NEW ZEALAND

PATENT SPECIFICATION

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NEW ZEALAND

"The Patents, Designs and Trade Marks Act 1921-22"

COMPLETE SPECIFICATION.

"Improvements in windmills"

I, ROLAND ROLF RICHARD, of Kynuna, in the State of Queensland, Commonwealth of Australia, Grazier, A British Subject /do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:-

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This invention refers to windwheels of the horizontal type and consists of constructional improvements designed with the object of attaining lightness consistent with necessary strength and to provide automatic means for retarding revolution of the windwheel during exceptionally strong winds.

A further object of the invention is to provide means for enabling ~~the windwheel~~ a windmill of the horizontal type to revolve during wind of low pressure, and for this purpose the windwheel is mounted on a float supported in a liquid such as oil, or water, or oil and water, contained preferably in a cistern whereby said float supports the weight of the windwheel and thereby reduces friction.

In the accompanying drawings- Fig.1 is an elevation (broken) of the mill, in which the float is employed.

Fig.2 is a vertical section of the windwheel, and

Fig.3 a plan

Fig.4 is an enlarged vertical section (broken) through parts of Fig.2, and

Fig.5 is a detail vertical section through the windwheel.

Figs.6 & 7 are enlarged detail views (broken) of the crank gear.

Fig.8 is a detail of a modification of the brake gear.

According to this invention, the sails or vanes 1 hang vertically from horizontal circular rims 2, being set at the desired angle and joined at intervals by bracing sheets 3 (figs.1 and 5) of metal or other suitable material set with their edges presented outwards and inclined upwards spirally so that the pressure on the lower part of the vanes will be transmitted upwards

to the rims 2 without twisting the vanes 1 or otherwise damaging same.

The upper rims 2 are supported by radial arms 4,5, suitably joined preferably to form cantilever trusses, the arm 4being provided with a circular rail 6 (Figs.2& 3) located immediately above stationary brake blocks 7 (Figs.1 & 2) which are attached preferably to the rim of a cistern 8. A space provided between the circular rail 6 and the brake blocks 7 is such as to allow contact of these parts under extra high speeds in high winds.

It will be evident without illustration that the rail 6 might be fixed to the top of the cistern and the brake blocks to the arms of the windwheel.

The brake blocks 7 as illustrated, are hinged as at 9 and one or more are provided with handles 11 so that they may be applied by hand when it is necessary to stop the windwheel rotating. The handle may be fixed by means of a bolt 12 passed through a rack bar 13. The arms 4 are attached to a central float F located intho cistern 8 containing water or oil or water and oil and supported on the frame and said float F is formed with a central sleeve or shaft 14 provided with bearings 15, 16, that rotate around a hollow stationary shaft or axle 17.

The bearings 15, 16 which may be either ball, roller or such other kinds as are in general use are connected together by means of rods 18 to hold them in position relative to one another and enable them being withdrawn through the sleeve 14 and they are also provided with set screws 19 which pass through the sides of the sleeve thus enabling said sleeve and windwheel to be centralized and rotate evenly around its axis. The

rods 18 are screwed or otherwise fixed to the lower bearings 16 and passed through holes in the upper bearing 15 and secured by nuts.

To the upper end of the sleeve 14 is fixed a boss 20 into which is fixed the central rotary shaft 21 of the windwheel which extends downwardly through the fixed shaft 17 and suitable bearings on the frame and is provided for instance with a crank disc 22 (Fig.1) to the crank pin 23 of which is connected a connecting rod 24 operating a balanced lever or "bob" 25 connected with a pump rod 26.

With this construction Fig.6 it is necessary that the bearing portion of the crank pin 26 be partly spherical and engage a corresponding seating 63 located in a container 64 for lubricant, the boss 65 of the crank disc also dipping into the container. The other end 66 of the rod 24 is bent down so that the pivot 67 on which it turns can be immersed in a container 68 filled with lubricant and fixed to the balance bob 25.

To the top of one of the arms 5 or else to an extension of the boss 20 a T-shaped crank pin 27 is fixed which is provided with a connecting arm 28 which receives reciprocating motion and may be connected for instance to a bell crank 29 mounted on a tower 30 and connected to a pump rod or vertical arm 31 to convey power to a lower level.

Owing to the crank pin rotating in a horizontal plane and the bell crank rocking in a vertical plane, provision must be made at the connections to obtain smooth motion.

As illustrated in Fig.7 the crank pin 27 works in a bearing 69 in an oil well 70 protected from rain by a cover 71 on the arm 28 and said pin has a collar 72 engaging a recess in the bearing to prevent the pin

rising.

The connecting arm 28 is bent down at its ends 73, 74 and one end 73 is connected to a cross head 75 on the pin, the limbs of said head being journalled in bearings 76 in the well.

The other bent end 74 of the arm 28 is similarly connected with a cross head 77 of a vertical pin 78, the limbs of said head being mounted in bearings 79.

The vertical member of the bell crank is hollow and acts as a bearing for the pin 78 which is provided with a collar 80 engaging a recess in said member. The latter is provided at the top with an oil well 81 protected by a cover 82 on the arm 28.

The pivot 83 of the bell crank is fixed in the walls of an oil well 84 fixed on the tower 30, and it engages bearings 85 on the bell crank, which is provided with a cover 86 to protect said well.

The end 87 of the bell crank is bent and its pivot 91 is fixed in a cup 88 of the pump rod 31 which cup holds a lubricant and is protected by cover 89 fixed to the bell crank, The bell crank is provided with a bearing 90 which oscillates around its pivot 91.

