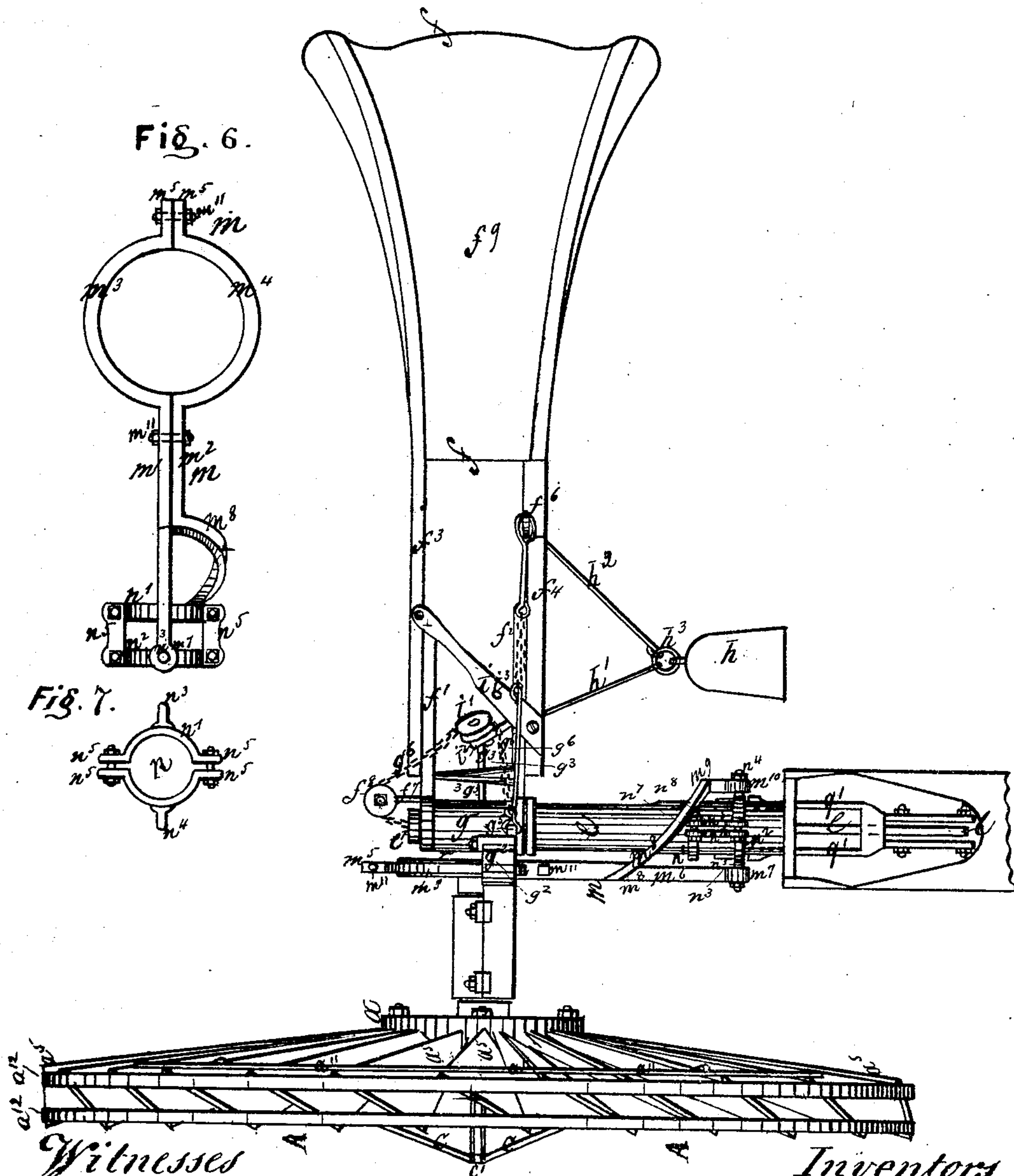


J. KEELER & C. C. HARRIS.
Wind-Mills.

No. 145,877.

Patented Dec. 23, 1873.

Fig. 1.



