

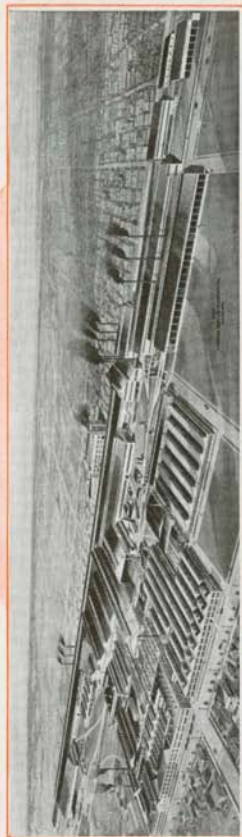
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# TIMKEN

*and*

## ITS PRODUCTS

**TIMKEN** Tapered  
Roller **BEARINGS**  
**TIMKEN ALLOY STEELS**  
**TIMKEN STEEL TUBES**  
**TIMKEN BITS**



Main plant of The Timken Roller Bearing Company, Canton, Ohio



Columbus, Ohio, plant of The Timken Roller Bearing Company

The company also  
has plants in  
England and Europe

## *The Timken Roller Bearing Company, Canton, Ohio.*

Automotive Division — Bearings for automobiles, motor trucks and busses.

Industrial Division—Bearings for all types of industrial machinery, farm implements and tractors.

Railway Division—Bearings for railroad passenger cars, freight cars and locomotives.

Bit Division—Timken Rock Bits for drilling rock for blasting.

## *The Timken Steel and Tube Company, Canton, Ohio.*

Alloy Steel Division — Electric Furnace and Open Hearth Alloy Steels; Special Carburizing Steels; General Purpose Alloy Steels; Special Analysis Steels.

Seamless Tube Division—Carbon Alloy and Stainless for all purposes; Mechanical Tubes; Cracking Still Tubes; Alloy Boiler Tubes; Condenser Tubes.

## *The Timken Service and Sales Company, Canton, Ohio.*

Branch warehouses in larger cities throughout the world, augmented by Authorized Distributors in principal distributing centers.

## Types of Anti-Friction Bearings

Anti-friction bearings are in such common use today, in automotive vehicles and industrial machinery, that most people are familiar with their characteristics as distinguished from "plain" bearings.

Plain bearings are merely cylinders of metal different in composition from that of the shafts which they support. The anti-friction bearing, on the other hand, consists of a circular group of steel rollers or balls revolving between two circular raceways.

There are in use today five general types of anti-friction bearings: (1) tapered roller bearings; (2) straight roller bearings; (3) cup-and-cone ball bearings; (4) annular ball bearings; and (5) ball thrust bearings.

Most types of anti-friction bearings have four principal parts:

1. A "cone" or inner race which fits over the shaft or spindle.
2. A "cup" or outer race which fits inside the wheel hub or other carrier.
3. A series of "rollers" or balls which revolve between the cone and the cup.
4. A "cage" or other device to keep the rollers or balls in position between the cup and cone.

The way in which these elements are designed and assembled has a marked effect on the ability of the bearing to stand up in service. The different types of bearings are illustrated in the diagrams on the opposite page.

### CUP-AND-CONE BALL BEARING

Radial (vertical) load capacity is sacrificed because the cup and cone are set at an angle in order to stand occasional end-thrust. It is impractical to compensate for wear in this bearing as the slightest wear of the ball race destroys the curvature and very principle of the bearing.



### ANNULAR BALL BEARING

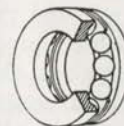
The radial (vertical) load capacity is sufficient, but to carry the same amount of load the bearing must be much larger than a roller bearing.

The end thrust capacity of this bearing is considerably less than the radial capacity. When this type of bearing becomes worn it must be discarded.



### BALL THRUST BEARING

The ball thrust bearing carries thrust loads only. It is usually used to supplement annular ball bearings at points where thrust loads are encountered. Naturally the use of two sets of bearings at one point of installation results in needlessly complicated, expensive design. The use of this bearing is usually limited to low speeds.



