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MACHINE TO GENERATE AND CONTROL AN AIRSTREAM

Filed Oct 17, 1960

3 Sheets-Sheet 1

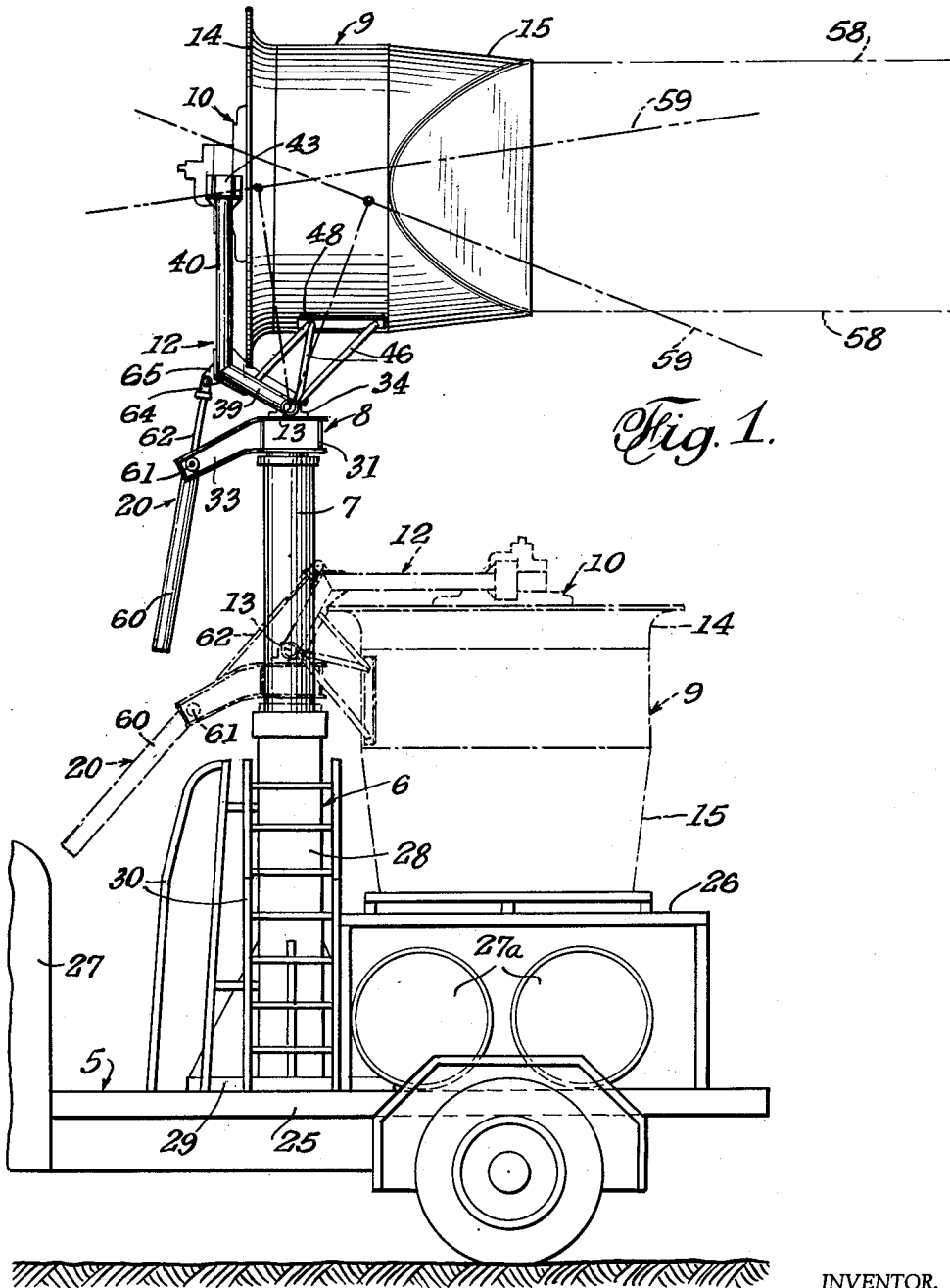


Fig. 1.