Witnesses
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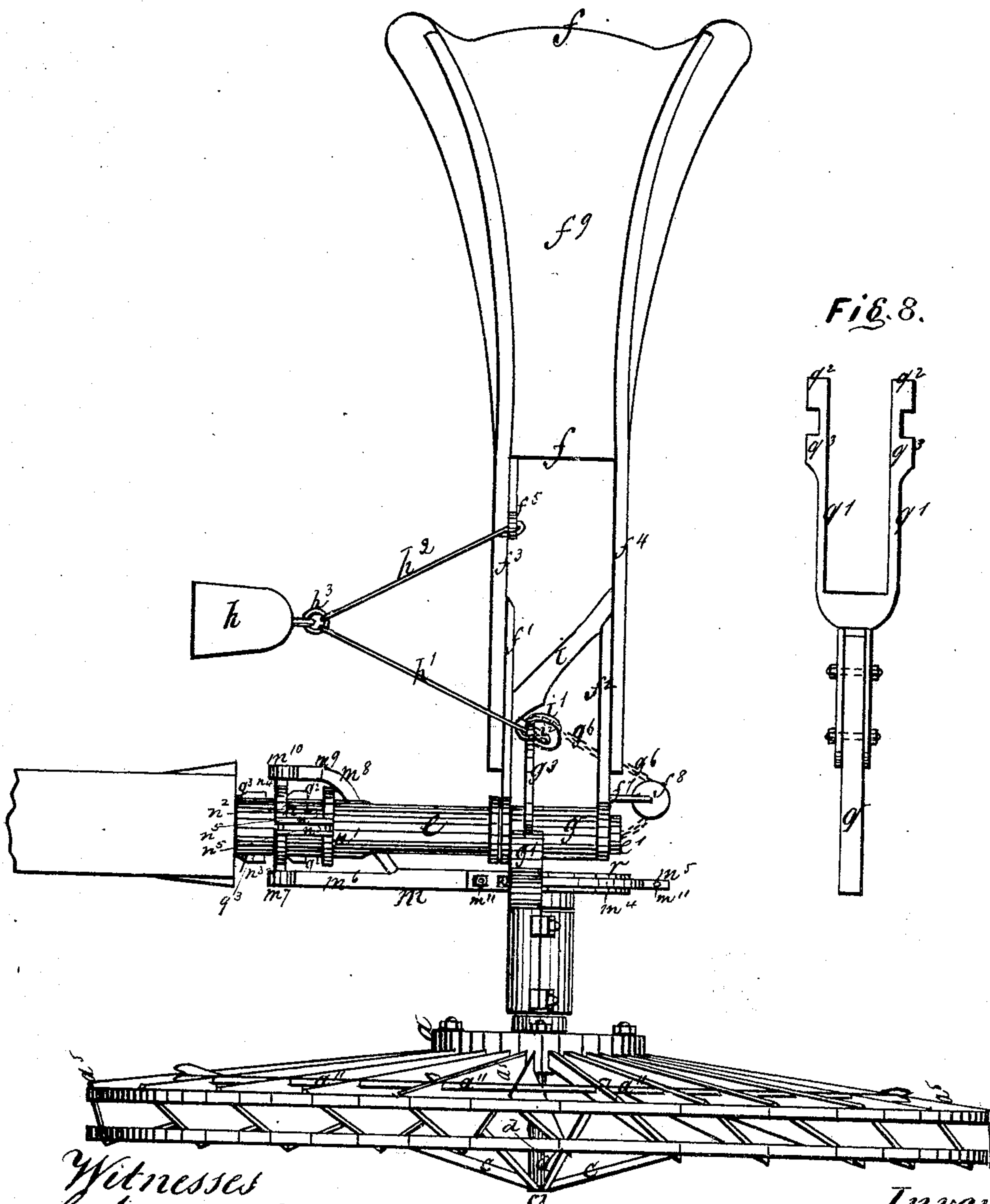
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Fig. 2.



