ribs on the cone was in a straight line.\(^9\) The influence of the automobile was beginning to be felt quite strongly, for the next design, with a one-piece pressed steel cage to eliminate the roller pintles, permitted higher speed operation through a reduction of friction, with a consequent lengthening of the life of the bearing.\(^10\) Figure 6 shows a more compact unit which could be mounted in a smaller space, thereby enabling engineers to include it in more positions in the then publicly approved automobiles, trucks and tractors. Wings on the cage guided and aligned the rollers.\(^11\) Later the flanges on the ends of the cage and along the rollers were eliminated to simplify design, Figure 7, and still further experience and research made it possible to remove the nib from the small end of the

\(^{8}\)Ibid., 11.  
\(^{9}\)Ibid., 13.  
\(^{10}\)Ibid., 15.  
\(^{11}\)Ibid., 17.  

-42-
roller, thus reducing the width, weight and cost without decreasing carrying capacity.\textsuperscript{12} This brings us to the Timken Tapered Roller Bearing of today, a series of tapered steel rollers operating between tapered raceways, and separated by a cage which serves only to space the rollers perfectly, Figure 8.\textsuperscript{13} All lines projected from the tapered surfaces of the integral parts of the bearing meet at a common apex on the axis of the bearing to produce what is termed "true rolling motion."\textsuperscript{14}

Making bearings ranging in size from three-fourths of an inch to those seventy-two inches in outside diameter and weighing four tons, the Timken Company prides itself in being the only such concern to control its product from the making of the steel to the finished bearing.\textsuperscript{15} We have mentioned typical consumers of Timken bearings: namely, the automotive, railroad, mining and general industrial companies; but some of these deserve discussion in a little more detail. The Railway Division of the Timken Roller Bearing Company has been active for some time in demonstrating the advantages of roller bearings in locomotive, passenger and freight car operation. The real beginning of this field of promotion was in 1929–30 with the construction of the world's first completely equipped Roller Bearing Locomotive at a cost of $150,000. Tested on fourteen railroads from coast to coast.}

\textsuperscript{13}Tbid., 24-27. 
\textsuperscript{14}Anti-Friction Bearings, 9. 
\textsuperscript{15}L.M. Klinedinst.
to coast, the unit was purchased from the Timken Company in 1933 and is still operated by the Northern Pacific Railway Company. An experimental train of one hundred cars was later built to demonstrate the adaptation of roller bearings. An example of increased performance through the use of Timken bearings is found in the 1944 service records of the Rock Island Lines. Of the 1,702,500 miles in freight service made in September, 1944, 456,000 miles were made with its seventy-four engines equipped with Timken Roller Bearings; these same engines did more than a third of the total work of the railroad's five hundred and fourteen engines.

It was necessary to turn the tires on the locomotives after eighty to one hundred thousand miles when Timken bearings were used, instead of the usual forty thousand miles with old style bearings. Today, for the first time in American railroad history, all new locomotives and passenger cars will ride the rails on roller bearings to prevent the nuisance of "hot boxes" on rail car axles and to reduce vibration. According to the Anti-Friction Bearing Manufacturers Association, roller bearings reduce resistance eighty-eight percent and lower locomotive costs by as much as two hundred percent through eliminating hot boxes and reducing frequent oiling and inspection, no longer requiring a safety limit. The Timken Company will produce about seventy-five

17 Hungerford, op. cit., 120.
percent of these bearings, it has been estimated.\textsuperscript{18}

The common vehicles of highway and railway do not con-
sume all of the output of Timken bearings. The machine

tool industry, with its countless heavy-duty spindles, is

about ninety-five percent Timken equipped. The rolling

mills of the steel industry, the more than 2,400,000

roller bearings in mine cars, and the wheel bearings and

rocker arms of airplanes and engines are additional mar-

kets for the tapered roller bearing. In modern power

drive assemblies; in the paper, oil, and road building in-
dustries; wherever one finds tractors, farm implements,

air compressors, quarry cars, belt conveyors, stokers,

logging and marine and power transmission equipment -

these are some of the current applications of the old
carriage bearing evolved to a modern precision manufactured

Timken bearing.\textsuperscript{19}

In the more than 30,000 different sizes, types and

specifications of bearings in service in millions of ma-

chines throughout the world, Timken, of course, is only

one of many producers. The tapered roller bearing has a
great many uses, but that is true of the other bearing
types also. By considering a few viewpoints of Timken

competitors we may grasp a more comprehensive picture of

the whole bearing industry and of the amount of advertis-
ing and selling it requires to keep any one of the bearing

\textsuperscript{18}The Canton Repository, July 14, 1940.

