OPERATING MEANS FOR GREENHOUSE VENTILATING PANELS

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This invention relates to greenhouses of the special structure described in my copending application, Serial Nos. 726,511 and 728,539 (now Patent No. 2,465,189), relating to greenhouse framing and roof structures, respectively, and is particularly directed to mechanism for operating the pivoted ventilating panels that form parts of the wall and roof structures of such a greenhouse.

As described in said applications, the greenhouse comprises a side wall fabric including an upper section of fixed panels, and a lower section of ventilating panels pivoted to swing upwardly and outwardly about horizontal axes. This wall fabric is supported on a masonry foundation wall by a metallic framework including vertical studs, the outer surfaces of which are spaced inwardly from the plane of the outer surface of the foundation wall, and bracket structure extending outwardly from the studs and supporting the wall fabric at such a distance from the studs as to lie outside of the plane of the outer surface of the foundation. The bracket structure includes means pivotally supporting the upper edges of the ventilating panels for swinging about horizontal axes arranged outside the plane of the outer foundation wall surface.

The roof structure comprises rafters supported on the vertical studs, a ridgepole supported by the rafters, and stringers supported by the rafters and intermediate studs. A sheathing is supported by the stringers and ridgepole, comprising fixed panel sections and other sections of panels that are supported by the ridgepole for horizontal pivoting movement at their ends adjacent the ridgepole, so they may be swung upwardly to provide ventilation.

It is one of the objects of the present invention to provide specialized operating mechanism for ventilating wall and roof panels mounted and arranged in these particular ways, and to cooperate with the panel arrangement in contributing to the utility thereof. In the drawings:

Fig. 1 is a vertical transverse sectional view through a section of greenhouse wall showing an embodiment of the invention;

Fig. 2 is a fragmentary side elevation showing the side structure of adjacent fixed and ventilating panels of a greenhouse wall;

Fig. 3 is a fragmentary transverse sectional view showing the operator applied to the ventilating panels of the roof;

Fig. 4 is a plan view of the operating shaft, partly in section on the line 4—4 of Fig. 1;

Fig. 5 is an isometric view showing the invention applied to a side wall section of a greenhouse; and

Describing the drawings in detail, the greenhouse structure is supported upon a foundation wall constructed of masonry or other suitable material. Embedded in the wall are the lower portions of a series of vertical studs 5, the outer surfaces 6 of which are spaced inwardly of the plane of the outer surface 7 of the foundation wall. Brackets 8 are secured to the studs 5 and project outwardly beyond their outer surfaces 6, and at their ends support a horizontal stringer 9. At points spaced along the stringer 9 brackets 10 are secured, such brackets being bifurcated and thereby presenting upper arms 11 and lower arms 12, each of which extends outwardly beyond the plane of the surface 1 of the wall 4. The upper arm 11 supports fixed panel structures 13 including lower horizontal rails 14. The lower arms 12 support pivot structures 15, spaced below and inwardly of the rails 14, but still outside the plane of surface 7 of the foundation wall, so that pivot panels 16, pivoted adjacent their upper edges to the structure 15, may be swung from open position to closed position in which their upper and lower edges respectively cooperate with the rails 14 and sill members 17 in the foundation wall 4 to form close joints. The panels 13 and 16 form the outer wall fabric of the greenhouse.

The operating mechanism forming the subject matter of this invention is arranged to give efficient and positive operation of the ventilating panels, and at the same time to be disposed relative to the greenhouse structure as to present no danger of damaging plants supported on benches adjacent the wall fabric. At the same time, the mechanism is so mounted as not to present obstructions in the aisles, or otherwise interfere with attendants working with the plants. A further advantage is that the various elements present no horizontal flat surfaces upon which moisture might collect.

The operating mechanism comprises a horizontal rotary shaft 20 that is supported on the studs 5 on the inner side of their inner surfaces 21. To support the shaft 20, brackets are provided that are secured to the studs and project beyond their inner surfaces. These brackets are in the form of complementary bearing plates 22 clamped to opposite lateral surfaces of the studs by bolts 23, in such disposition that substantial portions 24 of the plates project inwardly of the inner surfaces 21 of the studs. The projecting portions 24 of the clamp plates 22 are provided with mating part-bearing 25 forming circular bearings for the shaft 20. A narrow opening 26
may be left between the two parts to prevent binding.

