(No Model.)

F. McCLINTOCK.

WIND ENGINE.

No. 256,234. Patented Apr. 11, 1882.

Fig. 1.

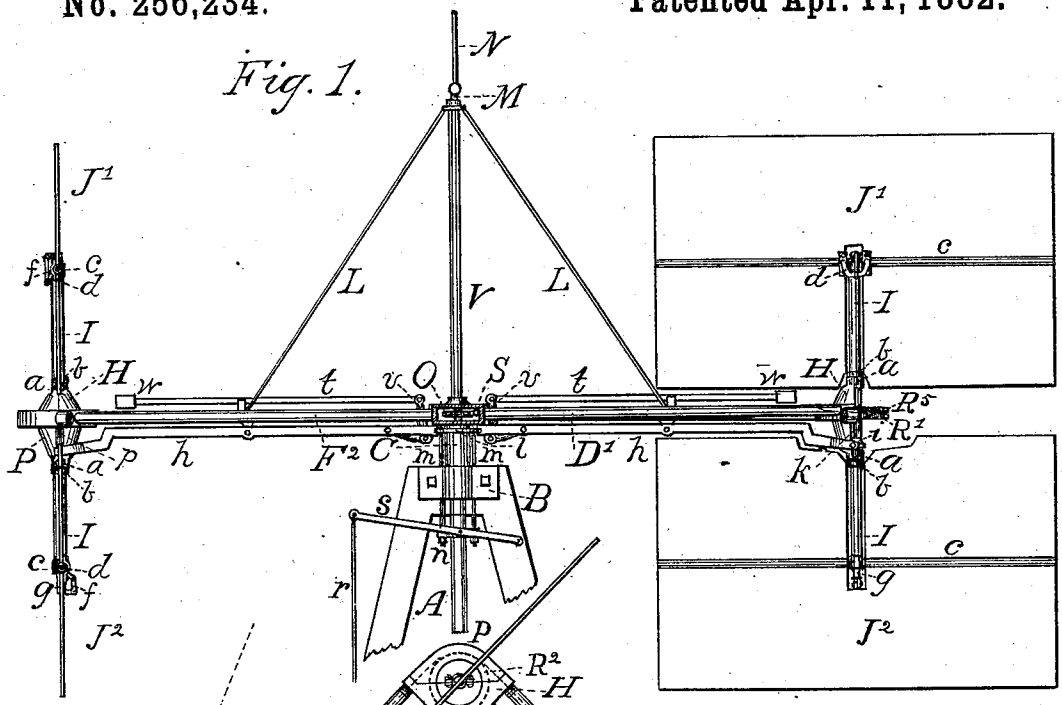


Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANK McCLINTOCK, OF WEST UNION, IOWA, ASSIGNOR OF ONE-HALF TO WM. McCLINTOCK, OF SAME PLACE.

WIND-ENGINE.

SPECIFICATION forming part of Letters Patent No. 256,234, dated April 11, 1882.

Application filed July 9, 1881. (No model.)

To all whom it may concern:

Be it known that I, FRANK McCLINTOCK, of West Union, Iowa, have invented a new and useful Wind-Engine, of which the following is a specification.

My invention relates to that class of wind-engines known as "horizontal;" and it consists in the manner of feathering the sails by revolving them on their axes, whereby the power of the engine is greatly increased, as the sails are in a position to do effective work during that half of the revolution that they are advancing toward the wind as well as while moving away from it; and in providing a sensitive, effective, and reliable governor or regulator, which will maintain a regular motion of the engine in variable winds and under different resistances offered by the work, with a simple method of stopping or starting the engine at will; also, in the manner of protecting the working parts from the weather, so that snow and sleet will not clog it up. I attain these objects by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side view of the engine, showing two arms and sails with the regulating-gearing; and Fig. 2, a top or plan view, showing the construction of the frame-work and the relation of the sails to each other and the vane, everything relating to the regulating-gearing being omitted to prevent confusion.

Similar letters and figures refer to similar parts in both views.

