

TIMKEN PRIMER

On the Care
& Character
of Bearings



✓ Howard.
Do not destroy.

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Timken Primer

On the Care and Character
of Bearings

THE IMPORTANCE OF THE
ANTI-FRICTION BEARINGS
IN YOUR MOTOR-CAR;

THE PLACES IN THE PLEAS-
URE OR COMMERCIAL CAR
WHERE THEY ARE USED
AND THE FUNCTIONS THEY
PERFORM;

THE RIGHT PRINCIPLES OF
THEIR CONSTRUCTION;

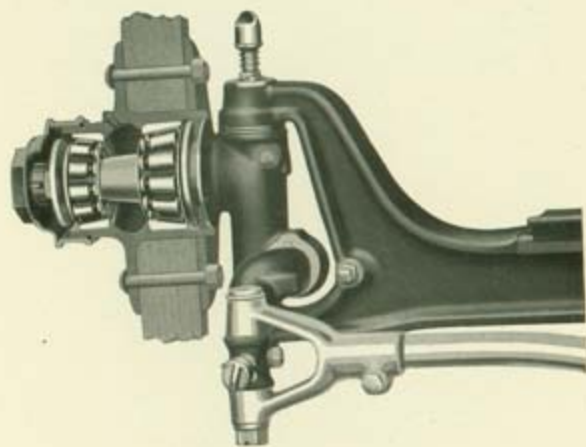
HOW TO CARE FOR THEM



(Sixth Edition)

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The Timken Roller Bearing Co.
Canton, Ohio, U. S. A.



Front-wheel bearings must meet side-pressure—often in excess of the vertical load



Grinding the hardened steel rollers

THE Timken Tapered Roller Bearing is a distinct type of bearing, differing from all other types. Its principles and their advantages are pointed out in the pages of this little book.

The Timken Bearing is an integral part of a motor-car—not in any sense an accessory, therefore its sale for motor-car use is practically confined to builders of cars.

The only axle-manufacturer licensed to use Timken Bearings is the Timken-Detroit Axle Co.

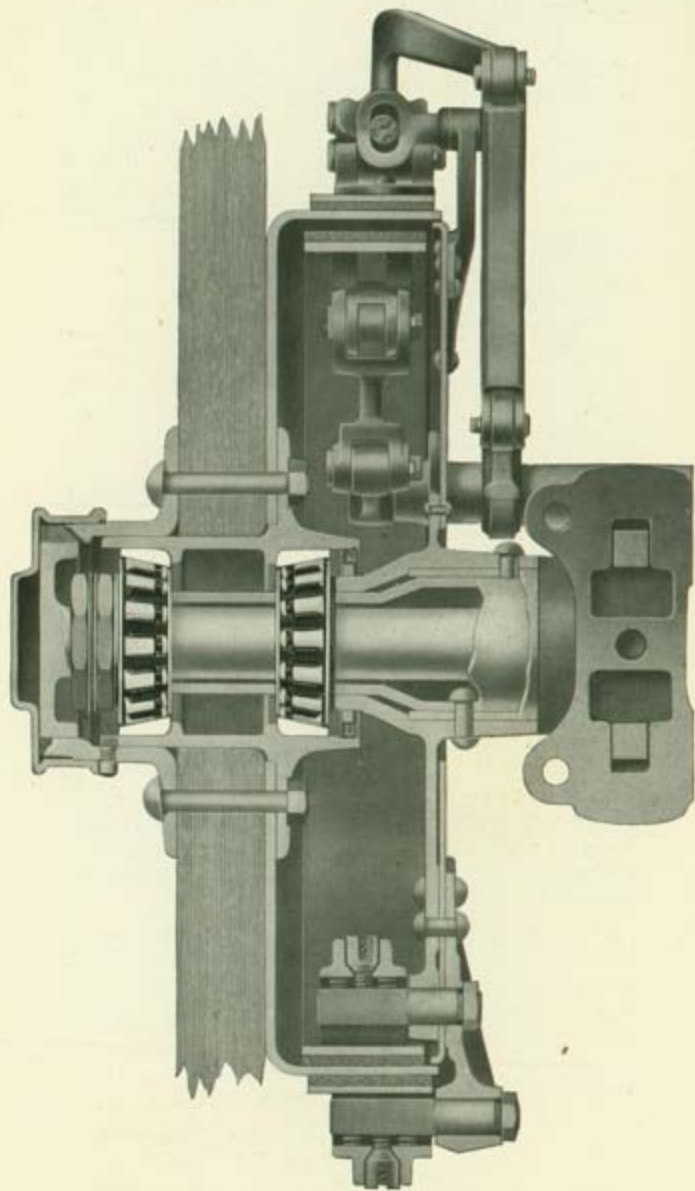
Besides being used in motor-cars and motor-car axles they are also used by builders of horse-drawn vehicles and by makers of electrical and other machinery. In fact wherever friction is to be eliminated, wherever loads are to be carried and, particularly where, in combination with these, "end-thrust" is to be met, the Timken Tapered Roller Bearing is almost indispensable.

Because the Timken is a distinct type of bearing, to replace other types with it is not always possible. Replacement should not be attempted without definite advice from the car-builder or from us to the effect that replacement at the point in question is practicable.