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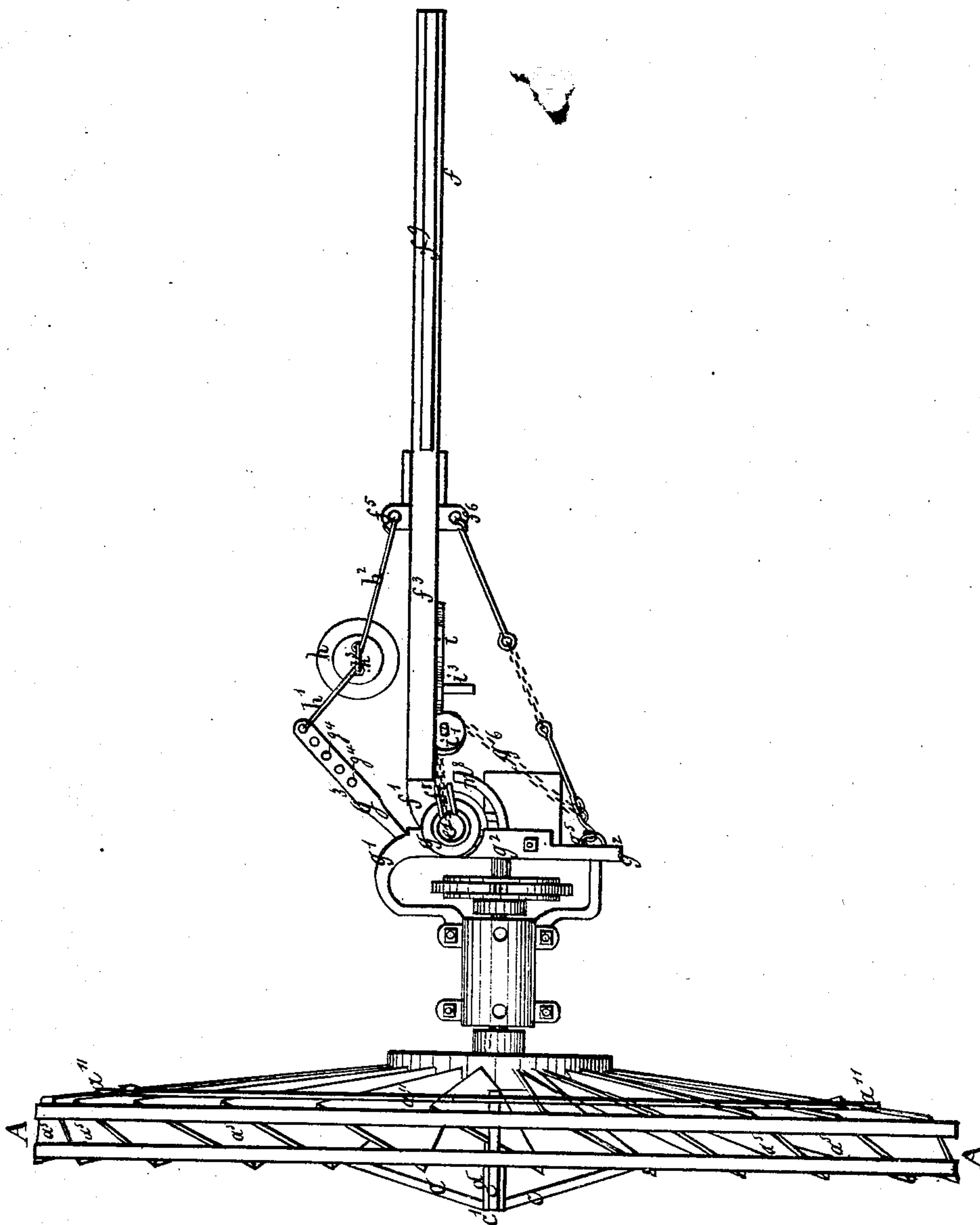
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Fig. 3.



Witnesses

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Fig. 5.

