Home-built jumbo-rotors USA 1890's - etc.

Please further consult the following highly recommended and very useful good books:

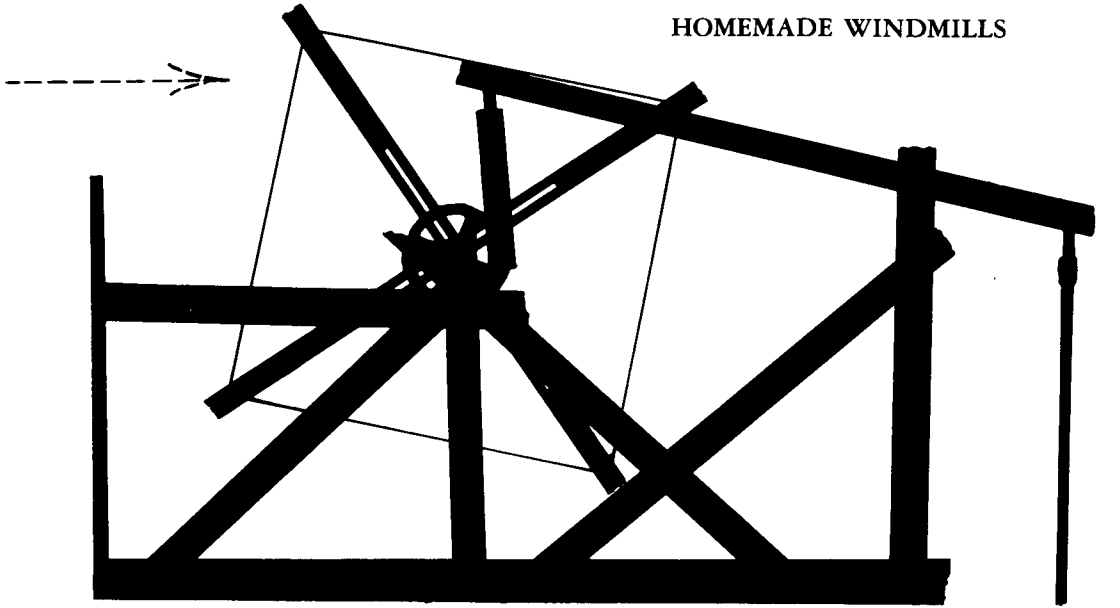
1: A Field Guide to American Windmills. T. Lindsay Baker,
University of Oklahoma Press USA 1985 ISBN 0-8061-1901-2
[the following illustrations are selected from this book]

2: The Homemade Windmills of Nebraska. Erwin Hinckley Bardour,
Nebraska Agricultural Experimental Station , Bulletin No. 59 USA 1899
[reprinted by Farallones Institute California USA 1976]

3: Wells and Windmills in Nebraska. Erwin Hinckley Bardour,
US Department of the Interior, Geological Survey, Water supply and Irrigation,
Paper No. 29 [? Washington DC. USA 1890's ?]

4: Horizontal Windmills, Draft Mills. Greville Bathe,
Allen, Lane and Scott Philadelphia, Pa. USA 1948

5: Penryn Windmill Book. Patrick Arnoldi, - Peterborough Ontario Canada 1995
orders to: — windmill@kawartha.com



Jumbo

The Jumbo, also known as the Go-Devil or Ground Tumbler, is the simplest and probably the least efficient of the many different types of homemade windmills that have been used on the plains and prairies of North America. The fabrication and use of these striking mills was greatest in the years around the turn of the century, although examples still may be found today.

In essence the Jumbo is an overshot wind wheel that bears the same relation to air as an overshot waterwheel does to water. It consists of a horizontal axle, to which four, six, or eight blades are attached, that is placed in a box or behind some type of shield. The prevailing winds strike the blades which extend upward beyond the protection of the box or shield, causing the wheel to turn. Because they are permanent structures, the mills are oriented so that they face the prevailing winds, and in this sense they are not self-regulating.

The advantage of the Jumbo, as for all homemade windmills, is its economy of construction. It is by no means the equal to either a manufactured or a shop-made mill, but it is available to users who cannot afford the much higher prices of the latter. Its virtue is its cheapness, and unless it can be put up at a small cost, it defeats its own purpose.

To build the mills inexpensively, a great variety of materials are used. Old wire, bolts, screws, nails, and other odds and ends of hardware hold them together, while cast-off materials such as scrap lumber, packing crates, and poles that are common refuse on farms are often used in their construction. Blades may be fabricated from lumber, corrugated sheet steel, and even canvas. Here and there around the farm are abandoned reapers, mowers, buggies, and wagons, all of which may have cranks, bearings, oil cups, sprocket wheels, and chains waiting to be used. Any farmer or rancher who is inventive enough to put together a homemade windmill has

the native intelligence to see quickly how such old and neglected items on his property may be adapted.

Jumbo mills usually are constructed on the ground, but on occasion one may find the remains of a Jumbo that was erected on a short tower to provide the blades with greater wind pressure. As the turning wheel spins, it creates a resisting cushion of dead air inside the boxes in which it operates. Some makers intentionally left cracks in the boxes, left the mills open on one or both ends, or fitted the mills on towers with trap doors to open to allow this compressed air to escape.

The typical Jumbo has no governing whatever. The greater the velocity of the wind, the faster the mill operates, sometimes to its own destruction. Some of the mills are outfitted with cut-off devices made from scrap material in the form of a wind break that can be pulled up on cables or mounted in front of the exposed blades on the windward side of the mill. The tendency of the Jumbo mills to run wild in high winds even with the use of such guards is the source of one of their other names, Go-Devil. According to the stories current at the turn of the century, "they go like that cloven-hoofed gentleman when the cut-off is low and the wind is high."

