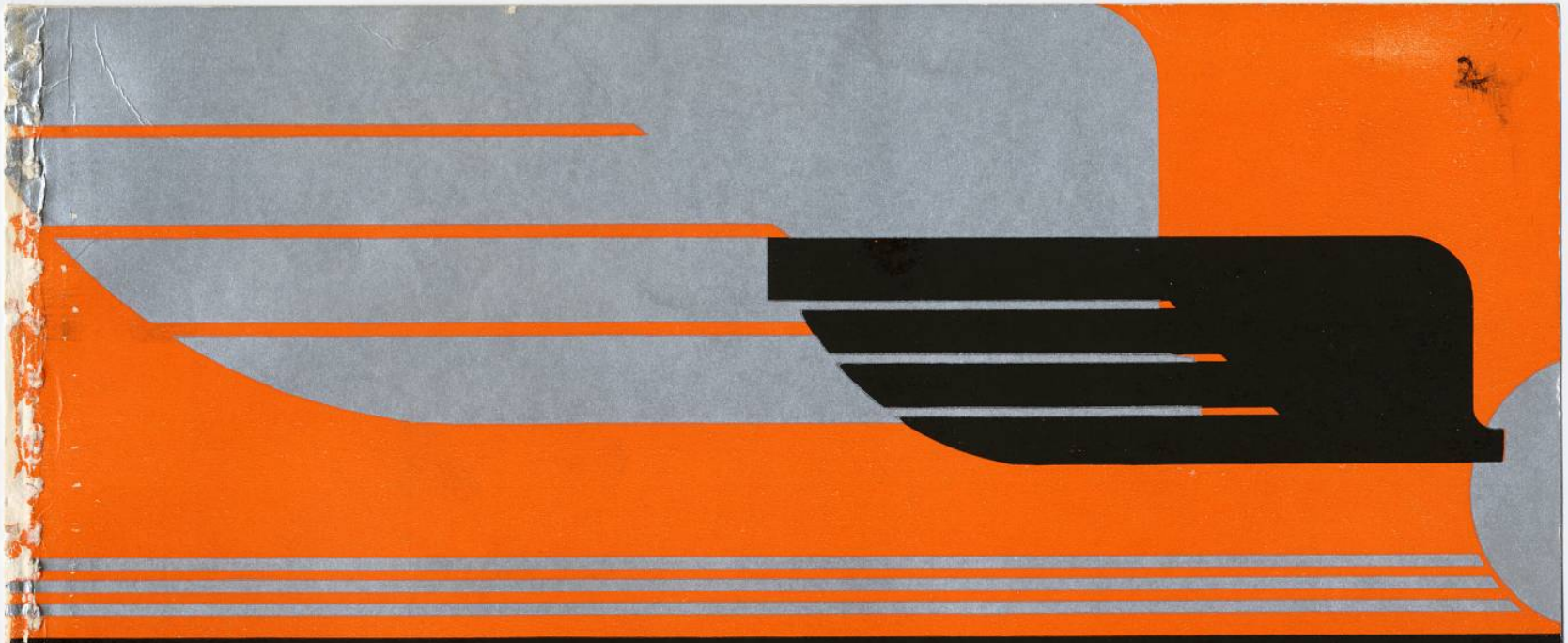
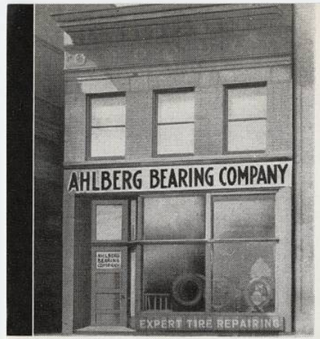