Giving real service to our customers, the builders of motor-cars, means serving our own best interests. To guarantee the bearings as we do, our Engineering Department must approve the sizes and the methods of mounting. This control over the use of our product is necessary to insure its giving greatest efficiency, longest life and most satisfactory service.

On receipt of full data covering the service required and the location of the bearings, we will advise in your interests the proper sizes and mountings. Data and sketches sent us for this purpose are treated by us in strictest confidence. It is quite common for us to receive drawings and data on undeveloped work.

THE TIMKEN ROLLER BEARING CO.



The rear-wheel bearings carry more than half the car's weight and load

CHAPTER ONE

The Importance of the Bearings in Your Car

WHEN a man's digestion is good, he doesn't know that he has a stomach. So it is with the bearings in a motor-car.

As one prominent car-builder has said, "the better the bearings, the less the owner knows about them."

Yet the bearings in your car are mighty important to you. Their design, quality, installation and care have a great deal to do with your cost of upkeep, with your personal safety, and with your satisfaction in driving.

The first function of bearings is to eliminate friction. No bearings do this absolutely, but the best reduce friction almost to the vanishing point.

There are many other things that bearings must do besides eliminate friction.

The Many Different Things the Bearings Must Do

The bearings in the hubs of the wheels carry the whole weight of the car, and its load. While doing this they have to meet all the shocks and stresses due to the bumps and the ruts of the road.

In turning a corner, for example, momentum tends to keep the car on its original course. People riding in the car feel this force pushing them outward along the seat.



This force is one that must be met by the bearings in your front wheels. It is called "end-thrust" and comes in addition to the weight on the bearings.

More than half the weight of a heavy touring car or loaded truck is borne by the bearings in its rear wheels. When the car bumps over a stone or drops into a rut, this force is greatly and suddenly increased.

Though the springs and the upholstery may protect you, the axle-bearings receive a shock like the blow of a sledge-hammer.

There are other places in the car where great stresses are met by the bearings. For example, power from the engine is transmitted to the rear axle by a tapered gear-wheel called the driving pinion (see illustration on page 14). The torsion of this pinion makes it try to climb on the teeth of the gear with which it meshes. The bearings on the pinion-shaft stand all the strain of keeping it from doing this.

The design or principle of the Timken Tapered Roller Bearing gives it marked superiority in meeting these varied shocks and stresses.

You Can't Afford the Risk and Cost of Inferior Bearings

Finite man has never yet been able to make anything that will not wear. Bearings—any bearings—are no exception.

Steel of the right chemical formula, heat-treated in the right way, hardened and ground to microscopically exact dimensions—helps bearings to resist the inevitable wear.

But beyond the story of steel, which all bearings can tell, comes principle of design.

To hold bearing-wear to a minimum, pressure must be held to a minimum. It is far better to distribute pressure over the entire length of

rollers than to concentrate it on mere points as with balls.

Timken Tapered Roller Bearings are right in steel and right in steel-treatment.

The taper of their rollers and cups and cones, gives them ability to meet "end-thrust."

Their rollers sustain the greatest loads and hold wear down to a minimum.

The Timken principle of design is so good that even this minute wear can be completely taken up by adjustment without the least sacrifice of its theory of design or practical operation.

And Timken Roller Bearings are meeting the absolute tests of actual service in thousands of pleasure and commercial cars in all parts of the world, under all conditions of load and road, in the mountains and on the plains.

They are giving satisfactory service even in cases where they are not given the care and attention they should receive.

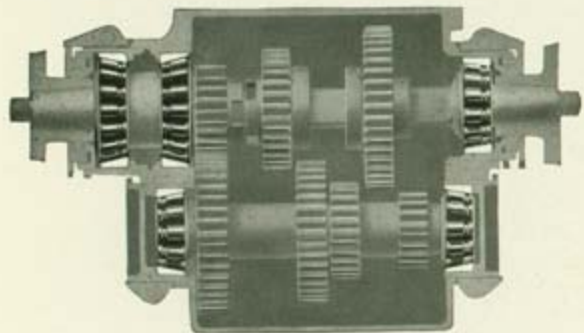
The condition of the bearings in your car is really so important to you that they deserve careful inspection at least every five thousand miles, and proper lubrication as often as that inspection discloses the need.



Where to Find the Anti-Friction Bearings in a Motor-Car

We shall mention only the points of greatest importance—those points in the car where elimination of friction is combined with carrying of loads or meeting of severe stresses and unusual shocks.

First come the hubs of the wheels. In each of these you will usually find two anti-friction bearings, although in some types of car you may



Good bearings in the transmission keep shafts in line and gears in mesh—saving power

find but one in the rear hub. Where there are two they are known as the outer and the inner.

In large touring-cars and trucks, where great weight makes steering difficult, you should also find an anti-friction bearing in the head of the steering-knuckle (see illustration on page 27).

Inside the housing of the rear axle you will find several anti-friction bearings, two and sometimes three of these are on the pinion-shaft (see page 14).

The bearing on the driving-pinion gear is one of the most important in the car.

The differential gears are also equipped with anti-friction bearings. These bearings must both carry the gears and sustain great end-thrust.