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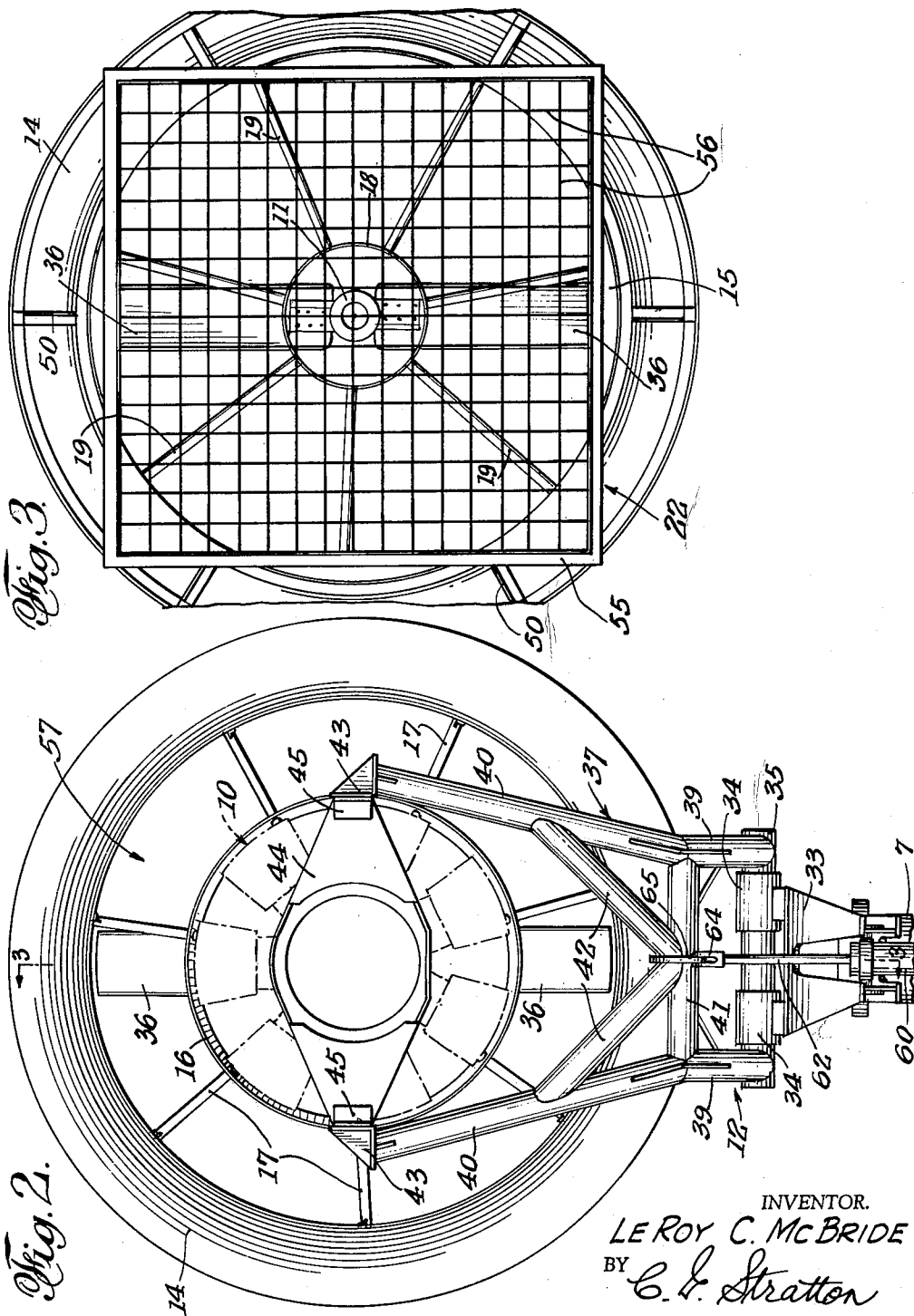
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