



Bulletin # 12

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📖 Riding 🌸 Collecting 🌸 Restoring 🌸 Research 🌸 History 📖

The Story of Bicycling In America

It can be imagined that from the beginning of humankind, a better (faster and easier) way to get around has been sought, and appreciated, by people in general. The earliest vehicles had wooden wheels on wooden axles: examples would include horse drawn chariots, wagons, and coaches. However, it was not until 1817 that Baron von Drais of Germany invented a vehicle that was the true precursor to the bicycle; i.e., a two wheeled vehicle that could be steered by the rider. The major types of machines, in chronological order, that occurred in the bicycle's first 100 years of development (i.e., up to 1917) are identified as:

- Draisines or Hobby Horses
- Velocipedes or Bone Shakers
- High Wheel (Ordinary) Bicycles
- High Wheel Safety Bicycles
- Tricycles
- Hard Tired Safety Bicycles
- Pneumatic Tired Safety Bicycles and Important Paraphernalia Developed for These Bicycles

Following is a description of the major types of machines that were invented during development of the bicycle through the year 1917.

Draisines



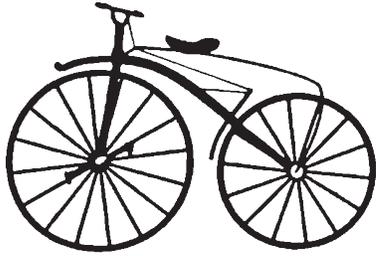
Draisines or Hobby Horses (Invented in Germany in 1817)

Draisines were simple vehicles with two wheels approximately the size of those on modern day bicycles that were connected by a beam so they were in line, one behind the other. There was a seat in the middle of the connecting beam on which the rider sat, and the rider propelled the vehicle forward by striding with his feet on the ground. The most important feature of this vehicle was its articulated front wheel by which the rider could steer the contraption. With steering came (for the first time) the ability to balance

on two wheels due to the rider's ability to steer into a fall to either side of the vehicle, which occurs constantly during the riding of any bicycle. So, the articulated front wheel on a two wheeled vehicle was truly a revolutionary invention that was probably discovered accidentally when Baron von Drais (the inventor of the Draisine) descended a hill and found that he could lift his feet off the ground and coast down the hill. In any case, this contrivance (named Draisine for its inventor or later, hobby horse for its flamboyant riders) enjoyed a brief period of popularity. These persons of means often dressed up in fancy clothes and paraded in public places for the purpose of showing-off: These 'Dandies,' were characterized as being vain and thoughtless of people who might get in the way of their hobby horse.

Some hobby horses were ridden in America, but their greatest popularity was in Europe; especially in France, England, and Germany. These vehicles were popular with a small set of people for a few years after their invention, but their significant weight (generally between 70 and 90 pounds), and their lack of brakes which rendered them dangerous, led to a loss of interest by all riders except for the real die-hards. [See the Bibliography for books by Roger Street for more information on this subject.]

Velocipedes



Velocipedes or Bone Shakers (invented in France in the early 1860s)

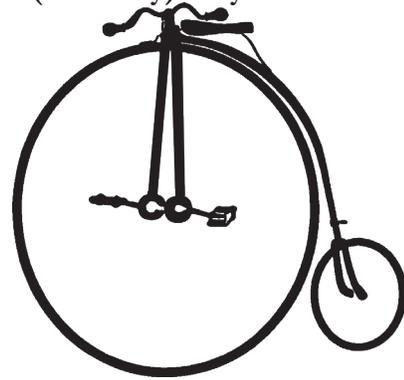
The first velocipedes were basically hobby horses with pedals attached to the front wheel axle. This type of bicycle was invented in the shop of Pierre Michaux in Paris, France, sometime around 1863. Pierre Lallement, who had been a machinist in the Michaux shop at the time this contraption was invented, came to the United States in 1866 carrying the essential parts to make a velocipede. By 1867 Lallement had assembled a velocipede in the shop in Ansonia, Connecticut, where he was working. He rode this velocipede in the country around Ansonia and to nearby New Haven. Lallement obtained a U.S. patent in 1867 for this invention which was the very first patent in the world for a velocipede. However, Lallement and his partner James Carroll were not successful in marketing this new invention in the U.S., and Lallement returned to France in early 1868.

