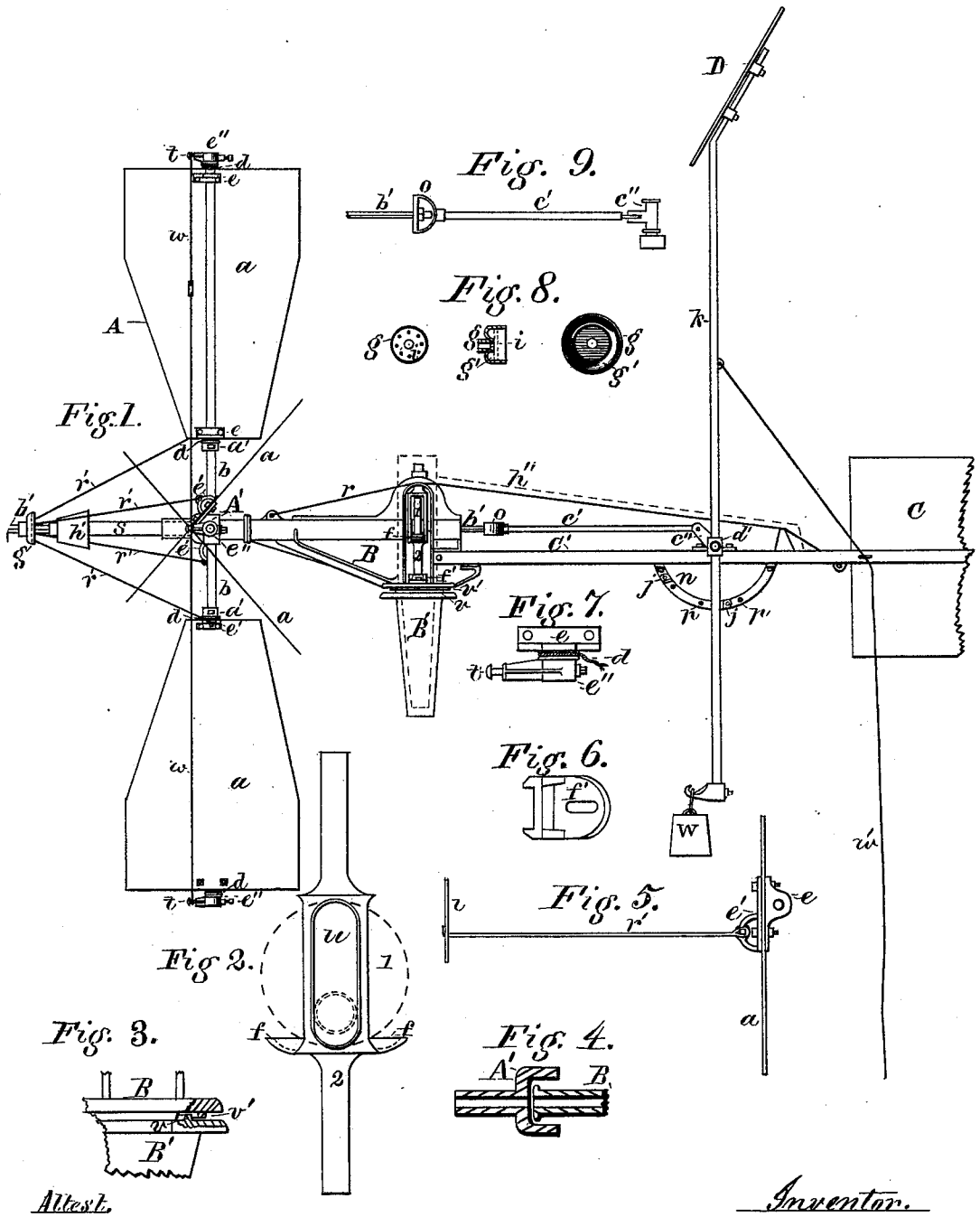
S. T. RUSSELL.
Wind-Engine.

No. 214,844. Patented April 29, 1879.



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SAMUEL T. RUSSELL, OF SPRINGFIELD, OHIO.

IMPROVEMENT IN WIND-ENGINES.

Specification forming part of Letters Patent No. **214,844**, dated April 29, 1879; application filed May 21, 1878.

To all whom it may concern:

Be it known that I, SAMUEL T. RUSSELL, of the city of Springfield, in the county of Clarke and State of Ohio, have invented certain new and useful Improvements in Wind-Engines, which improvements are fully, clearly, and concisely set forth in the following specification and accompanying drawings.

My invention relates to that class of wind-engines which are provided with an automatic governor; and consists in improvements in the governor and the several operative parts in connection therewith, rendering the wheel more sensitive and obedient to its action; also, in providing the various movable parts with facilities for lubrication, as well as to protect them from rain, sleet, &c., so as to keep the whole engine in proper condition for effective work.