### STRAIGHT ROLLER BEARING

The vertical load capacity is greater than a ball bearing of the same size. It has no capacity for thrust loads, and when thrust loads are present it must be used with special thrust bearings.



### TAPERED ROLLER BEARING

The Timken Tapered Roller Bearing has greater radial (vertical) load capacity than a ball bearing of the same size, and equal capacity to a straight roller bearing.

In addition it carries end thrust loads and all combinations of both radial and thrust loads.





## Design of the Timken Bearing

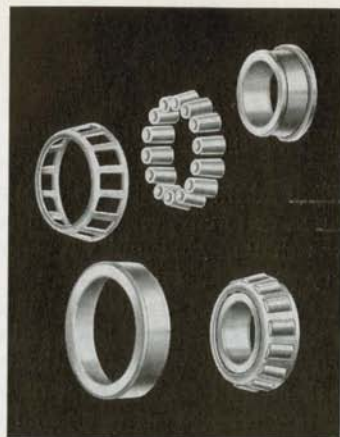
There are four distinct elements in the Timken Tapered Roller Bearing: the inner race which be-



cause of its mechanical profile construction is designated as the cone; the outer race which fits over cone and rollers, and is consequently termed the cup; the rollers, which roll between the cup and cone; and the cage which properly spaces the rollers and retains them about the cone.

### The Greater Load Area of the Timken Bearing

Fundamentally the Timken Bearing is a roller bearing. The use of rollers in an anti-friction bearing allows distribution of the load along a line of contact. The load is thus spread over the entire length of the roller. Hence the area exposed to wear in a roller bearing allows generous reduction of unit pressures and thus gives the roller bearing greater capacity, size for size, than other types. At the same time it makes no compromise in the matter of eliminating friction.



### The Timken Tapered Principle

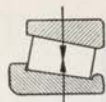
In its other fundamental, the Timken Bearing is a tapered bearing. The rolls, the outer surface of the cone and the inside of the cup are tapered. This enables a Timken installation to resist pressure successfully not only from one direction or two directions, but if necessary from all directions at once.

### Radial, Thrust and Resultant Loads

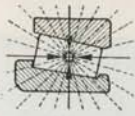
There are few types of machinery, the moving parts of which do not encounter two different forces or loads, radial and thrust.

Radial load is pressure at right angles to the axis on which the bearing revolves. It may be in the form of a dead weight, or it may result from the load from gears, the pull of a belt or many other causes.

Thrust load or end-thrust is pressure coming from the side or end; that is, along the axis of the bearing. It is caused by the tendency of any moving object to follow a straight line. It is the force felt when one is thrown to one side of an automobile when round-



Radial Load



Resultant Loads



Thrust Loads

*How the tapered roller bearing carries all combinations of all loads.*

ing a curve. End-thrust is by no means limited to wheel bearings, or to curves. It is generally present wherever the shafts, gears and wheels of any type of machinery are in motion.

To operate efficiently, an anti-friction bearing must carry all of these loads—radial loads and thrust loads and ever-varying combinations of the two—and it must carry them with a good factor of safety. The Timken Bearing because of its tapered design does carry all of these loads, and with an adequate margin of safety.

### Timken Positively Aligned Rolls

The Timken Bearing, which embodies the wear resisting principle of the roller bearing plus the load carrying versatility of tapered construction, is most skillfully contrived for its work. The roll in the Timken Bearing, as the illustration shows, has, at



its larger end, a flat surface which operates against the rib of the cone or inner race. This flat surface at the end of the roll is made to square exactly with the center line of the roll itself. As each roll revolves about the cone, it is kept in contact with the cone rib, in two areas. This two-area contact eliminates skewing and jamming for it compels the revolving roll to align itself perfectly at all times, and assures constant full-line contact between the roll and the cup on one hand and the roll and the cone on the other.

### The Timken Cage

The one piece cage or roll retainer does nothing more than space the rolls properly about the cone. By reason of its exact perforation and winging, the Timken cage allows each of the rollers in a bearing to perform, without interference, an exactly equal amount of work.