THE BALL BEARING

UP TO AND THROUGH A CENTURY OF PROGRESS

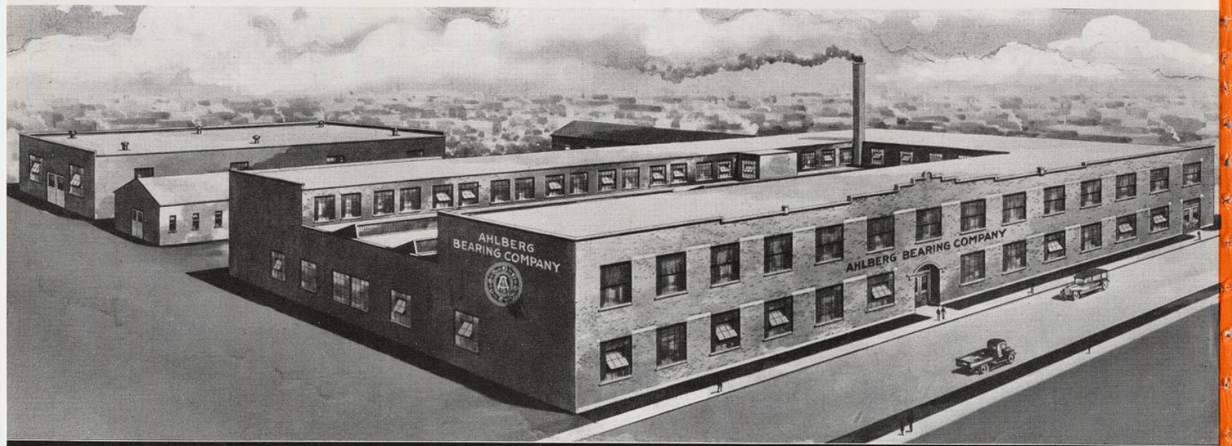
TWENTY-FIFTH ANNIVERSARY

1908 1933



TWENTY-FIFTH ANNIVERSARY 1908 · 1933

Back in 1908 when Theodore Roosevelt was President, the Ahlberg Bearing Co. had its origin in an obscure garage building loft in Chicago as a two-man organization. In 1933, while the first President Roosevelt's cousin, Franklin D. Roosevelt, is President, the Ahlberg Bearing Co. celebrates its Twenty-fifth Anniversary—today, a national organization embracing several hundred people, maintaining a large modern office and factory building in Chicago and twenty-seven factory-owned branches distributed throughout the United States.



THE BALL BEARING

up to and through

A CENTURY OF PROGRESS

This booklet is presented as our educational contribution to "A Century of Progress" Exposition and the Ball Bearing industry and, also, in commemoration of our Twenty-Fifth Anniversary.

AHLBERG BEARING COMPANY

317-327 EAST TWENTY-NINTH STREET · CHICAGO, ILLINOIS · U.S.A.

"A CENTURY OF PROGRESS" EXPOSITION · CHICAGO · JUNE 1 TO NOVEMBER 1 · 1933

AHLBERG BEARING COMPANY **Exhibit**

Travel and Transport Building

THE BALL BEARING UP TO "A CENTURY OF PROGRESS"

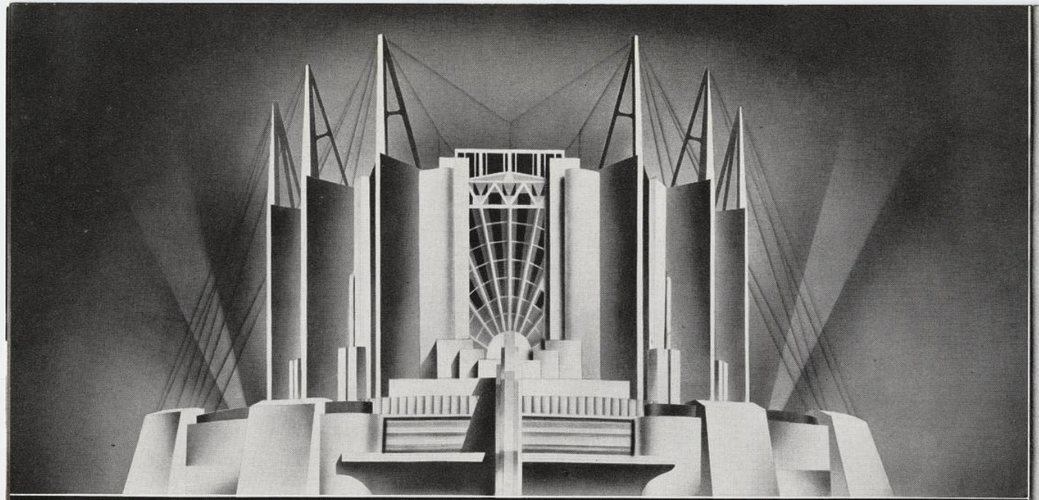
The evolution and the embodiment of the principles, methods of application, and materials which eventually developed into the ball bearing had their inception in antiquity.