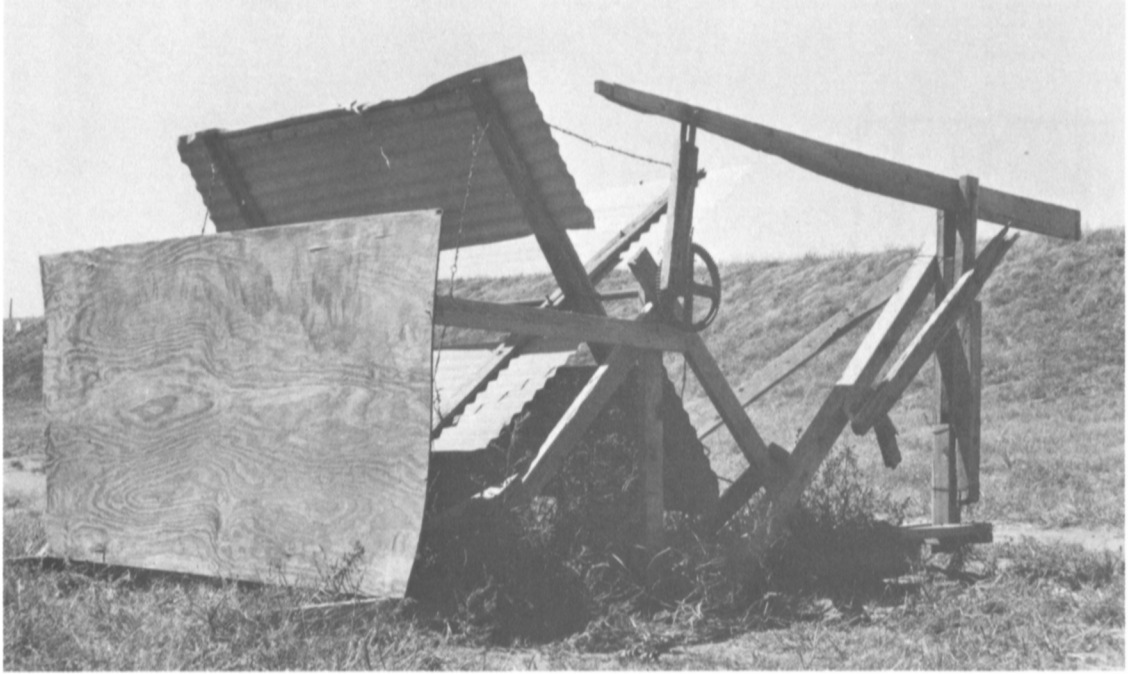
A typical intermediate-sized Jumbo constructed at the turn of the century was erected by M. J. Olson at Cozad, Nebraska. Used for irrigating his orchard and market garden, the box of the mill measured nine feet long, thirteen feet wide, and six feet high. Within the box was a six-bladed wheel with a radius of six feet and a length of eight feet mounted on a one-inch iron axle with bearings and oil cups taken from cast-off farm machinery. The axle was attached by means of a twelve-inch crank plate to a lever, the other end of which was fastened to a pump rod over the pump. The three-inch pump with a sixteen-inch stroke was capable of lifting from the eighteen-foot well twelve hundred gallons of water per hour, as measured by the owner. The mill and all incidental materials cost him but twenty dollars, while many smaller mills were built for as little as two dollars or even less.

A fine Jumbo windmill was constructed by Mr. Roy Hunsinger near Cooperton, Oklahoma, in 1916. This mill, illustrated in the photograph,

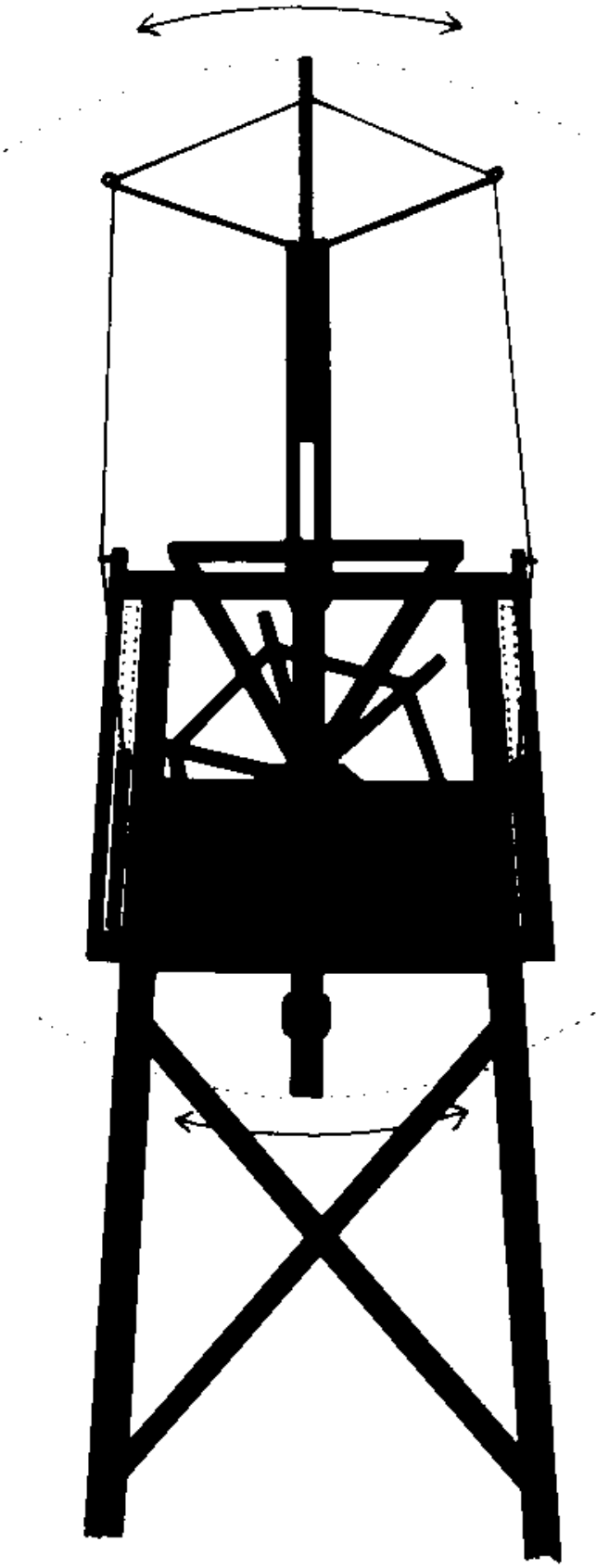
consists of a steel and wooden framework reinforced with barbed-wire braces. Built to pump from a shallow well on his ranch to water stock, the mill operated until 1967, when it was donated to the Museum of Texas Tech University. On one occasion a visitor to Mr. Hunsinger's ranch asked him what "that thing" was. Upon hearing that it was a windmill, the stranger replied, "Windmill! . . . I may not be very smart, but I know no windmill gets down and wallows on the ground like that thing's doing!"