### Timken-Made Steel

The superiority of Timken Bearings is not limited to the greater load area resulting from line contact; nor to the tapered principle, which permits them to carry all types of loads; nor to their positively aligned rolls, which keep the advantages of line contact and tapered construction functioning constantly. For Timken superiority goes right down to the raw material from which the bearings are made. Every Timken Bearing is made from special Timken steel, produced in the steel mills of The Timken Steel and Tube Company. In design, in construction, in workmanship, and in the steel itself are found the reasons why Timken Bearings have been so extensively used by automotive manufacturers for years, and have swept on so rapidly into all types of industrial and railroad equipment.



## Timken Equipped Passenger Automobiles

CROSSES INDICATE  
"TIMKEN BEARING EQUIPPED" POINTS

Make	Front Wheels	Rear Wheels	Pinion	Steering	Differ- ential
Auburn	.X.	.X.	.X.	...	.X.
Austin	.X.	.X.	...	...	.X.
Cadillac	...	...	...	.X.	.X.
Chrysler	.X.	.X.	.X.	.X.	.X.
Continental	.X.	.X.	.X.	...	.X.
Cord	.X.	.X.	...	.X.	.X.
Cunningham	.X.	.X.	.X.	...	.X.
DeSoto	.X.	.X.	.X.	.X.	.X.
Dodge	.X.	.X.	.X.	.X.	.X.
DuPont	.X.	.X.	.X.	...	.X.
Essex	.X.	.X.	.X.	...	.X.
Ford	.X.	...	.X.	.X.	.X.
Franklin	.X.	.X.	.X.	.X.	.X.
Graham	.X.	.X.	.X.	.X.	.X.
Hudson	.X.	.X.	.X.	...	.X.
Hupmobile	.X.	.X.	.X.	.X.	.X.
LaSalle	...	...	...	.X.	.X.
Lincoln	.X.	.X.	.X.	.X.	.X.
Marmon	.X.	.X.	.X.	...	.X.
Nash	.X.	.X.	.X.	.X.	.X.
Pierce-Arrow	.X.	.X.	.X.	.X.	.X.
Plymouth	.X.	.X.	.X.	.X.	.X.
Reo	.X.	.X.	...	.X.	.X.
Rockne	.X.	.X.	.X.	.X.	.X.
Studebaker	.X.	.X.	.X.	.X.	.X.
Stutz	.X.	.X.	.X.	...	.X.
Willys-Overland	.X.	.X.	.X.	.X.	.X.
Willys-Knight	.X.	.X.	.X.	.X.	.X.

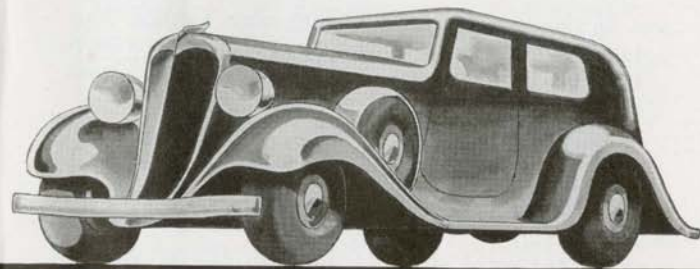
## Timken Bearings in Automotive Vehicles

The development and refinement of the modern automotive vehicle closely follows the development and refinement of the Timken Tapered Roller Bearing. Both represent 35 years marked by a continuous series of engineering accomplishments.

Timken Bearings are now used in over 90% of all makes of passenger automobiles. Their dominance in the heavy duty service demanded by trucks and busses is even greater—for there is not a single make of motor truck or bus which is not Timken Bearing Equipped.

You will find Timken Bearings commonly used in front wheels, rear wheels, pinion, differential, transmission, fan, steering gear and steering pivots.

The list of Timken-equipped automobiles affords the widest possible latitude for the exercise of individual preference as to style and price. "Is it Timken Bearing Equipped?" has been the accepted buying standard since 1898.





## TIMKEN BEARINGS FOR INDUSTRIAL MACHINERY

You will find Timken Bearings dominantly used in all types of machinery wherever wheels and shafts turn. Many of the toughest jobs in industry, which a few years ago were believed to be impossible for any anti-friction bearing to handle, have yielded to the endurance and load carrying capacity of Timken Bearings.