On the main and countershafts of your transmission you will find four or more anti-friction bearings (see picture above).

In the average pleasure car the number of important places where anti-friction bearings are used is fifteen or more according to the type of car.

In commercial cars there may be even more, owing to the fact that they are found not only on the dead-rear-axle ends, but also on the ends of the jack-shaft.

CHAPTER TWO

The ABC of Timken Tapered Roller Bearings

THE illustrations on pages 16 and 17 show the different parts of a Timken Tapered Roller Bearing.

First, the hardened-steel cone, made with two ribs, which fits over the shaft.

Second, the tapered, hardened-steel rollers which revolve about the cone.

Third, the pressed-steel cage which guides the rollers into position, but does not touch either cup or cone.

Fourth, the hardened-steel cup.

The cone, rollers and cup are composed of a steel made to Timken special formula.

Yet even this special steel, which is of the highest grade that can be obtained in the world, is not of itself sufficiently good for the Timken ideal of bearing quality.

It has to be treated by carbon, then by heat, so that the very structure and character of the steel are changed.

After the cones, rollers and cups are made with the extreme accuracy of automatic machinery, they are packed in pots containing a mixture rich in carbon.

These pots are sealed and heated at uniform temperature for carefully determined periods of time.

In this process of carbonizing, as it is called, the surface of the steel absorbs from the material in which it is packed a certain amount of carbon.

On the temperature and the length of time depends the depth of the carbonization.

Thus the surface of the steel part is so changed in chemical composition that in the after treatment it can be made extremely hard to resist wear, while the body of the part retains all its resilient strength and toughness.

After carbonizing, the parts are again heated to just the right temperature, for just the right length of time, and are rapidly cooled or "quenched" in water or oil.

Even the quenching liquid must be of just the right temperature.

This reheating and quenching is called "heat-treating."

The furnaces in which the parts are heated are so designed that the heat is evenly distributed and any desired temperature can be maintained within ten degrees.

Each size of roller, cup and cone must receive the heat-treatment that develops the degree of hardness and toughness best adapted to its particular use.

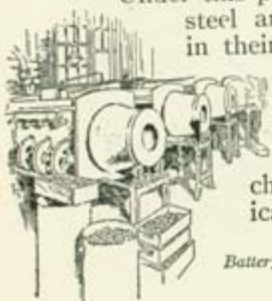
Timken has reduced heat-treatment to an exact science.

Each furnace has its electric thermometers, known as pyrometers, connected with a recording instrument. The man in charge of these instruments signals with red, white and green lights which tell the workman when to regulate his fire and when to remove his work from the oven.

Proper heat-treatment makes the surface of the parts glass-hard but not brittle, and leaves the interior of the steel tough and elastic.

Under this process the very molecules of the steel are changed in their nature and in their relative position to each other.

The result is that the parts are made of a steel that is radically different from the steel with which we start, both in its chemical composition and its physical nature.



Battery of heat-treating furnaces



How the Timken Bearing Works

The way in which Timken Roller Bearings operate can best be shown by a concrete example. Glance at the illustration on page 2 and you will see how these bearings are installed in the front hub of a motor-car.

The cup is firmly pressed into the hub; the cone carrying the rollers and cage is fitted over the axle-spindle. As the wheel turns, the rollers revolve between cup and cone.

This construction substitutes rolling-contact for sliding-contact and thus practically does away with friction.

To illustrate this principle, take a smooth, round lead-pencil or other cylindrical object and place it on your desk, then put a book upon it and move the book back and forth with your hand.

Now try moving the book on the desk without any roller and you have a practical example of the advantage of rolling-contact over sliding-contact.



Line-Contact vs. Point-Contact

The book and pencil also serve to illustrate another advantage of Timken Tapered Roller Bearings:

The advantage of the line-contact of a roller over the point-contact of a ball.

The rollers revolving between cup and cone touch both the cup and the cone in straight lines, extending the whole length of the roller. If they were balls instead of rollers, they would touch only in points.

Take a roller and a ball of equal diameter. It is easy to see how the line-contact of the roller enables it to carry the greater load.

How Timken Tapered Roller Bearings Meet End-Thrust

In the diagram page 13 the arrows represent the direction in which end-thrust bears upon the cup and the cone of a Timken Bearing and on corresponding parts of a cylindrical-roller bearing.

The fact that in a Timken Bearing the parts are tapered makes it impossible for this end-force to push the cup and cone apart.

From the diagram you can see, too, that there is absolutely nothing about a cylindrical roller to prevent this very thing from taking place.

To return to our experiment with book and pencil: Instead of rolling the book on the pencil move it sidewise, or along the length of the pencil. It moves easily because the straight roller has no capacity to resist end-thrust.

But, if your pencil were tapered, the book would rise—you would have to *push it up hill*.

In the Timken Roller Bearing this upward motion can't take place because the inner surface of the cup prevents.

So the Timken Bearing meets end-thrust.