Although highly inefficient, the Jumbo windmills were a common sight on the Great Plains in the years around the turn of the century, and a number of them have survived to the present day. Their greatest asset was their cheapness, and many of the mills were built by men who could afford no other means of lifting water than the hand pump. Often it was these crude mills that saved homesteaders from starving in years of drought. An example is known of a cucumber patch saved by the small stream of water flowing from a homemade windmill. The garden netted its owner a hundred dollars for pickles that were cut and marketed in September. As a writer at the turn of the century wisely noted, "The mill may not net its owner over $100, but if the rest of the crop is a total failure, this is worth more than one hundred cents per dollar."

Today Jumbo homemade windmills are comparatively rare, although examples still may be found scattered across the Great Plains. It is surprising that more people have not constructed them in recent years for such purposes as yard watering and ornamental use.



Roy Hunsinger's homemade Jumbo windmill on exhibit at the Ranching Heritage Center, Museum of Texas Tech University, Lubbock. Photograph by the author, 1975.



Haberlein Patent

"Economy is Wealth!! Make your own Wind-Mill. Why should you expend $75 or $100 for a windmill, when you can build your own at an expense of less than $20?" In these words Edward Frederic Haberlein of McPherson, Kansas, advertised his curious-looking windmill, which is a hybrid of the manufactured with the homemade mills. Made almost entirely from wooden parts, the Haberlein Patent mill is very much like an old-fashioned overshot waterwheel. Its difference is that it is an overshot wind wheel mounted in the top of a wooden box with movable sides.

Instead of actually manufacturing his windmill in a factory, Edward F. Haberlein decided that he could make more money with a smaller capital investment by selling the rights to individuals to build their own copies of the mill which he had patented in 1889. In April of that year he filed a patent application with the U.S. Patent Office for his improvement in the regulation of what already had become known as the Jumbo or Ground Tumbler style of homemade windmill, which is described with other types of homemade mills elsewhere in this book. Subsequently, on 24 September 1889, he was granted patent number 411,550 for his improvement. Soon thereafter he began marketing his patent rights.

To secure permission to build a Haberlein Patent windmill protected by Edward Haberlein's patent, the prospective customer paid him a stipulated fee. Curiously, this fee was based not on the number of mills to be erected, but instead on the size of the property on which one proposed to use the mill. As his trade literature notes, "the patent right only costs you $10 for a quarter section or $15 for a half section, if in one body." Payment of this fee gave the user "the privilege of maintaining one or as many mills as you may desire on said land." On receipt of the fee, Haberlein provided his customers with "full plans in detail" as well as with a

document transmitting to them the rights to use his patented mechanism. The patentee stressed in his promotional literature that the construction of the mill "requires no skilled mechanic" and that "every man can put it up."

The Haberlein Patent Windmill stands at the top of a short wooden tower which supports the wooden box upon which the overshot wind wheel rests. This wheel consists of a horizontal axle turning in bearings at the top of the box. Six large wooden blades radiate from this axle and are braced against each other with wooden supports. As the wind blows over the top of the box, it strikes the blades protruding above its top, causing them to turn. A crank plate on one end of the axle is fastened to a pump rod or the end of a walking beam, which operates the pump. Because the mill is always stationary, it is constructed so that the wheel faces the prevailing winds.