In the present state of the art the working condition of wind-engines, as affected by exposure to the weather, has been somewhat overlooked in efforts made to cheapen the cost of construction and in the substitution of materials of construction. Much of the failure in wind-engines is due to rigidity of connections and operative parts from oxidization of contracting metallic surfaces, caused by such exposure.

In the construction of my wind-engine I have provided all exposed operative parts with protectors and special means of lubrication, so as to render it at all times operative, and cause it to retain in its full degree the peculiar sensitiveness of its governor.

Figure 1 is a side elevation of my improved wind-engine. Figs. 2 to 9, inclusive, are details of the same.

A is the wheel, provided with four or more radial arms projecting from its hub A′ at right angles to the hollow shaft *s*, on which it is mounted, and to which it is rigidly attached. *a* are the wheel-vanes, which have plane surfaces, and are pivoted to the arms *b* a little in front of the middle to hold them more firmly to the wind, and are secured by collars *a′* and *e″*, which are fastened by set-screws. Collar *e″* on the arm-pit is of novel construction, being provided with an extension terminating in an undercut or shouldered end for the attachment of the binding-rods *w*, which connect the extremities of all the arms together. The extensions *t* project a few inches forward of the central vertical plane of the wheel, so as to slightly dish it when the binding-rods *w* are strained to their required tension, giving the wheel greater stiffness and strength, and preventing any rearward bending of the arms. An arched bracket, B, having its front extension hollow for the reception of the tubular shaft *s*, (which extends entirely through the bracket,) supports the wheel. Its main vertical stem extends down into the socket B′, inserted into the top of the derrick. The shaft *s* has an eccentric, 1, mounted upon it within the arch of the bracket, which actuates the pump-rod through an open vertical guide or yoke, 2, in which it turns. The ends of this yoke are square, and the upper one slides through a corresponding hole in the top of the arch, and its lower one between adjustable guide-plates *f′*, (see Figs. 1, 2, and 6,) bolted to the bracket to allow of taking up the wear. The yoke is provided with an oil-pan, *f*, cast on it at the bottom of its opening, in which the eccentric dips and takes up the oil as it revolves for lubricating the working parts within the arch of the bracket. The yoke is constructed with parallel sides having the long open slot *u* in them, allowing its movement over the shaft as the latter revolves. The shaft *s* has a short bearing in the rear side of the bracket B, the front or pipe end of which extends into the cavity of the hub A′ of the wheel, which is cup-shaped, as seen in longitudinal section, Fig. 4, so as to throw the weight of the wheel over the joint of the pipe-box, and provide the means for its protection from the weather. The wheel is balanced and guided by the rudder-vane C, extending from the rear of the bracket B. Its bearing-bar C′ is in two pieces, and the vane is bolted between them. Its forward end is fastened to the bracket, and the crank-plate *c″* of the governor is bolted on the top of it. A binding-rod, *r*, extending from the front end of the bracket over the arch to the tail-vane, strengthens and supports the latter.

The governor D consists of a quadrangular vane mounted on the upper end of a vertical

rod, *k*, held in a short sleeve, *d'*, attached to the crank-plate *c''*, which forms the pivotal point of the rod. The upper end of *k* is bent backward at an angle of about thirty degrees from a perpendicular, giving this inclination to the vane, the object of which will be hereinafter explained.

The rod *k* has a weight, W, hooked on its lower end. The rod has a sweep of about sixty degrees, or one-sixth of a circle.

A semicircular plate, *n*, provided with stops *j* and holes *p*, is bolted under bar C', having the crank-shaft *c''* for its center, to regulate the movements of the governor. A wire or cord, *w'*, is attached to the governor-rod *k* to allow it to be operated by hand when necessary.

Extending through the hollow shaft *s* from end to end, and projecting some distance in front of the wheel, is a square sliding rod, *b'*. At the front end of shaft *s'* a conical sheet-metal hood, *h'*, is affixed to rod *b'* to protect that part, which has a square pipe-box inclosed in it to guide the rod and prevent it from turning.

On the front end of rod *b'* is a head, *g*, rigidly attached. Its construction is fully shown in the details, Fig. 8. At the rear end of its hub it expands into a cup shape, having a raised flat center around the inclosed rod and an annular cavity, *g'*, encircling its raised central part.

A thin flat disk, *i*, perforated with a series of holes for the insertion of the angle ends of the rods *r'*, fits into *g* against the central raised part, so as to allow the bent ends of the several rods to lie in the annular recess *g'* when the plate *i* is inserted, as seen in Figs. 5 and 8. This method of connection allows freedom of motion and the removal of any one or all of the rods without breaking or bending them when necessary for repairs.

The rods *r'* diverge from the head *g* to the lower or inside edges of the wings or vanes *a*, where they are also flexibly attached to the plates *e'* by a bolt through the loop on that end, (see Fig. 5, which shows the connection of rod *r'* and the plate *e'*, the latter being held by bolts passing through the interposed vane *a* and the plate *e* on the opposite side, through which the arm *b* of the wheel extends.)

