D. KEMBLE.

WIND WHEEL.

APPLICATION FILED NOV. 2, 1914.

1,181,671.

Patented May 2, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

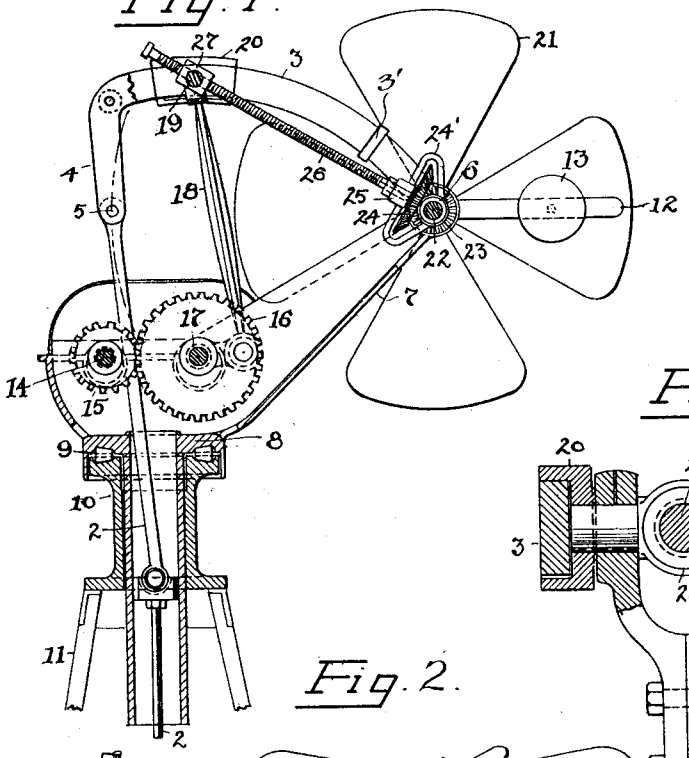


Fig. 3

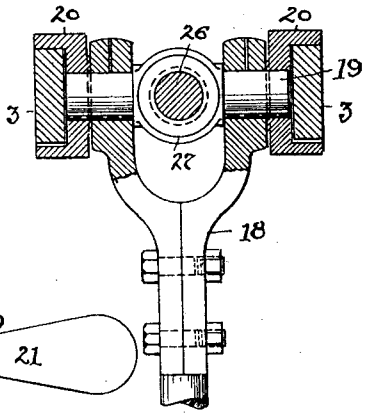


Fig. 2.

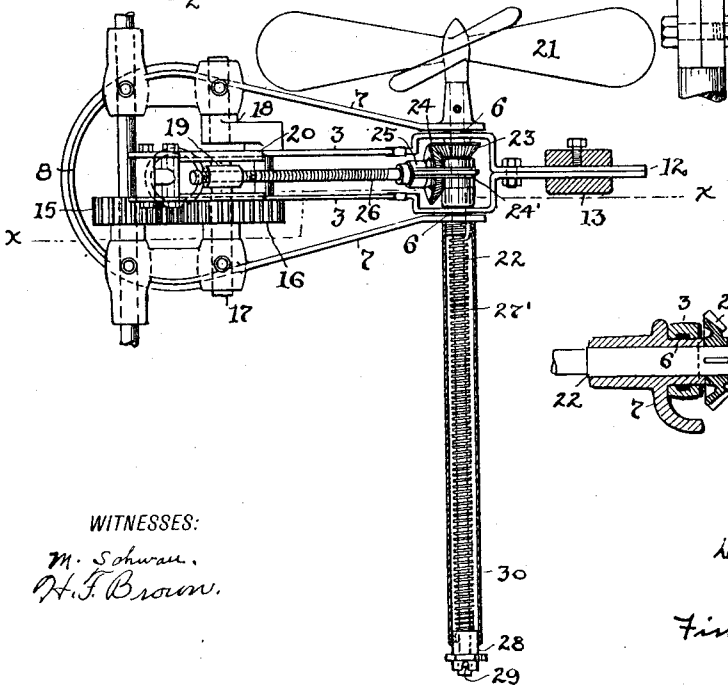
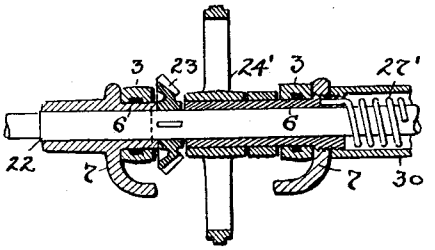


Fig. 4



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2 SHEETS—SHEET 2.

Fig. 5.