Operating linkage for swinging the pivoted panels 16 as the shaft 20 is rotated includes arms 27 extending laterally of the shaft 20, and conveniently fixed to it in the manner shown by being clamped to its surface by U-bolts 28. A preferred disposition of the arms 27 for operating the side wall panels is that shown in Fig. 1, wherein the arm is vertical when the panel 16 is closed. A link 29 is pivoted at 30 to the arm 27 at a distance from the shaft 20 which may be adjusted to suit the conditions and insure tight closing of the panels.

It is also possible there are two operating arms 27 and links 29 for each movable ventilator panel, as shown in Fig. 5, the outer end of each link being riveted or otherwise firmly secured to an operating bar 31 which extends the full length of the side wall of the greenhouse and is hingedly connected to the astragals of the panels 16 by means of links or hinge fingers 32 and pivot pins 33. The operating bar 31 is made in sections connected at their ends by expansion couplings 34 to provide a flexible structure.

Operation of the mechanism is obvious. When the shaft 20 is turned clockwise, as seen in Fig. 1, the panel 16 is swung outward. The advantages of the operating mechanism lie in its flexibility and capacity for adjustment to cooperate with the wall structure arrangement to provide a tight joint when closed and to be secure at all times. As noted in my application Serial No. 726,611, the position of the panels 16 outside the wall 4, and the relative inward spacing of the studs 5 is advantageous in greenhouses, and this spacing is made use of for the operating mechanism to provide arms and links of such lengths and relative angular dispositions as to ensure easy operation and tight closing of the pivoted panels, and yet place all of the mechanism in locations where it is out of the way and presents no danger of damaging plants.

An additional advantage of my improved panel operating means lies in the use with ventilating panels having all metal framing. In wood panels it is necessary that the supports that maintain the panels open be connected to the panels at, or adjacent to their bottom edges, since the weight of the panels is too great to permit their support adjacent the pivot axes if wood framing is used. Use of metal panel framing permits the operating links 32 to be connected to the panels at points spaced substantial distances from the free lower edges of the panels. This gives the advantage of a shorter lever action being required to open the panels, and consequently requires that the lever 27 swing through a relatively short arc to actuate the panels from closed to fully open position. This results in saving in space required for operation of the system.

Fig. 2 shows the operating means applied to the ventilating panels of a roof. The roof is supported on rafters 40 and includes movable panels 41 that are pivotally supported at their upper ends 42, upon a ridgepole 43 for pivoting on horizontal axes. The operating shaft 20 is supported by bearing brackets 22' of the form previously described, and the arm 27' is fixed to the shaft 20' in the position shown wherein it extends laterally and downwardly from the shaft when the panels are closed. The links 29' extend upward and are connected to the operating bar 31' which carries spaced links or hinge fingers 32' the upper ends of which are pivoted at 44 in the channel of each astragal in the roof panel 41.

The invention is not restricted to the precise dimensions and configuration of the several members as illustrated, being adaptable to other sizes and designs of greenhouse construction, as will be readily understood by those skilled in the art.

I claim:

1. A metallic building structure comprising a series of weather excluding and ventilating panels pivoted to said structure adjacent their alining horizontal edges for swinging about a common axis, operating mechanism for swinging said panels including a flexible actuating bar extending parallel to said axis and overlapping a plurality of said panels, an operating shaft mounted on said structure with its axis of rotation parallel to said actuating bar and provided with a plurality of spaced crank arms swingable laterally with respect thereto, means connecting said crank arms and bar for supporting the latter in adjusted position, and links at spaced intervals along said bar connected thereto and to said panels for securing the latter in adjustable position with respect to said building structure.

2. Operating means in accordance with claim 1 wherein the actuating bars are rigidly attached to the crank arm connecting means and flexibly connected to the links connecting them to the panels.

3. Operating means in accordance with claim 1 wherein the actuating bar is composed of a plurality of sections slidably connected at their ends to permit expansion and contraction independently of said panels and frame members.

4. Operating means for adjusting the horizontally pivoting ventilating panels of a metallic greenhouse structure comprising a series of parallel links pivoted to said panels at their outer ends and pivoted to a flexible operating bar at their inner ends, said operating bar being made in sections with slidable joints between successive sections, and means for simultaneously operating said sections to adjust said panels including a rotatable shaft supported with its axis parallel to said bar and provided with a plurality of crank arms, and connecting members pivoted at their inner ends to said crank arms and fastened at their outer ends to said operating bar to support each section thereof in operating position.

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REFERENCES CITED

The following references are of record in the file of this patent:

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