In the meantime, the Hanlon Brothers (a renowned acrobatic team) brought some velocipedes from France to America when they returned home in January of 1868. These French velocipedes were improved for use by the Hanlon's on stages in theatres, and they were granted a U.S. patent in July 1868 for this. Then, in August 1868 the Hanlon's performed races with velocipedes on the stage at Selwyn's Theatre in Boston, Massachusetts, and around the Boston Common. These demonstrations of the velocipede were widely publicized in America, and they were key factors in the initiation of bicycle-mania that swept America beginning in the fall of 1868 and continuing until the spring of 1869.

At the height of the velocipede's popularity, there were hundreds of riding schools in major cities around the country with smooth hard floors to ride on, and it was very fashionable to become a velocipede rider. It was predicted by many that the velocipede would supplant horses, but of course, this did not happen. When spring came in 1869, velocipede riders began to ride their vehicles outside on the streets only to find that it required much effort to pedal these heavy machines over the rough streets that were the norm at that time. Ascending hills was especially difficult and it was not long before interest in velocipedes died away and virtually disappeared from the scene in America.

[See the Bibliography for a book by David V. Herlihy (2003) and papers by Sanderson (2010, 2012) for more information on velocipedes.]

High Wheel (Ordinary) Bicycles



High Wheel (Ordinary) Bicycles, nick named Penny Farthings in Great Britain (developed in England in the early 1870s)

When these bicycles were first invented they were simply bicycles, but subsequently there was a need to differentiate them from newer types of bicycles so this style came to be called the "high wheel bicycle", and later the "Ordinary" or (especially in the United Kingdom) the "penny farthing."

High wheel bicycles evolved from the velocipede. Over time, the front wheel was enlarged (typically 48" to 60" diam.) to satisfy the desire for more speed, and in order to make the wheel as large as could be straddled by the rider, it was necessary to develop a way to get up on top of the wheel which brought forth the curved backbone with a small step over the small rear wheel. Also, the rear wheel was made smaller to enable the rider to get as close to the large front wheel as possible to facilitate mounting this vehicle.

Another advantage of the high wheel bicycle over the earlier styles of bicycles was metal wheels with wire spokes and solid rubber tires, which replaced the wooden wheels with iron bands for tires (from buggy wheel technology). This innovation created wheels that were significantly lighter and stronger than earlier types of wheels. In the final stage of development of the high wheel bicycle, ball bearings were added to the axles of the wheels and the pedals (and in the Trigwell head, to the steering head bearings as well) to reduce friction which made pedaling easier.

The high wheel bicycle was the first truly successful bicycle. On this vehicle, for the first time in the world, strong riders were able to travel 100 miles per day (or more) and go as fast as a racing horse (i.e., about 25 miles per hour) using only their own strength for propulsion. This success was due to the large front wheel, or driving wheel, that had the effect of putting the rider in a high gear, and the light weight of these machines, usually 35 to 45 pounds, that is in the range of what a 'fit' person can easily manage.

As suggested by their name, a defining characteristic of the high wheel bicycle is the large front driving wheel that effectively gives the rider a high gear with the possibility

of high speeds (if the rider is strong enough to push the wheel). On the other hand, a rider could choose a smaller wheel which gives the rider a lower gear making going up hills a bit easier, but the rider must make sure that the smaller wheel does not make his/her knees come up high enough to touch under the handlebars which could cause a crash. In any case, when choosing a high wheel bicycle, riders must consider their leg length and choose a machine with a front wheel that is as large as possible (to maximize the speed potential) while still enabling them to sit on the seat and reach the pedals when they are most distant (i.e., at the bottom of their cycle).

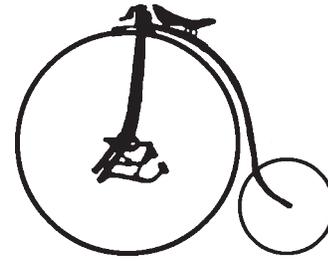
In spite of its advantages, the high wheel bicycle had some serious shortcomings: first, it took considerable skill, strength, and athletic ability to mount and ride a high wheel bicycle which limited the number of people who could ride this machine, and second, high wheel bicycles were dangerous. The rider's weight was located on top of the machine's large front wheel and just behind its center of gravity with the result that anything that suddenly impeded the forward motion of this wheel would cause the rider to plunge forward over the handlebars, and since the handlebars were across the rider's lap, the rider was normally thrown forward head first. When this happened the unfortunate rider's head was the first body part to hit the ground (this is called "taking a header"). As a result of this safety problem, many high wheel bicycle riders were seriously hurt, and this fostered a widespread effort to develop a 'safe' bicycle.