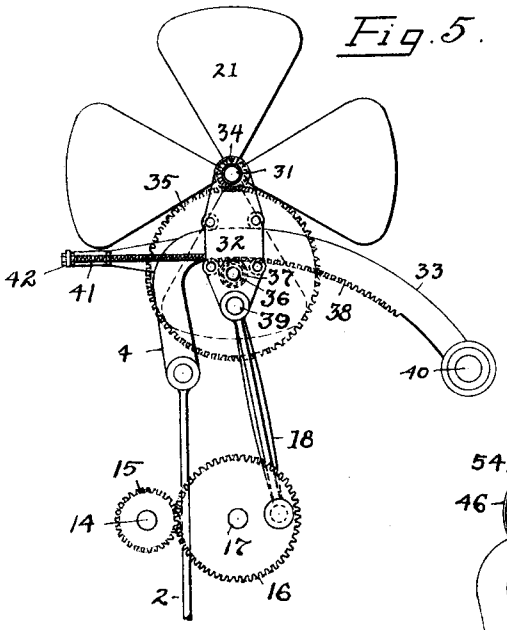


Fig. 9

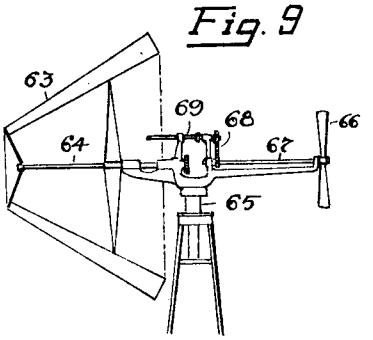


Fig. 6.

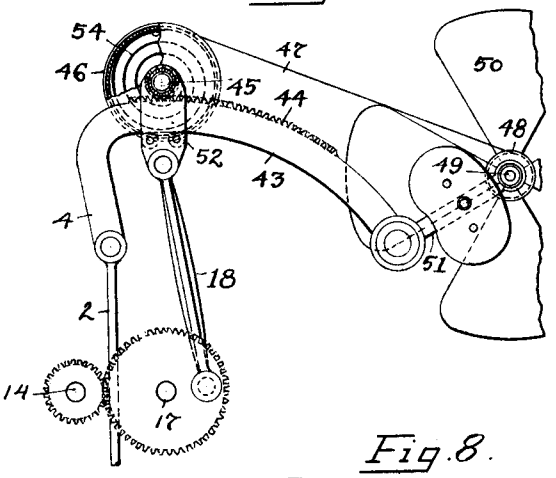


Fig. 8.

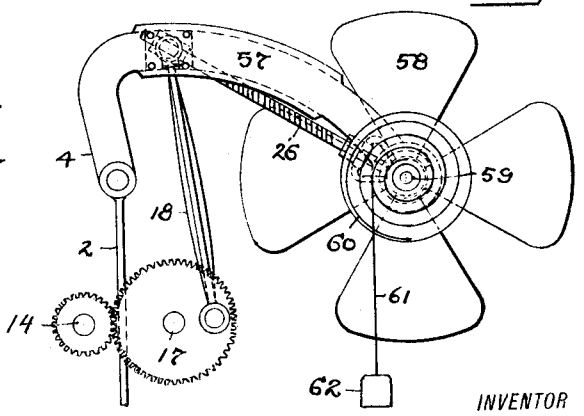
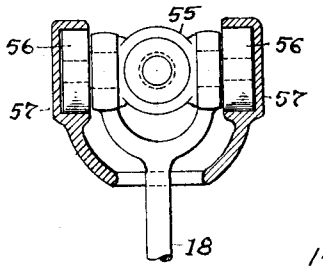


Fig. 7.



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WIND-WHEEL.

1,181,671. Specification of Letters Patent. Patented May 2, 1916.

Application filed November 2, 1914. Serial No. 869,797.

To all whom it may concern:

Be it known that I, DUSTON KEMBLE, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Wind-Wheels, of which the following is a specification.

This invention relates to an improvement in wind wheels, and the improvement comprises power transmitting mechanism which will automatically increase the length of the power stroke with increased speed of the wind wheel under high wind velocities and proportionally decrease the length of stroke with a decrease of wind velocity of pressure, thereby securing the maximum of power of the wheel at the different or variable wind forces, all substantially as shown and described and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of the wind wheel mechanism in which the invention is embodied, the said view being taken substantially on line *x x*, Fig. 2. Fig. 2 is a plan view of the said mechanism partially sectioned. Fig. 3 is an enlarged sectional elevation of the lifting and shifting parts as hereinafter fully described. Fig. 4 is a sectional view, enlarged, of the regulating fan shaft journals. Figs. 5 to 9 inclusive are diagrams of modified forms of the invention, each hereinafter more specifically described.