The problem of moving heavy blocks of rock, as far back as the Stone Age (10,000 B.C.), possibly lead to the first use of interposing crude spherically shaped objects between the rock and the ground. As a result, primitive man discovered rolling motion facilitated the moving of a load and produced less resistance (friction) than sliding motion.

The most ancient authentic record of the forerunner of the ball bearing appears in the Bronze Age, 3,000 B.C. Early Egyptians in a painting of the fifth dynasty illustrate a scaling ladder equipped with a pair of solid discs running on an axle.

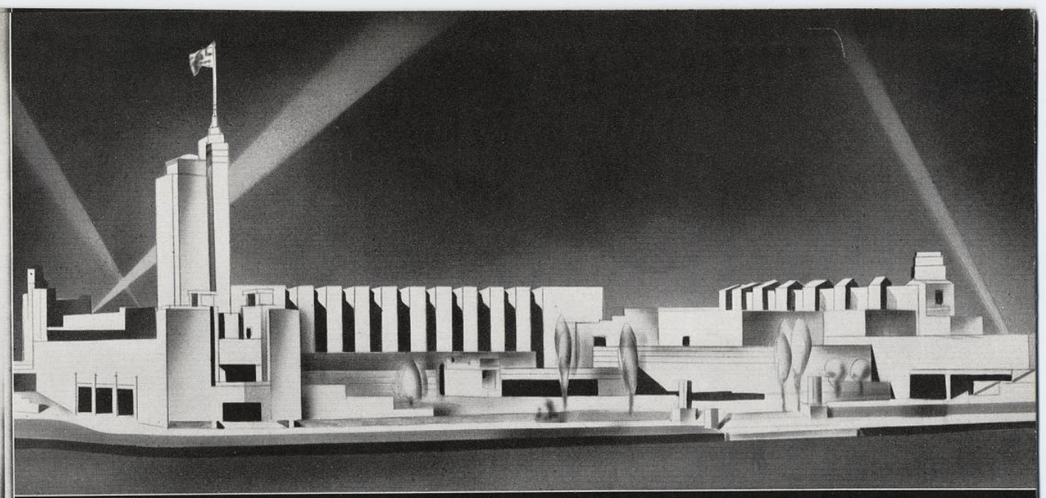
About 1100 B.C. in the Iron Age, the Assyrians and the Egyptians placed objects beneath huge blocks of stone to roll them over long distances from the quarries to the sites of the immense permanent monuments and palaces they were building. This is clearly shown in a picture still existing on the rocks in a grotto near El Bersheh.

Perhaps the earliest example of rolling motion as practiced today was in 300 B.C. At that time the Greeks used a battering ram as a war machine which operated on rollers with lips held in a cage rolling on the raceway or track.



TRAVEL AND TRANSPORT BUILDING

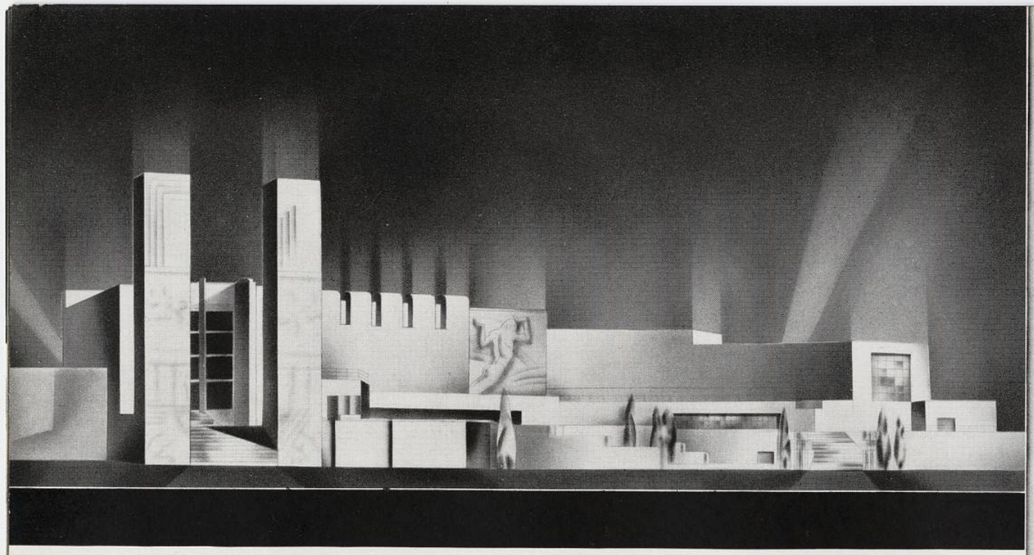
Unfortunately, from 300 B.C. until the Fifteenth Century practically no authoritative evidence has been found contributing to the history of this important development. Uncivilized artisans of primitive Europe are known to have facilitated the rotation of a shaft in their rough drilling contrivances by fitting the end with a very hard point carved out of a stag's horn, this point revolving in a socket of the same material. Also, it is believed the Romans must have made use of some form of the ball bearing on their chariots.