\textsuperscript{19}1942 Years of Engineering Development and Experience, 32-40.
concerns abreast of the market demands. A neighboring competitor, the Tyson Roller Bearing Corporation of Massillon, Ohio, makes a tapered roller bearing with no cage and a full complement of rollers; they claim a greater capacity and longer life with greater rigidity than can be obtained with a bearing using fewer rolls spaced by a cage. Tyson further claims better alignment through a four-point contact of the cone and large end of the roller, plus a superior grain flow in the steel of the cone produced by forging, as against the Timken cone made from seamless tubing. However, this firm also makes a cage type bearing almost identical with the Timken bearing for "regular duty." Tyson employs about three hundred persons and does not present so formidable a competition to Timken as might be expected.20

Hyatt Bearings Division of General Motors Corporation is, perhaps, one of the larger competitors of Timken. It concentrates on straight rollers, spaced by a cage, which are intended to carry only radial loads; bronze thrust washers are provided for the thrust loads. Hyatt makes a large variety of easily disassembled railroad bearings for which it, too, has a profitable market. It also manufactures a bearing having spirally wound strips of steel for flexible rollers.21 The Kaydon Engineering Corporation

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20 Tyson Engineering Data, 3-6.
sprang up in 1941 for war production of extra large size bearings, and this firm has continued into peacetime projects, producing tailor-made bearings of odd sizes and designs which can fill needs of industry which are not easily met by standard type bearings. Kaydon makes straight, spherical and taper roller bearings, as well as ball radial and thrust bearings. Because of its non-standard, non-mass production output Kaydon is able to compete with the larger bearing manufacturers on irregular sizes from four inch inside diameter to one hundred twenty inch outside diameter units. Thus, it may be observed that the anti-friction bearing industry is, indeed, made up of a large number of firms dealing with some thirty thousand types and sizes of bearings. In the industry Timken remains one of the few firms to concentrate upon one type of bearing on so large scale manufacture.

Today, Timken is also the leading producer of electric furnace steel, an enterprise started in 1915. Since then seven electric furnaces have been installed to produce 45,000 tons of ingots each month. These furnaces are of the Heroult arc type, basic lined, and consist of one one-ton, one 10-ton, two 25-ton, one 50-ton, one 90-ton, and one 100-ton capacity, the last named being the world's largest electric furnace. In addition, there are three open hearth furnaces of the oil-fired type.

The Steel and Tube Division of Timken is the world's largest producer of alloy steel mechanical tubing. Products of this division fall under the headings of steel bars and tubes. Bars, made from alloy, tool, or stainless steel, undergo more than two hundred analyses in the course of manufacture; such steels are used for forgings, machine parts, tools and dies. Another Timken development, Timken Graphitic Steels, contain finely divided particles of graphite, giving better machining quality and endurance to dies and gauges. Seamless tubing, made of either alloy, carbon, or stainless steel, finds its leading applications in the mechanical field where the material is machined to produce cylindrical parts. A typical use is in the making of both ball and roller bearings. Timken pressure tubing is the last of five products to be considered under this division. This is used to carry liquids or gases at high temperatures and pressures in steam power plants, oil refineries and chemical process plants. Stainless steel pressure tubing was developed for oil refineries about 1930 and now has international recognition. The Timken Purchasing Department spends about $200,000 daily keeping raw materials flowing into Timken furnaces. Chromium shipped from the Philippine Islands to refineries at Tacoma, Washington, finds its way into Timken as ferro-chromium alloy. It is met there by nickel from the Sudbury District of Canada, fluxes from Rosiclair, Illinois, and scrap from

automobile plants and wrecking yards in Detroit and throughout the country. In addition, pig iron, limestone, burnt lime, Texas fuel oil, and iron ore from the Mesaba Range in Minnesota are scheduled to arrive at the Timken plants at the same time, for such raw materials cannot be stored in quantity at the plants. 25

The Timken Detachable Rock Bit has been discussed in Chapter II, but the actual mechanical characteristics warrant more consideration. Figure 9 illustrates the finished rock bit, where it may be noted that the shoulder or junction of the bit with the drill stem takes the force of the hammer blow, protecting the threads which serve only to fasten the bit to the stem. A streamlined design, tapering from cutting edge to shoulders, allows cuttings to pass unobstructed along the sides of the drill stem, enabling easy removal of the steel from the hole. Manufacturing procedure includes a series of twenty steps involving selecting the steel, machining, annealing, boring, threading, grinding, inspecting, hardening, and final inspecting. Originally designed as a single use bit, it was lightly built. However, customers wanting to save the basic unit and threads began regrinding the bit; so Timken has been building a heavier bit, hardened deeper to withstand numerous regrindings. Frequently these bits are used five to eight times. The detachable bit can be mass-


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Deep Hardening

Non-Bottoming of Bit on Drill Stem

Shoulder Takes Force of Hammer

Streamlined Design
produced and controlled throughout its manufacture far better than can the cumbersome hollow drill steel with forged head. Furthermore, one set of hollow drill steels can suffice when cutting bits can be replaced on the job, saving costs, labor, and cluttering up of restricted working areas. The chief disadvantage with such large scale production is the restriction as to the types and sizes which can be made profitably. Careful experiments have given Timken engineers several designs which are adaptable to several drilling conditions, serving a wide variety of soft and hard rock mining, quarrying, and contracting. By equipping their distributors with special fitting and threading equipment Timken engineers have made it possible for customers to convert from the conventional forged drill steel to the detachable bit at a minimum of expense.²⁶

Timken laboratories are a finely developed section of the business upon which depends the quality of materials and workmanship. Chemical laboratories are employed to examine and test the steel for grain size, structure, strength, impact, hardness and non-metallic inclusions. More than 2,150 chemical analyses are made each day to check the composition of the steel output. The Physical Testing Laboratory was started about twenty years ago to determine the quality of workmanship when the materials are applied to actual working conditions. Fatigue tests show the life expectancy of bearings after countless other