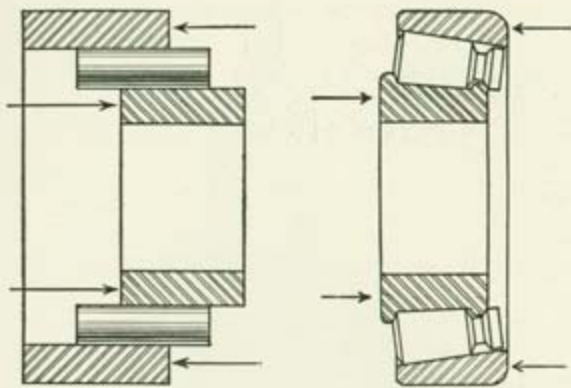
Why the Cone Has Two Ribs

As the rollers revolve about the cone, it is of extreme importance that neither of their ends shall travel farther or faster than the other.

The slightest deviation from the true position would destroy the straight line of contact and cause uneven wear.

To get this clearly in mind take a plain, conical, glass tumbler and lay a pencil vertically along its side. You will note uniform contact along the line of the pencil.

The moment, however, that you twist the pencil out of the vertical, you will see that it touches the tumbler only at one point.



The arrows indicate end-thrust and the diagrams show why its tapered construction enables the Timken to meet this force, while the straight-roller bearing can not.

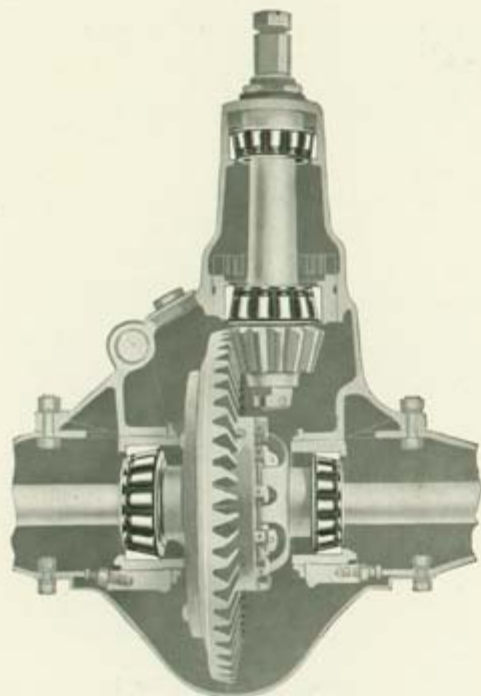
We must have a rib on the large edge of the cone in order to keep the tapered rollers from being pressed out from between the cone and cup. The contact between the large ends of the rollers and this rib tends in a very slight degree, to retard the large end of each roller.

So we must have another rib on the other end of the cone, against which a flange on the small end of the roller presses. This prevents all tendency to twist the roller out of its perfect alignment on the cone.

The Cage

In a wheel-bearing the load is borne by those rollers which are below the center of the spindle. There is very slight play, almost imperceptible, in the parts of the bearing above the center of the spindle.

The purpose of the cage is to guide those rollers which are above the center in their proper positions, during their idle period, and correctly align them as they enter their working zone.



Good pinion and differential bearings mean efficient transmission of power—saving gasoline

The cage also serves to hold the rollers on the cone of a disassembled bearing, when the cup is off, and to retain the grease used as a lubricant.

Perfect Adjustment without Sacrifice of Principle

This is one of the most distinctive and easily comprehended advantages of the Timken Tapered Roller Bearing.

The Timken Bearing is the only one in which adjustment brings the parts back into the identical, theoretically and practically correct

relationship in which they are when the bearing is first made.

When in 1908 the Thomas Flyer made its famous trip, from New York to Paris, the Timken bearings were given the hardest kind of service over almost 25,000 miles of road and trail.

Although the bearings were in perfect condition at the end of this trip, we had them returned to us for examination. The minute wear could scarcely be detected by the delicate measuring instruments at our factory.

By merely adjusting the bearings slightly all parts were found to be in exactly the same relation to each other as when the bearing was first made.

A Timken Roller Bearing properly mounted by the car-builder and not abused by the car-owner will last longer than the average car.

This means wiping a large part of maintenance cost entirely off the slate.

It means no dropping down of the transmission-shaft, consequent rattling, and loss of power.

The significance of this cannot be too strongly emphasized. The transmission-shaft must be absolutely in line to give efficient service.

The slightest deviation puts extra work on the engine.

The use of Timken Roller Bearings assures you wheels that run true without wobbling.

True-running wheels save tire-expense.

Timken Bearings stand up under the severe tests of daily service in commercial trucks.

They are the only bearings that have been found equal to this service.

Even if Timken Bearings were not made with the greatest care and accuracy they would still be superior, because they are right in principle.

The Timken Roller Bearing



A Timken Bearing with Cup Removed

Tapered rollers, revolving about a cone, sustain more load because they carry it along lines—not on points as balls do.

A Timken Roller Bearing has a much larger margin of safety than a ball bearing of the same size.



Complete Bearing, including Cup, End View



Cage that Holds Rollers in Place on Cone

It requires twelve operations and four annealings to make this one-piece cage out of flat sheet-steel.

As the parts are all tapered, any wear can be wholly taken up by adjustment—by advancing the cone into the cup.



Cone, Showing the Two Ribs

Two ribs on the cone are *absolutely necessary* to maintain the full line-contact, by keeping the rollers from twisting.

