(No Model.) 2 Sheets—Sheet 1.

E. W. KEMNER & A. F. WIKING.

WINDMILL.

No. 389,476. Patented Sept. 11, 1888.

Fig. 1

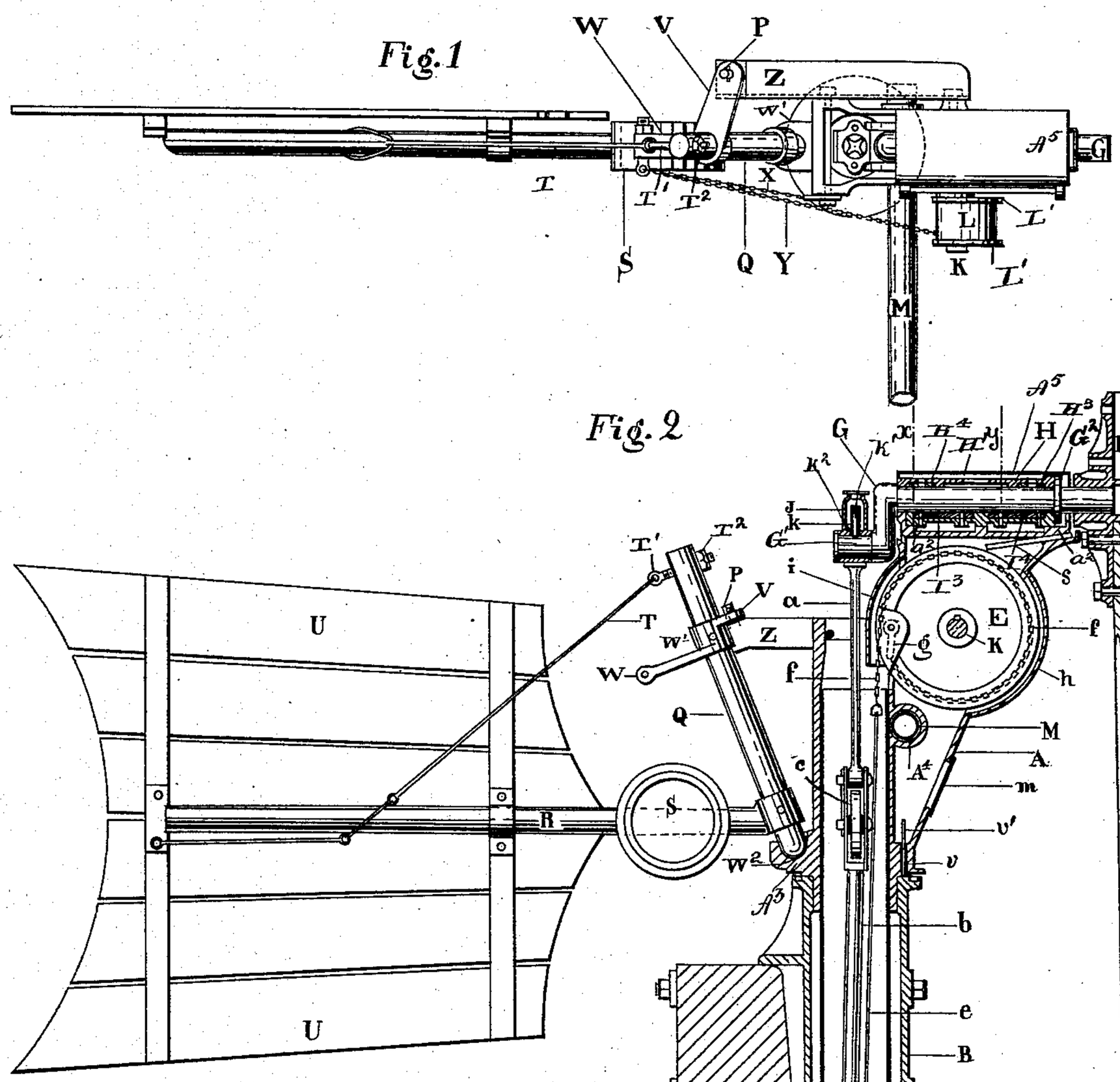

Fig. 3

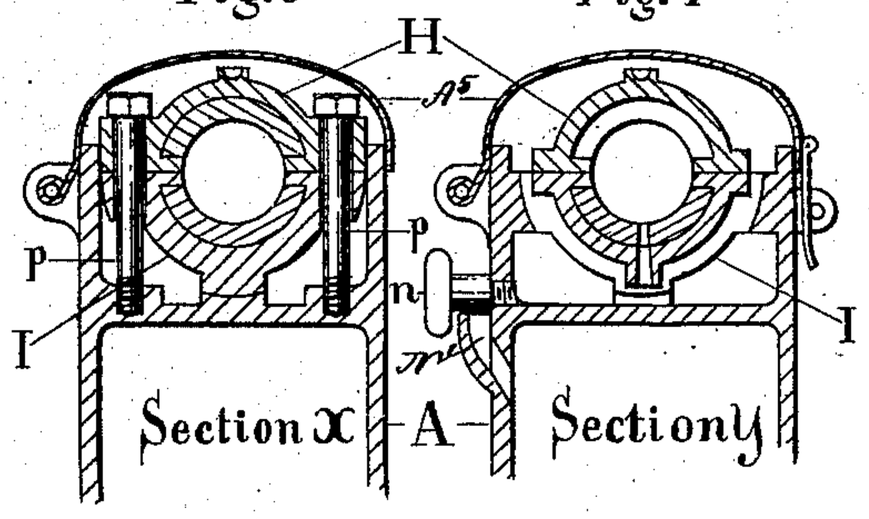

Fig. 4

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Fig. 8

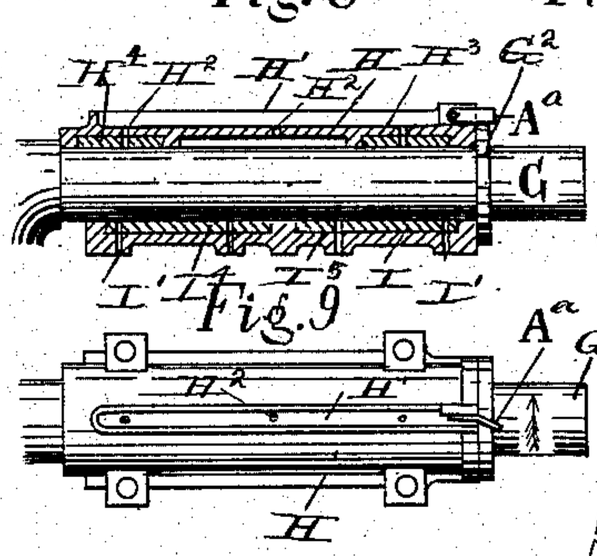

Fig. 9

Fig. 5

Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE.

ERNST WILHELM KEMNER AND ANDERS FREDRIK WIKING, OF YSTAD, SWEDEN.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 389,476, dated September 11, 1888.

Application filed October 15, 1887. Serial No. 252,445. (No model.)

To all whom it may concern:

Be it known that we, ERNST WILHELM KEMNER and ANDERS FREDRIK WIKING, subjects of the King of Sweden, and residents of the city of Ystad, in said country, have invented certain new and useful Improvements in Windmills; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a top view of our new and improved windmill with the wheel and side vane of the same removed. Fig. 2 is a vertical sectional view, the section being taken through the center of the machine and the rudder being placed in its working position. Fig. 3 is a vertical cross-sectional view of the wheel-shaft boxes, taken on the plane indicated by line *x x* of Fig. 2. Fig. 4 is a similar view taken on line *y y* of the same figure. Fig. 5 is a front view of the windmill with the whole right side of the wheel and a part of the fans on the left side of the same removed, the rudder being shown in its position for rest when not in operation. Fig. 6 is a side view showing the principal new features in the mechanism for regulating the speed. Fig. 7 is a side detail view of the connecting-rod guide. Fig. 8 is a longitudinal vertical central sectional view of the wheel-shaft boxes, and Fig. 9 is a top plan view of the upper wheel-shaft box.