²⁶Baker, loc.cit.
checks are made on the grain structure, machining, and stresses and strains. Timken has developed several testing devices in addition to standard laboratory equipment. Strains are observed by means of a photoelastic machine using polarized light or by use of the Electric Strain Gage to determine the magnitude of strains under loads. Small cracks and imperfections too fine for the naked eye to detect are registered through the use of a magnetic flux and iron powder (known as "The Magnaflux"); "Magni Glo" uses ultra violet light, and the supersonic tester employs high frequency sound waves to detect any imperfections. The world's largest axle testing machine determines the endurance limits of railroad axles under normal or extreme loads and speeds in the Timken laboratory. A profilograph magnifies surface variations from two thousand to five thousand times in an effort to prevent the passage of surface defects into consumer hands. By these and numerous other means Timken endeavors to control the manufacture of steel and bearings and to improve upon the quality and performance from time to time. Actual testing of consumer products with Timken bearing applications aids both the consumer and the plant in determining the best materials for the finished product.

27The State of the Company, No.5, April 21, 1946; A Trip Through the Timken Plants, 76-87.
CHAPTER IV
THE EMPLOYEE AT TIMKEN

No industrial nation of the world offers the rich variety and the rapid change afforded by the American scene. The most highly integrated industrial system in the world has developed in the United States, but the growth of organized labor has been slow in the past. The story of Timken must, of necessity, center around the worker, for only with available labor would the company have developed to the extent that it has. However, the Timken employee had never been affiliated with any national labor union until 1937, when the company recognized the then newly organized Committee of Industrial Organization as the representative of the employee for the purpose of collective bargaining.

At the turn of the century when the Timkens converted a section of their carriage shop in St. Louis into a small bearing department they employed only six men. The new enterprise proved successful and the Timkens, finding that their raw materials and markets were in the Midwest and the New England States, decided to migrate to Canton where between thirty and forty men were employed. As previously stated, it was in 1907 that the axle division was moved to the automotive center of Detroit. To meet the needs of the expanding company more and more employees were added to the payroll.
Until the advent of the C.I.O., only company unions existed at Timken plants, with the exception of the bricklayers who were then organized under the American Federation of Labor. According to company officials there were no labor problems until 1933, although union leaders state that problems did arise, but that there was not sufficient organization for these matters to be advantageously corrected.

The New Deal program favored organized labor which in turn supported Franklin D. Roosevelt for reelection. The National Industrial Recovery Administration of 1933, providing for collective bargaining between employers and employees, was declared unconstitutional by the Supreme Court in 1935. In the same year the Wagner Labor Relations Act, or the National Labor Relation Act, made collective bargaining generally mandatory on employers and employees. Thus, workers could form or join unions and deal through their elected representatives with their employers on matters of working conditions, hours and wages; the National Labor Relations Board enforced these provisions. When a split occurred in the A.F.L., the Congress of Industrial Organizations was formed under the leadership of John L. Lewis, head of the United Mine workers; both industrial and white-collar workers joined this group which encompassed many types of work other than the established crafts. Then Congress added the
Wages and Hours Act to fix standards in many industries and to bring up the minimum wage where it was especially low.¹

There were no strikes in the Timken Company until after the union contract was signed. Several minor strikes started after 1932, but no major labor disputes arose until October, 1945, at which time the firm encountered a thirty-three day strike.² The only previous work stoppage, of a week's duration, occurred in June, 1944, because of seniority grievances in the grinding department; 1,200 strikers then voted to return to work.³ The immediate causes of the thirty-three day walkout on October 15 were the suspension of a crew of ten inch-mill workers and a union allegation that the company was in violation of its company union contract in scheduling maintenance workers on Saturdays and Sundays. When the ten inch-mill workers refused to work shorthanded (three men instead of the usual five) they were suspended for one week by the company. The firm claimed that it was not unusual for a crew to work on a mill with two men short since this was done frequently during the war. The company maintained a labor gang before the war to fill in gaps, but it no longer had a pool of workmen and some crewmen from previous shifts were requested to remain for four additional hours.

¹Beard, op.cit., 458-459.
²L.M. Klinedinst.
³The Canton Repository, June 9, 1944.
The union had recently ordered a maximum forty hour work week for union members, but the company asserted that it had not violated the company union contract by setting up work schedules without first obtaining union consent. The union charged that despite Monday-through-Friday work schedules set up by the contract, Timken had arranged schedules so that some maintenance men could work on Saturdays and Sundays; while the company, in defending the disputed maintenance schedules, stated that they were not arbitrary and were the same as those in effect before the war when a forty hour work week did prevail. The Monday-through-Friday schedules left the plants over the weekend without millwrights, electricians, pipe fitters, and other maintenance employees. In some cases the only time to repair machinery was over the weekend when it was not in use; maintenance employees seemingly understood this and, according to the company, were willing to work more than the forty hours. The company admitted that its union contract called for a normal five day, eight hour schedule, but that it also permitted other schedules to be set up when the normal ones were not possible. 4

With the outbreak of this Timken strike, one-fourth of Canton's industrial workers were idle. Picketing of steel workers began without interference with the office employees. Finas Reynolds, president of the C.I.O.

