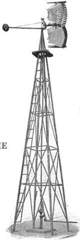
Monitor

VANELESS WINDMILLS



10-FOOT L-STYLE WITH WHEEL OUT OF THE WIND

31-FOOT TOWER WITH GIRTS 5½ FEET APART

BAKER MANUFACTURING CO.

EVANSVILLE, WISCONSIN

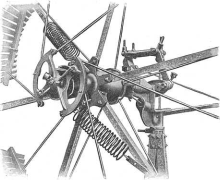
BRANCHES:

Omaha, Ft. Dodge, Cedar Rapids, Fredericksburg, Kansas City, Oakland, Northwestern Wind Engine Co., Minneapolis, and Ames-Baker, Ltd., Brandon, Canada

AUTOMATIC REGULATION

In Monitor Vaneless Mills the sections are hinged off their center of gravity. As the speed of the wheel increases, the sections throw out from the center, opening the wheel.

In order to get good regulation it is necessary that the friction of turning the sections in and out of the wind be small, the same as it is necessary that scales be small in friction in order to weigh accurately. We eliminate friction by oscillating the shipper spider instead of sliding it on the wheel shaft, the usual method.



The Shipper Spider Oscillates on the Wheel Shaft

ROCKING MOTION REDUCES FRICTION

By oscillating the spider, it is only necessary for it to rub on its support one-sixth the circumference of the shaft at the point where it bears, a distance of only three-eighths of an inch. With the usual construction, the shipper spider slides on the shaft more than a foot or thirty-five times as far as in our construction and with thirty-five times as much friction. We therefore have only a very slight drag to prevent the wheel opening when it reaches the proper speed, and vice-versa.

COMPARISON OF VANELESS AND STEEL MILLS

Experiments show that our 10-foot Vaneless Direct Stroke Mill pumps 20% more water than our 8-foot Back Geared Steel Mill.

When loaded as we recommend, the 8-foot steel mill starts in a six-mile wind, the vaneless in a seven-mile wind. In an eight-mile wind both mills pump at the same speed. In a fourteen-mile wind the 10-foot vaneless reaches its maximum speed of forty strokes per minute, while the 8-foot steel mill does not reach a like maximum speed until the wind velocity reaches twenty miles per hour. In winds greater than twenty miles per hour, both mills pump at their maximum speed—forty strokes per minute.

Neither steel nor wood solid wheel mills regulate so closely as our Vaneless Mills. Wind pressure on a solid wheel tends to make the wheel take a more or less oblique position to the wind according to wind velocity. On account of gyroscopic action, a rapidly revolving wheel does not change its plane quickly when a gust of wind strikes it. Wind gusts speed a solid wheel considerably before they start to turn the wheel out of the wind.

Our Vaneless Mills govern by centrifugal force the same as a steam engine. Centrifugal force overcomes the pull of the governor springs and opens the wheel. The wheel sections being very light, short and without gyroscopic action, respond instantly to slight changes in the speed of revolution.

FRICTION ELIMINATED

A common construction in vaneless mills provides for the transmission of the force of the governor weight to the wheel sections through a swivel on the wheel shaft or its bearing. This force, amounting to fifty or sixty pounds, tends to draw the wheel toward the center of the tower and to wear off the end of the wheel shaft bearing. In some designs, the swivel is large, creating considerable friction. In other designs the size of the swivel has been reduced by placing it directly on the shaft instead of around the shaft bearing.

The smaller swivel reduces the swivel friction but necessitates the enlargement of the shaft at the wheel bearing to three times its normal size to permit the shipper rods to pass through it. This enlarged shaft multiplies the friction of the wheel bearing three times, as the weight of the wheel has to slide in the bearing three times as far during each turn of the wheel.

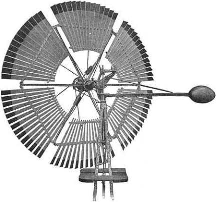
In our new mill, we have entirely overcome all the friction of the parts mentioned above. Two liberal tension governor springs, revolving with the wheel, act directly on the wheel sections through a shipper spider which oscillates on the wheel shaft. The only force acting through the swivel, while the mill is running, is that caused by the weight of the pull-out lever and wire—practically nothing. Our design eliminates the friction of the swivel, the crowding back of the wheel against the end of the bearing, and overcomes the necessity of an enlarged bearing.