The same letters of reference indicate corresponding parts in all the figures.

Our invention relates to self-regulating windmills; and the objects of our invention are partly to provide a continuous lubrication of the wheel-shaft and of the vertical bearings without waste of lubricant, and partly to construct a windmill composed of as few parts as possible, with the fewest chances or possibilities of derangement and at the least cost for building, without sacrificing any of the good qualities of older self-regulating windmills, these qualities being the power of steering the wheel square against the wind and the power of regulating the speed of the wheel, so that the same will not attain a velocity dangerous to the machine.

With these objects in view our invention consists in the new and improved construction, arrangement, and combination of parts which will be hereinafter fully described and claimed.

Referring to the several parts by letter, A indicates the main frame of the machine, which is hollow and is cast integral with or otherwise secured to or connected with a tube or pipe, D, which is the axis upon which the frame turns when the wind, acting upon the rudder U, changes the direction of the wheel. The frame A works on and in the socket-bearing B, which tubular bearing is bolted to the upper end of the post *l*, which supports the machine. The tube D extends through this tubular bearing B, and its lower end extends down through a collar or bearing, C, which is also bolted to the post *l*, as shown. Upon the lower end of the tube D, immediately below the bearing C, is secured, by a set-screw, *o'*, a collar, *o*, which serves the purpose of preventing the pipe, with the frame A and the whole machine, from being lifted by the wind when in operation. The upper part of the frame A is made in the form of a casing or box, (see Figs. 2, 3, and 4,) in which is placed the wheel-shaft boxes or bearings I and H—I indicating the lower box and H the upper box—being held in position by the bolts *p*. This upper part of the frame A is used as a reservoir for the oil that lubricates the wheel-shaft G. This wheel-shaft is formed at its rear end with the crank G' and at the forward end of the boxes I and H with a solid annular shoulder or cam, G^2, that works inside of the oil-receiver and against the ends of the boxes H and I, taking up the lateral thrust. The construction of the boxes, &c., will be hereinafter fully described. The frame A below this upper part, which forms the box for the wheel-shaft boxes, is formed hollow, and within this hollow part is mounted on a transverse shaft, K, a wheel, E, which is keyed on the said shaft, so as to turn therewith. Attached to this wheel by a link and pin, *g*, is a chain, one end of this chain being thus attached to the said wheel at the periphery thereof, when the chain then passes around the wheel and is secured at its other lower end to the upper end of the starting-rod *e*. Thus, by pulling on the rod *e*, the wheel E, with the shaft K, is made to revolve, and with

the shaft K revolves the cam L, which is keyed on the projecting outer end of the shaft K. This cam L is of the form most clearly shown in Fig. 6 of the drawings, and is keyed upon the outer end of shaft K, so as to revolve therewith, being also formed with the edge flanges L′, as shown in Fig. 1 of the drawings, to prevent the chain Y from running off of it in operation. This chain Y is secured at one end to the cam L, so as to wind up around the same when pulling on the rod *e*. The other end of the chain Y is secured to the outer end of an arm, W, the hub W′ of which is keyed upon the short shaft Q. This shaft Q rests with its lower end in a seat, W^2, formed in a projection, A^3, of the frame A, as clearly shown in Figs. 2 and 6. The hub of the arm W is formed on the side opposite to the said arm with another projecting arm, V, which is at its outer end secured by the pin P in a stationary position to the iron cam or projecting arm Z, which arm is firmly bolted to that side of the frame A, as shown. This pin or bearing-pivot P is cast solid, integral with the part Z, and stands at such angle that its central longitudinal line points toward the lower resting-point of the shaft Q, and in this line lies the axis round which the flexible rudder U turns.