This roller receives as great care, accuracy and fine workmanship as any part of a watch.



Complete Bearing, Side View



Timken "Short Series" Roller

CHAPTER THREE

Timken Quality in Material and Skill in
Manufacture

THE efficiency and life of any anti-friction bearing depend first of all on correct principles of design.

They depend also upon the materials from which the bearing is made and upon the care used in the making. Timken Bearings are made of good steel—the best that money can buy for the purpose.

The importance of the heat-treatment of this steel has already been mentioned on pages 9-10.

We have seen there one of the great cardinal principles in Timken manufacture—the elimination of human error as far as possible.

Another illustration of this principle is found in the gauging. Every roller in a Timken Bearing must be just the size of every other.

It would never do to trust the gauging of the rollers to human hands. Human liability to err is too great. The mechanical perfection of Timken Bearings is a matter of too much pride to us.

So we designed and built machines that take the rollers after they have been hardened and ground to the limit of human accuracy and sort them into lots in which every roller is the exact size of every other roller.

The machines do not err—they do not depend on human eyesight or judgment.

They distribute the rollers with unerring accuracy to different containers. The separation of the sizes is purely mechanical, and electrical. Electric contact decides which container each roller shall enter.

When the sealed containers are brought to the assembling-bench, the man whose duty it is to put the rollers into the cage surrounding the cone, is absolutely certain that every one is like every other.

Between the heat-treating referred to on page 9 and the automatic gauging referred to above lies an immense number of operations, inspections and testings that go to make up a uniformly perfect product.

The gauges used throughout the plant are themselves held to strict accuracy by a set of Swedish gauges which are the world's recognized standard of ultimate accuracy.

Only thus can we maintain that absolute uniformity that assures you a bearing which is right not only in its principles but in all its component parts.

Human Efficiency Important, too

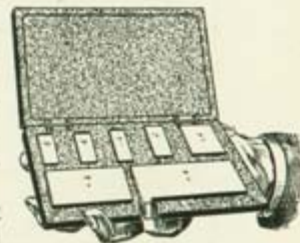
Although the liability of human error has been eliminated wherever possible, at the same time the human efficiency of the organization has been built up to the highest possible pitch.

It has taken years to bring the Timken organization up to the point where each individual puts brain, skill and loyalty into the doing of some one thing in the best possible manner;

To the point where the character of inspection ensures perfection in every pound of material, in every single operation, in every individual piece and in each assembled whole;

To the point where it is possible any week or month in the year to know exactly what each individual and each department in the factory is doing and how the sum total of efforts compares with that of any other week or month or year.

Only good mechanics apply for work at the Timken factory, for it is well understood among mechanics generally that bluff does not go here. A man's performance must be up to his pretensions from the start, and brilliance is not so much to be desired as faithful service, steady progress and willing adherence to Timken ideals.



Swedish Gauges

CHAPTER FOUR

Roller Bearings vs. Ball Bearings



ANTI-FRICTION bearings are either ball bearings or roller bearings.

Ball-bearings are either cup-and-cone or annular.

Roller bearings have either straight rollers or tapered rollers.

The first thing to get clear in one's mind is the distinction between point-contact and line-contact.

Point-Contact vs. Line-Contact

The simple experiment with book and pencil, described on page 11 has already given you an understanding of the advantage of line-contact as against point-contact.

A roller can sustain weight along its entire length; a ball only in a point.

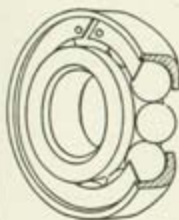
It is plain that to carry the same load as a roller, a ball must be very much larger.

This is an advantage of any roller bearing as against all ball bearings.

End-Thrust

There is one type of ball bearing and there is one type of roller bearing that can take end-thrust as well as vertical load. The cup-and-cone ball bearing (see page 21) can take end-thrust because the line (AA') which goes through the upper and lower points of contact of the ball is at an angle to the perpendicular.

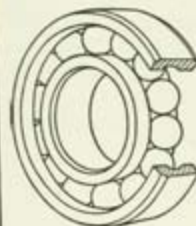
The principle by which the tapered-roller bearing meets end-thrust is the same as that of the ball, with the added advantage that the force is distributed over a line instead of being concentrated at a point.



CUP-AND-CONE BALL BEARING

In order to stand occasional end-thrust the cup and cone must be set at an angle which greatly sacrifices the vertical load capacity.

It is adjustable but this is really impractical as the slightest wear of the ball race destroys the curvature and the very principle of the bearing.

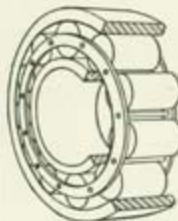
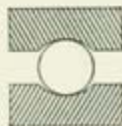


ANNULAR BALL BEARING

Vertical load capacity sufficient if the bearing is made big enough, but must be much larger than a roller bearing of the same capacity.

End-thrust capacity practically none, hence additional thrust bearings are necessary.

Not adjustable; must be replaced when wear occurs.

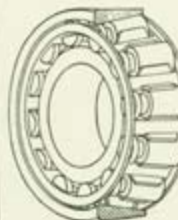


STRAIGHT ROLLER BEARING

Vertical load capacity greater than a ball bearing, where balls and rollers are of same diameter.