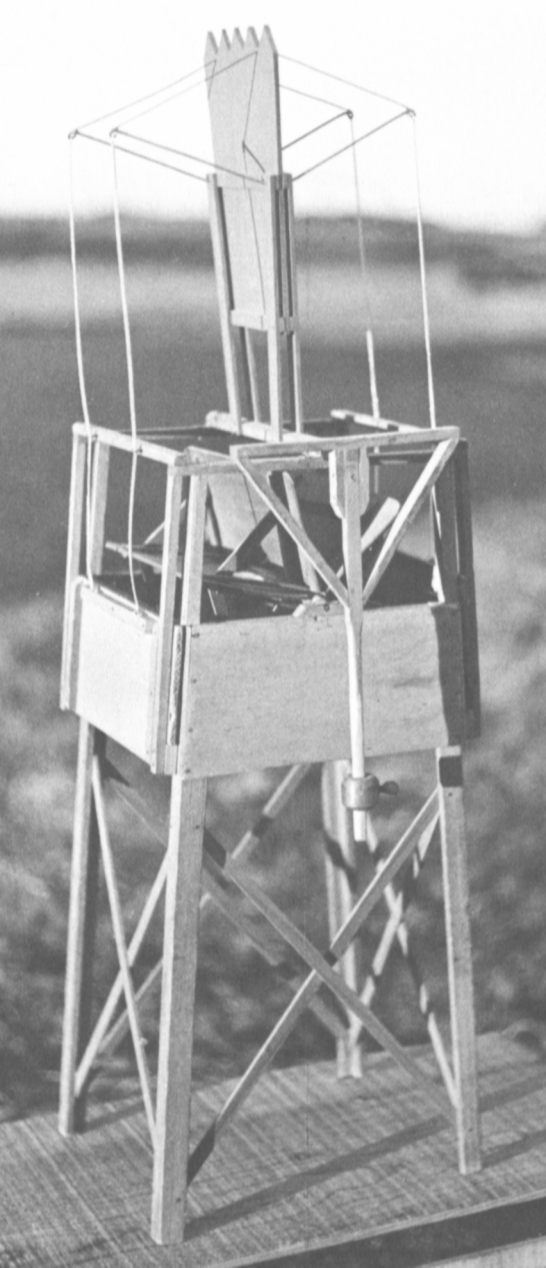
The governing system on the Haberlein Patent mill consists of several parts, one of which is a large "vane" extending vertically above the mill. On one side of its base is attached a governor weight arm. From the top of the vane ropes extend downward to the tops of two sliding doors or "wind guards," which move up and down on two sides of the wooden box. As wind velocities increase, the vane is blown backwards, and the ropes raise the wind guard on the windward side of the mill. This reduces the area of the wheel exposed to the wind and slows its speed. The governor weight on the arm attached to the vane, however, exerts pressure on the vane to return it to its normal vertical position and in this way lowers the wind shield on the windward side of the mill when wind velocities decrease. The sensitivity of the governing system is controlled by adjusting the position of the weight on the governor arm.

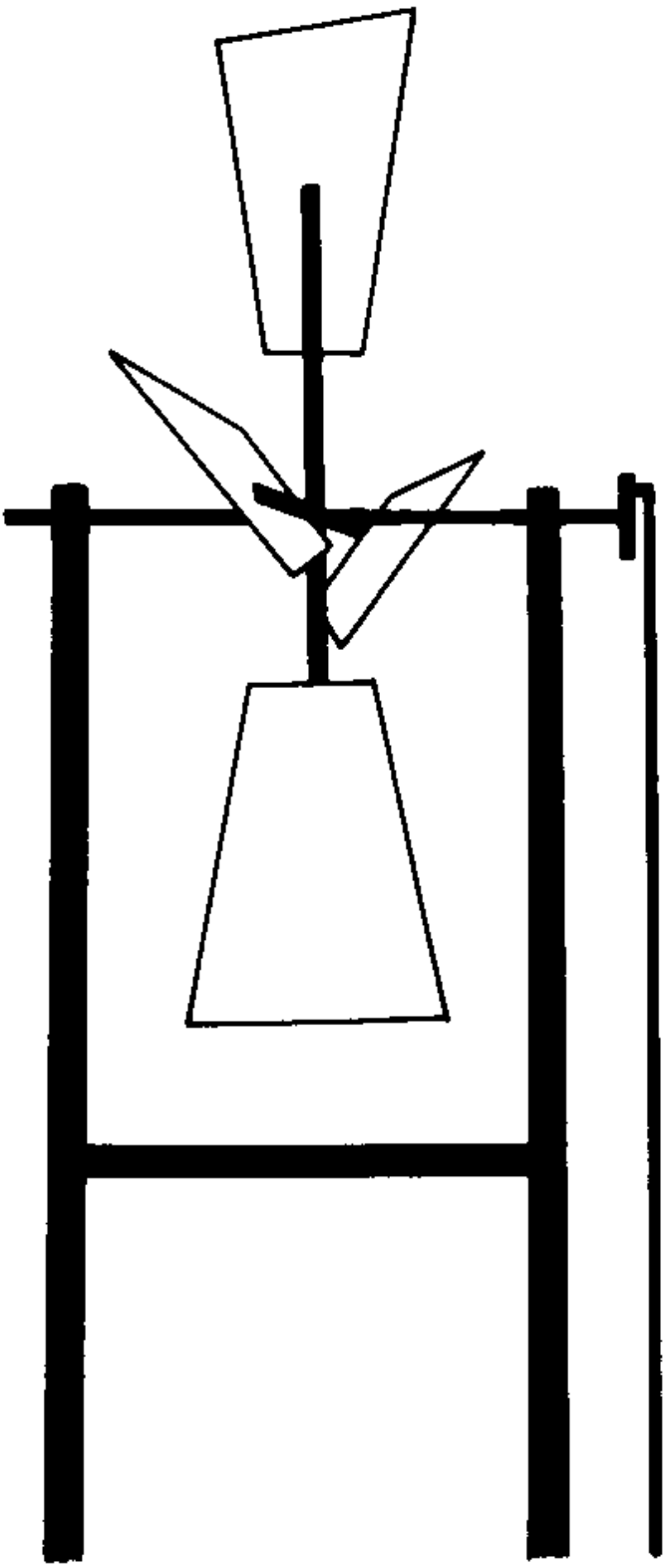
Haberlein Patent windmills were erected by the individual customers, who used whatever lumber or scrap material might be available for the purpose. There were virtually no metal parts, with the exception of the hardware holding the mill together, possible bearings on the axle, and the governor weight. Most of the metal parts needed could be pirated from cast-off farm machinery. Haberlein noted in his advertisements that his mill "need not

stand more than 12 to 14 feet high" and that it "has no castings or machinery about it," at least none provided by the patentee. Promoting the mill for livestock watering, he acclaimed it as "just the thing in a pasture, as it needs no attention."