From the foregoing it will be apparent that by pulling on the rod *e* the chain Y will pull on the arm W, and thus swing or turn the shaft Q, and with it the rudder U, around its axis until the rudder stops in a position parallel to the wheel F. The windmill is then stopped, and remains so, if the rod *e* is fastened after being pulled down. The rudder has then the position shown in Fig. 5, the wheel then turning its edge to the wind, and cannot, of course, revolve. The rod *e* is prevented from twisting by forming a suitable swivel-joint in it, which will permit that part of the said rod above the said joint to revolve with the rudder and wheel without turning the lower part of the same. On account of the axis of the rudder being in an inclined position, slanting, the rudder must, when turned round its axis, be lifted somewhat, as shown in Fig. 5 of the drawings, and the rudder will, as soon as the rod *e* is again loosened, fall or swing down, by its own weight, out into its lowest position, (shown in Fig. 2,) when the wheel will be immediately turned square to the wind, and the machine will again be in working order and will commence to operate. A stop-chain, X, is connected at one end to the frame A and at the other to the outer end of arm W, and serves to prevent the rudder from swinging over too far, and by adjusting the length of this chain X the rudder can be left at such an angle with the wheel that the latter will face the wind squarely, the arm Z and the pin P being to one side of a vertical plane through the wheel-shaft, and the point of attachment of the stop-chain X being upon the other side.

By arranging the axis of the rudder in an inclined position, as set forth, the rudder is made to operate as a counter-weight in the regulating mechanism in the following manner: A rod, M, extends transversely through the frame A through a hole, A^4, in the said frame below the wheel E, and upon the outer end of this rod is secured the side vane, N. This rod M can be moved or adjusted back and forth through the hole in the frame A, and is held in its adjusted position by the pin M′. Now, when the wind acts upon the side vane, N, and upon the rudder U, these two parts would swing or fold together like the leaves of a book, were it not for the fact that it requires a certain amount of effort or work to accomplish this folding together, because this cannot be done without a simultaneous raising of the rudder taking place, owing to the inclined axis around which the rudder turns. If, now, the wind has not sufficient strength or force to thus raise the rudder, then there will be no lifting and turning of the same, and the two parts—the rudder and the side vane—will not be folded together, and the wheel will continue to face the wind squarely and work to its highest efficiency for such a wind. If, now, the wind increases to such an extent that the pressure on the side vane and on the rudder is sufficient to overcome the resistance offered by the rudder having the inclined axis, then the side vane will turn toward the rudder, and the surface of the wheel will consequently come or stand at a more or less oblique angle to the wind, thus depending upon the strength of the wind. Thus the speed of the wheel is automatically prevented from exceeding a safe rate, no matter to what extent the wind may increase in force. By moving the side vane, N, farther from or nearer to the machine-frame A, the side vane will turn for a lighter or stronger wind, and, consequently, the highest rate of speed of the wheel will be regulated lower or higher accordingly.

From the foregoing it will be seen how the rudder turning round an inclined axis serves as a counter-weight to the pressure on the side vane, N.

S indicates a supplementary adjustable weight, which can be employed should the weight of the rudder be insufficient.

The rudder U is adjustably secured at the inner end of its shaft R to the lower part of the short shaft Q, and the rudder is then braced to the upper part of the shaft Q by the rod T, which is secured at its upper end to the eye of an eyebolt, T′, and this eyebolt extends through a transverse aperture in the upper end of shaft Q, and has screwed upon its threaded rear end a nut, T^2, and by turning this nut on the threaded bolt the height of the rudder can be adjusted by sliding the inner end of the shaft R up on the shaft Q the same distance that the outer end is raised by the rod T, when it is again secured upon the shaft Q by means of an ordinary set-screw.

d d′ indicate a joint in the upper part of the pumping-rod, which joint permits the upper part, *b*, of the pumping-rod to turn with the

wheel and machine without the lower part of this rod taking part in the rotary motion.