You will find Timken Bearings on practically all of the country's newest and modern steel mill roll necks, where loads run as high as 8,000,000 pounds. The largest plate mill in the world is equipped with Timken Bearings, weighing  $3\frac{1}{2}$  tons each.

In the oil fields you will find more Timken Bearings in use than any other type of anti-friction bearing—in drilling, pumping and auxiliary equipment of every kind.

In the mining industry Timken has been the dominant anti-friction bearing in mine cars for more than ten years. Nearly 1,000 leading mine operators use Timken Bearings in over 150,000 mine cars.

On the crank shafts of all types of compressors, pumps, and engines—one of the toughest jobs in all

Industry—you find Timken Bearings standard on practically all leading makes.

Timken is likewise dominant in the machine tool industry where Timken rigidity and accuracy have so radically revolutionized machine operation that over 95% of all new heavy duty machines are equipped with Timken Bearings.

Timken Bearings have brought the same revolutionary results in the operation of paper making machinery where in some operations production has been increased  $37\frac{1}{2}\%$ , while simultaneously decreasing power costs by 50%. The largest paper making machine ever built is completely Timken-equipped, containing more than 1,500 Timken Bearings.

The same story carries through in gear reduction units, with practically all such units made today equipped with Timken Bearings. Timken endurance is illustrated in this type of application for one of the first Timken-equipped gear reducers built is still going strong after nine years of day and night service, during which the bearings have turned more than 3,000,000,000 revolutions.

### Representative Types of Machinery in Which Timken Bearings Are Used

Grain Milling Machinery	Conveyors	Farm Implements
Clay Working Machinery	Motorcycles	Printing Presses
Electrical Machinery	Machine Tools	Bakery & Restaurant Machinery
Rubber Machinery	Fans, Blowers and Compressors	Steel Mill Machinery
Ice Making Machinery	Lawn Mowers	Engines
Paper Mill Machinery	Amusement Devices	Oil Well Equipment
Road Building Machinery	I-Beam Trolleys, Hoists and Cranes	Laundry Machinery
Elevators	Logging Blocks	Glass Making Machinery
Gear Reduction Units	Industrial Trucks, Trailers & Tractors	Leather Making Machinery
Pumps	Mine Cars	Tractors
Locomotives	Textile Machinery	Airplanes
Railway Equipment	Transmission Machinery	Pulverizing, Crushing and Screening Equipment
Saw Mill and Wood-working Machinery	Household Appliances	





## Timken's Spectacular Record on American Railroads

There are more Timken Bearings in use on American railroads than any other type of anti-friction bearing.

### PENNSYLVANIA RAILROAD

- 156 Electric locomotives
- 95 Main line coaches
- 95 Locomotive tenders
- 21 Dining cars
- 173 Multiple unit coaches (including 45 on the Long Island)
- 100 70-ton freight cars
- 6 Engine trucks
- 2 Steam locomotives—all axles

### MILWAUKEE ROAD

- 8 Olympian trains
- 2 Pioneer Limited trains
- 153 Pullman, Diners, Observation cars, Coaches, etc.
- 15 Locomotive tenders
- 15 Locomotive trailers

### NEW HAVEN ROAD

- 2 Merchants Limited trains
- 2 Yankee Clipper trains
- 100 Deluxe coaches
- 10 Dining cars

### CANADIAN NATIONAL

- 7 Locomotive trailer trucks
- 3 Locomotive tenders
- 2 Main line coaches
- 6 Oil electric coaches

- 12 Trailer trucks on Grand Trunk Western Ry.

- 35 Engine trucks on New York Central

- 1 Steam locomotive complete except trailer truck on New York Central

- 2 Steam locomotives complete on Lackawanna

- 6 Locomotive engine trucks on Lackawanna

- 24 Locomotive engine trucks on Burlington

- 11 Locomotive tenders on Burlington

- 20 Locomotive engine trucks on Lehigh Valley

- 30 Coaches on New Jersey Central

- 2 Dining cars on New Jersey Central

- 3 Locomotive engine trucks on Chesapeake and Ohio

- 15 Deluxe coaches on Chesapeake and Ohio

- 206 Street cars on Cleveland Railways

- 10 Street cars on Georgia Power Company

- 15 Cars on the Brooklyn-Manhattan Transit Subway

- 33 Pullman and Dining cars on Northern Pacific

- 5 Locomotive engine trucks on Cotton Belt

The Timken Locomotive—the first completely anti-frictionized locomotive in the world.