Despite the claims of Edward Haberlein, today no original Haberlein Patent windmills are known to exist in the field, although it would be comparatively easy to construct one based on preserved literature, the patent papers, and salesmen's sample models.

Original salesman's model of the Haberlein Patent windmill in the collection of Garnet Brooks, Shamrock, Texas. Photograph by the author, 1977.





Battle Axe

Almost as simple in design as the Jumbo, the Battle Axe was one of the most successful of the homemade windmills. It was used widely on the plains but seems to have been most popular in the Platte River valley near Grand Island, Nebraska, where hundreds of them were used at the turn of the century.

In its most basic form the Battle Axe consists of a tower supporting a horizontal axis and crank to which arms are attached that hold at their outer ends fan-shaped blades. The blades present a fairly sharp angle to the wind, and as the wheels turn and are viewed from the side, an optical illusion is formed in which the blades seem to slash wildly at the air in different directions, giving the mill its Battle Axe name.

Like the Jumbo, the Battle Axe is mounted in a stationary position facing the prevailing winds. Its axis is made from almost any material available, such as wooden shafts turning in wooden bearings, wooden shafts fitted with metal ends and babbitt bearings, sections of gas pipe turning in wooden bearings, or the axles from buggies, wagons, or other vehicles that turn in their own original bearings. Attached to the axles are four, six, eight, or as many paddle-shaped blades as may be desired. The mills generally were built eight to ten feet in diameter, but powerful mills successfully were made up to sixteen feet in diameter.

Cheapness is one of the most important criteria in the construction of a Battle Axe. As is the case with most homemade mills, if the mill costs too much to build, the reason for its construction is lost. Generally at the turn of the century it cost only two or three dollars to build a four-bladed, eight-foot Battle Axe mill. One that size usually was adequate for pumping water from a shallow well for 100 to 125 cattle. In building a Battle Axe, strong limbs and poles seem to answer as well as new lumber, while old packing crates and other

scrap furnish material suitable for the blades. Many Nebraska builders preferred to use cast-off farm machinery as a source for the axles and other ironwork, for most of the turn-of-the-century Battle Axe mills in the state were equipped with bearings, gears, rods, springs, wheels, and braces salvaged from discarded equipment.

All known Battle Axe windmills are nongoverning. They are built on permanent towers to face the prevailing winds, so their wheels can in no way turn away from increased winds. Thus, the stronger the wind blows, the faster they turn, occasionally to their own destruction. Some of them, however, employ either homemade brakes or brakes removed from abandoned farm vehicles in an effort to prevent their wheels from turning when the mills were not needed for pumping.

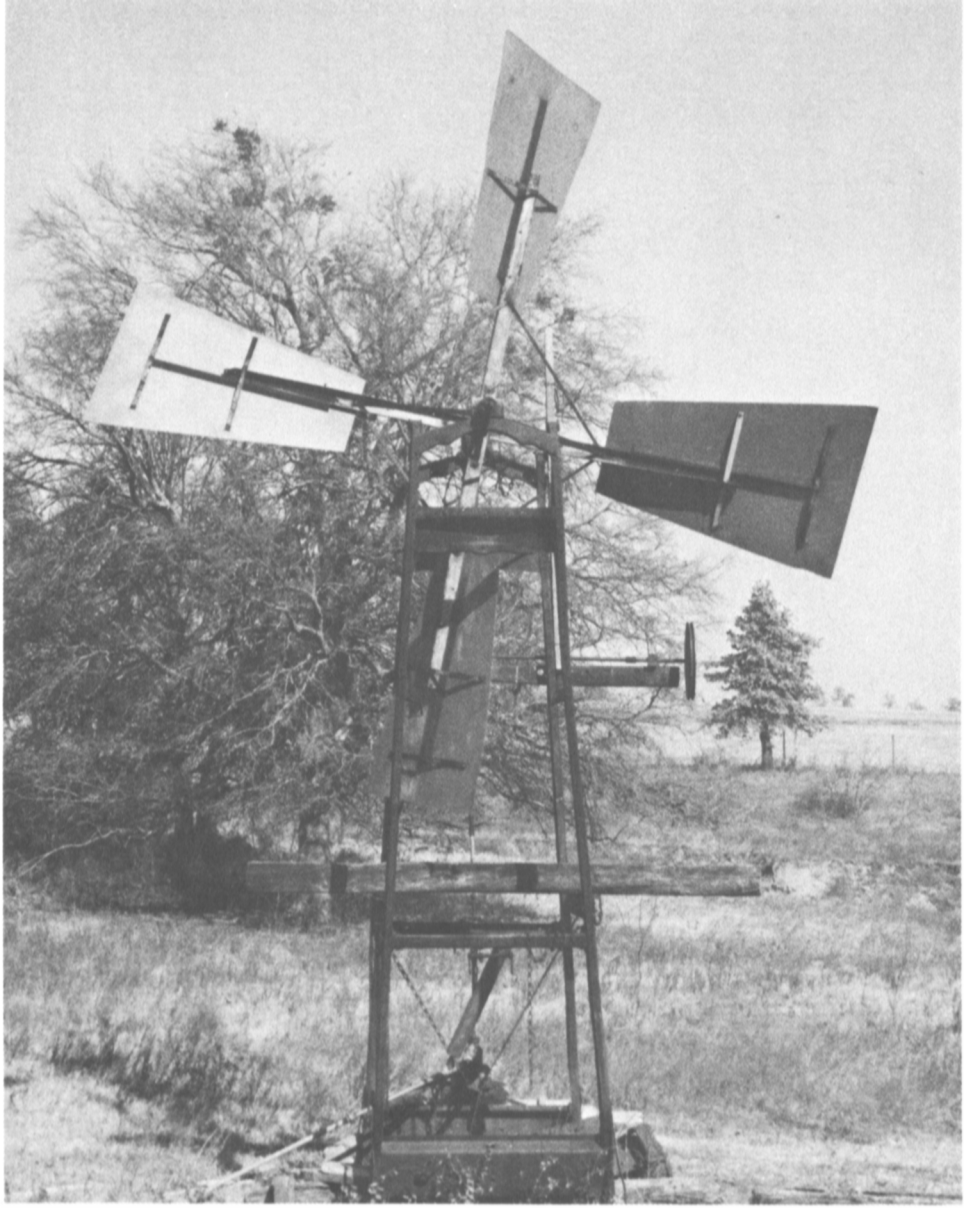
In the late 1890's Matthew Wilson of Overton, Nebraska, built at his farm what might be considered typical Battle Axe mills. On his sixteen-hundred-acre property he already had two large Perkins windmills, but he needed to supplement his water supply in order to water cattle in two pastures. Consequently, at the cost of $1.50 each, he built cottonwood timber towers and mounted on them two four-bladed Battle Axe mills, each to water fifty head of cattle in quarter-section pastures. One of the mills in addition provided water through a one-inch gas pipe to irrigate his one-acre garden.