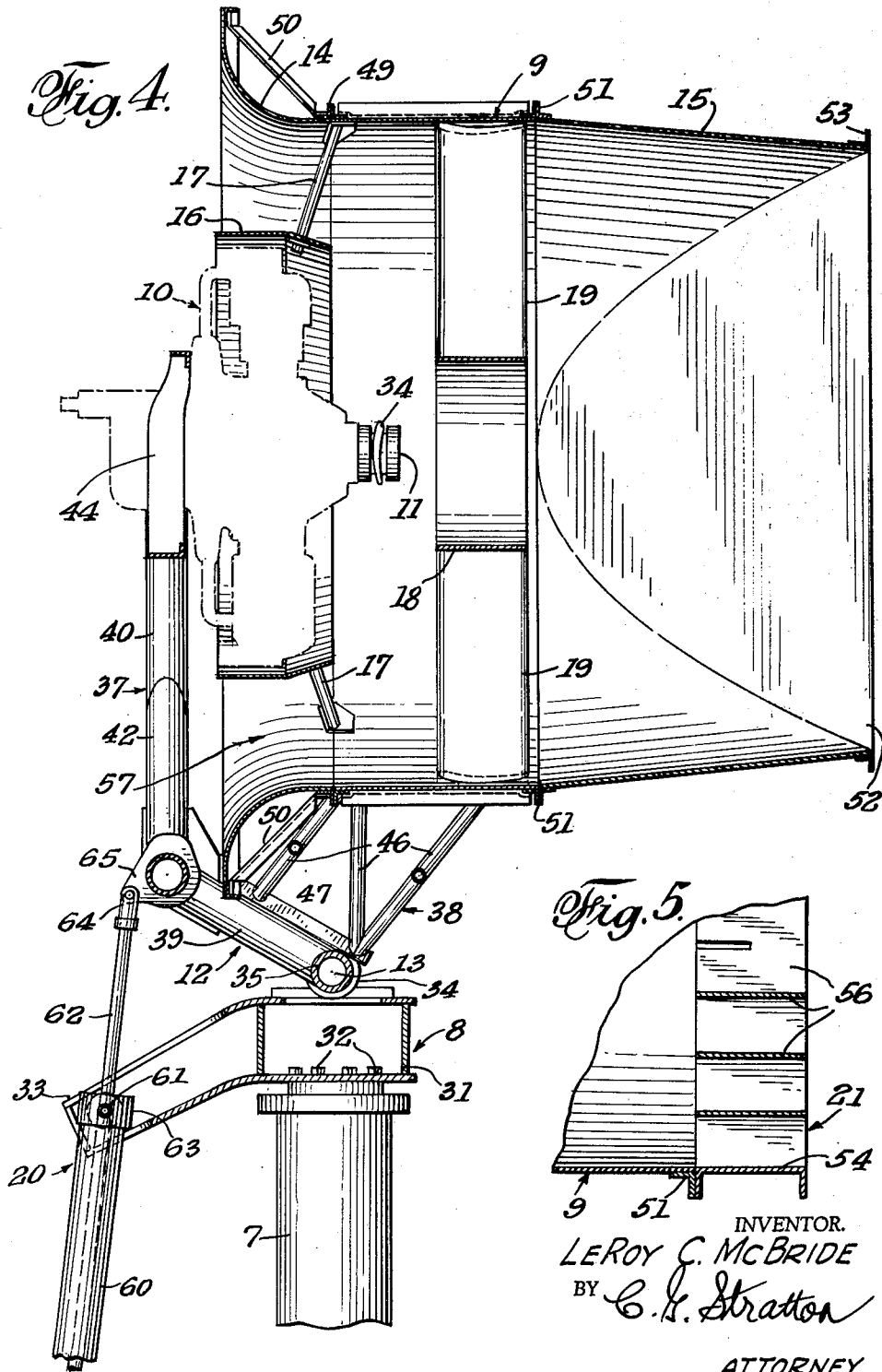
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3 Sheets-Sheet 3