The float F is provided on its side with small metal blades 32 (Fig.2) bent outwardly to propel the water or oil towards the wall of the cistern during strong winds, thus allowing the float F and the whole of the windwheel to descend until the circular rail 6 is brought into frictional contact with the brake blocks 7.

Alternatively as shown in Fig.2 blades 61 may be pivotted to the arms 5 and normally held out of contact with the liquid by a spring 62 but which by centrifugal action under high speed would dip into the liquid and retard the speed of the windwheel.

The float F may be conical or of other suitable

shapes and may be open at the top, or closed thereat and open at the bottom or it may be closed at both ends. When stability and smooth running are essential it would be so designed that its centre of flotation is near or above the centre of gravity of the whole windwheel and the centre of wind pressure would be approximately opposite the lower bearing 16 which would thereby become the centre of resistance thus minimizing the bending moments on the fixed shaft or axle 17 and the rocking of the windwheel during irregular wind currents.

Owing to this and the fact that the arms 4,5 upper rims 2 and other parts of the windwheel are necessarily above the float F and only the lower rim 52 and part of the vanes 1 can project below the float F, the float is best made in the shape of the frustum of a cone, (inverted) in order to raise the centre of flotation.

To prevent friction and consequent loss of power all stays bolts and other fastenings are located inside the float and only the sheet metal forming the outer skin being in contact with the water in which it is suspended.

The float F may be constructed in a variety of different ways. For instance it may be made entirely of sheet metal of sufficient thickness to stand the pressure of the water and transmit this to the arms 4,5, of the windwheel, but for reasons of economy it is preferable to make it of thinner sheet metal 33 as illustrated and kept in shape by means of an angle iron frame work attached to the sleeve 14 and to the arms 4, 5 of the windwheel.

As shown in the drawings these supports consist of an angle iron ring 35, (Fig.2) to which the upper part of the sheet metal 33 is attached and which is in turn

attached to the arms 4 of the wheel which serves the double purpose of keeping the upper part of the sheet metal circular and fastening it to the arms of the wheel. Angle iron ribs 34 attached to the above ring 35 prevents the sheet metal collapsing inwardly and conveys the pressure due to the weight of the windwheel downwards or otherwise conveys the upward pressure of the water to the arms of the wheel and also transmits the pressure exerted by the wind from the vanes 1 through the arms 4 down to the bottom bearing 16 of the sleeve 14.

These ribs 34 may be strengthened in case of large windmills by means of struts projecting inwardly towards the upper part of the sleeve 14 or the inner part of the arms 4 of the wheel.

The lower ends of these ribs 34 are fastened to the flanged ring 36 which is fastened to the flanged ring 37 screwed or otherwise fixed to the bottom of the sleeve 14.

The sheet metal 33 is fitted between the flanges of the rings 36 and 37 and the joint is made water-tight by means of red lead, putty, india-rubber, insertion or such other suitable material.

In case it is preferred not to use the float F as such or in cases where it is desired to take the weight of the windwheel as for instance when water has inadvertently got into the float F, or the cistern 8 is leaking, a bearing 38 with rollers or balls, such as are in general use is placed immediately under the bearing 16 and above the upper end of a sleeve 39 fixed to the main frame 40 so as to take the weight of the windwheel as it rotates, and enable it to be used pending repairs. In case the float is not required as such the cistern may be reduced in area and merely contain lubricant oil for the working parts.

When the windwheel is supported upon the

bearing 38 above the sleeve 39 the windwheel cannot descend sufficiently for the effective use of the brakes in strong winds. It is necessary therefore to provide an additional brake for this purpose.

A suitable form of construction is shown in Fig.8 and consists of a brake block 141 mounted on pivot 142, in such a position as to descend on the top of the cistern or a circular fixed rail 143 fixed thereto.

The block is normally held clear above the rail 143 by a counter balance weight 144 on an arm 145 of the brake, said arm being connected to arm 4 of the frame by a spring 146.

From the axis of arm 145 extends an arm 147 pivotally connected at 148 to a connecting rod 149 pivotally connected to a suitably guided sliding weight 150 adapted to slide on a horizontal radial rail 151.

During strong wind centrifugal force overcomes the weight of the counterbalance weight 144 and tension on spring 146 and weight 150 moves outwardly and causes the block 141 to bear upon the rail 143.

To prevent the access of rain dust or other material into the float F and cistern 8 a cover of sheet metal 41 is fastened to the float F immediately under the arms 4, and over rail 6 and its edge 41^a is turned downwardly to prevent rain being blown into the cistern.

The cistern 8 may be made of any suitable material and of any shape but it is made preferably of thin sheet metal 42 supported in position and shape by an angle iron frame-work and is in shape conical corresponding to that of the float F.

The frame work consists of an angle iron ring 43 (Fig.2) and ribs 44 which are placed on the outside to prevent any obstruction to the circulation of the water inside and thus minimize the friction on the float F.

The jointing of the sheet metal 42 is effected similarly to that of the float F except that the flanged ring 45 is on the inside and is bolted to the opposite flange 46 formed on the main supporting sleeve 39 of the fixed shaft 17 said flange 46 also forming the bottom of the cistern 8.