## Timken Bearings For Railroads

Many years ago Timken started to develop the Timken railroad bearing. This bearing is now an established success with a fully demonstrated performance record behind it. Many of the country's most famous trains are Timken Bearing Equipped.

In locomotives the use of Timken Bearings has been rapidly expanding since Timken built and put in service the world's first completely anti-frictionized locomotive. There are already 11 railroads with 376 Timken-equipped locomotives in operation or on order with 162 completely Timken-equipped—Timken Bearings on all axles.

Timken's position in the railroad field is clearly defined by the number, variety and success of the applications of Timken Bearings in all types of rolling stock. There are more Timken Bearings in use on American railroads than any other type of anti-friction bearing.

From the standpoint of the railroad, Timken Bearings have reduced starting resistance 88%, cut power consumption, eliminated hot boxes, and made it possible to speed up schedules and haul longer trains.

And from the standpoint of the traveler, they have greatly increased riding comfort by eliminating jolts and jars when starting and stopping.

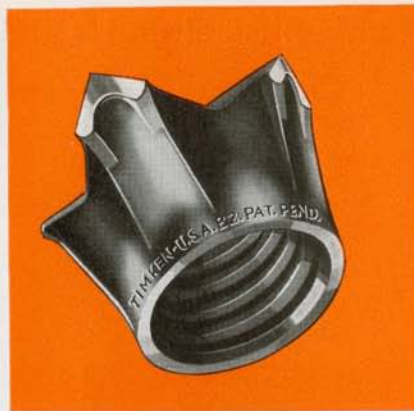


## Timken Bearings For Airplanes

The results of Timken's third-of-a-century experience in applying bearings is well demonstrated in the world's newest and most spectacular industry—Aviation.

In landing wheels, with the advent of brakes, anti-friction bearings became an immediately demanded necessity, and Timken's long experience in applying bearings immediately solved the problem. Timken Bearings are now used in the landing wheels of practically all new airplanes.

Similarly, in the rocker arms of high speed aviation engines, need arose for a bearing which would lick lubrication problems at high temperatures, and permit a unit assembly to eliminate the handling of many parts. Timken designed and completed tests on such a bearing, and it is already being used extensively.



## The Timken Rock Bit

Drilling rock for blasting has always been an expensive operation, involving a large investment in drill steel, resharpening equipment, labor and transportation. The Timken Rock Bit—a removable bit which attaches to the end of the drill steel—eliminates the majority of these expenses.

The Timken Rock Bit replaces the conventional bit which is forged on the end of the hollow drill steel. It is held tightly against an upset shoulder on the steel by means of a special left hand thread designed for strength and easy removability.

When a Timken Bit becomes too dull for further service it is merely removed and replaced with a new one—a matter of seconds. It is much more economical to throw away a used Timken Bit than it is to resharpen the conventional type.

Timken Rock Bits, on the market only a little over a year, have already revolutionized drilling costs on many important drilling operations in all parts of the country.

## The Timken Steel and Tube Co.

In the alloy steel and tube industry, Timken has consistently been a leader in applying new methods and creating improved alloys...

It was Timken who pioneered in the control of grain size...

It was Timken who brought the use of nickel molybdenum steels to the highest plane of development they have ever attained...

And it was Timken who established such accurate control in the manufacture of steel tubing—including the making of the steel itself—that Timken has long been the world's largest manufacturer of alloy steel tubes.

Timken steel owes its origin to the fact that sixteen years ago The Timken Roller Bearing Company adopted a policy of assuming complete control over the quality of the materials used in Timken Bearings.

The bearings achieved such a reputation for endurance that the steel itself achieved a similar reputation; and a large increased demand for it rapidly developed from manufacturers of other types of products.