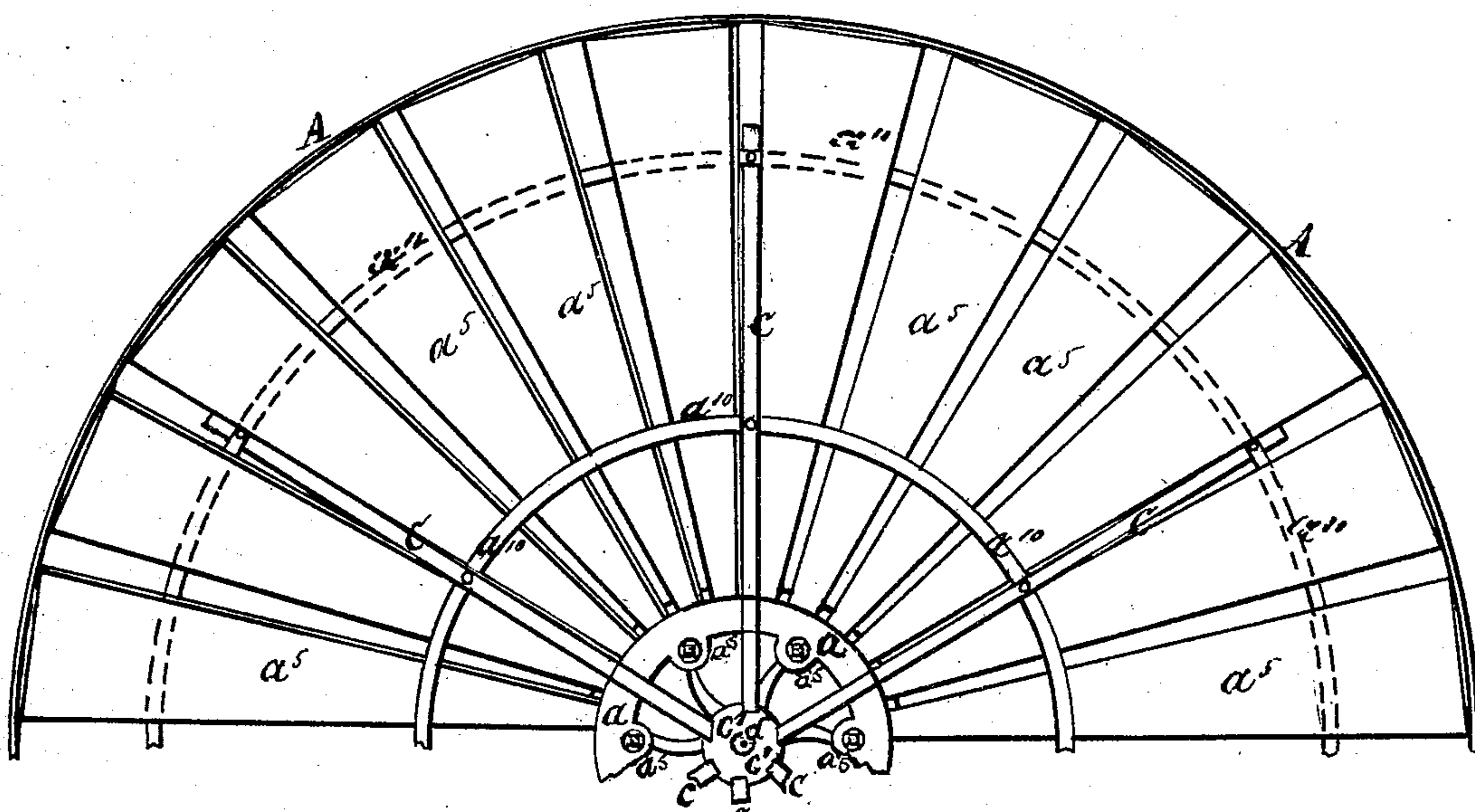
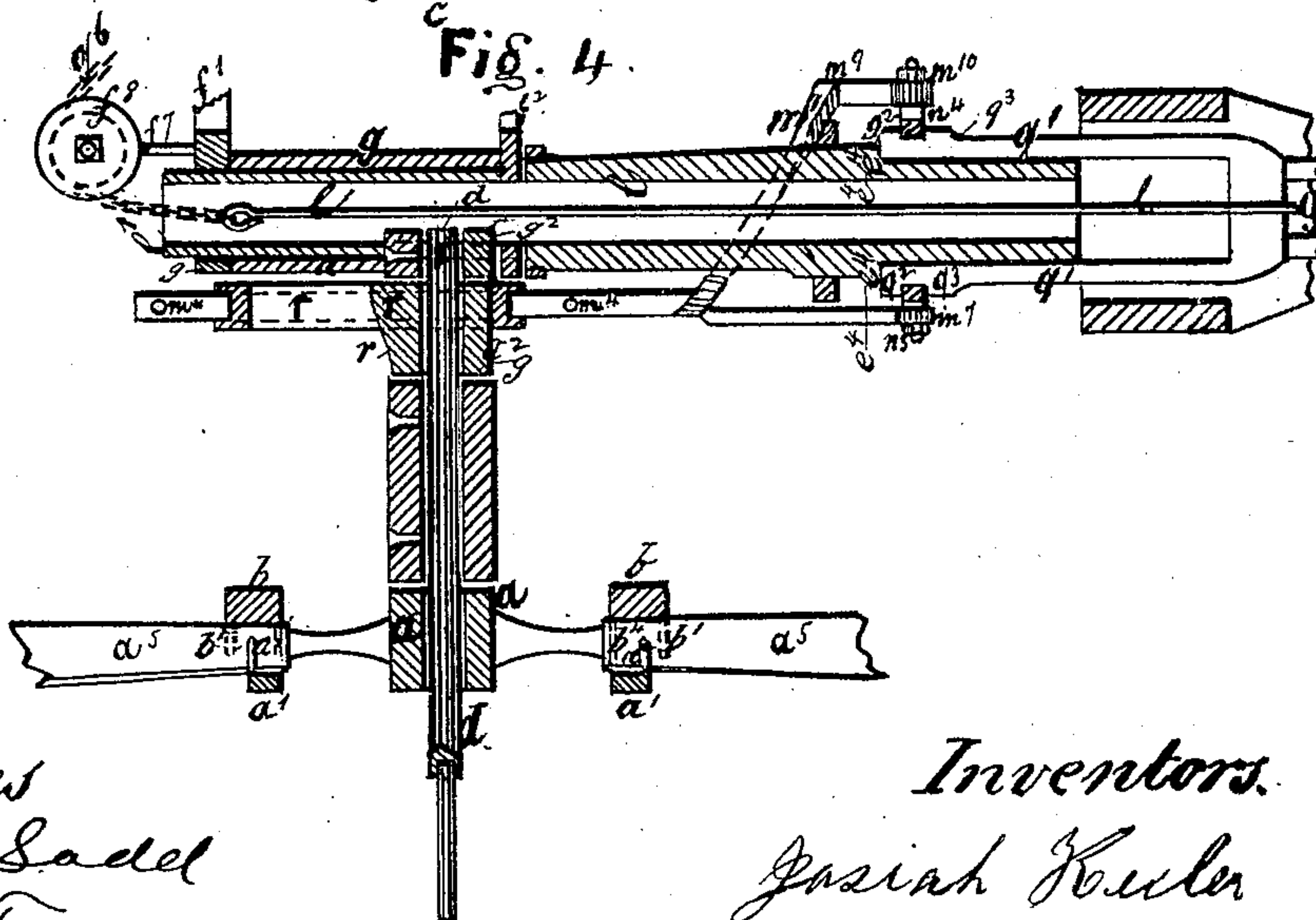