Each 10-foot mill is now furnished with a ball bearing turntable used at the bottom of the pipe. This bearing carries the full weight of the mill. During light winds, the pumping capacity of the mill is increased as much as 15% because the wheel faces the wind squarely at all times.

Monitor Vaneless Windmills

WOOD SECTIONS—DIRECT STROKE

10-foot L-Style; 12-foot M-Style



10-foot Vaneless—in-the-wind

A STANDARD TYPE

For more than forty years we have manufactured vaneless wood-wheel windmills. Several styles were made during the first ten years. Then a mill was designed which has been marketed for over a third of a century in successful competition with other makes. Our new vaneless mills embody the best ideas that we have gathered during our long experience in manufacturing. They are built in 10-foot and 12-foot sizes.

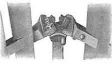
FEW PARTS

Simplicity is desirable in all machines but it is especially valuable in windmills because they are given so little attention. The new mill is very much simpler in design than the old mill. It has but one-half the castings and less than one-fourth the number of joints between the wheel sections and the spokes of the wheel. At the hub of the ten-foot wheel, four castings take the place of twelve on the old mill.

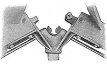
In winds above fourteen miles per hour, the speed of the wheel (likewise the speed of the pump) is practically constant. A gust of wind has little effect on it for the increased centrifugal force due to a small increase in the speed of the wheel quickly turns the sections farther out of the wind reducing the effective sail surface.

The friction of the regulating parts has been so much reduced and other features have been so carefully worked out that in all but very light winds the speed of the wheel is practically constant. Close observation is necessary to detect any variation in the speed of pumping. Constant pumping at a steady gait delivers the most water and causes the least "wear and tear" on both pump and mill.

Our swivel has a long travel which reduces the wire tension. This makes the mill well adapted for use with a windmill regulator, as it is not so hard on the regulator dogs and the regulator is less liable to stick and give trouble.



Section Joint with Sections in-the-wind

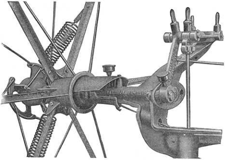


Section Joints with Sections out-of-the-wind

NO RATTLE—LITTLE WEAR OF WHEEL SECTIONS

In all other makes of Vaneless Mills the motion of the sections is limited by stops at the center of the wheel. Each section is held in position by a shipper rod acting through several joints. On account of the looseness of these joints, each section drops out of the wind a little when it gets into the lower part of the wheel and drops back into the wind when it gets into the upper part of the wheel. The continual movement of the sections on every revolution makes a disagreeable rattle and causes undue wear in the joints, both increasing with time. We avoid this serious defect by placing stops on the sections themselves (not at the center of the wheel) to limit their motion into the wind. The springs hold the sections against these stops with more force than their weight, thus eliminating the unnecessary movement, rattle and wear mentioned above. **We have therefore a folding wheel as durable as a solid wheel.**

The area of the bearings on which the sections are pivoted is three times that used in the old mill. These bearings will last many years without oil although oil will prolong their life and cause the mill to regulate better.



Sleet Guards for Shipper Parts

SAFETY FEATURES

The sections are also provided with stops to limit their motion when turning out of the wind. Should a shipper rod fail in a storm, the wind will hold the sections against the stops parallel to the wind—a safe position. In other mills, no stops are used except at the center of the wheel and a loose section continues to turn until it presents its full surface to the wind again—narrow ends of the sails out and wide ends in. In this position the wheel is almost certain to wreck.

The section hinge rods and nuts, as well as the nuts for holding the section eye rods, are locked in such a way that there is no possibility of the nuts coming off. Lock washers are provided for all other nuts.

All sliding surfaces of the shipper parts are covered with sleet guards. There is no need of climbing the tower on cold, stormy winter mornings to knock off an accumulation of ice on the shipper parts to let the mill go into the wind. MONITOR Vaneless Mills are built for winter as well as summer use.