High Wheel Safety Bicycles

This type of bicycle was invented first in England in the early 1880s with the United States inventing two important types in the mid-1880s.

As noted above, high wheel bicycles were spectacularly successful in many respects, but they suffered in that they were intrinsically dangerous. In response to this safety problem, there was a concerted effort to develop a safer design. The characterizing feature of all the safety high wheel bicycles that resulted from this effort was positioning of the seat farther back from the bicycle's center axis that was directly over the large front wheel of high wheel bicycles. Several designs that met this criterion were developed in the early 1880s and culminated around 1890 when the next stage in the development of the bicycle took center stage and soon dominated the scene. The major versions of high wheel safety bicycles may be categorized as follows:

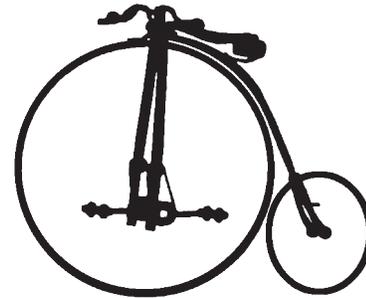
The Facile



The Facile

The wheel on this bicycle is turned by the action of levers that are attached at the front to extensions of the front fork arms and to the ends of the crank arms as they project backwards. The pedals are attached to the ends of the levers that project to the rear of the front wheel axle. This configuration allowed the seat to be moved back and downwards putting the rider farther behind the machine's center of gravity and closer to the ground making falls less dangerous. In the earliest versions, there were no gears in the front axle, but later versions had gears incorporated in the front axle which made it possible to have a smaller front wheel with all the advantages of a large wheel for speed.

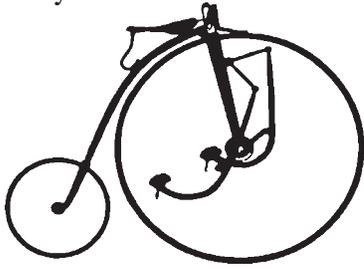
The Kangaroo



The Kangaroo

This design used a smaller front wheel (usually about 36" diameter) than was normal on a high wheel bicycle (48" to 60" diameter), and it had the pedal cranks mounted on extensions of the front wheel forks that positioned the pedals below and behind the front wheel axle. The pedal cranks were attached to the front wheel axle by chains that ran on toothed sprockets. This arrangement enabled the bicycle to be geared up so that it ran like a high wheel bicycle by using a sprocket on the wheel axle that was smaller than the sprocket on the pedal cranks. This design was very successful, and riders of Kangaroo style bicycles were able to compete with high wheel bicycles in both speed and distance rides.

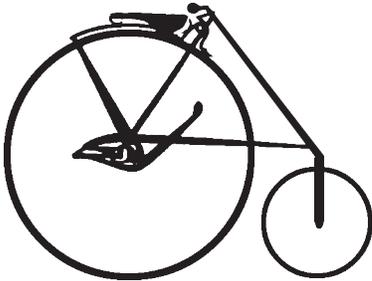
The Xtraordinary



The Xtraordinary

This design was invented by George Singer of Singer & Co. of Coventry, England. It features long arms attached near, and pivoting from, the top of the fork arms and extending downwards to attach to the pedals before swinging downwards and backwards. Pedals were attached to the ends of these long arms which resulted in the pedals being lower and behind the position of pedals on a high wheel bicycle. This allowed the seat to be positioned lower and farther behind the machine's center of gravity with the result that this version of the high wheel bicycle was safer than its predecessor.

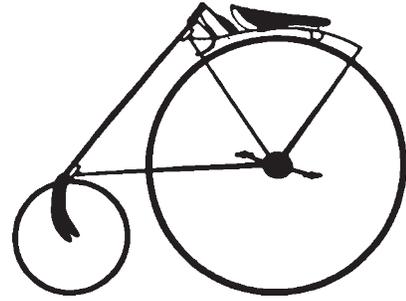
The Star



The Star

This design was invented by George Pressey of New Jersey, U.S.A., and manufactured by H.B. Smith & Co. in Smithville, NJ. It was 'safe' because the small wheel for balance was placed in front of the large driving wheel with the result that it was very difficult to fall forward (i.e., take a header). The other departure in design from high wheel bicycles was the use of levers to propel the machine instead of pedals on crank arms. Star bicycles tended to be faster than high wheel bicycles because riders can pump their legs up and down (as is required when riding a Star bicycle) faster than they can move them in a circle (as is required in operating a high wheel bicycle). A most interesting feature of the Star bicycle was its ability to be ridden down a flight of stairs which was impossible to do with the Ordinary bicycle.