Fig. 4.



Witnesses
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James F. Todd

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UNITED STATES PATENT OFFICE.

JOSIAH KEELER AND CHARLES C. HARRIS, OF KEWANEE, ILLINOIS.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **145,877**, dated December 23, 1873; application filed August 7, 1873.

To all whom it may concern:

Be it known that we, JOSIAH KEELER and CHARLES C. HARRIS, both of Kewanee, in the county of Henry and State of Illinois, have invented certain new and useful Improvements in Windmills; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

Our invention relates, first, to the application of two hoops or bands, one being secured to the face of the wheel and the other to the back of such wheel. These hoops, in connection with the braces, hereinafter more fully described, serve to hold the fans or vanes in their relative position, giving additional strength and rigidity to the wheel.

The front edges of the fans or vanes are notched or recessed, and the hoop or band is bolted or otherwise firmly secured in these notches or recesses to the edges of the fans or vanes on the face of the wheel, and the rear edges of the fans or vanes are similarly notched or recessed, and another hoop or band is bolted or otherwise firmly secured in these notches or recesses on the back of the wheel. These two hoops or bands are some distance from each other, the one affixed to the face of the wheel being nearest the hub, and the one affixed to the back of the wheel nearest to its periphery.

A series of braces are employed, which are affixed to a casting at the end of the horizontal shaft, and pass over the hoop affixed on the face of the wheel, to which hoop they are firmly bolted or otherwise secured, and thence under the hoop affixed on the back of the wheel, to the under side of which hoop or band such braces are also firmly bolted or otherwise secured.

By means of these hoops or bands and the braces the fans or vanes inserted in the hub and tightly clasped or held therein, the parts are firmly and solidly held together.

Hoops or bands are affixed to the outer and inner edges of the fans or vanes, forming the periphery of the wheel, and giving the same further strength and rigidity.

Our invention relates, secondly, to the peculiar construction and arrangement of the

main vertical hollow standard and parts connected with the driving mechanism of the mill. Such standard being constructed hollow and of three different outside diameters, the upper or smallest outside diameter carries the upper and lower braces or extensions, to which the arms of the tail are secured, and between these two braces a hollow cylindrical tube is inserted, on the upper edge of which rests the upper brace or arm, the lower brace or arm resting on the shoulder formed by the increasing diameter of the main hollow vertical standard, and thus allowing the arms or braces to revolve freely around the main hollow vertical standard, as well as the cylindrical tube, each turning freely and independently of each other. To the cylindrical tube, revolving around the main hollow vertical standard, the bearings of the horizontal shaft carrying the wheel are affixed on each side. One of the bearings has an arm or extension formed thereon. This arm or extension is provided with a series of holes formed therein for the purpose of attaching one end of a rope-chain or other suitable means for supporting a weight, the other end of such rope-chain or other suitable means being affixed on the tail of the mill, so that, by means of this weight, the wheel can be regulated and set to the wind according to the work it has to perform; and the cylindrical portion, revolving freely around the main hollow vertical shaft, acting as a pivot to the wheel, will allow such wheel to turn around the main vertical standard, and shut itself off gradually and automatically as the wind increases, and completely so as the wind changes to a gale, thus protecting such wheel from being damaged or broken by the action of a storm; and, by means of a stop affixed to a transverse bar on the tail, against which one of the bearings will rest when the wheel is shut off from the wind, will further protect the parts from being deranged or broken by a sudden gale springing up, and also prevent collision between the wheel and the tail. As the wind decreases in force, the weight above referred to, acting as a compensating-weight, will gradually bring the wheel back, and so hold it constantly to the wind. The main hollow standard at its lower or thickest part has grooves formed in each side, in which grooves two arms, to which the working or pumping