The box at the top of the frame A, in which the wheel-shaft turns in its boxes, forms an oil-reservoir. The oil placed in this reservoir is brought up by the cam G^2 on the forward part of the revolving wheel-shaft G to the top of the forward end of the top wheel-shaft box, H, and this upper box, H, is formed on top with a longitudinal groove, H′, into which this oil enters at the forward end thereof, the oil thus raised by the cam of the revolving shaft being guided into this groove by the small guide-latch A^a, which is pivoted at its inner end to one side of, in, the forward open end of this top groove, as shown in Figs. 8 and 9, the weight of this latch holding its outer part down on the revolving cam G^2. It will thus be seen that as the wheel-shaft revolves the annular shoulder or cam G^2 at its forward end will raise the oil to the top, when it will be guided by the latch A^a into the top groove, H′, of the top box, H, and the oil will then pass down through the holes H^2, leading through the box H from the bottom of the groove H′ to the shaft. The lower box, I, is formed with the holes I′, leading through its bottom for the exit of the oil, which is fed in from the top to the shaft. Both the upper box, H, and the lower box, I, are formed with the interior recesses or seats, H^3 I^3, for the reception of the Babbitt-metal bearings H^4 I^4, and the lower box, I, rests upon shoulders a^2, formed at the ends and the middle of the lower part of the box formed at the upper end of frame A.

The top of the frame is closed by a rounded hinged cover, A^5, which can be opened to remove the boxes I and H, to clear the oil-holes and to rebabbitt the said boxes.

The upper box, H, can of course be lifted right out when the screw-bolts *p* are removed, and the lower box, I, can also be taken out without dislocating the wheel-shaft G by the following construction: The lower curved surface of the lower box, I, rests upon bearings a^2, which are curved upon their upper sides, so that their said sides are concentric with the center of the shaft G, and by this construction when the bolts *p* have been removed the lower box, I, can be turned round and over the shaft G and lifted straight out. This feature of being able to remove the box I so easily without disturbing the shaft G facilitates the cleaning of the oil-holes and the rebabbitting of the boxes when such is required. When the oil in the upper box at the top of frame A becomes thick and unfit for use as a lubricant for the wheel-shaft, it is drained off out of the said reservoir by taking out the screw-plug *n*, immediately below which plug is a cup, N′, on the frame A, which cup has a hole at its bottom leading down into the frame A, so that the bad oil will run down into the inner lower part of the hollow frame A, (see Fig. 1,) which lower part is the oil receiver or reservoir for the bearing B. In the lower solid part of the frame A is a vertical hole, *v*, in which is loosely fitted the pin *v′*, and the oil admitted to the lower part of frame A works down through this hole *v* to the bearing at the upper end of the socket-bearing B.

m indicates a screw-cover in the lower part of frame A, which can be removed when cleaning of the receiver or oil-hole of the lower part of frame A is required.

When the lower box, I, is removed, the shaft G rests upon the end walls of the upper reservoir. The upper end of the pumping-rod is connected to the pin or outer end of the wheel-shaft crank by the connecting-rod *a*. The upper end of the pumping-rod *b* is forked, and in this forked upper end is journaled a roller, *c*, while the lower end of the connecting-rod *a* is pivoted in the extreme upper end of the pumping-rod above the said roller. This roller works inside of the pipe D, and serves to guide the lower end of the connecting-rod *a*, and at the same time reduces friction.

h and *i* indicate curved covers, which are bolted to the frame A, over the wheel E, at the points shown, the said covers forming, in fact, continuations of the frame A at those points.

J indicates an oil-cup, which is cast to the upper half-box of the bearing, in which the pin of the crank of the wheel-shaft revolves, at the upper end of the connecting-rod *a*. This oil-cup is closed by a screw-cap, and is formed with a small central vertical pipe, *k*, the lower end of which opens down through the bottom of the oil-cup, and in this pipe is placed loosely a pin, *k′*, which will work up and down as the shaft revolves, the oil in the cup entering the tube *k* through a small aperture, k^2, drilled in through the said pipe at the bottom of the oil-cup. This device, it will be seen, will effectually and automatically oil the bearing of the crank-pin. The wheel is built up solid of the arms *r* and girts *r′*.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

In a windmill, the combination, with the oil receiver or chamber in the top part of the main casing, having the lower opening controlled by the screw-plug, of the oil-cup immediately below the said opening, having the hole leading into the interior of the main casing, said casing being further provided with a vertical aperture, and the pin playing in the same at the lower solid shouldered end of the main casing, and the socket-bearing, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ERNST WILHELM KEMNER.
ANDERS FREDRIK WIKING.

Witnesses:
EMIL U. PERSSON,
BERNDT STURSZON.