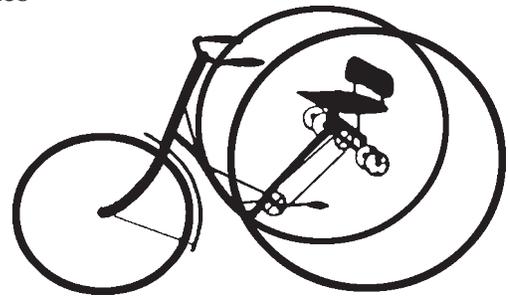
The Eagle



The Eagle

This American invention simply placed the small balancing wheel in front of the large driving wheel which made the machine safe by making it difficult to tip over in a forward direction which would send the rider flying head first onto the ground in front of the bicycle. In this respect, the Eagle was safe for the same reason that the Star bicycle was safe. However, the Eagle retained pedals on the axle of the large wheel for use in driving the machine forward rather than use of an arrangement of levers to accomplish this essential function. Like the Star bicycle, one could even ride down a flight of stairs on the Eagle bicycle. However, this bicycle design had one problem that restricted its usage to the most skilled riders: namely, this design did not permit having a mounting step so riders were required to do 'pedal mounting' which many riders could not master. In spite of its shortcomings, the Eagle design had good acceptance by high wheel bicycle riders, but its commercial success was limited because it was introduced near the end of the high wheel bicycle era (i.e., at the end of the 1880s).

Tricycles



Tricycles were made with High Wheels for Adults (invented and developed first in England in early 1880s).

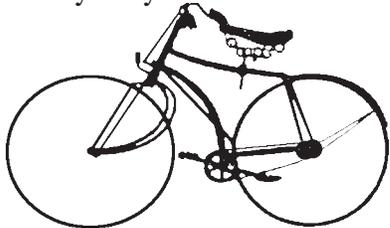
Tricycles were introduced to the cycling public in the early 1880s for use by adult riders who wanted the safety of having a stable platform. These tricycles were characterized by one or more large driving wheels that gave them the advantages of a 'high gear'. The three wheels of these machines were generally arranged in a triangular fashion so that the tendency to tip over was minimized. Tricycles tended to be magnificent machines with their large wheels and imposing bulk, and they were the cause of some im-

portant technological developments such as the use of chains to transmit power from pedals to wheels, rack and pinion steering mechanisms, and differential drive systems.

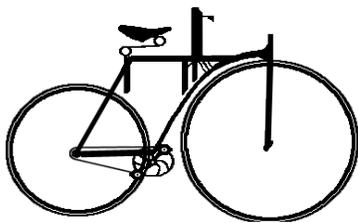
Tricycles were used by women who wanted to ride but could not ride the high wheel bicycle because their clothing was not suited to the activity (i.e., the long skirts and numerous undergarments required in that period). However, tricycle riding was made quite acceptable when it became known that Queen Victoria had purchased several of these machines for her family's use, and it was reported that the Queen herself was a tricycle rider.

In the first years of their existence, some thought that tricycles were superior to bicycles, but after a very few years, it was recognized that tricycles with their greater weight and complexity were intrinsically slower, more difficult to pedal, and more expensive than bicycles. By the mid-1880s the interest in tricycles had waned and after that it was mainly the tandem form of these machines (i.e., with two seats) that were used by couples to ride around town.

Hard Tired Safety Bicycles



Hard Tired Safety Bicycles (invented first in England in mid-1880s)



Rover (the first safety bicycle)

A big step forward came in 1885 with the introduction of the 'Rover' safety bicycle by James Starley of Coventry, England. This revolutionary form of bicycle had two smaller wheels (i.e., smaller compared to the large wheel of an Ordinary bicycle) and the rider sat between the wheels with his/her feet on pedals that were connected to the rear wheel by a chain. The use of a chain to connect the pedals to the rear wheels enabled the machine to be geared-up so that the Rover safety bicycle's smaller wheel effectively turned as though it were a larger wheel, and could be geared to be equal to the size of a high wheel bicycle, or even greater. This arrangement of the basic parts of the bicycle was like the arrangement of basic parts on a modern

bicycle, but there were some important differences: first, the tires were made of solid rubber rather than rubber tires with air filled inner tubes (pneumatic tires had not yet been invented), and second, the frame connecting the wheels was composed of a single strong tube rather than of three tubes in a triangular arrangement. Safety bicycles with some of the features of the Rover had been put forth earlier, but it was the 1885 Rover that was the first truly successful safety bicycle.