4 Ibid., Oct., 6, 1945. -58-
Golden Lodge, a few days after the strike began, announced that the union had not filed grievances with the company as the first step towards settlement under the company-union contract procedure because Timken took the position that it would not recognize general grievances, and the union had no intention of filing individual grievances. When the company suspended the entire mill crew and when it revised work schedules without the union consent, Reynolds considered these as general grievances. On the other hand, the company asserted that only certain employees were affected by the two grievances and that their complaints should be taken through the four-step company-union grievance procedure.5 The four steps were as follows: the employee registered his grievance with his foreman, department superintendent, and department representative in turn, and if correction did not result he then took it to the grievance committee, and as a last resort, to the board of arbitration.6 Company officials stated repeatedly that they would not begin negotiating with the union officials unless the strike was called off and employees returned to their jobs. Union officials stated that they would not call off the strike until they reached an understanding with the company on the issues that led to the walkout. In countering a company statement that it had authority to set up work schedules

5Ibid., Oct.17, 1945.
61943 Agreement, 10-16.
without union consent because of an arbitrator's decision in a dispute at the Columbus Timken plant, Finas Reynolds asserted that the union had obtained a favorable decision from an arbiter in a ten inch-mill dispute in Canton in 1944. In the latter dispute, declared Reynolds, the arbiter ruled that employees did not have to work shorthanded; if the company expected the union to accept an arbiter's decision setting up a precedent, then the company should accept an arbiter's decision favorable to the union.7

As the strike entered its second week it spread to Columbus where union members walked out in apparent sympathy with the Canton unionists.8 To news reporters going through the plant the strike undoubtedly appeared tragic, as it did to William E. Umstattd, the company president. Nearly $50,000,000 worth of equipment lay idle as the unnatural silence filled the strikebound Canton plants for thirty-three days. About $3,000,000 worth of bearings were in the process of manufacture when the walkouts began; many of the bearings were greased or covered with large strips of oiled paper to protect them from moisture damage. Most of the machinery was oil coated. In the Dueber Avenue bearing factory a small number of men and women wrapped various sizes of bearings to protect them. Only one man remained at work to run machines that had to be in operation. Tens of thousands of bearings, in

7The Canton Repository, Oct.18, 1945.
various stages of manufacture when the strike began, were needed urgently by many manufacturers trying to get back into full peacetime production as quickly as possible.

In the melt shop on Harrison Avenue the largest electric furnace in the world was cold during the strike. Two days were needed to bring it up to heat slowly so the interior would not crack. The outside storage tanks, filled with white oil grinding compound, collected large amounts of sludge which could be removed only on Saturdays and Sundays. To keep up steam during the strike a small number of employees tended boilers and slept inside the plant. 

On October 25 the company president was prevented from entering the plant while a group of thirty World War II veterans were picketing. The purpose of using veterans as pickets, declared the union, was to demonstrate to regular pickets the support of returned veterans. One veteran, not knowing the identity of Umstattd, urged him not to enter the plant. Mr. Umstattd then ordered the office staff, which previously had not been annoyed by the pickets, to stay home and avoid danger of violence from mounting tension.

When a question arose over protection by the Canton Police Department to be given employees willing to work,

the mayor chose to accept only the decision of the Stark County Common Pleas Court, since both company and union disagreed upon who should enter, and the police could not form their own conclusions.\textsuperscript{11} The strike became an issue in the November election when Mayor Carl Klein and William Umstattd wrote public letters to each other. While the mayor proposed that the company should certify a list of employees whose presence at the plant was considered essential and that the C.I.O. should agree to pass such identified persons through the picket lines, Mr. Umstattd said, "the company would not, by agreement or otherwise, compromise the American principle of a man's right to work, nor would it discriminate among its employees by choosing names for such a list."\textsuperscript{12}

On October 31 the nine day sympathy strike at Columbus ended in response to a request from the international United Steel Workers officials. The Pittsburg international union office also reported that the Canton union was sent a message ordering striking unionists to return to work. However, the union denied ever having received any such message.

The union offered a three-condition proposal to the company as follows: there would be no reprisals against any employee of the company for participation in the strike unless a mutual agreement existed between the company and

\textsuperscript{11}Ibid.  
\textsuperscript{12}Ibid., Oct. 28, 1945.  
-62-
the union; all maintenance employees would work either forty or forty-eight hours a week, five or six consecutive days; full crews should be provided on all shifts in the ten inch-mill within two days after the employees returned to work, and if full crews were not provided the employee would have the privilege of discontinuing operations in the mill without being penalized. Umstattd, in commenting on his company's rejection of the union proposal, stated that the company position was unchanged and that they would carry issues that could not be settled satisfactorily by negotiation to arbitration for a final decision. In response to the union's proposal that there would be no reprisals against strikers, Mr. Umstattd said, "The union has penalized the men by keeping them out of the plants for three weeks and we certainly do not intend to penalize them further if they come back to work." 13

Four days before the strike ended a meeting of sixty Canton civic leaders was held at union request. The Reverend R.W. Blemker, pastor of the First Reformed Church, proposed a secret vote, while Reverend Oscar Mees, pastor of the Martin Luther Church, appealed to the union to give in, to show that it had the community's welfare at heart. He suggested that the employees return to work and then a company-union settlement would be reached, thus gaining favorable public opinion for the union. Rev. Mees pressed Finas Reynolds who admitted that only about one-half of the two

