Straight Forks and Pneumatic Tires: Historicizing Duchamp's *Bicycle Wheel* of (1913)

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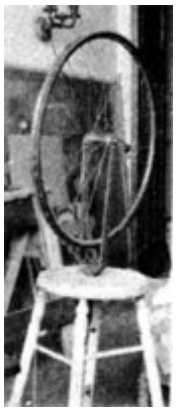
- 

- Figure 1
  Bicycle Wheel

(1913) on a Stool.
Photograph taken
at Duchamp’s studio,
circa 1917

- Figure 2
  Bicycle Wheel
  (1913) on a Stool.
  Photograph taken
  at Duchamp’s studio,
  circa 1917
- Figure 3
  Bicycle Wheel
  (1913) on a Stool.
  Photograph taken at
  Duchamp’s studio,
  circa 1917

In response to a discussion of the Duchamp bicycle sculpture on the massbike listserv, I have a couple of quibbles about statements on bicycle history on your pagehttp://asrlab.org/articles/why_bicycle_wheel.htm

The following statement is not entirely accurate:
”The straight fork bicycle might have looked fine, but the irregular twists, turns, throws and pitches of a Bicycle Wheel, when attached to a straight fork, were dangerous and unstable—hence, the name given to the bicycle with a straight fork design: the “Bone Shaker.”

The term “boneshaker” applies to bicycles built from approximately 1863 to 1878, with a relatively small front wheel constructed like a wooden wagon wheel—the bicycle shown inIllustration 6 on the page is of this type. Most bicycles made from approximately 1878 to 1890 had tensioned steel spokes, a larger front wheel and a smaller rear wheel. These bicycles had straight forks and were called “ordinaries”, highwheelers” or, with derogatory intent “penny farthings”—not “boneshakers.”

The rough ride of the boneshakers was due largely to the solid steel or rubber tires. Highwheelers also had solid rubber tires, but the ride was smoother—the large front wheel, nearly directly under the rider, bridged road surface irregularities better. The rear wheel was small, but it was far behind the rider, and the frame member between the rear wheel and the saddle was rather long and flexible.

The real breakthrough in ride quality came with the introduction of Dunlop's pneumatic tires in the 1890s—along with chain drive, this invention made for a comfortable ride with the bicycle frame design still in use today.

Straight forks were used on highwheelers as well as boneshakers. A curved fork does somewhat smooth the ride, because it is springier than a straight fork—however, its effect in smoothing the ride is much less than the effect of the pneumatic tires or the highwheeler's large front wheel.

The boneshaker in your illustration has a vertical steering axis, a straight fork and therefore zero trail. It was discovered at some time in the early development of the bicycle that a bicycle was self-steering (like a supermarket shopping cart caster) if it has trail—that is, if the tire contact patch is behind the projection of the steering axis to the road surface. Only a bicycle with trail can be ridden no-hands. This was the case with typical highwheelers; the slight tilt of the fork's attachment to the frame created the trail.

With the rear-wheel chain-driven safety bicycle, the steering axis had to be tilted even further so the front wheel would clear the rider's feet. Although the fork of such a bicycle is curved ("raked") *forward* at the bottom, the tire contact patch is still *behind* the steering axis. A straight fork would bring the wheel closer to the rider's feet and place the tire contact patch too far behind the steering axis, resulting a heavy feel to the steering, and excessive response to shifts in rider position.

What is the provenance of the fork in the Duchamp construction? It might be from a unicycle – unicycles still use straight forks to this day. Or it might be from an old highwheeler, and cut down to fit the smaller wheel used in Duchamp's construction. Or, more likely in my opinion, the fork could be from an early safety bicycle, for example, the "bantam" bicycle shown on page 20 of the book *Bicycle Science*, 1983 edition (MIT Press), by Whitt and Wilson and also on page 158 of the wonderful 1896 book *Bicycles and Tricycles*, by Archibald Sharp (reprint edition from MIT Press, 1979). Many early safeties had a straight fork. There are other examples of such bicycles on pages 154, 280 and 288 of Sharp's book.

And in connection with this, the following statement is not accurate:

"Manufacturers had not produced bicycles with straight forks for over 30 years Many safeties made in the 1880s and early 1890s had straight forks. So 20 years is accurate; 30 years is not. That is why I consider it most likely that the Duchamp for was salvaged from an old, disused safety bicycle."

I am not a real expert on old bicycles. A member of the Wheelmen, who collect and restore old bicycles, might have a more definite opinion of the provenance of the fork. I am sending this message to the massbike list and Prof. Wilson, who, I'm sure, will be interested in having a look at your page.

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