Now, having in mind the object set forth in the foregoing preamble, I employ the usual connecting rods 2 which, presumably, connect with a pump and in respect to which the term "stroke" applies in its ultimate effect. However, the "stroke" so called, is dependent, and relative. Thus, the said rod is reciprocated through an oscillatory member 3 having a downwardly-extending extremity 4 connected with said rod by a pivot bolt 5. Member 3 comprises two levers or bars which are bowed or curved in their main portion to substantially the segment of an arc and spaced apart, relatively as seen in plan Fig. 2, but rigidly connected with each other at their respective ends so as to produce a unitary structure and operation. The primary pivot for oscillatory member 3 is located at the outer end thereof directly opposite the end 4 or connecting rod pivot 5 and comprises two hubs or trunnions 6 on the inner sides of the arm 7 of the swivel post 8 which is rotatably supported upon roller bearings 9 at the top of the tubular mounting 10 on the tower structure 11. The levers or bars of member 3 have straight extensions 12, and a counterweight 13 is adjustably mounted thereon to equalize or balance the weight of the parts on the connecting rod side of the member.

The swivel post 8 embodies bearings for a transverse shaft 14 to carry the wind wheel, not shown, and a pinion 15 on this shaft meshes with a gear wheel 16 fixed on a crank shaft 17 also mounted in bearings at the top of post 8. The crank at the middle of the crank shaft 17 is engaged by a connecting bar 18, which is preferably provided with a divided end adapted to pivotally engage a short transverse fulcrum shaft 19 having its ends rotatably supported in channel-iron bearings 20 slidably mounted on the curved edges of the side bars of member 3.

The shaft 19 and the slidable bearings 20 provide a shifting operating fulcrum for oscillatory member 3, and obviously when this fulcrum is carried toward the primary pivot for said member the oscillatory movement thereof will be correspondingly increased. A reverse movement of the fulcrum outward toward the extremity 4 will shorten the oscillatory stroke of member 3, the object being to lessen this stroke when the velocity of the wind subsides and to lengthen the same when the velocity increases. In either or both cases, the operating position of the fulcrum slides 20 is determined by the speed of the wind primarily, a result obtained by means of a wind-actuated fan 21 of any desired size and power, mounted on one end of a transverse shaft 22 extending through and having bearings in the hubs 6 at the bifurcated outer end of arm 7. A bevel gear 23 is fixed to the fan shaft 22 within the space between the two hubs 6, and a second bevel gear 24 is supported in mesh with gear 22 by a yoke member 24′ sleeved to turn on one of the hubs 6 and having a lateral hub 25 to support a screw rod 26 centrally between the side bars of member 3. Rod 26 extends toward the crank end of member 3 and is in screw engagement with the enlarged nut portion 27 centrally of the fulcrum shaft 19, whereby rotation of the fan shaft 22 in either direction will cause a shift in position of the slides 20 and the fulcrum

19 for connecting bar 18. Fan 21 will rotate its shaft 22 in one direction, and a coiled spring 27′ on the projecting portion of the shaft will be placed under tension during such rotation and effect a return or reverse rotation when the wind pressure on the fan decreases below the tension of the spring. One end of the spring is secured to the outer end of the long hub 6 of arm 7, and the other end of the spring is fastened to a tension adjusting device comprising a notched sleeve 28 rotatably mounted at the end of the shaft and adapted to have separable locking engagement with a pin 29 on the shaft, see Fig. 2. A tube 30 incloses and protects the spring 27′.

Now, as to this particular group of parts, it will be observed that the wind controlled fan 21 is the initial member in the group relied upon to change the position of the fulcrum 19 of the connecting bar 18 by rotating the screw rod 26 and carrying said fulcrum away from the working end toward the primary pivot of oscillatory member 3, thus increasing the oscillatory movement of said member and likewise the length of stroke of the pump rod 2. However, there is also a limit provided for this movement, otherwise the nut and screw rod would become locked or be injured, and this limit is fixed by a stop 3′ on bars 3. The spring 27′ is so connected with the fan shaft 22 that it will be gradually wound or tightened by the rotation of the fan 21 until it reaches a certain tension. When the fan 21 is restrained from further rotation by the spring 27′ or stop 3′, the other parts in gear therewith remain stationary until the wind pressure diminishes sufficiently to allow the stored up power in the spring to dominate the fan and cause an opposite rotation of the fan and its connected screw rod and at last restore the fulcrum shaft 19 to a normal position approximately as shown in Fig. 1.