13 Ibid., Nov. 2, 1945.
thousand union members present at a mass meeting had participated in a hand vote. Reynolds stated that a hand vote was used because an amendment to a strike-ending proposal was defeated and he had no authority to order a secret ballot unless it was voted at a regular union meeting. Reynolds also admitted that of the half of the union members voting, at least one hundred forty had voted to call off the strike. One civic leader expressed his opinion that both sides were stubborn and stiffnecked. State Representative Ed. Witmer, long an A.F.L. leader, told the group of civic leaders that it would be easier for Timken to give in because Umstattd had authority to end the strike while no similar authority was enjoyed by union leaders.14

W.W. Powell, federal labor conciliator, met separately with each side several times during the strike. Finally, on November 12 Timken instructed the office force, plant superintendents, and foremen to return to work after being idle for eighteen to twenty-seven days. Some employees used stop-gap work at other plants and on farms in order to meet personal expenses during the strike. About 1,400 unemployment compensation claims were filed by idle Timken workers at the Ohio Bureau of Unemployment at Columbus, but these claims were disallowed because the

14 Ibid., Nov. 15, 1945. -64-
unemployment was caused by a labor dispute other than a lockout. The company attempted to pay its employees until payroll workers were prevented from entering the plant, after which the company made public the fact that it was willing to advance $15 a week to all employees for a period of four weeks as soon as operations were resumed. Returning workers could not draw their regular pay until the second Friday after the return to work. Some checks were mailed to bearing workers.

At the first two mass meetings unionists had voted by a show of hands to continue the strike. It seems probable that public opinion plus confidential meetings held between the federal conciliator and labor and company officials must have led to the secret ballot, because the thirty-three day old strike was called off by a vote of four to one. The secret vote came after a mass meeting at which only about one-half of those present voted, but the strike was ended, relieving a growing unrest in the city of Canton. Two weeks were required to return to normal operations. The bottoms had to be replaced in six electric furnaces.

Zanesville plants halted operation after November 8 due to shortages in material. They obtain unfinished bearings from Canton. The Newton Falls and Wooster plant operations were far below normal since they, too, receive

15 Ibid., Nov.10, 1945.  
16 Ibid., Nov.17, 1945.
much stock from the Canton plant. However, neither Columbus, with its nine day sympathy walkout, nor Mt. Vernon were seriously affected by the strike. It was estimated by A.M. Donze, Vice-President-in-Charge-of-Production, that the strike resulted in a payroll loss of nearly $2,000,000.17

Strikes threatened greater delays to reconversion at the outset of 1946 than had been caused by strikes at the end of 1945. The C.I.O. unions aimed for a greater share of the income from American industry. These strikes held up the production of automobiles, of key products in the building industry, and of various other items needed to step up the output of articles for which the public was hungry.18 On January 21 the Timken Company was once more strikebound in Canton and three other cities because the C.I.O. had called a nationwide steel strike. In an attempt to avert the work stoppage the company offered a 17.5 percent wage increase prior to January 11. This would have meant an approximate increase of $6,000,000 a year, an offer which was not accepted by the union. The United Steelworkers of America-C.I.O. countered with a proposal that Timken increase all wage rates twenty cents an hour with no difference between skilled and unskilled labor, experienced or inexperienced, a principle which Timken considered dangerous to the American economy.19

17 The Timken Trading Post, Nov., 1945.
18 The United States News, Jan. 11, 1946.
19 The Canton Repository, Jan. 15, 1946.
August 23, 1945, the company had offered union workers a ten percent boost in pay which was not accepted. However, salary and non-union workers received the benefit of the ten percent, and later, seven and a half percent increases. Two out of every three industrial workers in Canton were out of work when the nationwide steel strike opened. Timken offered a new contract, but it did not meet the union demand of twenty cents an hour. Benjamin Fairless, a native of Stark County and president of U.S. Steel, criticised President Truman's suggestion of eighteen and a half cents an hour retroactive to January 1. Fairless' argument was based upon the principle that if wages were increased steel prices would also mount, and this in turn would affect allied industries.

When the strike began on January 21, the 1943 contract between the company and the union was cancelled, with the company charging the union with violation of the no-strike pledge. The company and the union had met on January 12 but negotiations bogged down when the union insisted on an equal hourly increase, while the company held out for a strict percentage basis. The union claimed that a new company-union contract had been drawn up on December 5, but that the company had refused to sign it. Thus, with the outbreak of the strike the union insisted chiefly on

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21 Ibid., Jan. 21, 1946.
22 Ibid., Feb. 11, 1946.
an eighteen-and-a-half cents hourly increase retroactive to January 1 and the company's acceptance of the bargaining agreement of December. I.W. Abel, District Director for the union, was quoted in The Canton Repository on February 11 as having stated that the company and the union had agreed on all provisions of a new contract at a meeting held in December. The company asserted that there was no agreement between parties negotiating about a contract until the contract was actually executed and delivered. The company believed that there was no question of repudiation involved in the action taken by the company on December 17, because the week following December 5 there had been a meeting of the Wage and Policy Committee of the union in Pittsburgh. It was at this time that the union determined that there would be a strike, originally scheduled for January 14. The opinion of the union counsel was that the form of termination clause ordered by the War Labor Board made it feasible for the union to call a strike for a general wage increase without breaching the no-strike clause in the contract under discussion. At that time Timken was operating under the 1943 contract, which, according to the company, did not contain a termination clause in the form ordered by the War Labor Board on February 27, 1945, in proceedings involving only the U.S. Steel Corporation. Under these circumstances, the company