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MACHINE TO GENERATE AND CONTROL AN AIRSTREAM

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7 Claims. (Cl. 230-116)

This invention relates to a machine for generating wind, i.e., a continuous stream of air moving at high speeds, and primarily useful to counter the onrush of forest and brush fires, and particularly to cool and turn back the wall of heated air in advance of such fires. Thus, an object of the present invention is to provide a machine that, by slowing or arresting the progress of a fire in wooded areas, greatly facilitates employment of fire-extinguishing steps, resulting in savings of property and of woodland areas.

Another object of the invention is to provide a wind-generating machine that is capable of mobility so that the same may be readily maneuvered to effective operative position, the movement thereof through city streets and under bridges and road overpasses being effective due to adjustability between an elevated operative position and a lowered position that provides nominal headroom clearance.

A further object of the invention is to provide a machine of the character above referred to that is capable of adjustment to various operative positions so that the direction of the air stream that is generated may be easily controlled and, therefore, changed as desired in a simple and efficacious manner.

A still further object of the invention is to provide a wind-generating machine that eliminates whirling turbulences of the air stream or, at least, considerably straightens the same, thereby providing a stream that retains a beam-like form that has maximum force, rather than spreading, and, therefore, reducing the force applied by the stream to a concentrated area. In other words, the straightening feature of the machine causes an application of the full force of the stream to a particular point of an oncoming conflagration, because the stream is a concentrated one.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description, and which is based on the accompanying drawings. However, said drawings merely show, and the following description merely describes, preferred embodiments of the present invention, which are given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

FIG. 1 is a side elevational view of a wind-generating machine according to the present invention, and shown in operative position in full lines and in its lowered position in dot-dash lines, the view showing the machine mounted on a truck, whereby the same is mobile from place to place.

FIG. 2 is an enlarged elevational view of the oncoming side of the machine.

FIG. 3 is a similar view of the opposite or downstream side of the machine, the view being modified to include wind-straightening means not shown in FIG. 1.

FIG. 4 is a further enlarged vertical sectional view as taken on the line 3-3 of FIG. 2.

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FIG. 5 is a fragmentary sectional view of an alternative construction.

The present wind-generating machine comprises, generally, a mounting vehicle 5, a support 6 affixed to the vehicle, a ram 7 mounted in said support to move vertically, a head assembly 8 affixed to the upper end of the ram 7, an air duct 9, an engine 10 disposed partly within the duct and with its output shaft 11 on the axis of said duct, a combined support frame 12 for the duct and engine and connected by a pivot 13 to said head assembly, an air inlet bell 14 extending from the inlet end of the duct 9, a transition section 15 extending from the downstream end of the duct, a cowl 16 encircling the engine and affixed to the duct 9 by means of radial supports 17, a vane ring 18 downstream of the cowl 16 and axially centered with the duct 9, a set of radially arranged flow straightening vanes 19 that extend between the duct and the vane ring, and means 20 that interconnect the head 8 and the support 12 to adjust the position of the support and the means carried thereby on the pivot 13, whereby the duct 9 is adapted to be moved between a folded low position and one of several selected operative positions, as desired. Instead of or in combination with the straightening vanes 19, there may be provided a flow-straightener section 21 which may replace the transition section 15 and be directly affixed to the downstream end of the duct 9, as in FIG. 5, or a flow-straightener section 22 may be affixed to the downstream end of said section 15, as suggested in FIG. 3.

The vehicle 5 is preferably wheel-borne, as shown, and, regardless of its general design, has a chassis 25 that carries the present machine and which serves, also, to mount a support frame 26 for the wind-generating portion of the machine, as well as fuel tank 27a. Unless the vehicle is made up as a trailer, the same has a cab conventional form.

The support 6 is shown as a hydraulic cylinder 28 that by means of a base 29 is vertically supported on the chassis 25, preferably forwardly of the frame 26. Optionally, ladders 30 may be provided to facilitate access to operating portions of the machine above the top of cylinder 28. While the same is not shown, the cylinder 28, in which the ram 7 operates, may receive and vent hydraulic fluid in conventional ways to cause extension or lowering of the ram, as desired. Such a system is preferably arranged to extend the ram part way, if desired. The ram being conventionally round, the same may be turned in its cylinder, enabling direction adjustment of the machine without the need for maneuvering the vehicle 5 for this purpose.

The head assembly 8 comprises a rigid frame 31 that is affixed to the upper end of the ram 7, as by bolts 32 and has a laterally-extending bifurcated arm 33 that is preferably downwardly angled, as shown. Said head assembly is provided with spaced horizontal and aligned bearings 34 in which the pivot 13, in the form of a horizontal tube 35 is adapted to turn, said tube 35 comprising part of the frame 12.

The duct 9 is shown as a large tube of sheet metal, in practice about 72 inches in diameter, but either smaller or larger depending on requirements. Said tube is relatively short, as can best be seen in FIG. 4.