The mechanism as thus shown and described has the fulcrum-shifting fan 21 and the parts operated thereby as auxiliary elements to the usual wind wheel parts and supplements said parts as described and for the purpose set forth. Obviously, if the wind be low, the length of the pump rod stroke is nearly at its minimum, as in Fig. 1; but if the wind be high the length of the stroke may be carried to the maximum, which is as far inward on the lever 3 as the stop 3′ thereon will permit the fulcrum slide to go. Thus, the fan 21 and spring 27′ control the fulcrum-shifting mechanism, while the main wind wheel operates the pump or other load connected with the rods 2 through the gears 15 and 16, the connecting bar 18, and the oscillatory member 3.

It will, of course, be understood that the minimum and the maximum shifts of the fulcrum on the operating lever represent the extremes of movement of the said fulcrum, and the shifting will pause at any intermediate point according to the degrees of wind pressure upon the fan 21. That is, the fan may be checked at any intermediate point according to the pressure thereon at the time, and it will play the fulcrum back and forth on said lever subject to varying wind pressure. Of course, both said fan and the wind wheel are subject to the same wind at the same time, and hence the fulcrum controlling mechanism responds to the breeze or wind, whatever velocity it may have, and adjusts itself accordingly. It is evident, also that the regulating fan 21, with its shaft, spring and other connecting parts, might be set out upon the extensions 12 of the oscillatory member 3, which is herein shown as carrying the counterweight and this would not interfere with the successful working of my general plan, since all parts of the mechanism would move together substantially as in Fig. 8. Moreover, it is not necessary that the regulating fan 21 be placed in front, *i. e.* on the windward side of the main wind wheel, since it will operate on either side of the main wheel if its spring be properly adjusted to meet the requirements in either case.

The object in using an oscillatory member or rocker arm between the crank bar 18 and the pump rod 2 is to secure a nearly vertical arc of motion for the head of the pump rod, thus enabling it to operate in the space between the main shaft 14 and the crank shaft 17 and thus maintaining a central balance of gravity for the whole structure over the swivel post 8. Moreover, the peculiar shape of my curved oscillatory member or rocker arm, including the depending extremity to which the pump rod 2 is attached, enables a shifting fulcrum 19 to be employed without seriously disturbing the general position of the arc through which the head of the pump rod is moved except to lengthen said arc at both its extremities, and the use of a screw rod to shift the operating fulcrum or crank rod joint on the curved oscillatory member is of advantage as it accomplishes the desired result with comparative ease while capable of holding the fulcrum firmly in position against a natural tendency of the same to shuffle back and forth according to the different angles assumed by the oscillatory member during each cycle of the crank stroke. In fact, the operation of the fulcrum shifting screw is almost limited to the alternate quadrants of each crank stroke when the regulating fan is drawing the fulcrum shaft or joint toward the primary pivot of member 3, and to the other alternate quadrants of each crank stroke when the fan is relaxed in tension to permit the spiral spring on the fan shaft to reverse the motion and push

the fulcrum shaft toward the outer end of the arm. Moreover, the action of this spring is much more powerful when most needed, namely, when the fulcrum 19 is nearest the primary pivot of the oscillatory member 3.

On account of the short length of the curved portion of the oscillatory member or rocker arm on which the fulcrum shaft 19 is adapted to slide, this type of regulator can only increase the stroke to 2 or 2½ times its initial length when starting under the lowest wind velocity at which the wheel can operate the given pump. Nevertheless, it may yield other incidental advantages. For instance, if it be desired to have the pump start in operation with summer winds of very moderate velocity, say, of only 6 to 8 miles per hour, this can be effected by using a suitable ratio in the gears of the main and counter shafts and making the pump of a proper size. Then, whenever the wind rises to twice the initial velocity, that is, to 12 or 16 miles per hour, not only will the pump be operating twice as fast as at the start, but it will have twice as long a stroke; and will also continue to have this maximum long stroke for all higher velocities. Moreover, since the reversing spring on the shaft of the auxiliary fan can be changed in tension at will by use of the adjusting device 28, it is entirely feasible to have the wind wheel arranged to start the pump with a wind of only 6 to 8 miles per hour in the season of summer breezes. Then by tightening the spring so as to make the wheel operate the pump with a minimum wind of 12 to 14 miles per hour in the season of heavy winter gales, we can connect a second similar pump to the first one and operate them both in parallel, thus doubling the output, and altogether operating in a higher range of wind velocities than is usual.