BRONZE BEARINGS

The wheel shaft turns in polished Tobin bronze bearings and the wrist pin eye of the pitman is lined with the same material. These bronze bearings can be replaced without taking the wheel apart.

Bronze Bearings

RELIABLE LUBRICATION

Compression grease cups are used on all the principal bearings. Some manufacturers use a grease cup containing a vertical wire, which is supposed to work the grease down automatically, but our experiments with cups of this kind were not satisfactory. The compression grease cup puts a positive pressure on the grease, forcing it into the bearings.

Around the middle part of the wheel shaft bearing is a large grease chamber, filled from a single large cup. The grease gradually works from the chamber into both wheel shaft bearings, the surplus going into the swivel. Another grease chamber surrounds the large wrist pin and furnishes this important bearing with liberal lubrication. Our provision for supplying grease to the principal bearings makes it unnecessary to climb the tower frequently to grease the mill.

There is a compression grease cup for lubricating the shipper spider, two for lubricating the pitman guide hinge, one for each end of the pitman and the top of the piston rod.

VERTICAL PITMAN—WRIST PIN

The pitman stands above the wrist pin instead of hanging from it. In this position, it starts the column of water slowly and lessens the strain and friction of the pumping parts.

Pitman

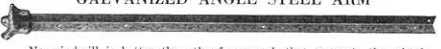
The upper end of the pitman is guided by a link or rocker with liberal bearings well separated at the hinge to the main casting, to eliminate friction.

There is no cross-head or sliding guide. They have the wearing surfaces exposed to the air, which collect grit in dust storms, and the oil is washed away in rain storms. The wearing surfaces rub a long distance on one another. Sliding guides wear rapidly, are high in friction and difficult to keep oiled.

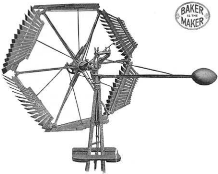
Both ends of the pitman have compression grease cups. The lower cup is supplemented by a grease chamber which surrounds the wrist pin bushing and from which the grease works gradually to the wrist pin through two small holes in the bushing.

The wrist pin is usually large and rigid. The end that goes into the crank is tapered. It is not shouldered down but is left the full diameter where the taper starts, making it very rigid. The taper is great enough to insure easy removal for changing the stroke. If the nut is properly tightened, the wrist pin cannot work loose.

GALVANIZED ANGLE STEEL ARM



No windmill is better than the framework that supports the wheel. Galvanized angle steel arms are used in the "L" and "M" style vaneless because steel does not swell or shrink, allowing the bolt nuts to loosen and work off as is the case with wooden spokes. The arms are braced by steel rods set into the wide wheel hub, also by the section rods which connect the ends of the arms. The framework is light yet very strong, rigid, lasting and it catches but little wind.



10-foot Vaneless out-of-the-wind

BALANCE WEIGHT

The balance weight is pointed and catches little wind. The weight, therefore, does not prevent the wheel from facing the wind squarely even when it is light and variable. A galvanized steel angle braced by a ⅝-inch steel rod forms a strong all-metal truss to support the weight.

WHEEL SECTIONS

The only wood parts used in the mill are the wheel sections which are made of select cypress, not basswood as used by some of our competitors. The sections are painted two coats by dipping in a mixture of pure white lead, zinc and linseed oil. This method of painting insures all surfaces being thoroughly soaked and all joints well filled with paint. Many of our old vaneless mills painted the same way have stood for thirty years.

Six wheel sections are used on the 10-foot mill and eight are used on the 12-foot mill. The latter wheel is actually 12 feet 9 inches across, but as the hole in the center is relatively large, we call the mill a 12-foot mill.

MISCELLANEOUS

The 10-foot Vaneless Mill fits on the same towers as the 8-foot Steel Mill K-style and the 12-foot Vaneless fits on the same tower as the 12-foot Steel Mill H-style. Ball bearing turntables are regularly furnished.

Strokes on 10-foot Vaneless "L"—4½, 6 and 8 inches.
Strokes on the 12-foot Vaneless "M"—6, 8 and 10 inches.
These mills are covered by U. S. Patent No. 1,251,619.

9-26-30M—Printed in U. S. A.