End-thrust capacity none, requiring additional thrust bearings.

Not adjustable; must be replaced when wear occurs.

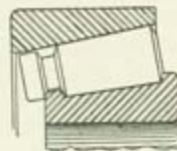


TIMKEN TAPERED ROLLER BEARING

Much greater vertical load capacity than ball bearings.

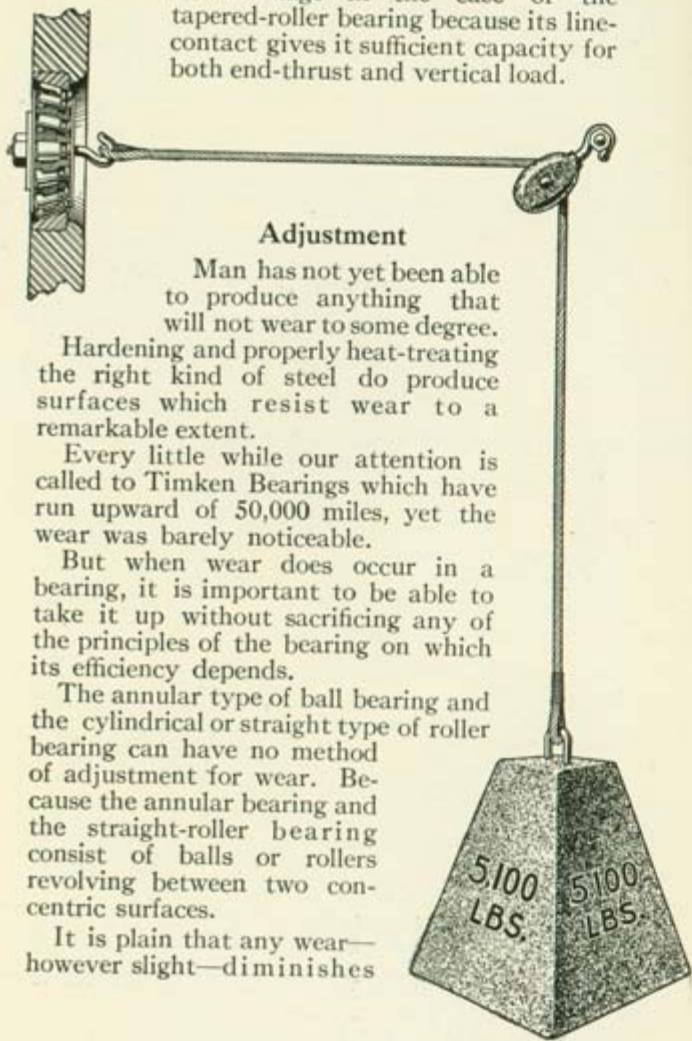
Has an equal capacity for end-thrust on account of the taper of cone, rollers and cup.

Is perfectly adjustable — taking up all wear without any sacrifice of its original principles.



See chapter four for full explanation.

The angle which enables a cup-and-cone bearing to meet end-thrust seriously diminishes its capacity for vertical load. This is not a disadvantage in the case of the tapered-roller bearing because its line-contact gives it sufficient capacity for both end-thrust and vertical load.



Adjustment

Man has not yet been able to produce anything that will not wear to some degree.

Hardening and properly heat-treating the right kind of steel do produce surfaces which resist wear to a remarkable extent.

Every little while our attention is called to Timken Bearings which have run upward of 50,000 miles, yet the wear was barely noticeable.

But when wear does occur in a bearing, it is important to be able to take it up without sacrificing any of the principles of the bearing on which its efficiency depends.

The annular type of ball bearing and the cylindrical or straight type of roller bearing can have no method of adjustment for wear. Because the annular bearing and the straight-roller bearing consist of balls or rollers revolving between two concentric surfaces.

It is plain that any wear—however slight—diminishes

the diameter of the ball or roller, and adjustment would mean bringing the two concentric surfaces slightly closer together.

To bring these surfaces closer would require expanding the inner ring, or contracting the outer. This is clearly impossible, because they are made of solid steel.

But, in the cup-and-cone and in tapered-roller bearings, these surfaces are brought closer together by simply moving the cup and the cone nearer to each other from the sides.

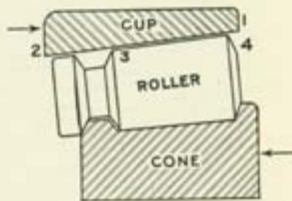
We have mentioned the fact that wear slightly reduces the diameter of the ball or roller. Naturally, also, there is slight wear on the outer surface of the cone and the inner surface of the cup in any type of bearing.

In a cup-and-cone ball bearing the wear forms a slight groove in both cup and cone. This destroys the curvature of both the cup and the cone. And the whole efficiency of this type of bearing depends on preserving the proper curvature.

Adjustment cannot possibly remove the grooves, and therefore does not restore the full efficiency of the bearing.

In a tapered-roller bearing, provided the cone has two ribs so that the rollers are always in perfect alignment, wear is evenly distributed over the entire surface of the roller, and the entire surfaces of both cup and cone.