The conical shape of the cistern 8 is preferable as it allows a freer circulation of the wind inside and through the windwheel as the wind being deflected by the vanes 1 at different angles creates a kind of vortex which assists the rotation of the windwheel and a partial vacuum which occurs in the rear of the wind drum together with an uplift of the air currents due to the resistance of the structure renders the rear vanes more effective when there is less obstruction offered by the cistern.

In order to increase the buoyancy of the water in the cistern 8 and so reduce the size of both cistern and float, common salt or any other soluble compound of the alkali metals such as Barium Bromide, Calcium Bromide and the like may be added and in order to minimize or retard evaporation such salts as have an affinity for water may be added such as calcium chloride or barium chloride, furthermore for the latter objects the surface of the water may be covered with oil.

The sizes of the cistern and float should be sufficient to carry the whole weight of the windwheel but where the prevailing winds or other conditions admit they may be made of any lesser size provided they are sufficiently high to maintain a sufficient reserve of lubricating oil in the sleeve 14 and thus save attention and risk on the part of attendants. In this case the cistern may be entirely filled with oil.

When possible in place of a cistern any natural

or artificial water such as reservoirs or lagoons may be used in which case the windwheel would be mounted in same.

For the purpose of providing lubrication for the bearings 15, 16 that will last a long time, the space between the fixed shaft 17 and the sleeve 14 is filled with oil and in order to provide for a longer supply the space above the upper bearing 15 may be enlarged or the space may be permanently supplied by means of a storage cistern having a pipe connected with said space.

The sleeve 14 may be made of cast iron in one piece but as lightness with strength are of importance it would be made of mild steel tubing in two pieces, joined by union flanges 92 (Fig.4) the fixing bolts 93 passing through arms 4.

The rims 2 may be made in various ways but preferably from channel or angle iron bars curved and fastened so as to form two concentric rings at a distance apart that would be suitable for attaching the vanes or sails 1.

The vanes or sails 1 are attached to the rims 2 by means of brackets 50 made of sheet metal or light angle iron pressed into shape to suit the curvature of the vanes or sails one leg 51 of these brackets being horizontal and fastened to the rim rings 2 and the other leg being vertical and attached to the vanes.

The lower ends of the vanes or sails are fastened to the rim 52 which in the case of small windmills is best made of segments of sheet metal suitably joined to which the vanes are attached by means of brackets similar to those described for attaching the vanes to the upper rim 2. In large windmills the lower rim 52 would be made of angle iron similar to but lighter than the upper rim 2 similar brackets being used.

The vanes 1 are set at an angle of between 30^{0} and 40^{0} to radii of the windwheel and are bent horizontally to the form of a parabolic curve the apex edge of which is disposed outwards and the base edge inwards.

This curvature is maintained by the bracing pieces of sheet metal 3 cut and bent to the same curvature as the vanes and fastened in between the vanes by screws or rivets or soldered as in Fig.5. These sheet metal braces 3 are also to be set at an angle so that a series of them will form a spiral reaching from the bottom rim 52 to the top rim 2 and so transmit the pressure received from the wind upwards to the arms 4 and 5 of the windwheel.

In addition and to prevent torque of the vanes 1 in strong winds certain vanes at intervals and preferably those immediately below the arms of the windwheel are made of extra strong sheet metal and are braced diagonally from the bottom of each to the arms 4 on both sides near the ends by means of curved and inclined light iron rods or stout wires 53 (Fig.5-) as may be necessary.

When the windwheel rotates a proportion of the vanes or sails must be always coming up against the wind and those in front will present surfaces that are curved backwards from it and those in the rear will be coming up mostly edge on to it, while this back pressure is of little importance in districts where the winds are strong and constant it is otherwise where they are not and for this reason a rotary wind screen 54, 55 is provided.

This wind screen is mounted on a frame-work 56 which is pivotted on a shouldered seating 57 on the sleeve 39 immediately under the cistern 8 and is provided with three or more wheels 58 that run on a circular rail 59

concentric with the windwheel and supported on the main frame 40.

Attached to the frame work 56 and remote from the screen is a vane 157 similar to those of the annular type of windmill in general use and set at such an angle as to bring the wind screens properly into position to screen the vanes 1 moving to windward.

The wind screen itself consists of the two walls or parts 54, 55 curved parallel to the vanes the former of which is on the outside of the vanes and projects upwardly so as to protect the vanes in front and the other part 55 is on the inner side of the vanes and projects upwardly so as to protect the on-coming vanes further back from inside. The screens are made of sheet metal fastened to angle iron supports 60 and the frame work 56 is made of angle iron of suitable cross-sectional area and suitably strutted.

HAVING NOW particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:-

1. In windmills of the horizontal type, the arrangement in which the horizontal windwheel is supported by a float supported in a body of liquid.

2. In windmills of the horizontal type, a horizontal windwheel having centrally affixed thereto a float supported in a stationary cistern containing liquid.

3. In windmills of the horizontal type, a horizontal windwheel with a conical float supported in a correspondingly shaped cistern containing liquid.

4. In windmills of the horizontal type, a horizontal windwheel rotatably supported in a cistern containing oil, a hollow stationary shaft surrounding the central rotatable shaft of the mill and provided with bearings, both shafts extending through said cistern and

an outer sleeve to which the rotating windwheel is fixed containing lubricant and having fixed thereto interior bearings adapted to bear upon the bearings of the stationary shaft.

5. In windmills of the horizontal type, a horizontal windwheel having centrally affixed thereto a float supported in a cistern containing water or oil or water and oil, a hollow stationary shaft surrounding the central rotatable shaft of the mill both extending through the cistern and float and an outer sleeve fixed to the latter and containing lubricant and having fixed thereto interior bearings at the upper and lower ends of the float connected by rods.