23Ibid., Feb.12, 1946. -68-
then told Mr. Abel on December 17 that it would not sign a contract containing a clause which the union could breach under an alleged claim of right.\textsuperscript{24}

When the strike had entered its fifty-second day, Phillip Murray, National President of the C.I.O., filed seven charges against Timken charging violations of the N.L.R. Act. Murray definitely believed that Timken wanted to crush the union,\textsuperscript{25} while the company, in referring to Mr. Murray, stated, "He accuses with abandon and recklessness. The Timken Roller Bearing Company is definitely not trying to break the Union."\textsuperscript{26} The union's complaint to the N.L.R.B. included charges that the Timken Company had gone over the heads of rightful bargaining representatives of employees in addressing the employees directly, had attracted strikebreakers by advertising an open shop, and had offered rewards against violence by pickets when there was no evidence of violence. The union insisted it had not broken a contract, as it had already expired. The $5,000 reward offered by Timken followed acts of violence on a public highway adjacent to the Gambrinus plant. Several assaults are on record from January 29 to February 20, and again on March 15.\textsuperscript{27}

On March 14, the second time since March 8, Mr. Reynolds received a petition for a special meeting of union members.

\textsuperscript{24}Ibid., Feb.17, 1946; Columbus Citizen, Feb.17, 1946.
\textsuperscript{25}The Canton Repository, March 14, 1946.
\textsuperscript{26}Ibid., March 15, 1946.
\textsuperscript{27}Ibid., March 14,15,16, 1946.
The petition, drawn up by twenty unionists, was ignored by Reynolds who termed it a "strikebreaking document" and "the first fruit of a well-planned campaign by the Timken Roller Bearing Company to destroy the Union and to break the spirit of members whose solidarity in this strike up to this point has not been broken." Reynolds continued, "The Union will not and cannot respond to an appeal from a group of people who are willing to place the destiny of the Union in the hands of the Timken Company." He disclosed that one of the four groups represented in the last appeal was led by an employee, Elmer C. Gruber, who was facing charges "preferred against him by his own fellow workmen for committing acts unbecoming a union member." J.J. Lennon, spokesman for a six-member group appealing March 4 to both the company and union negotiators to reach an agreement, claimed that the union's by-laws compelled the union leaders to call a special meeting when petitioned by ten members. It was Lennon's belief that the majority sentiment of the workers was to end the strike. Another signer, Paul R. Roach, stated that new leadership was needed for the union and "we will see that as soon as possible we will get new leadership." The general idea was to have a special meeting of only union members and use the secret ballot. Reynold's reaction to Lennon's request was that

\[28\text{Ibid., March 14, 1946.}\]

\[29\text{Ibid.}\]

\[30\text{Ibid.}\]
it was just another move by the firm to "sponsor a back-to-work movement by using as tools for that purpose union renegades and company stooges."31

In a telegram to David J. McDonald, Secretary-Treasurer of the United Steelworkers of America G.H. Turner, Supervisor of Labor Relations in the company, gave the conditions under which the company would bargain with the union.32 The union offered to resume work under the 1943 agreement.33 When the company rejected the union proposal on March 6, it made a counter-proposal calling for a reinstatement of the 1943 contract except for the union security provisions - the maintenance of union membership and the company's checkoff of union dues. These controversial issues had both been secured by the union during World War II from the War Labor Board in return for a no-strike pledge. In exchange for voluntary maintenance of union membership and dues checkoff Timken asked the C.I.O. to agree on penalties for strikers to insure them against a recurrence of work stoppages.34 The fifty-five day strike was terminated on March 16 after an agreement was reached during a two-hour meeting between company and union representatives. Work resumed under the 1943 contract and union security was maintained. Although the company had previously opposed this they now granted it.

31 Ibid.
33 Columbus Citizen, March 15, 1946.
34 The Canton Repository, March 16, 1946.
despite the fact that it had a contract with the A.F.L. for more than twenty-five years and had never been requested by that union to collect dues. This was the important issue in the strike. Employees returned to work on March 18.

The eight-week strike had brought a court injunction limiting picketing at the Columbus plants in addition to the Wooster, Gambrinus and Canton plants. The union halted two back-to-work movements at the Columbus plant; a similar move at Wooster was successful on February 21, and when the strike officially ended over seventy-five percent of the Wooster workers were on the job. A financial loss from operations of $991,541.43 for the six months ending June 30 showed the effects upon the company of the last strike.

While Southern Democrats and Republicans from the rural North in Congress, interested only in maintaining a low-wage economy, tried to save the nation from organized labor, the latter more than held its own in the bitter struggles of the reconversion period. At Timken labor won union security plus a wage boost which helped to offset the cost of living. The Nation believed that labor

35Columbus Citizen, March 12, 1946.
36The(Massillon)Evening Independent, March 7, 1946.
37The Canton Repository, March 17, 1946.
38Ibid.
39Ibid., August 7, 1946.
40New Republic, Feb. 11, 1946.
41The Nation, March 23, 1946.
"has repelled a vigorous and apparently well organized attempt on the part of management to take advantage of the readjustment period to undermine the strength of the unions." 42