The rear end of rod *b'*, behind the bracket B, (see Fig. 1,) is connected, by a swivel, *o*, with rod *c'*, which is pivoted to the crank *c''* of the governor, so that the wheel-vanes are readily thrown in and out of the wind when the governor is operated.

When the vane D of the governor is blown back its inclination on rod *k* allows it to assume a horizontal position in line with the plane of the wings when out of the wind, or nearly so, allowing the wheel to continue its rotation, however slowly, instead of suddenly stopping it, as it would if placed vertically on the rod from its continued resistance to the wind. This mode of constructing the governor allows the wheel to recover its motion much sooner, even when stopped, and gives it increased steadiness in high or low velocity.

By reference to Figs. 1 and 3 it will be seen that the bracket B has a downwardly-projecting drip-ledge, *v'*, which overhangs an upwardly-projecting flange, *v*, surrounding the hollow of the socket B', protecting the oil or grease lying in the joint between the two from the weather. It also prevents the evaporation of the oil, as it forms an inclosed joint.

The dotted line *h''* represents a sheet-metal hood or cap, extending over the bracket B and the governor-connections *b' o c' c''* in rear of it, protecting these parts from the weather. Collars *e''* and *a'* on the wheel-arms are grooved to receive a greased cord, *d*, (see Fig. 1 and enlarged view, Fig. 7,) to lubricate and protect the joint between them and the ring-plates *e*, with which they contact.

I am aware that wind-wheels and wind-engines with devices for governing the wheel by a rod or rods extending through a hollow shaft are not new, and I do not claim this mode of construction. In most machines of this kind suitable devices for connecting the vanes with the rod extending from the governor are arranged between the wheel and its supporting-bracket. In some a runner for the converging connecting-rods attached to the vanes is used; in others rods extending from one side of the bracket to the other are also used.

I claim as my improvement—

1. In a wind-engine, the combination of the vanes *a*, having plates *e e'*, rods *r'*, head *g*, having recess *g'* and plate *i*, rod *b'*, swivel *o*, rod *c'*, crank *c''*, and governor D with shaft *s* and bracket B, as and for the purpose set forth.

2. Head *g*, having a recess, *g'*, and perforated plate *i* for flexibly attaching the converging ends of rods *r'*, and allowing any one or more to be removed at will without bending or breaking, substantially as and for the purpose hereinbefore set forth.

3. Hood *h'*, in combination with rod *b'* and hollow shaft *s*, as and for the purpose set forth.

4. In a wind-wheel, A, constructed substantially as shown, the hub A', having a concave or cup-shaped body part extending over the end of the bracket-pipe B, for the purpose before set forth.

5. The tip-collar *e''*, having a forward extension, *t*, for supporting a binding rod or rods, *w*, in front of the line of the arms *b*, as shown and specified.

6. In combination with a radial arm, *b*, and a vane, *a*, pivoted thereon, substantially as shown, a tip or cap collar, *e''*, provided with an extension, *t*, for supporting a binding rod or rods forward of the vertical plane of the wheel-arms, and a packing, *d*, for lubricating and protecting the parts, as hereinbefore specified.

7. A grooved collar for wind-wheel arms

provided with a packing of greased cord, yarn, or other like material for protecting the contacting surfaces of the collar and contiguous wing-plate and lubricating them, substantially as described.

8. Yoke 2, constructed substantially as described, with an oil-pan, *f*, cast on it at the bottom of its opening, as and for the purpose hereinbefore set forth.

9. In combination with the pump-rod of a wind-engine yoke, 2, having oil-pan *f*, eccentric 1, plates *f'*, bracket B, and shaft *s*, as shown and specified.

10. In wind-engines, a governor-rod, *k*, having its top end bent at an angle of about thirty degrees backward from a perpendicular for the purpose of giving a like inclination to its vane D, rigidly attached to the inclined part, as and for the purpose hereinbefore set forth.

11. In combination with a governor, D, located upon the tail-vane C of a wind-engine, and operated as specified, the semicircular plate *n*, having stops *j* for arresting the movement of the governor-rod *k* at the proper points.

12. In combination with the governor-rod *k* and its connections, the rock-shaft or crank-piece *c''*, provided with a sleeve, *d'*, for carrying said rod and its governor-vane, substantially as shown and specified.

13. In a wind-wheel, A, constructed as described, a binding-rod, *w*, in combination with the projecting collars *e''* on its arm-tips, as and for the purpose hereinbefore set forth.

14. The hood or covering *h''*, inclosing bracket B and extended over the connecting operative devices of the governor on the rudder-vane stem C' between the bracket and the tail or rudder vane C, as and for the purpose set forth.

15. The plates *f'*, in combination with yoke 2 and bracket B, as and for the purpose hereinbefore set forth.

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