HALL OF SCIENCE

Leonardo da Vinci, the famous Italian genius of the Renaissance, has left manuscripts dated 1494-1519 A.D., the contents of which reveal a remarkable insight of friction. In them he distinguished between sliding and rolling friction and observed the importance of polishing the surfaces of parts that slide, move in a groove, or revolve around a pivot.

Prior to 1520, stone missiles must have been placed under gun carriages in England to expedite their conveyance, because in that year there are records mentioning that these stones were replaced by cast iron balls.



ELECTRICAL AND COMMUNICATIONS BUILDING

In 1534, Benvenuto Cellini, in his autobiography, recites that in moving a statue he built for the King of France, he employed small wooden balls on the base. He goes on to explain that this made its moving so simple his young son easily pushed it toward the King as he approached. Later Cellini used ebony balls, the hardest wood obtainable, for the same purpose.

Guillaume Amantons published a memorandum on sliding friction about 1600.

A windlass, designed by De Mondran and used by the Physicist Arthod when studying the fall of bodies, which was similar to Leonardo da Vinci's idea, was built in 1720.

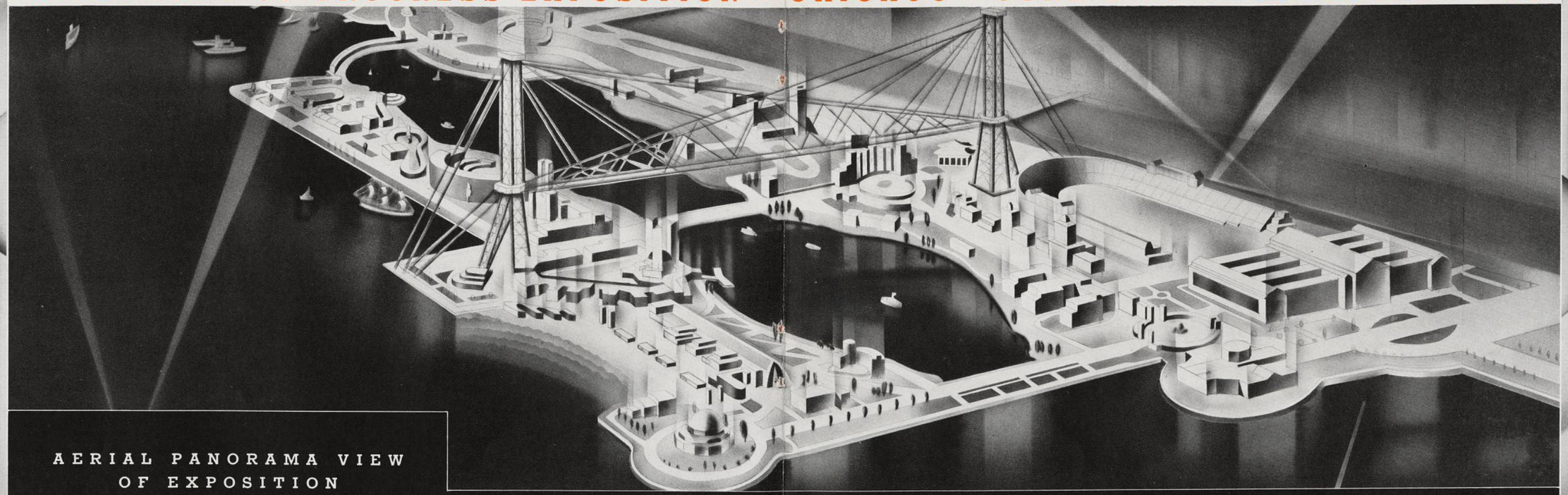
By this time patents had already been taken out in France for constructions intended to diminish friction by the application of rolling motion.