The main shaft A, which revolves in journal-boxes bolted to the tower, (only the upper one, B, being shown,) has a casting, C, firmly keyed on its upper end, which forms the hub or center of the frame-work. The upper part of this casting is hollow, as shown in Fig. 1, in which one side is cut away to show the interior. The arms D′, D², E, F, and G, which I prefer to make of iron tubing, are attached to the sides of this box in pairs. At the outer extremity of each pair of arms are attached boxes H, which have journal-boxes *a*, in which revolve the shafts I, carrying the sails J′ J². Pieces of tubing K′, K², K³, and K⁴ extend diagonally from box to box around the frame and screw into the sides of the boxes by right and left hand threads, so that they serve to thoroughly bind together and strengthen the frame-work. A piece of tubing, V, is attached to the cover of the box C, and firmly secured in a vertical position by stay-rods L, extending from the top of it diagonally downward to the arms. A shaft, M, with a vane, N, keyed to its upper end, passes through the tubing V, being fitted to journal-boxes at the top and bottom of it. A pinion, O, having teeth adapted to use with a drive-chain, is keyed to the lower end of this vane-shaft and inclosed in the box C.

The sail-shafts I are simply pieces of wrought-iron pipe or tubing turned smooth where they fit into the journal-boxes *a*, and fitted with collars *b*, which prevent the shafts from sliding up or down. The sails are attached to the shafts I in sections, each sections J′ J² being hinged to a cross-horizontal arm, so that it can be revolved on its axis from a vertical to a horizontal position. The sails are placed half on each side of the sail-shafts, so that the pressure of the wind is equalized and has no tendency to revolve the sail in either direction. Pinions R′, R², R³, and R⁴, adapted to work with the same drive-chain as the pinion O, but each having double the number of teeth, are keyed firmly to the said shafts I. On one of the shafts there is also another pinion, R⁵, of the same size, but fitting loosely to the shaft. A drive-chain, S, passes, as shown by the dotted lines, from the center pinion, O, through the pipe D′, around pinion R⁵, then, passing through pipe K′, around pinion R², and so on around the engine, returns to the pinion R′ and through the pipe D² to the center pinion. The boxes H have tightly-fitting covers P, (the one on arms D′ D² being removed in the drawings,) so that the pinions and drive-chain are thus entirely protected from the weather. The plane of the sails is so arranged with reference to the direction of the vane that when arms D′, D², and F are at right angles and arms E and G parallel with the vane, the sail on arm D′ D² makes an angle of ninety degrees, those on arms E and G angles of forty-five degrees in opposite directions, while that on F is parallel

with the vane, and therefore with the direction from which the wind is blowing, as shown in Fig. 2. The wind striking the sails will thus have a tendency to turn the entire engine on the main shaft A, as the three sails which offer any surface to its action on arms D' D², E, and G are each in a position to utilize its force. The action of the wind on the vane N prevents the pinion O from revolving with the engine, and, in combination with the pinions R', R², R³, and R⁴, and drive-chain S, causes the sail-shafts to revolve in the same direction as the engine, but making only one-half a revolution with each revolution of the engine. The effect of this is to increase regularly the angle which the sail makes with the wind's direction from zero when in the position of arm F to ninety degrees during a half-revolution of the engine, and decrease it in the same manner during the remainder of the revolution back to the position of arm F. The dotted lines show the angles made by the sails at intermediate points. It will be seen from this that each sail is capable of utilizing the force of the wind in turning the engine during the entire revolution, except at the one point when it is parallel with the direction of the wind. (Shown on arm F, Fig. 2.) I have represented an engine with four arms and sails; but the same construction can be applied to a greater or less number.