6. In windmills of the horizontal type, a horizontal windwheel supported on bearings in a cistern containing oil, said cistern formed of sheet iron fixed to angle iron ribs attached at the top to an angle iron rim and clamped at the bottom between flanges and flanged rings substantially as illustrated.

7. In windmills of the horizontal type, a horizontal windwheel having centrally affixed thereto a float supported in a cistern containing water or oil or water and oil said float and cistern formed of sheet iron fixed to angle iron ribs attached at the top to angle iron rims and clamped at the lower ends between flanges and flanged rings substantially as illustrated.

8. In windmills of the horizontal type, a horizontal windwheel supported on bearings in a cistern containing oil, the upper frame of the windwheel provided with a crank pin with a connecting arm joined to a bell crank to which a vertical rod to be reciprocated is attached.

9. In windmills of the horizontal type, a horizontal windwheel having centrally affixed thereto a float supported in a cistern containing water or oil or

water and oil the upper frame of the windwheel having a crank pin with connecting arm joined to a pivotted bell crank to which a vertical rod to be reciprocated is connected.

10. In windmills of the horizontal type, in which motion is imparted by a crank pin at the top of the windwheel by means of a connecting arm articulated to a bell crank operating a vertically reciprocated rod, the arrangement in which the crank pin and a pin connection on the bell crank connected with the connecting arm are horizontally rotatable and said pins, the pivot of the bell crank and connecting joint of the latter with the rod to be reciprocated are contained in oil baths.

11. In windmills of the horizontal type, in which motion is imparted by a crank pin at the top of the windwheel by means of a connecting arm articulated to a bell crank operating a vertically reciprocated rod the arrangement in which the connecting arm is bent down at each end one of which is provided with bearings engaging a cross head on the crank pin the latter being rotatable on bearings in an oil well and the other end of the arm connected to a similar pin located in an oil well and rotatably engaging a bearing in the upwardly projecting limb of the bell crank, the other end of which is bent and provided with a bearing engaging a fixed pivot pin in an oil cup connected to the rod to be reciprocated and the pivot of the bell crank is fixed in an oil well and journalled in a bearing on said bell crank substantially as illustrated in Fig.7 of the drawings.

12. In windmills of the horizontal type, a horizontal windwheel comprising a frame axially mounted on bearings and provided with radial arms supporting at their outer ends a series of suspended vanes.

13. In windmills of the horizontal type, a horizontal windwheel comprising a frame provided with radial arms axially supported by a float in a cistern containing a liquid and having at its circumference a series of suspended vanes.

14. In windmills of the horizontal type, a horizontal windwheel comprising a frame axially mounted on bearings and provided with radial arms supporting at their outer ends suspended vanes braced together by means of spirally arranged metal sheets.

15. In windmills of the horizontal type, a horizontal windwheel comprising a frame connected with a sleeve around a central fixed hollow shaft and provided with bearings said bearings being supported on bearings on said shaft and said frame being provided with axial arms from the outer ends of which are suspended the wind wheel vanes braced by means of spirally arranged metal sheets.

16. In windmills of the horizontal type, a horizontal windwheel comprising a frame provided with radial arms axially supported by a float in a cistern containing a liquid and having at its circumference a series of suspended vanes braced together by means of spirally arranged metal sheets.

17. In windmills of the horizontal type, a horizontal windwheel mounted on bearings and comprising a frame axially mounted on bearings and supporting at their outer ends suspended vanes braced together by means of spirally arranged metal sheets and by means of inclined curved rods joined to the interior edges of the vanes.

18. In windmills of the horizontal type, a horizontal windwheel comprising a frame provided with axial bearings supported on bearings located in a cistern containing a lubricant said frame having radial arms with

suspended vanes braced by spiral metal sheets and connected on their interior edges by inclined curved rods.

19. In windmills of the horizontal type, a horizontal windwheel comprising a frame with radial arms axially supported by a float in a cistern containing a liquid and having at its circumference a series of suspended vanes braced together by means of spirally arranged metal sheets and by means of inclined curved rods joined to the interior edges of the vanes.

20. In windmills of the horizontal type, a horizontal windwheel, a frame therefor consisting of horizontal and inclined radial arms joined to form cantilever trusses and connected to annular rims from which the vanes are suspended and said frame supported on bearings in a cistern containing lubricant.

21. In windmills of the horizontal type, a horizontal windwheel comprising a frame axially supported by a float in a cistern containing a liquid and having at its circumferenced a series of suspended vanes said frame consisting of horizontal and inclined radial arms joined to form cantilever trusses, said horizontal arms being connected to annular rims from which the vanes are suspended.

22. In windmills of the horizontal type, a horizontal wind wheel comprising a frame axially supported on bearings located in a cistern containing lubricant, said frame having radial arms with suspended vanes and a circular rail and brake blocks adapted to contact during excessive revolution of the windwheel.

23. In windmills of the horizontal type, a horizontal windwheel comprising a frame with rqdial arms axially supported by a float in a cistern containing a liquid and having at its circumference a series of suspended vanes and a circular rail fixed to the underside

of said rotary frame adapted during excessive revolution of the windwheel to contact with stationary brake blocks located beneath said rail.