The engine 10, in this case, an internal combustion engine of the radial type, forms not part, per se, of the present invention, being provided solely to revolve the propeller blades 36 mounted on the engine shaft 11, said shaft being so disposed as to locate the blades 36 at the inlet end of the duct 9. As can be seen from FIG. 2, said propeller blades 36 are of a length to have minimum but safe clearance inside the duct.

The combined support 12 has an engineer-mounting frame part 37, and a duct-mounting frame part 38, said

parts being fixedly connected so that both together turn on the axis of pivot tube 35.

The part 37 comprises the tube 35, tubes 39 on opposite tubes 39 on opposite sides of the bearings 34 and extending rearwardly and upwardly from tube 35, vertical tubes 40 extending from the upper ends of tubes 39, a cross tube parallel to tube 35 and extending between the joints of tubes 39 and 40, and brace tubes 42 interconnecting the tubes 40 and the middle part of cross tube 41. The above-described rigid frame part 37 is provided at the upper ends of the tubes 40 with gusseted angle brackets 43, and an engine mount 44 extends transversely between said mounts and is welded thereto as by means of clips 45. The engine is, of course affixed to said mount 44 and is, therefore, rigidly connected to the support part 37.

The support part 38 comprises a frame in which tube members 46 rigidly connect transversely spaced angle members 47 affixed to the tubes 39, and transversely spaced channel members 48 that are welded to the outside of the duct 9, as can be seen in FIG. 1. Thus, the duct 9 and engine 10 are held relatively fixed by the combined support 12, both being movable in an arc together around the axis of the pivot tube 35.

The bell 14 provides a leadin flare for the incoming air, the same being connected to the duct by mated angles 49, and is rendered rigid by brace angles 50 that dampen any tendency for the bell and the duct to resonate.

The transition section 15 has the circular form and size of the duct tube, where the same is connected to said tube by angles 51 and changes to a square form at the downstream outlet 52. An angle stiffener 53 is provided at said outlet 52. As above indicated, the section 15 may be omitted, in which case, a circular frame 54 of the same size may be connected to the duct 9 (FIG. 5). If the section 15 is used, the downstream end thereof may mount the square frame 55 of the flow straightener 22. Whether such a circular frame 54 or square frame 55 is used, the flow straightener 21 or 22, as the case may be, is provided with intersecting sheet metal vanes 56 in egg crate arrangement, as illustrated in FIGS. 3 and 5.

The cowl 16 is shown as a circular ring or band that encloses that part of the engine 10 that resides within the bell 14, the same confining any heat generated by the engine against affecting the incoming air which largely enters the duct 9 through the annulus 57 that is defined between the bell 14 and said cowl 16.

The supports 16 are shown as radially arranged tubes of small diametral size since all they need carry is the lightweight sheet metal cowl.

The vane ring 18, also of sheet metal, is disposed on the downstream side of the propellers within the duct 9. The flow straightening vanes 19 being arranged radially as spokes with the ring 18 as the hub and are fastened at their respective inner and outer ends to the ring and the duct.

Since the action of the propellers 34 sets up a whirling motion in the air stream generated thereby, the present machine, by means of the air foil type vanes 19, or the intersecting vanes 56, or both, counters the whirling tendency and so straightens the flow that the same leaves the machine with little or no spread. In fact, the air stream, as suggested by the dot-dash lines 58 of FIG. 1, comprises a concentrated continuous blast of air that has substantially the initial force imparted by the propeller blades 34 and has the capability of arresting on-rushing air moving 50 to 60 miles an hour or more. Because the same is concentrated, it can be better directed laterally and up or down and its fire-arresting ability is greatly enhanced thereby.

The means 20 has a manifold purpose. The same may be used as a handle for swiveling the machine on the axis of the ram 7, thereby enabling an operator to pinpoint the point of impact of the air stream, as desired; and the same comprises power means for tilting the duct to a desired position, either horizontal, as shown by the

full lines of FIG. 1, at any desired operative angle, as suggested by the lines 59 of said figure, or at an inoperative vertical position at right angles to the full line position, whereby the machine has low clearance for movement under and past overhead obstructions.