The sails are each divided into sections J' J², which, as before stated, are attached or hinged, so as to be movable from their normal vertical position to a horizontal position, when they will offer no surface to the action of the wind, and the engine will remain still in the highest winds. I prefer to construct these sections of sheet-iron; but wood or cloth attached to an iron frame may be used with equal facility; and I would attach each half of the section at its center to a small piece of tubing, *c*, which slips upon round cross pieces or arms on the sail-shafts, fitting loosely enough to turn easily. The two halves of the sections, after being placed in position on the cross-arms, one on each side of the sail-shafts, are securely joined together by the trip-levers *d*, and also by riveting them together above and below the ends of the sail-shafts. The sections of each sail are connected, so as to turn together, by slide-rods *g* passing through the sail-shafts, each trip-lever *d* being connected to said slide-rods by links *f*. The slide-rods are attached so that their weight acts to hold the sections in a vertical position, as shown in Fig. 1. There should be an even number of these sections to each sail, and the trip-levers are placed on opposite sides of the sections alternately, so that when they are partially turned to a horizontal position the action of the wind on half of the sections will be neutralized by that on the other half and no up or down strain be communicated to the arms of the frame. The slide-rods of the different sails are connected, so as to work together, by means of levers *h*, which are pivoted near their centers to the frame-work of the engine. The outer extremities of these levers are forked, and clutch on two sides rings or sliding collars *i*, which are bolted to the slide-rods through slots *k* in the sail-shafts. The sliding collars are protected from the weather by being inclosed in the boxes H, the slots *p* allowing the forked levers *h* to reach them. The inner ends of the levers *h* are slotted to fit on a ring, *l*, which slides easily up or down on the lower part of the casting or hub C, being kept from tilting by the small guide-rods *m*, which pass through slots in the journal-box B, and having their lower ends bolted to a sliding collar, *n*, which slides upon the main shaft A. Any downward movement of the collar *n*, guide-rods *m*, and ring *l* thus throws all the sections simultaneously from a vertical toward a horizontal position. A shut-off rod, *r*, extending to the foot of the tower, can be attached directly to the collar *n*, or, as shown in Fig. 1, to a lever which is attached to the collar.

For the purpose of governing the motion of the engine so as to secure nearly the same speed in variable winds and when doing work which offers a variable resistance, a centrifugal governor is arranged to throw the sections toward a horizontal position, thus reducing the area of sail without altering the angle which the sail as a whole presents to the wind. This governor can be applied in different ways, perhaps the best for small engines being that shown in Fig. 1, which consists simply of horizontal sliding rods *t*, with weights *w* attached near their outer extremities, and attached at their inner ends to the vertical arm of elbows *v*, the horizontal arms being attached to the levers *h*. The elbows are bolted or pivoted to projections from the hub C. Thus the centrifugal force developed in the weights *w* by the revolution of the engine is applied through elbows *v*, levers *h*, slide-rods *g*, links *f*, and trip-levers *d* to reducing the area of sail carried, any increase of the speed of the engine being attended with a proportionate decrease of sail-surface, and by properly proportioning the parts the engine will preserve a regular and steady motion at any speed desired within certain limits. An independent or detached governor can be applied similar in principle to the steam-engine governor, only its action will be upon the shut-off lever *s* instead of upon a throttle-valve.

I am aware that prior to my invention horizontal wind-engines were patented in which the sails were made to revolve on their vertical axes with one-half the velocity of the engine by means of toothed wheels and chains. Therefore I do not broadly claim that principle; but

What I do claim, and desire to secure by Letters Patent, is—

1. In a horizontal wind-engine, the combination, with sails attached to vertical sail-shafts which revolve with one-half the velocity of the engine, of a frame consisting of a central box or hub and horizontal arms with boxes on their outer extremities having bear-

ings in which the sail-shafts revolve, the boxes being joined by diagonal tie rods or tubes, and with the arms securely trussed by means of diagonal rods extending to the upper end of a vertical tube rising from the center, in which the vane-shaft revolves, substantially as shown and described.

2. A horizontal wind-engine with sails hinged in sections to horizontal cross-pieces on vertical sail-shafts which revolve in boxes attached to horizontal arms, said sail-shafts being geared so as to make one-half of a revolution for each revolution of the engine, in combination with trip-levers *d*, links *f*, slide-rods *g*, sliding collars *i*, levers *h*, sliding collars *l* and *n*, guide-rods *m*, and a centrifugal governor, substantially as and for the purpose specified.

3. In a horizontal wind-engine, the combination, with sails attached to vertical shafts which revolve at the rate of one-half a revolution for each revolution of the engine in boxes attached to horizontal arms, of tubing D', D^2, K', K^2, K^3, and K^4, covered boxes H, and hollow sail-shafts I, for the purpose of protecting the working parts of the engine from the weather, substantially as specified.

4. In a horizontal wind-engine, the combination, with sails attached to vertical shafts which are geared to make one-half of a revolution for each revolution of the engine, of sails attached or hinged to sail-shafts in sections, half of the area of the sail above and half below the plane of said horizontal arms, and the sections arranged to turn on their horizontal axes in alternately opposite directions, substantially as and for the purpose specified.

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