24. In windmills of the horizontal type, a horizontal windwheel comprising a frame axially supported on bearings in a cistern containing lubricant, said frame having radial arms with suspended vanes and a wind screen for said vanes mounted on a frame pivotted about the axis of the mill and provided with a vane set at a suitable angle.

25. In windmills of the horizontal type, a horizontal windwheel comprising a frame with radial arms axially supported by a float in a cistern containing a liquid and having at its circumference a series of suspended vanes and a wind screen for the vanes mounted on a radial frame pivotted about the axis of the mill and provided with a vane set at a suitable angle.

26. In windmills of the horizontal type, a horizontal windwheel comprising a frame with radial arms axially supported by a float in a cistern containing a liquid and having at its circumference a series of suspended vanes and a wind screen for the vanes mounted on a radial frame pivotted about the axis of the mill and provided with a vane set at a suitable angle, said screen consisting of two curved walls respectively on the outside and inside of the vanes and said frame provided with rollers running on a circular fixed rail.

27. In windmills of the horizontal type, a horizontal windwheel comprising a frame with radial arms axially supported by a float in a cistern containing a liquid and having at its circumference a series of suspended vanes and a wind screen consisting of two curved walls respectively on the outside and inside of the vanes and mounted on a frame pivotted about the axis

of the mill and provided with a vane set at a suitable angle, said frame carrying rollers, running on a circular rail.

28. In windmills of the horizontal type, a horizontal windwheel comprising a frame with radial arms having suspended vanes and axially supported by a float in a cistern containing a liquid said float or the frame provided with blades for propelling the liquid outwardly in high winds.

29. In windmills of the horizontal type, a horizontal windwheel comprising a frame axially mounted on bearings and provided with radial arms, from which the vanes are suspended and a brake block operated by centrifugal force of the windwheel to contact with a circular rail.

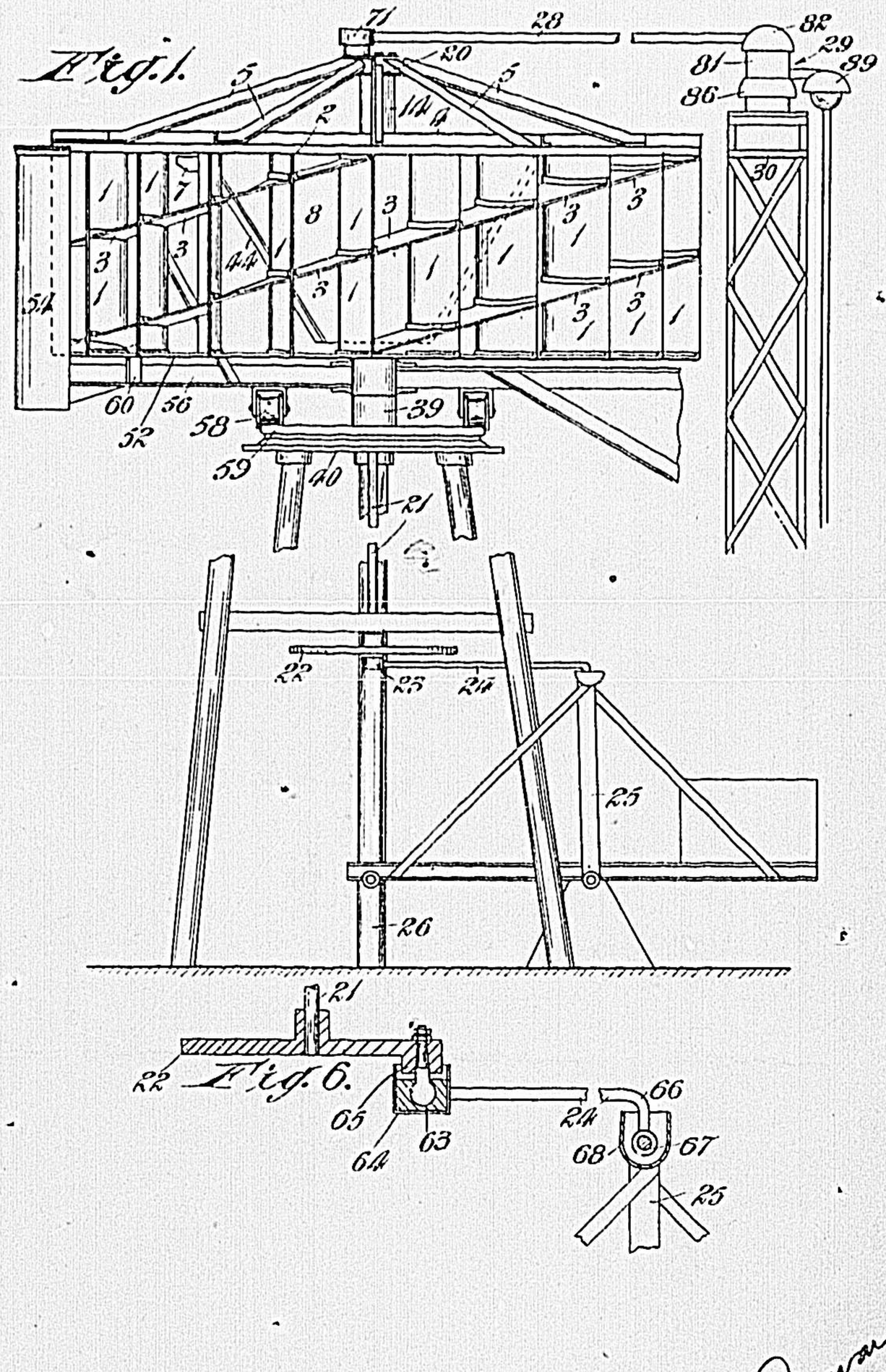
30. In windmills of the horizontal type, a horizontal windwheel comprising a frame axially mounted on bearings and provided with radial arms from which the vanes are suspended and a brake block pivotally mounted above a circular rail said brake having two arms one counterweighted and spring controlled and the other connected by a rod to weight adapted to slide on a radial rail.

at Wellington
DATED/THIS 8th day of November 1922

Baldwin & Raynard
Attorneys for the Applicant.