As with any large manufacturing concern, the routine of employment and provision for employee welfare is a huge responsibility of management. The employee situation cannot be left with a mere labor grievance arrangement; there are plant safety and health rules, insurance benefits for the employee and his family, hospitalization funds, morale builders, and provisions for advancement and the use of ingenuity and initiative. The long story behind the Timken employee has taken forty-five years to develop, but a few of the more impressive provisions will give one a comprehensive picture of the whole. Timken's health departments begin their services to the employee when he takes his physical examination to insure him of work suited to his physical ability, and to insure other employees that contagious diseases are not being brought into the plant. Periodic checkups enable the company to stay current on the individual's health. Accident compensation is provided in accordance with the Ohio Workmen's Compensation Law; any personal injury is immediately reported when such is incurred during work periods in order to comply with the law as well as to give the injured

42 Ibid.
medical attention at the firm's hospitals and first aid stations.

All employees are insured through the Aetna Life Insurance Company. Prior to January, 1945, a contributory plan of group life insurance was used. In 1944 the Board of Directors approved a company-paid plan of Group Life, Sickness, and Accident Insurance which became effective January 1, 1945. The contributory plan, still in effect, insured on the basis of salaries and number of dependents of the insured. An average income of from $1800 to $3000 permitted insurance of $2500 at a cost of about $1.50 per month; this gave hospitalization for thirty or seventy day periods for dependents or employee, respectively, at rates of about five dollars a day.43

The new plan takes effect only upon the completion of three months continuous active service. This plan gives all employees a life insurance of $1500 and a weekly sickness and accident benefit of $15, the entire cost being paid by the Timken Company.44 The life insurance is payable in the event of death from any cause, at any time or place. The health plan covers hospitalization for a thirteen-week maximum period under any continuous period of disability; if the employee is over sixty years old he may not receive more than the thirteen-week benefit during

44Employees Group Insurance Plan.
any calendar year. Because of the large number of women employed, the company also has made provision for pregnancy confinement. Termination of employment leaves the employee with the option of losing his life insurance or converting it within a thirty-day period; accident and sickness policies terminate when the worker leaves the company.

The usual facilities of parking, cafeterias, rest rooms and refreshment dispensers are found throughout all Timken plants. A badge with serial number and photograph identifies each employee upon entering the plant and during the course of his duty hours. Because of the many skilled labor requirements at Timken plants, training is an important preliminary procedure. An apprentice training program is maintained for men between the ages of eighteen and twenty-one who desire to learn skilled trades; applicants are selected by qualification and undergo a probationary period, the successful completion of which entitles them to a four year apprentice program. Employees are advanced on the bases of ability, skill, and seniority. The highest standards of quality and service are encouraged constantly. A suggestion box system is employed which gives employees an opportunity to submit their ideas which follow the lines given here: increasing the production and improving the quality of Timken products; reducing production costs without
decreasing quality; improving equipment; improving manufacturing methods; eliminating waste of time or material; improving working conditions; and eliminating accident and fire hazard. Names are withheld until the best suggestions have been selected, and prizes are awarded on a monthly departmental as well as a yearly grand prize basis.45

Employees of the Timken Roller Bearing Company are affiliated with the C.I.O., exclusive of foremen or supervisors who spend more than seventy-five percent of their time in a supervisory capacity, watchmen, guards, factory clerks, general clerical workers, salaried employees and bricklayers. Bricklayers are associated with the A.F.L., while most of the rest are not affiliated with any of the large unions. Vacation time is allotted according to the length of employment, beginning with one week of vacation for the first year of employment, with an additional day for each additional year until a maximum of two weeks is accumulated.

The Timken Company has expanded greatly to reach a total of 18,000 employees and it is upon the business and inventive knowledge of its late founder, Henry H. Timken, Sr., that the great concern rests today.

45 Manual for Employees, 12.
CHAPTER V
HENRY H. TIMKEN

HIS CHARACTERISTICS AND CONTRIBUTIONS

The account of the early beginnings of the Timken Company has already given us some idea of the man who was largely responsible for its success. His ingenuity was early shown when he developed a new type of automobile and truck axle to help his company fight off a depression in 1904. Having no salesman in the field, he took to the road himself. Firmly established as a contributor to the automotive business, he soon branched into the alloy steel fields. With the expansion of the bearing and alloy steel business, Mr. Timken became less attached to the managerial duties of an executive and devoted more of his time to supervision of his entire plant; this soon led to supervision of the expanding company, not merely to the one large plant. He found that hard, conscientious work was the key to finding real opportunity and made that the basis for advancement of those in his employ.

"His responsibilities gave him little time for relaxation and for that reason he was looked upon by many as a reticent, hard-boiled, hard driving type of executive. To those who worked in close association with him and shared in the few pastimes which he allowed himself, he was gruff and all business while at work, but kindly,
considerate and congenial away from the plant."

His was an open mind for suggestions on changes in plant procedures, but he weighed each particle of information carefully, allowing it to slide through the channels of his remarkably retentive memory. This was, perhaps, an outgrowth of his legal training. He had a strong aversion to procrastination; his every movement and thought seemed to be born from orderliness. David B. Day, his attorney and close friend, tells of his exactness, his clear and deliberate thinking, and his quick grasp of the situation. Day said of him, "He could bring more concentrated thinking to bear on any subject than any man I have ever known. When he tackling a problem he seemed to be able to push everything else from his mind. This ability to center his attention and energy on one thing at a time to the exclusion of everything else, I believe, was an outstanding factor in his success in business."2 His ability to recall complicated formulas and data astounded engineers and chemists; business associates refreshed their memories from notes before resuming discussion with Mr. Timken.