As a result, the steel mills have been continually enlarged and The Timken Steel and Tube Company has become one of the largest manufacturers of high grade alloy steel and tubing in the world, with a monthly capacity of 30,000 tons—of which over 20,000 are available for commercial use.



## Products of The Timken Steel and Tube Company

### ELECTRIC FURNACE AND OPEN HEARTH ALLOY STEELS

Special Carburizing Steels    General Purpose Alloy Steels  
Special Analysis Steels

### SEAMLESS TUBES

Carbon Alloy and Stainless for All Purposes  
Mechanical Tubes    Alloy Boiler Tubes  
Cracking Still Tubes    Condenser Tubes



# TIMKEN Tapered Roller BEARINGS

## Dominant Throughout All Industry

The Timken Roller Bearing Company is the largest manufacturer of roller bearings in the world.

Over 350,000,000 Timken Bearings have given satisfactory service.

The world's first completely anti-frictionized railway locomotive is on Timken Bearings, and many of the country's famous trains.

Timken Bearings are standard equipment in over 90% of all makes of automobiles, motor trucks and busses—in front wheels, rear wheels, transmission, pinion, differential, fan, steering pivots and steering gear.

Timken Bearings are used at the hard service points of practically every make of tractor and in all types of farm implements.

Timken Bearings have made the use of anti-friction bearings possible in many tough industrial jobs formerly believed to be "impossible" for anti-friction bearings. They are dominant in practically every type of machinery throughout all Industry.

"Is It Timken Bearing Equipped?" is your most important question in buying automobiles, motor trucks, and any type of railroad or industrial equipment.

# TIMKEN Tapered Roller BEARINGS

## The Reasons Behind Their Dominance

Greater load capacity. Timken Bearings carry the loads along the full length of *rollers*, giving them greater capacity, size for size, than any other type.

Tapered construction. This provides for all types of loads—radial (from above); thrust (from the side); or both in any combination.

Wear resistance. Timken Bearings are made of special alloy Timken steel, the most enduring material ever developed for anti-friction bearings.

Positively aligned rolls. This exclusive Timken feature compels the rolls to align themselves perfectly at all times, assuring continuous full capacity of the bearing.

Frictionless. The Timken Bearing is frictionless within the fine limits of one-tenth of one per cent.

Unequalled rigidity. This Timken characteristic has put Timken Bearings in an overwhelming majority of machinery applications where extreme accuracy is required.

Maximum life. Timken endurance is the combined result of tapered roller design; Timken-made special alloy steel; positively aligned rolls; case-hardened outer surfaces; and Timken's precision methods of manufacture.

## The Timken Service and Sales Company

Product—service! Branch warehouses are maintained in principal cities throughout the world, augmented by legitimate service outlets in all leading distributing centers. When you buy your bearings from these authorized suppliers you are assured of getting *genuine* Timken Bearings of the correct size, load capacity and taper to duplicate *exactly* the original bearing that was built into your machine. You are never farther from a Timken Bearing than your telephone.

Atlanta, Ga. .... 280 Spring Street N. W.  
Boston, Mass. .... 1107 Commonwealth Avenue  
Chicago, Illinois .... 2534 S. Michigan Avenue  
Cincinnati, Ohio .... 236 East 9th Street  
Dallas, Texas .... 409 Olive Street  
Detroit, Mich. .... 4222 Second Blvd.  
Kansas City, Mo. .... 1819 McGee Street  
Los Angeles, Calif. .... 1361 S. Figueroa Street  
Minneapolis, Minn. .... 1025 Harmon Place  
New York, N. Y. .... 16 West 60th Street  
Philadelphia, Pa. .... 1208 N. Broad Street  
Pittsburgh, Pa. .... 4925 Liberty Avenue  
San Francisco, Calif. .... 1800 Van Ness Avenue  
Seattle, Wash. .... 321 East Pine Street  
St. Louis, Mo. .... 3300 Lindell Blvd.  
Toronto, Ontario, Canada .... 55 Charles Street, West





*Century of Progress*  
**1933**