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Fig. 1.



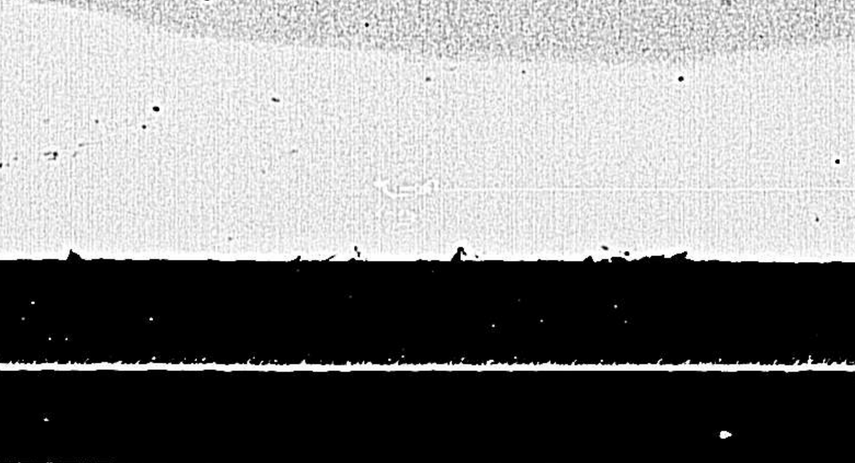


Fig. 6.

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Fig. 2.

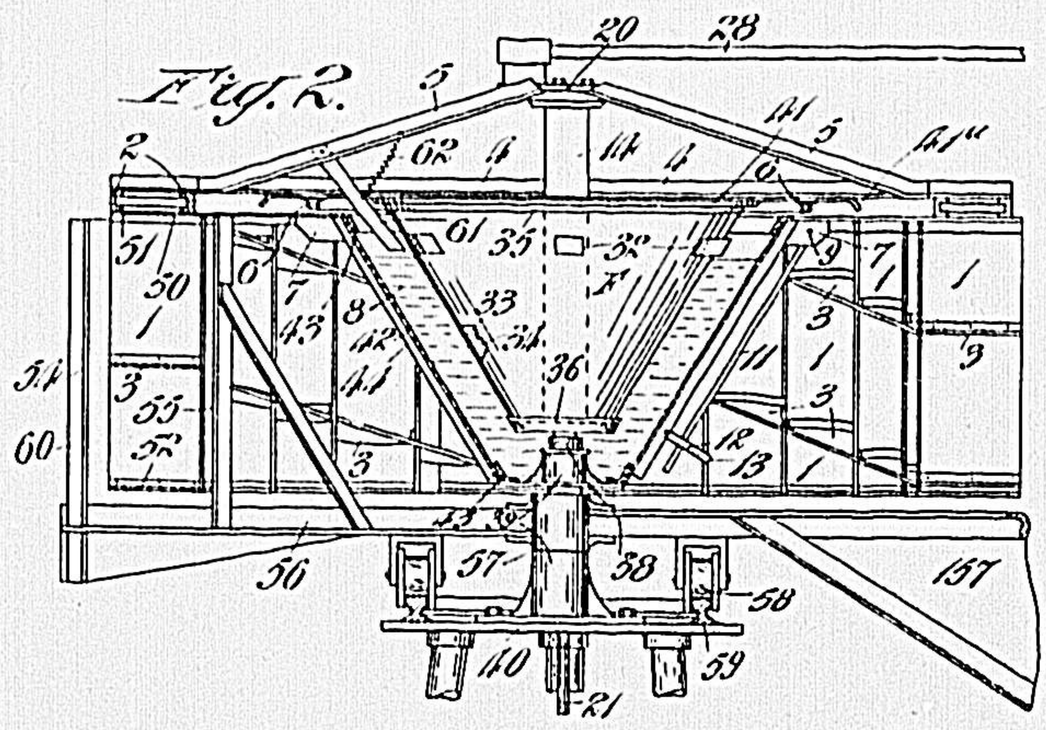
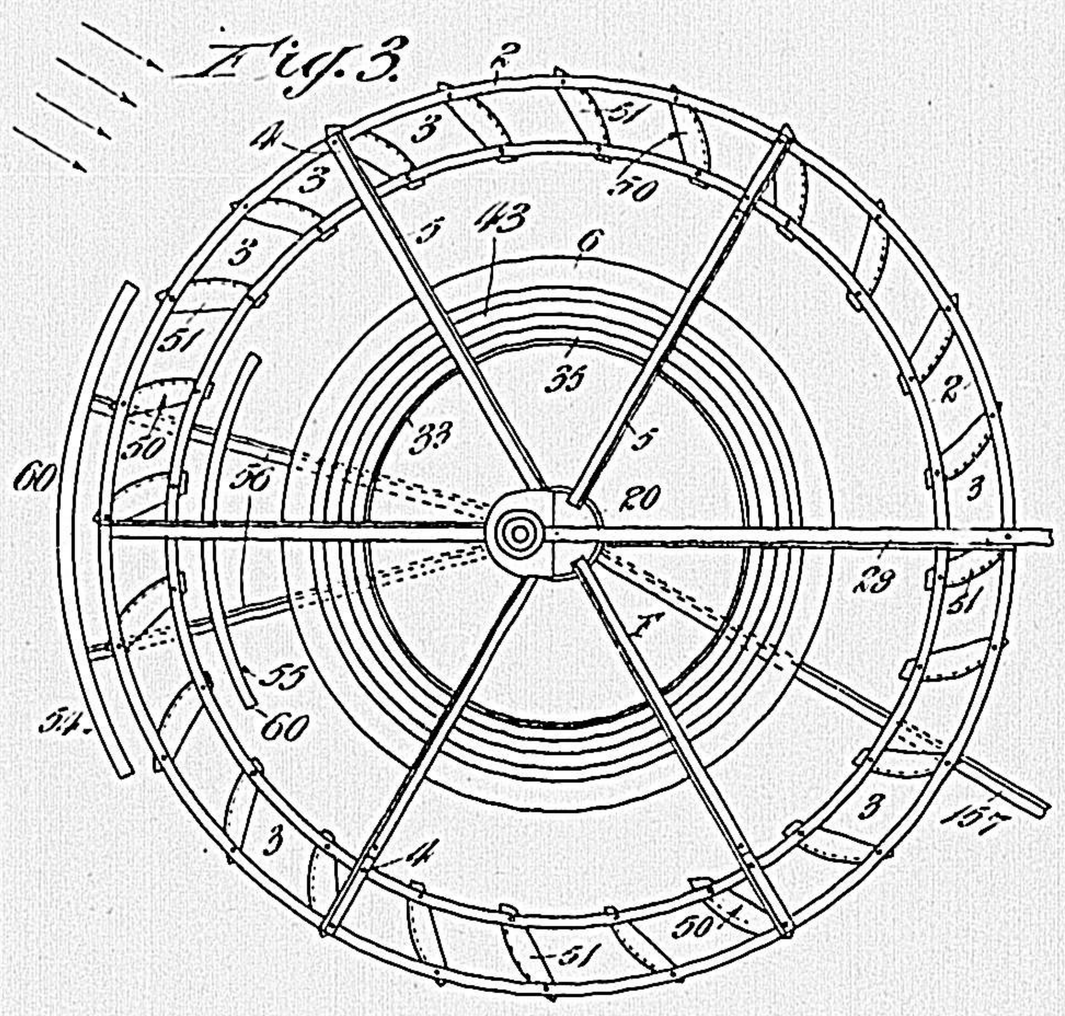


