

WINDMILLS in AMERICA

(The Role they Played in America's Expansion)

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Railroads may have fueled America's expansion into the West, but windmills made it possible to stay there

The World's Fair

The year was 1893, and the Midwest was experiencing World's Fair fever. Chicago's town fathers, eager to show that their prairie city was more than just a cow town, had created a grand spectacle to celebrate the four-hundredth anniversary of the discovery of America. From the day of its opening, the theme of the Columbian Exposition was Progress.

One of the most popular non-electrical exhibits at the fair, and the one most representative of the real world of the 1890s, was the spectacular windmill display. A veritable forest of windmill towers was erected around the lagoon, and atop them sat fans of every conceivable size and description.

Windmill Manufacturing

Windmill manufacturing was an important industry in the Midwest during the latter half of the nineteenth century. More than seventy-five windmill makers were in business that year, and displayed their products at the Chicago World Fair.

Early Windmills

Windmills have existed in America since colonial times with designs copied from the Dutch and English, with four radiating, cloth-wrapped wooden arms to catch the breeze. They were used all along the East Coast to pump water, grind grain, saw lumber, and power machinery. The American farm windmill, with its circular fanlike wheel we associate with Kansas or Nebraska grainfields and Texas or Wyoming cattle country, is a more recent and uniquely Yankee creation.

The Railroad's Need

Chicago's was growing as a railroad hub and these railroads needed a method of filling water tanks for their steam engines. Before municipal water systems were a reality, every private home, public building, fire station, and stable in every Mid-western town either collected rainwater in cisterns or drew water by hand from private wells. Every one of them was a potential windmill customer.

Meeting the Demand

A new factory was set up in Batavia, west of Chicago, under the name of the United States Wind Engine and Pump Company. With the completion of the transcontinental railroad after the Civil War, and the westward expansion of farming and ranching onto the arid high plains, the need to pump water for irrigation, livestock, and locomotives became nationwide.

Leonard Wheelers applied for a patent for the windmill in 1867 and soon started to manufacture the Eclipse Wind Engine. The Eclipse used a wooden-slat wheel, which had more blades and did not open and close with changing wind conditions. It had a simple weathervane-like rudder attached to the engine frame, which pointed the wheel into the wind, and a second, smaller vane parallel to the wheel, which turned the wheel edgewise to a strong wind.

The windmill market in the 1870s and 1880s seemed inexhaustible. Factories sprang up in small towns from Ohio to Nebraska. Thomas Perry attached a rudder vane to the back of the Eclipse motor to keep the wheel facing the wind. It was hinged so that even though the vane always remained true to the wind, the motor was able to swing 90 degrees sideways. Perry attached an adjustable spring between the vane and the motor frame to prevent the wheel from swinging out of the wind until it reached 30 miles per hour. If the wind speed decreased, the spring would once again pull the wheel back into the wind.

The Aermotor

A major innovation in the Aermotor was the elimination of the direct-drive crankshaft which was replaced by a strong, simple transmission that allowed the wheel to revolve three-and-a-half turns for every power stroke. This allowed the wheel to extract more energy from light winds and reduced stress on the pump in high winds. Although it developed only about half a horsepower, the new Aermotor could do a surprising amount of work. With a 15- to 20-mph wind an 8-foot wheel could pump more than 3,000 gallons of water a day from a 200 foot well.

In the early 1890s Aermotor designed an all-steel tower which caught on and were used by most windmill manufacturers. Finally, in 1915, the company redesigned the motor with a sealed gear box that required an oil change only once a year.

The Arid High Plains

The arid high-plains region was the last to be homesteaded. When its ranchers were finished installing windmills, and Midwestern towns and cities built water systems, the market

dwindled and the industry went into a slow, steady decline. With the Depression of the 1930s, the windmill business appeared to be headed for extinction.

Windmills are still the most economical method of extracting water from the ground. In addition to replacement sales, Dempster and Aermotor both have found an active market for windmills among ecology-minded Californians and Floridians. A number of golf courses around the country use them as an eye-catching way to water greens.

Power Generating Windmills

Ever since ancient times, humans have used wind power as a convenient source of electrical energy. The huge windmills used to generate wind power may be thought of as objects that give us a look at what may come in the 21st century. Some estimate that within about 20 years, wind-power may produce about 65% of the electrical power used by humans.