Said means 20 is shown as a hydraulic cylinder 60 carried by the arm 33 of the head by means of trunnions 61 at the upper end of said cylinder. A piston is operable in said cylinder, the same having a piston rod 62 that extends through the cylinder head 63 and is connected by a clevis 64 to a fixed ear 65 on the support assembly 12. By providing for inlet of hydraulic flow to the lower end of cylinder 60, the piston thereof is projected, causing the parts carried on pivot 13 to pivot according to the degree of piston projection. FIG. 1 shows three operative positions and one folded non-operating position with the downstream end of the duct resting on the frame 26 of the chassis 5. The last mentioned position, of course, entails retraction of the ram 7, as shown. Pressure fluid supplied at the top end of the cylinder will cause retraction of the piston and opposite pivotal movement of the duct.

From the above it will be clear that the present machine may be used in various ways. Because of its portability and ease of adjustment for directing the air stream, the machine may be used in the early mornings to blow away and evaporate moisture from fruit in orchards so the same will not split under the heat of the sun. Also, dispersion of chemicals over wide agricultural areas, instead of dispersion by aircraft, is rendered less costly and also more accurate as to covering of desired areas. In fact, the present machine may be used whenever air movement in large quantities is desired, as, for instance, in motion picture sets simulating storms and the like.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the constructions are, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular forms of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A wind-generating machine comprising a pivoted support frame, an engine provided with a propeller and fixedly mounted on the frame, an impermeable and circular air duct around and spaced from said engine, a cowl around the engine and cooperating with the air duct to define an annular air passage therebetween, means fixedly connecting said duct and cowl to the frame, an air-flow straightener on the outer air duct on the downstream thereof, and a tubular extension from said circular air duct having a gradual transitional change from a circular to a rectangular cross-sectional form to provide a rotation-resisting rectangular discharge outlet for air forced by the propeller through the air-flow straightener.

2. A wind-generating machine according to claim 1 in which the air stream straightening means includes a set of fixed radial air foil vanes on the downstream side of the engine and propellers and upstream of the tubular extension.

3. A wind-generating machine according to claim 1 in which additional air stream straightening means is provided on the discharge end of the tubular extension.

4. A wind-generating machine according to claim 2 in which the air stream straightening means further comprises flat intersecting sheet metal vanes in egg crate arrangement on the discharge end of the tubular extension.

5. A wind-generating machine comprising a vertical ram provided with an extensible member rotational therein, a head affixed to the upper end of said member, a frame pivotally mounted on said head, extensible handle

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means interconnecting the head and frame to move the latter on said pivot to adjust the angle thereof relative to the axis of the ram and extensible member therein, the frame, thereby, being movable and adjustable rotationally and angularly on its pivot by manipulation of said handle means, and movable vertically with the extensible member, a propeller-provided engine and an air duct around said engine both fixedly carried by the frame, a set of flat intersecting sheet metal vanes in egg crate arrangement on the downstream side of the engine, and a set of fixed radial air foil vanes disposed between the engine and the set of intersecting vanes.

6. A wind-generating machine comprising a vertical ram provided with an extensible member rotational therein, a head affixed to the upper end of said member, a frame pivotally mounted on said head, extensible handle means interconnecting the head and frame to move the latter on said pivot to adjust the angle thereof relative to the axis of the ram and extensible member therein, the frame, thereby, being movable and adjustable rotationally and angularly on its pivot by manipulation of said handle means, and movable vertically with the extensible member, a propeller-provided engine and an air duct around said engine both fixedly carried by the frame and movable therewith, said air duct having an intermediate cylindrically tubular part, an air leadin flared part at one end, a transition section at the other end and having a rectangular outlet, and means to straighten the flow of air so generated and located inward of the outlet.

7. A wind-generating machine comprising a vertical ram provided with an extensible member rotational therein, a head affixed to the upper end of said member, a frame pivotally mounted on said head, extensible handle means interconnecting the head and frame to move the latter on said pivot to adjust the angle thereof relative to the axis of the ram and extensible member therein,

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the frame, thereby, being movable and adjustable rotationally and angularly on its pivot by manipulation of said handle means, and movable vertically with the extensible member, a propeller-provided engine and an air duct around said engine both fixedly carried by the frame and movable therewith, said air duct having an intermediate cylindrically tubular part, an air leadin flared part at one end, a transition section at the other end and having a rectangular outlet, and means to straighten the flow of air so generated and located outward of the outlet.

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