rod is affixed, slide up and down, these two arms being provided with lugs or ears, between which is held a band or ring. This band or ring is formed in two sections or halves, as shown in Figs. 1, 2, 12, and 13, forming, when bolted together, two rings or bands, the lower one having projections or axles formed on each side, to which the arms of the connecting or driving rod are affixed. The connecting or driving rod is also formed in two sections, which, when bolted or otherwise secured together, form at one end the circular strap, which passes between the flanges of the eccentric-wheel. The two parts have formed on their upper semicircular portion projections or ears, having a hole formed therein for the reception of a bolt, by means of which the two sections are bolted together, as shown by Figs. 1, 2, 3, and 12, and on the under side of the strap each part has an extension formed thereon, also provided with suitable bolt-holes for the reception of bolts, by means of which they are bolted together, as shown in Figs. 1, 2, and 12.

The extension of one of the sections is vertical, and is provided at its lower end with a bearing for the reception of one of the projections or axles formed on one side of the lower ring or band.

The extension of the other section or half has a curved portion formed thereon, encircling half of the main hollow vertical standard, which curved end is provided with a vertical extension, having a similar bearing formed at its lower end, into which fits the axle or projection formed on the opposite side of the lower band or ring, as shown in Figs. 1, 2, 3, and 4.

The brace or arm to which the upper arm of the tail is secured is provided with an upright shaft, on which is mounted a pulley, and the brace to which the lower arm of the tail is affixed is connected with the upper brace and arm of the tail by an inclined transverse bar, having upon its edge, at or near the lower brace and arm of the tail, a stud affixed, on which stud a pulley is mounted at right angles to such transverse bar.

The chain or rope, or other suitable means, to which the shifting-rod is attached, on issuing from the main hollow shaft, traverses over the pulley affixed on the upper brace; thence it runs under the pulley affixed at right angles to and on the inclined transverse bar, and is firmly attached to the ear or loop formed on the extension or arm affixed on the bearings of the main vertical standard. The inclined transverse bar is further provided on its face, at or near the center, with a projection or stud, acting as a stop for the wheel when turned around the main hollow vertical standard and shut off from the wind, thus preventing such wheel from turning around too far, damaging itself, or the tail and mechanism connected therewith, by a sudden shock or collision.

When it is desired to shut off the wheel from the wind, all that is necessary is to pull upon the shifting-rod, which, being attached to the

chain, causes the same to be drawn down through the main hollow vertical shaft, over the pulley on the upper brace, and under the pulley on the inclined transverse bar, causing the extension on the bearings of the horizontal shaft, and, consequently, the latter and the wheel, to turn around the main vertical hollow standard by means of the cylindrical pivot, to which the bearings are affixed, and cause such wheel to face the tail of the mill, thus shutting it off effectually from the wind; but that those acquainted with the construction of machinery of this class may fully understand our invention, we will proceed to describe the same more in detail by aid of the accompanying drawings.

Figures 1 and 2 represent opposite side elevations; Fig. 3, a plan; Fig. 4, a section; Fig. 5, a front elevation of one-half of the wheel; and Figs. 6, 7, and 8 represent detail views of parts of apparatus constructed according to our invention.

The fans or vanes a^5 are secured by means of a hoop or band, a^{10} , affixed to the face of the wheel. Such fans or vanes are provided with recesses or notches on their outer edges, into which the hoop or band a^{10} is secured by means of bolts or other suitable means. Another hoop, a^{11} , affixed to the inner face of the wheel a , and some distance from the hoop or band a^{10} , is similarly secured to the fans or vanes a^5 as the hoop or band a^{10} above described, further securing the fans or vanes a^5 in position, and such fans or vanes are finally held in place by two hoops or bands, a^{12} a^{12} , encircling the outer and inner peripheries of the fans or vanes a^5 , thus forming the wheel A. To give additional strength and rigidity to the wheel A, braces C, affixed to the casting C^1 at the end of the horizontal shaft d , are fastened, by means of bolts or pins, to the upper side of the hoop or band a^{10} , and to the under side of the hoop or band a^{11} , thus forming a very solid and rigid wheel, which, at the same time, is capable of being easily repaired when the wheel is damaged by any cause. e is the main hollow vertical standard, formed of three different outside diameters, the upper portion, e^1 , of which is of the smallest diameter, and around which revolve the braces f^1 f^2 , to which the arms f^3 f^4 of the tail f are secured. Between these braces f^1 f^2 a hollow cylinder, g , is inserted, revolving independently around the main standard e , and acting as a pivot to the wheel A, as hereinafter described. This hollow cylinder g has arms or extensions g^1 g^2 cast or otherwise formed or affixed on each side, which are so constructed as to form the bearing for the horizontal shaft d of the wheel A, as shown in Figs. 1, 2, 3, and 4. The arm or extension g^1 is provided with another extension, g^3 , affixed near the hollow cylinder g , and extending, at an angle to the main hollow standard e , some distance toward the tail of the mill. This extension is provided with a series of holes, g^4 g^4 , to which and a hole formed in the ear of the casting affixed on the tail f a chain