Fig. 3.



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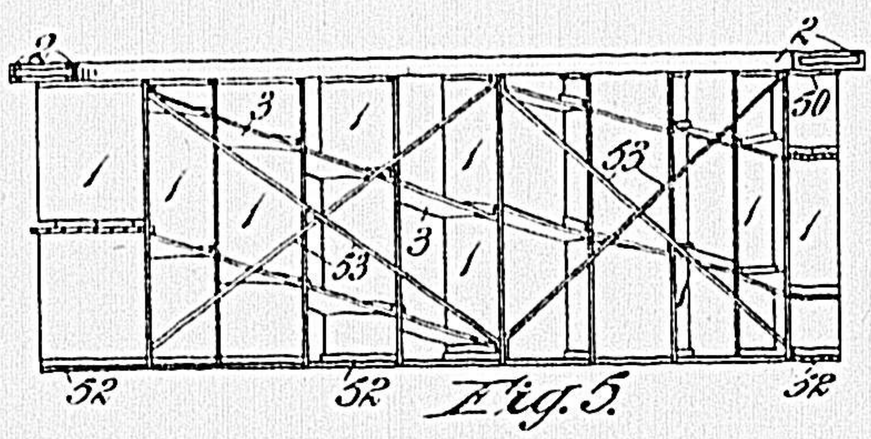
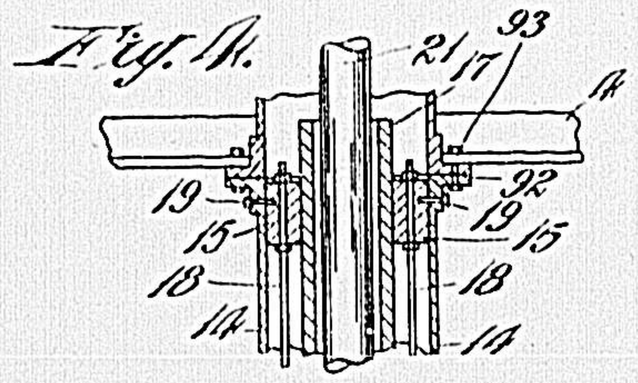
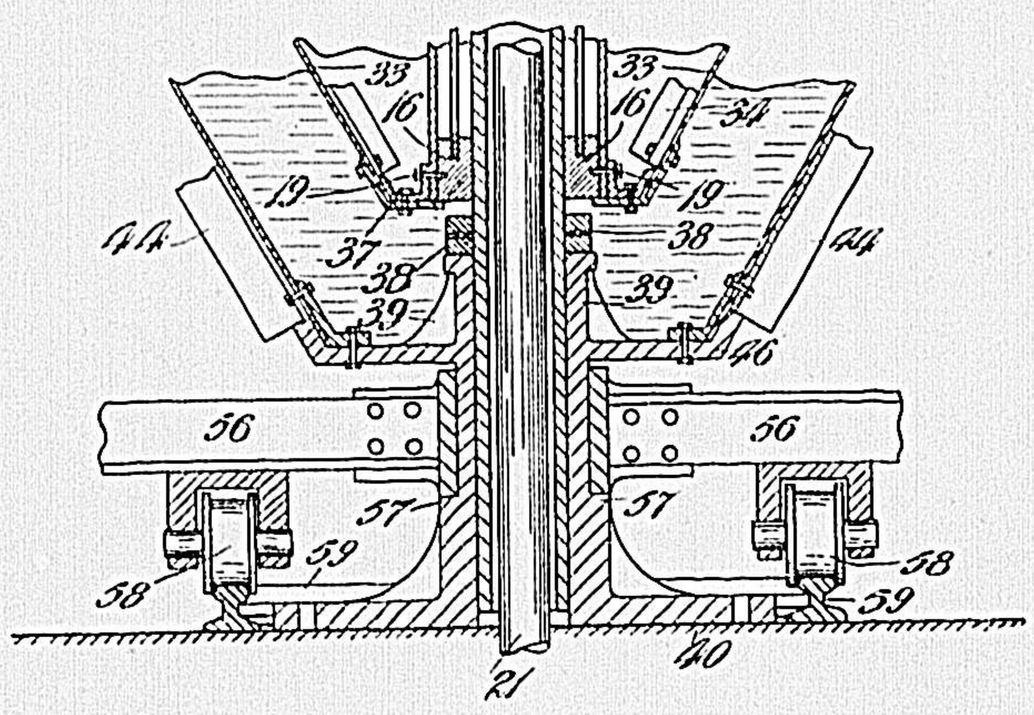