Rover safety bicycles proved to be as fast as high wheel bicycles, and many riders switched to this new style of bicycle because they were safer, easier to ride, and a bit less expensive. The high levels of interest in Rover bicycles fostered their rapid further development and soon led to the diamond frame and other improvements. However, two problems had to be overcome before smaller wheeled safety bicycles would become the dominant form for bicycles: first, the smaller wheels with hard rubber tires produced an uncomfortably hard ride, and second, the rider on a hard tired safety bicycle was not as impressive as a rider perched on a high wheel bicycle. Invention of the pneumatic tire brought solutions to both of these problems in that air filled tires resulted in a more comfortable ride and the superior speed of pneumatic tired safety bicycles trumped the elegance of the high wheel bicycle. This ultimately led to the final stage in the development of the bicycle up to 1917 which ends the bicycle's first century.

Pneumatic Tired Safety Bicycles



Pneumatic Tired Safety Bicycles (pneumatic tires were reinvented about 1888 in Dublin, Ireland), and Important Bicycle Paraphernalia for These Bicycles (1880 – 1917)

John Boyd Dunlop, a Scottish Veterinary Surgeon living and working in Belfast, Ireland, invented and patented a pneumatic tire in 1888. Unknown to Dunlop, this type of tire had already been patented in 1845 by Robert Thompson, but the importance of the pneumatic tire was not appreciated at that time and this earlier invention had been forgotten by all concerned. The story is that Dunlop's intention was to make his son's bicycle more comfortable by using air filled tires in place of the solid rubber tires that were standard at that time. Dunlop's first pneumatic tires were made of rubber surgical tubing wrapped, and cemented, around the rim of the wheel with some cotton cloth glued to the outside of the tubing to increase the tire's durability. Air was inserted into the rubber tubing with a

football pump. In experimenting with these air filled tires, Dunlop found that they rolled farther and faster than the same wheels with solid rubber tires.

In May 1889, a standard safety bicycle fitted with Dunlop's air filled (i.e., pneumatic) tires was winning races in Belfast, Ireland, and in July 1889, it won several races in Liverpool, England. The bicycle world knew that something important had happened when an Irishman, riding a bicycle made in Ireland, beat some first class English bicycle racers on their own turf. Dunlop had developed his pneumatic tire to make bicycles more comfortable, but it was the recognition that safety bicycles fitted with pneumatic tires were faster than bicycles fitted with any other type of tire that made pneumatic tired safety bicycles an immediate success. The demand for safety bicycles with pneumatic tires increased rapidly in 1890 and 1891 during which time a great amount of effort was made to improve the dependability of pneumatic tires, and factories were revamped to make pneumatic tired bicycles. The result of this activity was that by about 1892 the pneumatic tire had been improved so that these tires were reasonably dependable, and from this time on virtually all bicycles made were pneumatic tired safety bicycles. Besides being more comfortable, safer, easier to ride, and faster than previous forms of the bicycle, the pneumatic tired safety bicycle was also less expensive than earlier styles of bicycles. All these advances resulted in a vehicle that had great appeal at a time when there were few alternatives for personal travel, and they laid the basis of a period of bicycle-mania that swept America in the 1890s.



Chainless Safety

'Chainless' safety bicycles were developed in the late 1890s. The driving mechanism on these bicycles depended on bevel gears that connected a drive shaft running through one of the chain stays from the pedals in the front to the rear wheel axle. Bicycles with this type of drive system were cleaner than those with chains, but they had the disadvantage of making it more difficult to repair flat tires on the rear wheel because it was difficult to disassemble and then to reassemble the bevel gears in correct alignment. In addition, they were more expensive than bicycles with chain connected drive systems. Chainless safety bicycles were common from their introduction

in the late 1890s, but they virtually disappeared from the marketplace by 1915.

After the introduction of pneumatic tired safety bicycles, the burgeoning market for bicycles led to the development of other paraphernalia related to bicycles. The most important of these items were:

(1) Bicycle Bells: Bicycles were known as 'silent steeds' because they were virtually noiseless in their operation. This created a need for a means to warn pedestrians that a bicycle was approaching, and bells were ideally suited for this purpose. Many companies adapted bells for use on bicycles, but the New Departure Company of Bristol, Connecticut (already known widely for its door bells), was particularly successful in making bicycle bells that were dependable, had a most pleasant sound, and were often highly decorated.