or other means for supporting a compensating-weight (hereafter described) is suspended. To the tail f , at the end of the arm f^4 , a casting, having ears or projections $f^5 f^6$ formed on each side, is affixed. These ears $f^5 f^6$ have holes formed therein for the reception and fastening of chains, ropes, or other suitable means for operating the shifting devices of the wheel, as we will presently describe more in detail. One end of a chain or rope, h^1 , is fastened in either of the holes $g^4 g^4$, and the other end to a ring, h^3 , to which a weight, h , is suspended. One end of another chain or rope, h^2 , or other suitable means, is also fastened to the ring h^3 , and the opposite end of such rope or chain h^2 is fastened in the hole of the ear or loop f^5 on the casting affixed on the arm f^4 of the tail f . The weight h serves as a compensating-weight, and holds the wheel A to the wind when not too strong, but will, however, allow the wheel A to gradually veer round the main hollow standard as the wind increases in force, and completely veer round and face the tail f whenever the wind increases to a gale, thus shutting itself completely and automatically off the wind; but so soon as the gale decreases, either gradually or suddenly, the compensating-weight h will cause the wheel A to resume its position before the wind and operate as before. The arm or extension g^3 , provided with a series of holes, $g^4 g^4$, as above mentioned, is for the purpose of adjusting the compensating-weight h according to the work the mill is to perform, and also according to the force of the prevailing wind. If but a slight breeze is stirring, the weight is suspended nearest the shaft, and removed therefrom as it increases in force, until the maximum at which it is safe to operate is reached, the weight being then suspended in the outer hole, g^4 , of the arm or extension g^3 ; but should then the wind increase gradually, the wheel A will gradually veer round by means of the cylindrical portion g , to which the arms or extensions $g^2 g^3$ are formed, and which form the bearings of the horizontal shaft d of the wheel a , until such wheel A has completely veered round, and faces the tail f when the wind has increased to a gale, and is then completely shut off. It is evident that by this arrangement the wheel is not liable to be damaged or broken by a storm.

On the upper brace f^1 , to which the arm f^3 of the tail f is secured, a standard or bracket, f^7 , is affixed, on which a pulley, f^8 , is mounted. The braces $f^1 f^2$ and the arms $f^3 f^4$ of the tail f are connected together at or near their center, between the main hollow vertical standard e and the body f^9 of the tail f , by an inclined transverse bar i , provided near its lower end with a pulley, i^1 , mounted on a standard or bracket, i^2 , at right angles to such inclined transverse bar i . The arm or extension g^2 , formed or affixed on the cylindrical portion or pivot g , is provided at its outer end with a loop or ear, g^5 , having a hole formed therein, to which a chain or rope, g^6 , or other suitable means, is firmly and securely attached. This chain or