By no means all Battle Axe mills were built so long ago. The striking mill shown in the photograph was constructed by M. J. Killebrew of De Leon, Texas, in 1928. Killebrew purchased his sandyland farm outside the town in the mid-1920's, knowing that it was crossed by two quite deep gullies. After he moved there, he learned that every time there was a heavy rain the gullies grew larger. About the same time, the town officials in nearby De Leon began placing pressure on the owner of a local auto graveyard to move his large collection of scrap vehicles outside the city. The wrecking yard owner learned of Killebrew's washing gullies, and the two men came to an agreement whereby the dealer removed his unwanted cars to Killebrew's gullies, where the farmer hoped they would stop or retard the erosion. The idea worked only mod-

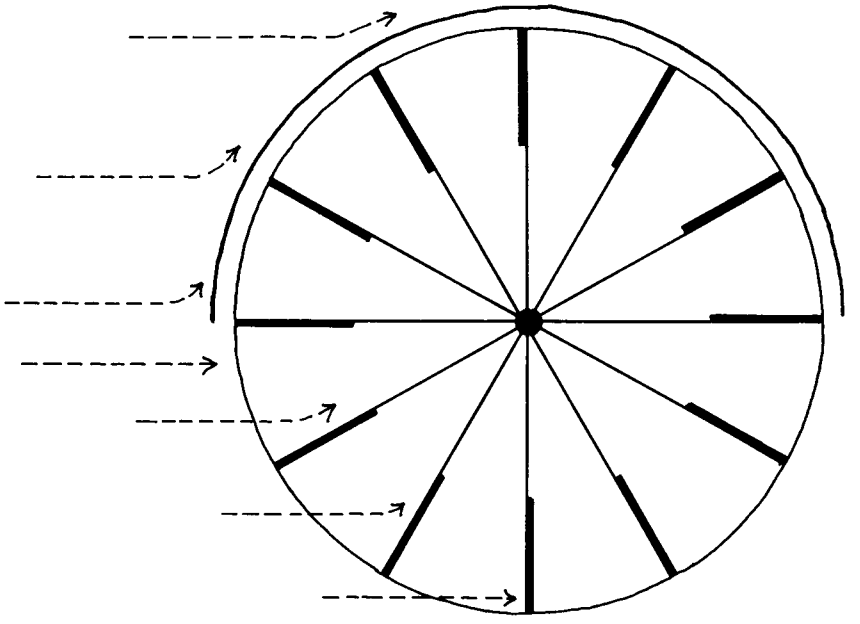
erately well, with a number of the rusted hulks winding up downriver after some unusually heavy rains. The vehicles, however, provided an almost inexhaustible supply of parts for the farmer's tinkering.

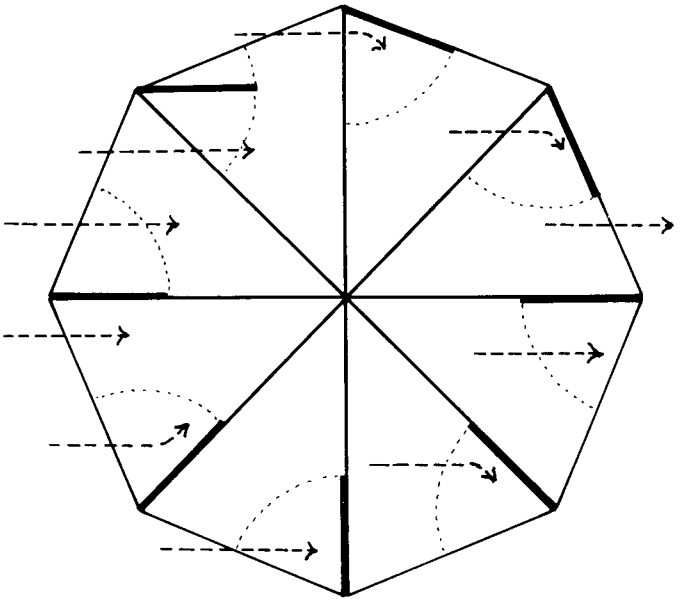
Although Killebrew had never seen a Battle Axe windmill, he had seen pictures of the Dutch mills in Europe, and he decided to try building one of his own design from the scrap parts to pump water to his house, over six hundred feet away. Above a hand-dug twenty-two-foot well, the inventive farmer erected a tower made from two old Chevrolet automobile frames, empty gasoline tanks still attached to the bottom. He connected the two frames together with steel supports and then placed across their top the drive shaft from a Model T Ford, the universal joint still in place but performing no function. To one end of the shaft, which turns in wooden bearings of his own making, Killebrew attached, to serve as the crank plate, a pulley from an old piece of cotton gin machinery. To the pulley a pump rod was fastened. The original blades on the mill, attached with arms to the main shaft, were made from the hoods of Model T Fords, flattened and braced, and these fans remained in use until the recent past, when they finally rusted through and were replaced with the current aluminum blades. Killebrew's Battle Axe still remains in operation, pumping water from the well to his house and to troughs watering whatever livestock may be nearby when he takes in cattle for pasturage.