Therefore, the proportions of these parts are still theoretically and actually correct, and when brought together by adjustment, the working principle of the bearing is absolutely as perfect as when it was first installed.



If wear occurs, leaving slight space between cup and roller, adjustment can be made by moving the cup or cone in the direction of the arrows.

As 1-2 and 3-4 always remain exactly parallel, the adjustment brings the different surfaces into perfect line-contact, and no principle of the bearing's efficiency is impaired.

Selection by Elimination

Load-Capacity

We have seen in comparing roller with ball bearings that if the diameter of the balls and rollers is the same, the roller bearing has greater capacity for carrying load.

End-Thrust

We have seen that neither the annular ball bearing nor the straight-roller bearing are able to take end-thrust.

That this is recognized by the makers of annular and straight-roller bearings, is shown by the fact that they advocate the use of special thrust-bearings in connection with the others when end-thrust is to be met.

It is plain that both the cup-and-cone ball bearing and the tapered-roller bearing are able to meet end-thrust, in addition to vertical load.

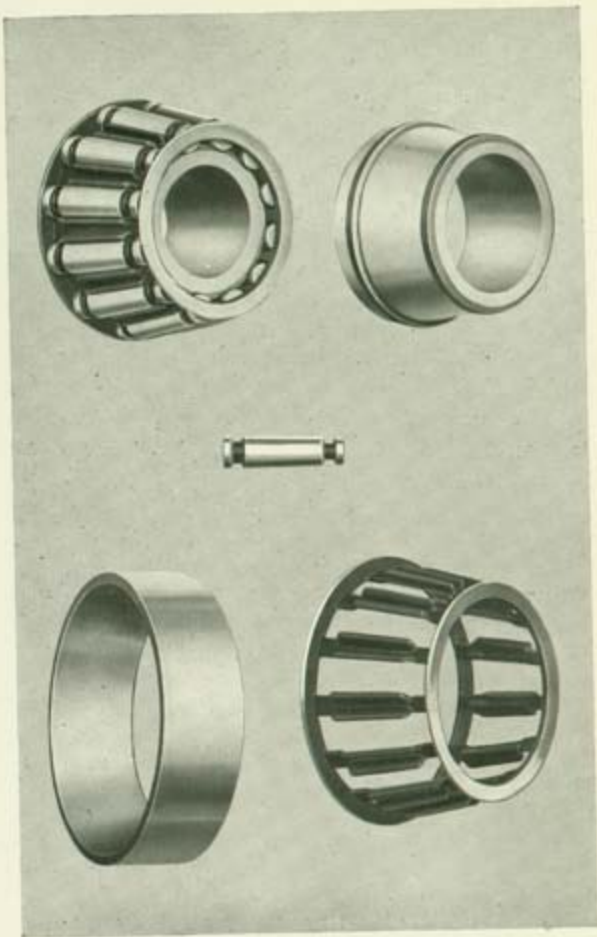
But owing to the superior load-carrying capacity of the roller over that of the ball, the tapered-roller bearing sustains end-thrust without any practical diminution of its ability to carry vertical load.

Adjustment

Owing to the fact that in a roller bearing the load is carried on lines instead of points, wear is less in the roller bearing than in the ball bearing.

We have seen that when wear does occur—as it inevitably must in time—in the Timken Tapered Roller Bearing that wear can be taken up by adjustment, without the slightest sacrifice of either the theory or practice of its principles.

From the moment of beginning to use the cup-and-cone ball bearing, wear—however slight—starts to impair the principle upon which its efficiency depends. And while adjustment is possible, it does not correct the impairment of the principle.



Timken Long Series Roller Bearing

Where all Virtues Combine and No Defects Appear

The importance of the bearings in your car is so great; the functions they must perform satisfactorily are so varied; the shocks and stresses which they must meet are so many and so severe, that you can't afford to have anything but the best.

Cost of up-keep, comfort, satisfactory everyday service, and even your personal safety depend upon the use of the right bearings in your car.

Of all the types of anti-friction bearings in existence, there is only one that combines the capacity to carry the maximum vertical load with the capacity to meet all stress of end-thrust; and that is perfectly adjustable without any sacrifice whatever of its original principles.

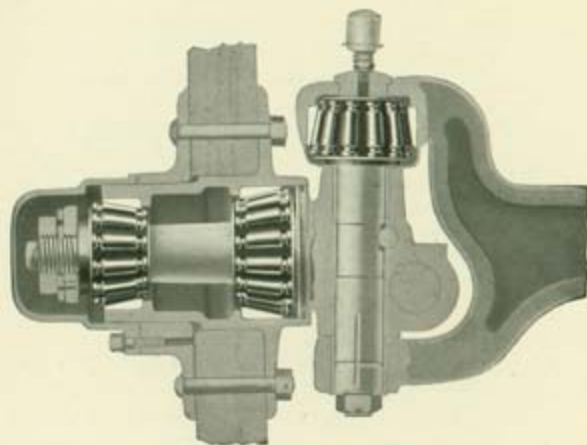
That bearing is the Timken Tapered Roller Bearing.

It is the bearing which is used today by the manufacturers of the highest priced, the best-known and the best made motor-cars of every type in the United States, and by many European builders also.