After 1737 and before 1806, Columbus, whose name is perhaps more frequently associated with electricity, discovered the laws governing friction. He also succeeded in constructing a ball bearing which bears a marked resemblance to modern types.

An interesting event in the progress of the ball bearing is the methods used in 1770 to transport the stone on which the statue of Peter the Great was placed in a park in St. Petersburg (now Leningrad). A stone weighing 1500 tons had been selected for the base. To move it the 2½ miles to a vessel on the Finnish coast, a laborer originated the idea of using "U"-shaped raceways of copper in which large copper balls were laid. Similar raceways were placed on top of the balls and the block of stone on top of these. The motion was effected by ropes from two windlasses. Six weeks were required to move it.

In 1776, a design for reducing friction in the escapement of watches was conceived by Henry Sully. At the same time, Dutch engineers used rolling motion ideas in windmills to make the "setting" of the mill by the wind easier.

A CENTURY OF PROGRESS EXPOSITION • CHICAGO • JUNE 1 TO NOVEMBER 1 • 1933



AERIAL PANORAMA VIEW
OF EXPOSITION

A patent for the use of a ball bearing, specifically for reduction of axle friction, was issued in England in 1787. During this year two Englishmen, John Garnel and William Milton, proposed to replace sliding friction by rolling friction on shafts used in Dutch windmills.

As a consequence of the rapid and universal development of machinery, about 1790 numerous examples of ball bearings are to be found in its wake.

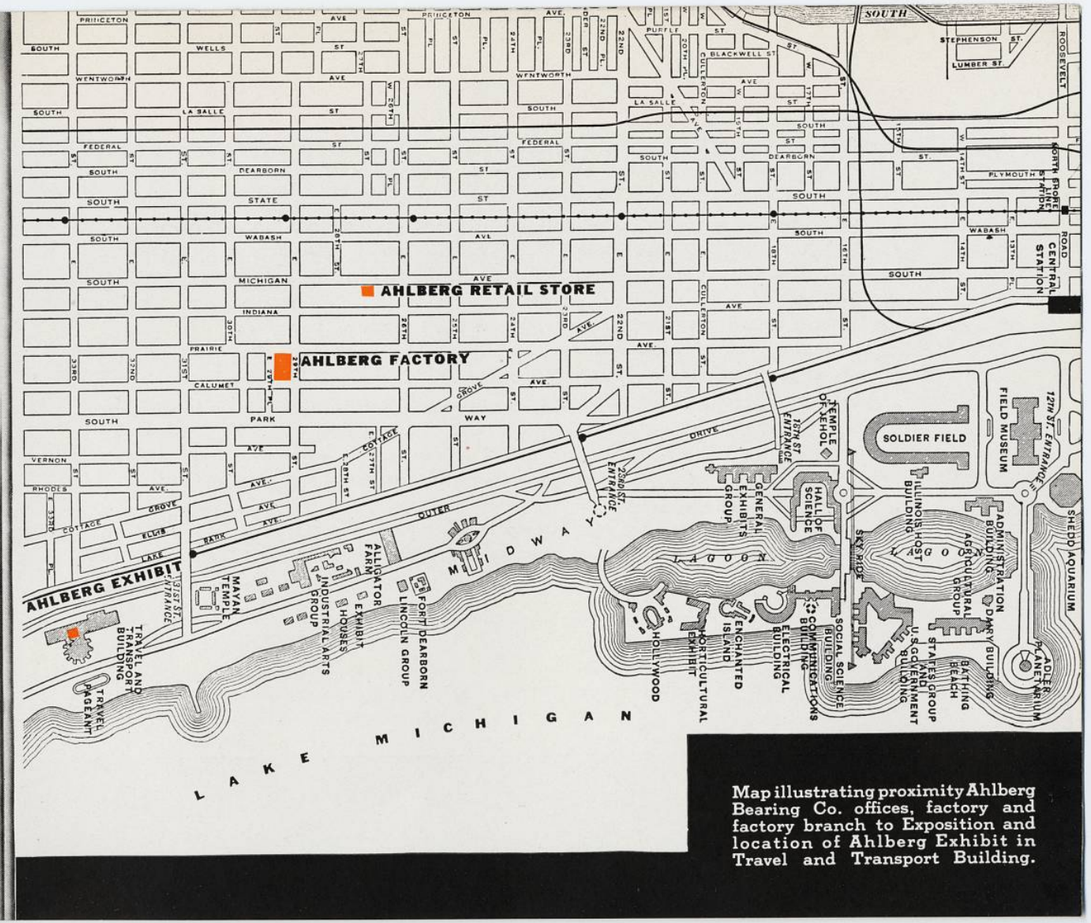
The 400 pound weathercock of the Trinity Church, Lancaster, Pa., was mounted on a rolling motion principle in 1794. It is believed that either Robert Fulton, or Getz, the man who engraved the first Washington penny, constructed this bearing.