The Battle Axe, one of the most striking of all the homemade windmills, was very popular on the Great Plains during the late nineteenth and early twentieth centuries. Today the mills are seen only occasionally in such cases as M. J. Killebrew's mill made from scrap auto parts or the wooden Battle Axe reconstructed in Pioneer Park at Lincoln, Nebraska, in the 1930's. Wherever they are seen, they are always impressive, as the big blades "cleave the air in a belligerent fashion" like knights of old swinging their weapons of war.



M. J. Killebrew's homemade Battle Axe windmill on his farm near De Leon, Texas. Photograph by the author, 1975.





Horizontal Windmills

Horizontal windmills, those mills with vertical axes, were used by surprising numbers of individuals on the Great Plains and in the Midwest both for pumping water and for operating gristmills or other machinery requiring rotary power. Although they were never common, a number of these mills have survived to this day and present an interesting look into the inventive minds of their builders.

The turbine wheels of horizontal mills revolve around a vertical axis, receiving their motive power from the wind which strikes only some of the sails. It is the means of controlling which sails are exposed to the wind which creates the major division between the two styles of nineteenth-century horizontal windmills.

In some vertical-axis mills the wheel is surrounded by a series of movable shutters. These shutters come together to form a more-or-less closed cylinder around the wheel when the mill is shut off, but when it is turned on these shutters partially open to admit the wind on one side and exclude it from the other. Yet other mills of this basic design employ, instead of shutters, a semicircular hood or shroud which is mounted so that it can revolve around the turbine wheel and direct the wind to its proper side through the action of a vane. When in operation, half of the blades are exposed and half are shrouded, whereas when not in use the hood swings into a position covering the entire windward side of the wheel. The mills of this general style during the nineteenth century often were known as "turbines" or "turbine windmills."

Other horizontal windmills, commonly called "merry-go-round" mills, are equipped with a number of individual sails or blades which are pivoted on the main frame of the wheel. They are free at one edge "like a flag flying at a mast," swinging edgewise away from the wind. When the center is passed as the large wheel turns on these mills, each of the blades swings back against a rigid arm or bracket that holds it in place, exposing its surface to the force of the wind. In this manner half of the sails are in the wind while the other half are swinging edgewise away from it. Some of these mills turned on their vertical axis alone, while the larger examples usually employed a circular track, such as the mill built at the turn of the century by S. S. Videtto near Lincoln, Nebraska. This large and very striking horizontal windmill was approximately forty feet in diameter, ran on a circular steel rail track, and was connected by gears to a tumbling shaft which drove pumping machinery.

Both styles of horizontal windmills were used on the plains and prairies, but the "turbine" was more popular. A typical homemade turbine mill was erected about 1900 by a Czech immigrant, Joseph Vinduska, at his blacksmith and machine shop located in Pilsen, Kansas. Mounted atop the roof of the building, the fourteen-foot-diameter mill op-

erated grinders, lathes, circle saws, and other machinery, as well as pumping water for domestic use, stock watering, and irrigation. A newspaper published at the time reported that "other windmills of the community look rebellious in comparison to Mr. Vinduska's machine, and fling their long arms madly round and round as if they were in frantic protest against the domination of their turbine rival."

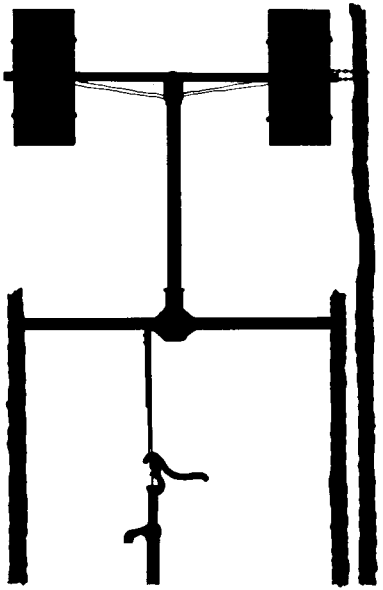
Not all the homemade turbine windmills were on the plains. In 1883 George Gladden of Napoli, New York, visited Nebraska, where he saw a turbine mill in operation. Believing that sufficient winds swept across his farm back East, on return there he started planning the construction of such a mill. Atop a building he constructed a turbine wheel eighteen feet in diameter and thirteen feet high, using sixteen outer shutters to control the wind striking the wheel. Originally the Gladden mill was equipped not only with machinery for elevating and grinding grain, but also with an apple grater, cider press, wood lathe, and equipment for a small shop. In a twenty- to twenty-five-mile-per-hour wind, strong for the locality, Gladden's turbine made about twenty revolutions per minute, producing an estimated twenty horsepower. His mill complex operated for about forty years until the thrust bearing at the base of the vertical axis cracked, after which time the mill ceased to run. Today it is preserved by the Glover's Mill Energy Center, Inc., of Randolph, New York, and is open to the public.