It is the bearing which the leading commercial-car builders have found to be the only one capable of standing up under the extra-trying conditions that a commercial car has to meet all day long and every day.

Wherever in a pleasure or commercial car the service required is the hardest, the shocks and stresses to be met the severest, there the Timken Tapered Roller Bearing is most likely to be found.

Year by year, builders are placing them in more parts of their cars. Scarcely ever are they left out of a car which has once contained them, and invariably when left out, it is because of price—never because of deficiency in service.




*Nearly every truck has Timken Roller Bearings
in its front axle*

Seventy-six and three-tenths per cent of all the pleasure and commercial cars shown in the great exhibition in Madison Square Garden, in January of this year, were equipped throughout or in part with Timken Roller Bearings. Over half of those cars contained Timken Bearings in more places this year than last.

There can be but one all-inclusive and sufficient reason for this, namely—that Timken Tapered Roller Bearings give satisfactory service wherever they are used.

CHAPTER FIVE

On the Proper Care of Timken Bearings

 **T**IMKEN Roller Bearings have given remarkable service, even in cases where the owner of the car and the chauffeur who drove it knew nothing about bearings or about their proper care. However, a good servant deserves kind treatment and even these ideal bearings will give better service if they are understood and appreciated.

A good driver should know very soon if anything is wrong with his bearings.

A good chauffeur should understand the importance of keeping the bearings properly lubricated, and as Timken Roller Bearings are adjustable, should know how to adjust them.

The Timken Roller Bearing requires the minimum of attention.

Examination of the Bearings

To assure the best service, Timken Roller Bearings should be examined at least once to every 5,000 miles of travel.

If it should happen that one of the rollers had become damaged, the best plan is to remove the cone carrying the cage and rollers; it can then be sent to the nearest service-station of the car-builder for repair or replacement.

Single rollers should not be replaced by anyone other than the maker, to insure that all rollers are of exactly the same size.

Every Timken Roller Bearing is guaranteed to the builder of the car against any defects in material or workmanship, and we prefer that the car-owner should apply to the builder for repairs if any are needed. If necessary, however, the bearing can be shipped to our factory at Canton, Ohio.

One of the greatest advantages in the use of Timken Roller Bearings is the fact that duplicates can always be obtained of any size of bearing that has ever been made at our plant. We not only carry a supply of the various sizes, but have the jigs and tools to make any part of any bearing that we have ever sold.

Thus, even if the builder of the car goes out of business, the owner can still obtain new Timken Bearings that will fit absolutely, because all of the parts are perfectly interchangeable.

Adjustment of the Bearings

Every time a wheel is removed, the cup of the bearing is removed with it, and consequently the bearing must be properly adjusted when the wheel is replaced.

The best method is to turn the bearing up tight, and then revolve the wheel a few times by hand, which overcomes any tendency to "backlash."

Then back off the adjusting-nut very slightly, so that by grasping the two spokes in a perpendicular line—one above and one below the hub—you begin to feel a very slight shake in the wheel. If this is more than barely perceptible, it is too much, and the adjusting-nut should be a little tighter.

When you have it just right, lock it, and the bearings will give the best of service.

Gear-bearings should be turned up to snug fit, but not so tight as to prevent the gears from turning freely.

The above instructions are purposely very brief, and should be supplemented with practical common-sense. It is better that adjustment and lubrication should be taken care of by the garage, or by a thoroughly competent chauffeur.

Lubrication of the Bearings

Any light grease or heavy oil will serve as a lubricant for Timken Roller Bearings, if it is positively free from acid.

The lubricant should be placed in grease-cups, where they are provided.

In the case of wheel-bearings, the lubricant should be spread with a paddle. It is advisable not only to spread it upon the cage holding the rollers, but also to fill the hub. This may appear like too much grease, but any apparent excess will be taken up by the parts as soon as they are in operation.

The greatest care must be exercised to see that there is absolutely no grit on the paddle, in the grease, or on the bearings themselves.

Should the presence of grit be detected, the only thing to do is to wash the bearings thoroughly with gasoline and dry them, after which the lubricating should be done over again.



Long rows of "automatics" turn out thousands of cups, cones and rollers "in the green" each day

Right Principles the Corner Stone

¶ Long before the manufacture of Timken Roller Bearings had reached anywhere near its present advanced state of perfection—

¶ Long before Timken study and experience had developed the present analyses for steels and the present formulas for heat-treating the parts—

¶ Timken Tapered Roller Bearings won marked success over all other types.

¶ Before there were any motor-cars, when horse-drawn vehicles ruled supreme—the Timken Roller Bearing proved its worth.

¶ Crudely made as it was in those early days, yet its unique principles of design enabled it to give a service that no other bearing could give.

¶ When the motor-car industry started, it was our faith that the Timken Bearing would win the predominant place in the new service because of the wonderful efficiency due to its principles of design.

¶ The foundations of our faith were sure. The experience of hundreds of thousands of motor-car owners has justified that faith.

¶ And in the years during which Timken methods of manufacture have attained their present high state, our faith has become the faith of the great majority of the builders of pleasure and commercial cars.



The Timken Roller Bearing Co., Canton, Ohio



New York Branch: 1000 Broadway



Chicago Branch: 1347 South Michigan Ave.