Cardinet took out the first French patent for a ball bearing in 1802.

Cranes used in the quarries of Scotland as early as 1805 contained ball bearings.

In 1825, George Stephenson used a simple arrangement of bearings mounted in a special housing. A model of this bearing is on exhibition at the South Kensington Museum.

The history of the Ball Bearing up to the beginning of "A Century of Progress" culminates in 1833 when a number of projectiles, having a total weight of fifty-one tons, were transported at Romorantin on balls which rolled along a specially made raceway, an arrangement similar to that made use of in moving the statue of Peter the Great in 1770.



Map illustrating proximity Ahlberg Bearing Co. offices, factory and factory branch to Exposition and location of Ahlberg Exhibit in Travel and Transport Building.

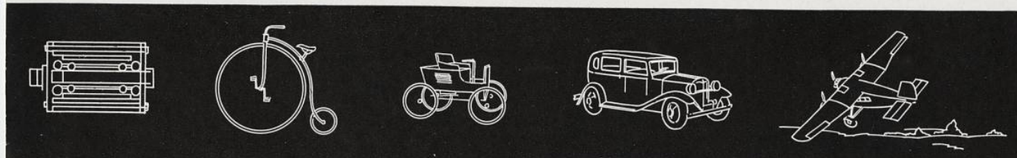
THE BALL BEARING THROUGH "A CENTURY OF PROGRESS"

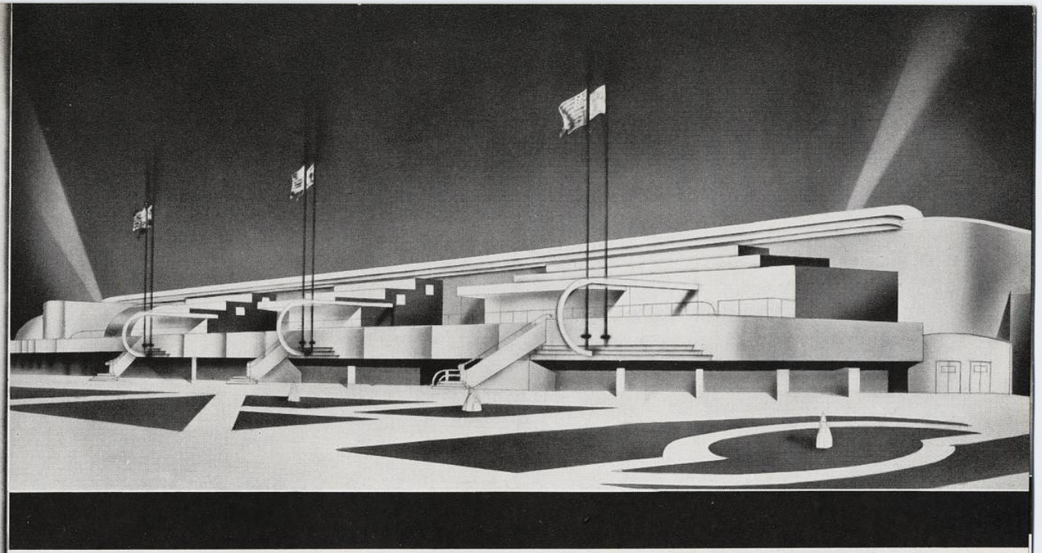
Through the ages, from the beginning of civilization up to 1833, the principle of rolling motion was established and the practical application of the ball bearing to diminish friction was used. While important pioneering in a practical way had been done, the use of mathematical formula to eliminate the hazards of failure and determine loads, stresses, etc., remained undiscovered. "A Century of Progress" opened in 1833 with a background of only theoretical experience concerning the ball bearing.