In addition to the homemade horizontal windmills, several turbine-style vertical-axis mills were marketed commercially during the nineteenth century. One of the early such mills was that produced by F. and D. Strunk of Janesville, Wisconsin; it was patented by them in 1866. Known at the time as Strunk's Windmill, it won the second prize for windmills at the Wisconsin State Fair in 1866, at which gathering it pumped all the water used by stock on the grounds from a well over one hundred feet deep. The editors of *Scientific American* considered the mill of sufficient importance to illustrate it on the cover of their 6 February 1867 issue. Among the other commercially manufactured turbine mills were the Hercules Wind Engine of the 1880's made by D. H. Bausman of Lancaster,

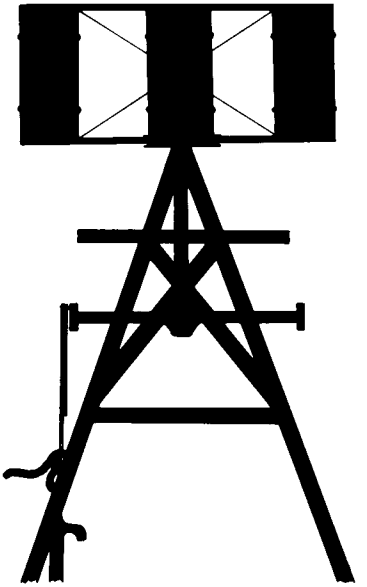
Pennsylvania; the Turbine Wind Mill also of the 1880's manufactured by A. H. Southwick of Des Moines, Iowa; and the Little Giant produced at the turn of the century by Charles Hunt of Wichita, Kansas.

Even today experiments are being conducted with new styles of vertical-axis windmills for use in generating electricity. The old horizontal mills, however, have almost all disappeared. Among the few remaining are the Gladden mill at Napoli, New York, and a steel vertical-axis mill which has been saved to be preserved in part at the Windmill Gardens Museum Village outside Fremont, Michigan. Today the old turbines and merry-go-round mills are far more common in historic photographs than in the field.

The homemade horizontal windmill on the Geezman farm in Custer County, Nebraska, photographed by Solomon D. Butcher in 1887. Courtesy Solomon D. Butcher Photograph Collection, Nebraska State Historical Society, Lincoln.



Oil Drum Windmill



Ingenuity in the design and construction of homemade windmills was by no means limited to the nineteenth century. During all the twentieth century, experimenters, both scientists and backyard mechanics, have worked with design after design in an effort to find the ideal windmill. The criteria for determining the "ideal" mill, however, seem to vary with each inventor. Some seek greatest power, others desire the highest efficiency, and yet others demand the lowest possible cost of production. The Oil Drum windmill, which became most common during the hard years of the Great Depression, answered this last demand—cheapness of construction.

Many farmers in the Dust Bowl, after suffering year after year of bad crops and low market prices, were unable to afford the cost of expensive repairs for their damaged or worn windmills. When the old Dempster No. 8 or Steel Monitor finally bit the dust, they had to find some means to continue pumping their most essential resource, their supply of underground water. Some of these farmers chose to build what has come to be known in its numerous variations as the Oil Drum windmill.

With thousands of auto graveyards scattered across the country, not to mention even more thousands of discarded steel drums littering farms and ranches during the 1930's, the materials were readily at hand for building a rudimentary windmill which might take the place of one damaged or worn beyond repair. The homemade mills are made from the differential and drive shaft from a junked automobile, two steel drums cut in half, and such scrap lumber, wire, bolts, and nails as are found on most farmsteads.

To erect an Oil Drum mill the builder must first construct a tower to support his machine. Made from scrap lumber, timbers cut from a pasture or woodlot, or any other such otherwise unused materials, the towers ideally should be high enough

to provide a fifteen-foot clearance for the wheel above nearby obstructions, but most of them never reached such lofty pretensions. In the top of the tower is mounted the auto differential with the drive shaft pointed upward. This differential is securely tied down with any binding materials, such as U-bolts or clamps, that are available. At some time before it is placed in the tower, the differential is partially disassembled, and hot molten lead is poured between its two spider gears, locking them together so that they work as one.

The wheel of the mill consists of a framework supporting two steel drums which have been cut in half and mounted in one way or another to the top of the auto drive shaft, which becomes the vertical axis of the windmill. The appearance of a mill with four cup-shaped cut-in-half drums is something like that of an anemometer. A great variety of means are used in fabricating the wheel, with some builders using a wooden framework, others employing scrap iron, and yet others mounting the wheel atop a disused automobile wheel that has been keyed to the top of the upright drive shaft. Almost always the steel drum wheels are reinforced with wire bracing.

At one end of one or the other of the two car axles the builder attaches a crank plate, which might be a modified automobile wheel hub, a heavy wooden disc, or a crank gear from a piece of abandoned farm machinery. This crank plate is attached with some type of wrist pin to the wooden pump rod over the well, and it transmits the reciprocal pump stroke to the pumping cylinder underground.

At one time in the 1930's, Oil Drum windmills could be seen in almost any rural neighborhood on the Great Plains, but today most of them have disappeared. Little effort has been made by windmill collectors or historical institutions to preserve this striking but nearly vanished element of Dust Bowl ingenuity, even though it is a classic example of efforts by rural people to survive on the limited means available to them during one of the most difficult periods in American history.

Abandoned Oil Drum homemade windmill with two cut-in-half steel drums missing as it appears in a Sumner County, Kansas, pasture. Photograph by the author, 1979.