rope g^6 passes under the pulley i^2 , thence over the pulley, thence over the pulley f^8 , into the main vertical hollow standard e , where it is connected with the shifting-rod l , and, by means of this shifting-rod l and the chain or rope g^6 , and the pulleys f^8 and i^1 , the wheel can be shut off from the wind when so desired, and the operation is as follows: When it is necessary to stop the mill, all that is required is to exert downward pressure, by pulling, or by means of a lever or other suitable means, to the shifting-rod l , which will communicate such power to the chain or rope g^6 , traversing over the pulley f^8 and under the pulley i^1 , and cause the arm or extension g^2 affixed or formed on the cylindrical portion g , and forming the bearing of the horizontal shaft d , and consequently the wheel A, to veer round the main hollow vertical standard e , and face the tail f , thus completely shutting it off from the wind. The inclined transverse bar i is provided on its face, at or near the center, with a stud or projection, i^3 , against which the outer end of the arm or extension g^2 rests whenever such wheel A is shut off from the wind, either by hand or by the force of a gale, and thus acts as a stop to such wheel A, and prevents the same or the arm g^2 from striking against the tail f , and, by a sudden collision, causing either the wheel A or the tail f , or the mechanism connected therewith, to be broken or damaged. m is the connecting-rod formed in two parts, $m^1 m^2$, as shown in Figs. 1, 2, and 6, the upper ends $m^3 m^4$ being semicircular, and forming the strap to receive and hold the flanges of the eccentric-wheel. Each semicircular portion $m^3 m^4$ is provided with a lug or ear, $m^5 m^5$, having a hole formed therein for the reception of a bolt or pin. The part m^1 is provided, at its lower end, with an extension, m^6 , the lower end of which is formed into a bearing, m^7 , for the reception of the axle or projection n^3 , formed on one side of the band or ring n^2 , hereinafter more fully described. The part m^2 is also provided, at its lower end, with a curved extension, m^8 , partially encircling the main vertical standard e , and at m^9 has a vertical arm or extension, the lower end of which is also formed into a bearing, m^{10} , for the reception of the axle or projection n^4 , formed on the opposite side of the band or ring n^2 . The parts $m^1 m^2$ are further provided with bolt-holes near and under the semicircular portions $m^3 m^4$, for the reception of bolts or pins m^{11} , by means of which and the bolts in the ears or lugs $m^5 m^5$, and the axles or projections $n^3 n^4$, formed on the opposite sides of the band or ring n^2 , the two parts of the connecting-rod m are securely held in position. The band or ring n is formed in two parts, $n^1 n^2$, each part being provided with ears or flanges $n^5 n^5$, having holes formed therein for the reception of bolts or pins, and, when bolted together, form two separate rings, $n^1 n^2$, connected together by means of the ears or flanges $n^5 n^5$. The part n^2 has formed on each side an axle or projection, $n^3 n^4$, which enter the bearings $m^7 m^{10}$ on the lower ends of

the arms or extensions $m^6 m^9$ of the connecting or driving rod m . The main vertical hollow shaft e has slots or grooves $e^4 e^4$ formed on each side of its lower or thickest portion, in which the arms $q^1 q^1$ of the working or pumping rod q slide. These arms $q^1 q^1$ are provided on their upper end with lugs or ears $q^2 q^2 q^3 q^3$, between which lugs or ears the band or ring n^2 is held. The band or ring n^1 serves as a further bearing to the connecting-rod m , giving the band or ring n^2 additional strength and friction-surface, rendering such band or ring n less liable to become damaged.

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

1. In the wheel of a windmill, the combination, with the fans or vanes a^5 and the hoops or bands a^{12} , the braces C and hoops or bands $a^{10} a^{11}$, arranged and constructed substantially as and for the purposes described.

2. In the connecting or driving rod m of a windmill, the parts $m^1 m^2$, composed of semi-circular portions $m^3 m^4$, forming the strap to hold the flanges of the eccentric-wheel r , lugs or ears $m^5 m^5$, extension m^6 , bearing m^7 , curved extension m^8 , provided at m^9 with a vertical arm having a bearing, m^{10} , at its lower end, in combination with the main vertical standard e , ring or band n , slots or grooves $e^4 e^4$, and the working or pumping rod q , all arranged, constructed, and operating substantially as shown and set forth.

3. In a windmill, the wheel A , horizontal

shaft d , in combination with the connecting-rod m , main vertical standard e , ring n , formed of parts $n^1 n^2$, axles or projections $n^3 n^4$, ears or flanges n^5 , and the arms $q^1 q^1$, lugs or ears $q^2 q^3$ of the working or pumping rod q , all arranged and constructed and operating substantially as shown and described.

4. In the automatic shifting devices of a windmill, the main hollow standard e , cylindrical portion or pivot g , arms or extensions $g^1 g^2$, forming the bearings for the horizontal shaft d , arm or extension g^3 , provided with holes g^4 , in combination with the arms $f^1 f^2$, tail f^9 , chains or ropes $h^1 h^2$, weight h , loop or ear f^5 , inclined transverse bar i , stud or projection i^3 , forming a stop to the wheel A , horizontal shaft d , and wheel A , all arranged, constructed, and operating substantially as set forth.

5. In the shifting mechanism of a windmill, the shifting-rod l , in combination with the main hollow standard e , chain or rope g^6 , pulleys $f^8 i^2$, inclined transverse bar i , and stud or projection i^3 , loop or ear g^5 , horizontal shaft d , and wheel A , all arranged, constructed, and operating substantially as shown and described.

In testimony that we claim the foregoing we have hereunto set our hands this 29th day of July, 1873.

JOSIAH KEELER.

CHARLES C. HARRIS.

Witnesses:

CHAS. K. LADD,

JAMES F. TODD.