In 1849, a German concern, Sayner Hutte, used ball bearings in cranes. The Bavarian State Railways utilized a ball bearing designed by Baron von Rudorffer in 1847.

Seller's Bearing, for forming a portion of each box of spherical form and supporting them in guiding sockets to allow the boxes held to play within the sockets as a universal joint, was patented in 1849 by Edward Bancroft.

Krupp, Germany, employed ball bearings in hoists and machinery in 1855 to 1871. In 1856 patents were taken out in many countries for ball bearings in machinery. Germany in 1858 granted a patent to George Weckamp of Budapest for a ball bearing on wagons.





AGRICULTURAL BUILDING

An important ball bearing arrangement for bicycles, patented in 1869 by Suriray, started the ball bearing era. This patent was the basis for much progress made later by Hertz Boussinesq, Poincare, Stribeck and others.

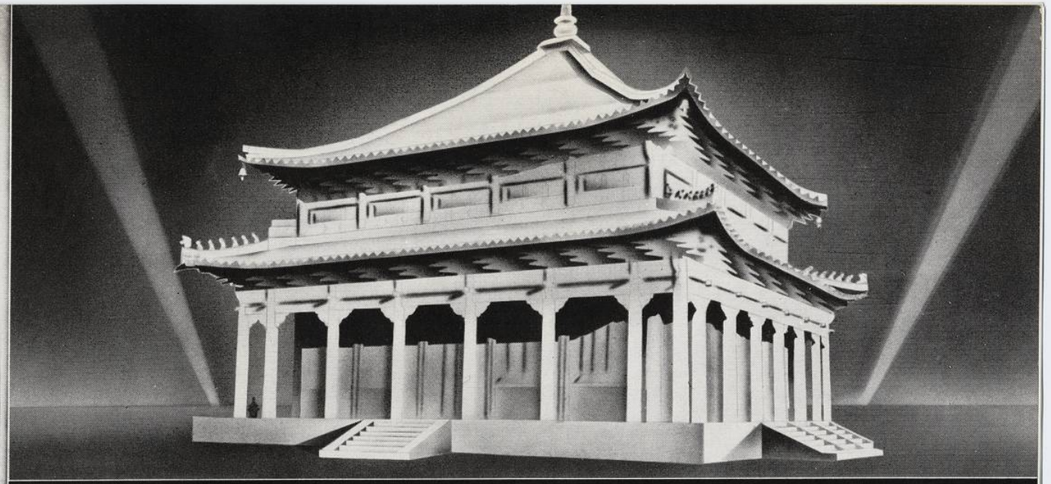
By 1883, the bicycle vogue in England, wielded a definite influence on the manufacture of ball bearings. Conversely, ball bearings made practical the general use of the bicycle.

TOWERS OF FEDERAL BUILDING

At Cornell University tests were made in 1886 to 1888 on various bearings of cast iron, wrought iron and steel, to determine co-efficients of rolling friction and stresses.

Up to 1899, little was known fundamentally beyond theoretical deductions by Henry Hertz on the contact of elastic bodies. Professor Stribeck, in 1900, developed his marvelous mathematical calculations for determining size and kind of ball bearings required to carry given loads. This essential scientific knowledge accelerated the development of the industry.

As with the bicycle, the advent of the automobile at this period created a



GOLDEN PAVILION OF JEHOL

new demand for ball bearings, thereby focusing the attention of engineers on the necessity for further improvement. The resultant progress gave impetus to the development of the automobile.

At that time ball bearings were made principally in Germany and Italy. There were only two small producers in America. The costs were prohibitive due to inadequate production and limited markets. Many automobiles used here were imported and equipped with foreign bearings. Repairs were costly; cars were frequently laid up weeks pending arrival of bearings from abroad.