(2) Hand Brakes: The first hand brakes consisted of a lever on the handlebars that when operated would cause a rod running beside, or inside of, the head tube to move downward bringing a brake shoe down upon the surface of the wheel. The friction between the brake shoe and the surface of the tire would act to slow down the bicycle, and even to stop the bicycle if applied with sufficient force.

(3) Lights: Lights were useful if the bicycle was ridden at night. The first lights were candle holders. These lights were mainly to warn others that a bicycle was approaching since they gave insufficient light to illuminate the roadway. Then came oil lamps. These lamps provided much more light than candle lamps, but the amount of illumination was still only minimally sufficient to light the way for a cyclist at night. Carbide lamps that depended on acetylene gas produced by dropping water onto calcium carbide were developed in the mid-1890s, and these lamps were capable of producing enough illumination to enable relatively safe cycling at night. Finally, in the earliest years of the 20th century, lamps powered by electricity stored in batteries were available for use on bicycles. As could be expected, electric lamps and their associated batteries were continually improved, and they came to dominate the field by the end of the bicycle's first 100 years.

(4) Cyclometers: Devices to monitor the miles traveled by a bicycle had been invented in the 1880s for use on high wheel bicycles, and in the 1890s, they were adapted, and improved, for use on safety bicycles. Interestingly, there was little interest in recording the speed traveled until after the bicycle's first 100 years (i.e. about 1917) after which this function became a standard feature of cyclometers.

(5) Freewheels: The freewheel function allows the rear wheel to roll when the pedals are stationary in contrast to the situation with a fixed wheel which requires that the

pedals rotate whenever the wheel rotates. The freewheel function has many advantages for the rider, but it does eliminate the braking capability of back-pedaling and consequently the use of a freewheel on a bicycle imparts a requirement that some alternate form of brake be installed to provide for controlling the speed, and stopping the bicycle.

(6) Coaster Brakes: Coaster brakes were first developed in the second half of the 1890s, and their development was primarily an accomplishment of North American inventors. A coaster brake is a mechanism contained within the hub of the rear wheel, and the brake is applied by back-pedaling. This type of brake is very easy to use, and it eliminates the need for any other braking device although extra braking power was easily provided by a hand brake that operated on the rim of the front wheel. Europeans generally preferred using a combination of a simple free wheel with hand brakes because of the lighter weight of this arrangement with the result that the very best hand brakes were developed in Europe during the early years of safety bicycle development (i.e., from the late 1880s through the early 20th century).

(7) Bowen Cables: The placement of flexible cables inside stiff hollow housings enables the easy and efficient movement of an object such as caliper brakes or a derailleur by remotely and conveniently located controllers such as levers fastened to the handlebars. This simple and efficient device that is used extensively was invented in 1896 by Ernest M. Bowden, an English cyclist and author.

(8) Rear Hubs with Internal Gear Shifting Mechanisms: Mechanisms to shift gears that are completely contained within the rear hub were developed in England by Mr. Sturmey in the first years of the 1900s. Gear changing was accomplished by hand operation of a shifting lever that was mounted on the handlebars or on the top tube of the frame and connected to the gear shifting mechanism by a cable that ran along the tubing of the bicycle's frame. The key developers of these in-hub gear shifting mechanisms were the Sturmey Archer Company in England and the Fichtel & Sachs Company in Germany.

(9) Derailleurs (for Gear Changing): Derailleurs are devices attached to the frame of the bicycle where they serve to move the driving chain from one sprocket to another so as to change the gear ratio between the pedal

crank and the rear wheel axle. The first commercial production of derailleurs was in St. Etienne, France, in 1914, and use of these devices has grown slowly over the years until today they are the most commonly used device for changing gears on bicycles.

Conclusion

The development of pneumatic tired safety bicycles (beginning about 1885) with greater safety, speed, and lower cost brought on the almost complete demise of all other styles of bicycles from earlier times, and this transition was complete by about 1892. Many riders of earlier styles of bicycles, and especially riders of Ordinary high wheel bicycles, were saddened by the demise of the earlier machines. However, no one could be sad about the increased interest in bicycles that ensued with the availability of pneumatic tired safety bicycles with their improved safety, comfort, speed, affordability, ease of riding, etc. Interest in all styles of the wonderful bicycles from yesteryear has been revived in recent times by **The Wheelmen** and similar organizations in other countries around the world. These organizations are committed to preserving old bicycles and the history that surrounds them. Public displays of these historic machines with informed explanation of their features ensure that the story of these machines and their development will be preserved for society today and for future generations.

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