At one time he was threatened by an anonymous person demanding a sum of $25,000. Mr. Timken personally placed the "sum" under a bridge as specified by the extortionist and waited for the man to pick up the dummy package. Police waiting near Mr. Timken caught the culprit who

1The Canton Repository, Oct. 14, 1940.
2Ibid.
proved to be a Timken employee of foreign birth who had become embittered over personal misfortunes. Mr. Timken interceded for him, but he was given a short prison sentence. During the prison term Timken looked after the man's family and gave his two sons employment; the father was recalled to the plant upon his release.

H.H., as he was generally known, was a generous contributor, though few people ever knew the magnitude of his gifts. He did not want publicity; in fact his closest associates still protect his confidences concerning his many benefactions to individual and public causes. After the first World War he gave a large meeting hall that the American Legion might strengthen its forces in the community. A $200,000 donation to the Canton park system was one of the public contributions. 3

His appearance impressed others with his aggressive action. He enjoyed outdoor life when he could find time away from the factories. Hunting, fishing, reading and an occasional sociable game of cards provided his chief forms of relaxation. Travelling was another one of his favorite avocations, but he had little time for it; he made several trips to Europe, usually combining business with little pleasure. Regardless of what he did, where he went, he seldom wholly shut himself away from business; he frequently received daily reports from his factories while on hunting or fishing trips. The plant's success

3 Information from Canton Chamber of Commerce.
meant so much to him that despite the fact that he had all the money one could wish for he would not retire.

His home on a fifty acre estate was always a quiet and well ordered home, seldom a place of social gatherings. After the business became well established he spent some of his summer vacations on Georgian Bay or at his lodge at Little Current, Ontario. Later he spent the winters near Palm Springs, California. At one period in his life he enjoyed quail hunting on 12,000 acres of land he purchased for hunting rights in Alabama, where Negro tenants looked forward to his annual visits when he would call them by name.

He took an active interest in the Republican Party and was a close friend of the Hardings. Though he contributed to campaign funds he never entered the political field.

In 1904 he married Edith Kitzmiller at Braddock, Pennsylvania; they made their home in Canton. Three sons, all Harvard graduates, followed their father in the business field. Sons Henry and William Robert are executives of the firm: Henry is director of the company and vice-president and general manager of the steel and tube division; Robert is assistant to the company president. Son John is a resident of New York and associated with the publishing house of G.P. Putnam and Sons.

H.H. Timken was chairman of the board of directors of the Timken Roller Bearing Company, former chairman of
the board of Hercules Motors Corporation of Canton, and a director of the Timken-Detroit Axle Company. He also served as director of the Louisiana Land and Exploration Company, as former director of the First National Bank and the First Trust and Savings Bank of Canton, and held many other directorates in business concerns in Canton and in California.

Following his death in 1940, his estate was formed, according to his wishes, into a Timken Foundation which carries on the charitable work which he started. Probably no better concrete memorial to him could exist than the Timken Vocational High School which he built before his death for the city of Canton. Characteristic of his thoroughness, he explored fifty-four leading cities for the best points in their schools which became incorporated in this great modern school. Built at a cost of over $1,250,000, the school accommodates more than 1,400 boys and girls in over twenty fields of vocational training.4

Typical of the generosity of the living Timken is the recent gift by the Timken Foundation to the Warren, Ohio, hospital of an oxygen tent, living memorial to the Timken Servicemen of World War II. Counterparts also have been installed recently at three plant hospitals.5

O.D. Foster, in writing the biography of Timken some years ago, stated: "Timken is absolutely a square shooter.

4 The Canton Chamber of Commerce.
5 The Timken Trading Post, June, July, 1946.
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Anything which bears his name must be the best that can be made. His ethics are high and his fetish is precision.\textsuperscript{6}

\textsuperscript{6}Forbes and Foster, \textit{op.cit.}, 263.
BIBLIOGRAPHY

I Government Publications


II Newspapers


The Columbus Citizen (Ohio). 1946.

The Evening Independent (Massillon, Ohio). 1946.


III Biographies


IV Histories, General and Special


V Company Materials

1943 Agreement. Golden Lodge 1123 of CIO, Canton, Ohio, 1943.

Anti-Friction Bearings. The Timken Roller Bearing Company, Canton, Ohio, 1941.


42 Years of Engineering Development and Experience. The Timken Roller Bearing Company, Canton, Ohio, 1940.


A Trip through the Timken Plants. The Timken Roller Bearing Company, Canton, Ohio, 1939.


Letter from Secretary, The Timken-Detroit Axle Company, Detroit, Michigan, 1946.


VI Materials from Competitors


Tyson Roller Bearing Corporation, Letter: Design Progress of Tapered Roller Bearings, 1939; Tyson Engineering Data, Massillon, Ohio, 1939

VII Conversations

Canton Chamber of Commerce, Canton, Ohio, 1946.


Reynolds, Finas, President of Golden Lodge, CIO, 1945.

VIII Periodicals

Baker, John B., "Ten Years of Detachable Bit Development," reprinted from The Mining Journal, Feb. 28, 1942


The New Republic, CXIV, No. 6, 174-175 (Feb. 11, 1946).

Newsweek, "Rolling Along to War," XIX, 44 (Jan. 26, 1942).


IX Miscellaneous


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