The fan and screw mechanism for shifting the operating fulcrum for the oscillatory member 3 is the preferred form of operating structure, but I may use a belt or chain operating with pulleys or sprockets to transmit the power from the fan to the fulcrum slides, and the fan may be located at any desired distance from the swivel post and the wind wheel. Such modifications are illustrated in Figs. 5 to 9.

In Fig. 5, the fan 21 is mounted on a short shaft 31 journaled at the top of a box or slide 32 adapted to travel on the curved oscillatory arm 33, and a pinion 34 on the fan shaft 31 meshes with a large gear 35 on a shaft 36 also journaled in the box or slide 32. A pinion 37 on shaft 36 meshes with the teeth of the rack 28 on the bottom edge of the arm 33 and rotation of the fan in one direction causes the slide 32 and the crank connection 39 to shift their position relatively to the primary pivot 40 of arm 33. A spring 41 attached to the slide 32 and to a projection 42 on arm 33 causes a return travel of the slide.

In Fig. 6, an oscillatory member 43 is provided with a gear rack 44 which is engaged by a pinion 45 operated by a band wheel 46 and a belt 47 extending therefrom to a small pulley 48 on the shaft 49 carrying the fan 50. The fan shaft is mounted on the straight arm 51 of the oscillatory member 43 and oscillates therewith. Rotation of the fan causes the slide 52 engaged with the crank rod 18 to travel in one direction on member 43, and a convolute spring 54 causes a reverse movement.

Fig. 7 shows a crank rod fulcrum or connection 55 having rollers 56 adapted to travel in a channeled oscillatory member 57, such as further illustrated in Fig. 8. The fan 58 in this form of the device is mounted on a shaft 59 having a spiral pulley 60 upon which a flexible cord or connection 61 is adapted to wind and unwind under the action of the fan and a weight 62.

Fig. 9 is a reduced view of a wind wheel 63 of conical shape which is carried by a main shaft 64 at one side of the swivel post 65. The regulating fan wheel 66 is supported at the outer end of a separate shaft 67 on the opposite side of the post, and a sprocket and chain connection 68 transmits the power from the fan shaft 67 to the bevel gear shaft 69 at the top of the post, which shaft corresponds to the shaft 22 in Figs. 1 and 2. The oscillatory arm and screw rod are omitted from Fig. 9, but it will be understood that these parts are used and connected in the same manner as shown in said Figs. 1 and 2.

What I claim is:

1. In a wind wheel, crank mechanism comprising a curved oscillatory operating member having a rigid depending extremity for a pump rod attachment and a crank connection in shifting relation therewith, and auxiliary wind and spring operated means to shift said crank connection to vary the stroke of said member proportionately to the velocity of the wind.

2. A wind wheel operating mechanism, a curved rock arm having a pendant extremity, a pump rod connection engaged with the said extremity, a movable fulcrum and means to transmit power thereto and to said arm, an auxiliary wind wheel and means supplemental to said wheel adapted to shift the said fulcrum more or less, dependent upon the varying wind pressure.

3. In a wind wheel, a curved power transmitting member adapted to oscillate, a crank and connection therefor and a shifting member for said crank connection mounted on said member, a wind controlled mechanism to shift said connection in one direction having a shaft and a spring

sleeved on the said shaft to counteract said movement and restore the same to normal when the wind subsides.

4. A power transmitting device, comprising an oscillatory member, and a crank connection slidably engaged with said member, in combination with an auxiliary wind wheel and its shaft and power transmitting members and a torsional spring to operate said crank connections, and a tension adjusting device to twist said spring.

5. In a wind wheel, a main shaft and a crank shaft and gears therefor, in combination with a curved oscillatory lever having a rigid pendant extremity, a connecting rod engaged with said extremity and disposed to reciprocate in the space between the main shaft and the crank shaft, and a crank connection for said lever.

6. In a wind wheel, a swivel post, a curved member mounted to oscillate upon said post, a crank and connecting rod to operate said member, said member having a counterweight extension at one end and a rigid downwardly-extending arm at its other end, and a power transmitting rod connected with the extremity of said arm.

7. In a wind wheel, a crank shaft, a reciprocable pump rod, a curved oscillatory member and a pump rod connection therefor, a crank connection slidably engaged with said oscillatory member, and auxiliary means to slide said crank connection, the said parts being arranged so that the center of curvature of said oscillatory member is substantially co-incident with the crank shaft axis at the mid-stroke of the pump rod in all the variable positions of the sliding member.

In testimony whereof I affix my signature in presence of two witnesses.

DUSTON KEMBLE.

Witnesses:
F. J. GREER,
R. B. MOSER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."