Fig. 5.

Fig. 4.





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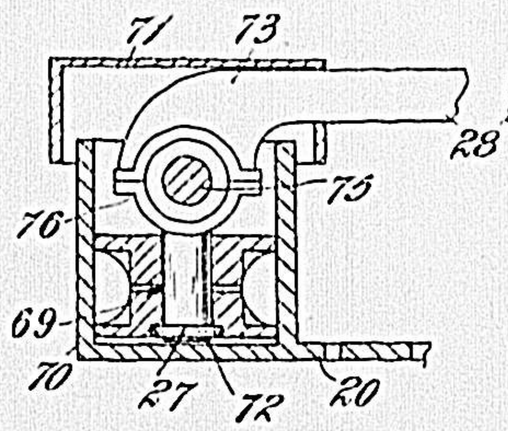
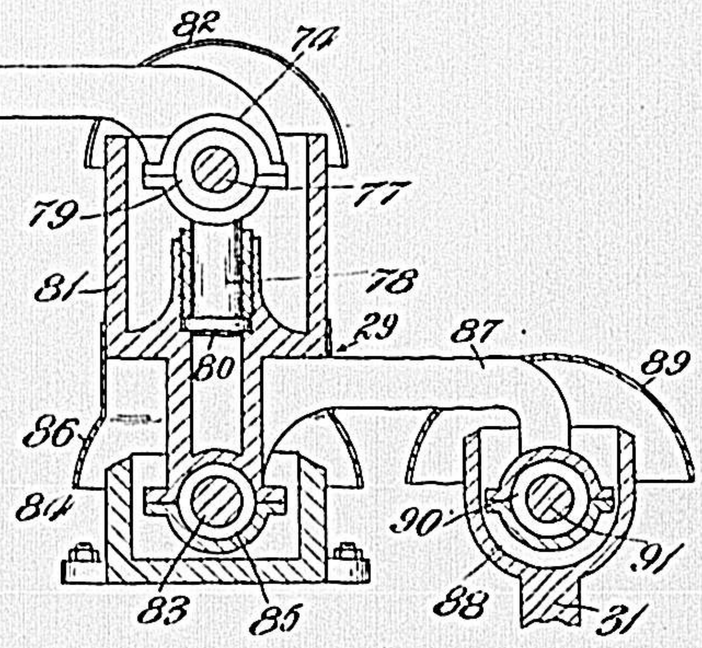


Fig. 7.



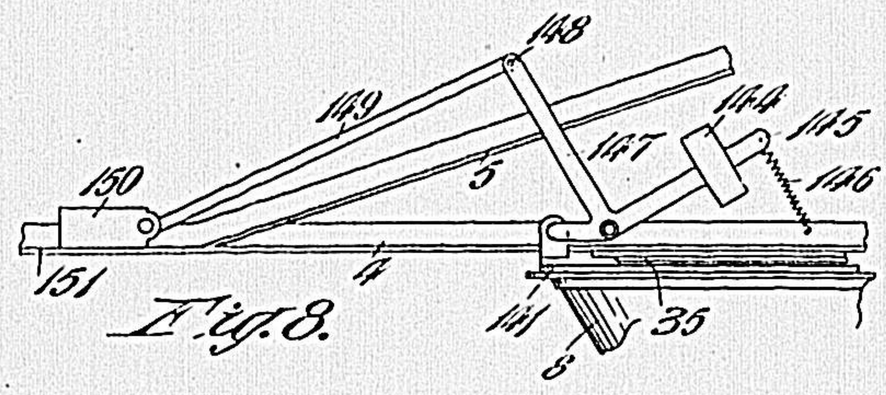


Fig. 8.

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