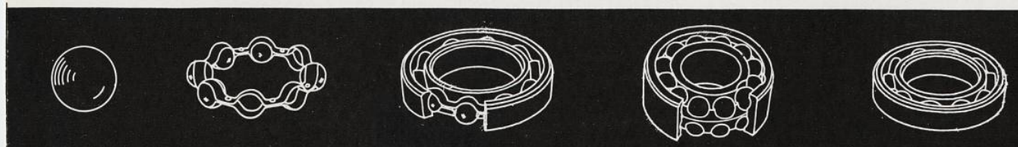
This problem of delayed repairing service confronted C. J. Bender and his mechanic, K. E. Ahlberg, who operated a garage and auto livery in Chicago in 1908.

Mr. Ahlberg endeavored to overcome this handicap. He devised an attachment to a standard lathe which permitted the regrinding of the raceways of worn bearings. This made immediate repair possible. Furthermore, this process saved one-half of the imported bearing cost. Tests proved the reground bearing equal to a new one. The possibilities of this improved service to users of bearings was seen by Mr. Bender. Presenting this innovation to the automotive trade, he found ready acceptance.

By 1910 the demand for this new bearing service was so universal in Chicago, Mr. Bender decided to make it available throughout the country. A branch and warehouse was opened in New York and outlets in other large cities. By 1920 distribution was nation-wide.

The continued success of the Ahlberg Bearing Company prompted their embarking in 1925 upon a program of making custom built quality (CJB) bearings.

Under the guidance of Mr. Bender, president since its inception, the Ahlberg Bearing Company has constantly made contributions to the industry. This insures that the Ahlberg Bearing Company will maintain its position in the ball bearing industry in the future as it has in the past quarter century.



TWENTY-SEVEN FACTORY BRANCHES AND DISTRIBUTORS EVERYWHERE

The strict adherence to a policy of quality in materials, accuracy in manufacture and precision in inspection has developed a nation-wide demand for Ahlberg Bearing Company products necessitating the maintenance of the proximity of service through twenty-seven factory-owned branch warehouses.

The increasing recognition of the true economy of quality in bearings is responsible for the present size and strength of this company. The Ahlberg Bearing Company pledges to industry permanent adherence to this policy of uniform quality.

FACTORY BRANCHES

Akron, Ohio	153 W. Exchange St.	Jefferson 1224
Atlanta, Ga.	308 Ivy St., N. E.	Walnut 7339
Baltimore, Md.	1 W. Biddle St.	Vernon 5089
Boston, Mass.	1020 Commonwealth Ave.	Aspinwall 0553
Brooklyn, N. Y.	1097 Bedford Ave.	Main 2-8050
Buffalo, N. Y.	902 Main St.	Grant 1177
Chicago, Ill.	2637 Michigan Ave.	Victory 9700
Cincinnati, Ohio	126 E. 14th St.	Parkway 5166
Cleveland, Ohio	4201 Euclid Ave.	Henderson 8460
Columbus, Ohio	278 E. Long St.	Adams 1544
Dallas, Texas	213 S. Pearl St.	7-3059
Denver, Colo.	7 W. 13th Ave.	Tabor 8650
Detroit, Mich.	4708 Cass Ave.	Columbia 1350
Kansas City, Mo.	210 E. 16th St.	Harrison 3547
Memphis, Tenn.	1087 Union Ave.	2-1590
Milwaukee, Wis.	760 N. Jackson St.	Daly 0564
Minneapolis, Minn.	14 S. 13th St.	Geneva 4858
New Orleans, La.	722 Girod St.	Raymond 4755
New York, N. Y.	37 W. 65th St.	Trafalgar 7-2860
Omaha, Neb.	2851 Farnam St.	Atlantic 4794
Philadelphia, Pa.	856 N. Broad St.	Park 2968
Pittsburgh, Pa.	4823 Liberty Ave.	Schenley 4480
Providence, R. I.	48 Franklin St.	Gaspee 0071
St. Louis, Mo.	2831 Locust St.	Jefferson 0372
St. Paul, Minn.	411 N. Exchange St.	Cedar 0403
Toledo, Ohio	142 Tenth St.	Main 3607
Washington, D. C.	1409 "S" St., N. W.	North 7589

AHLBERG BEARING COMPANY CHICAGO ILL

ABCO

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