July 21, 1931. B. V. WITT 1,815,388

ORCHARD HEATER

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Fig. 1.

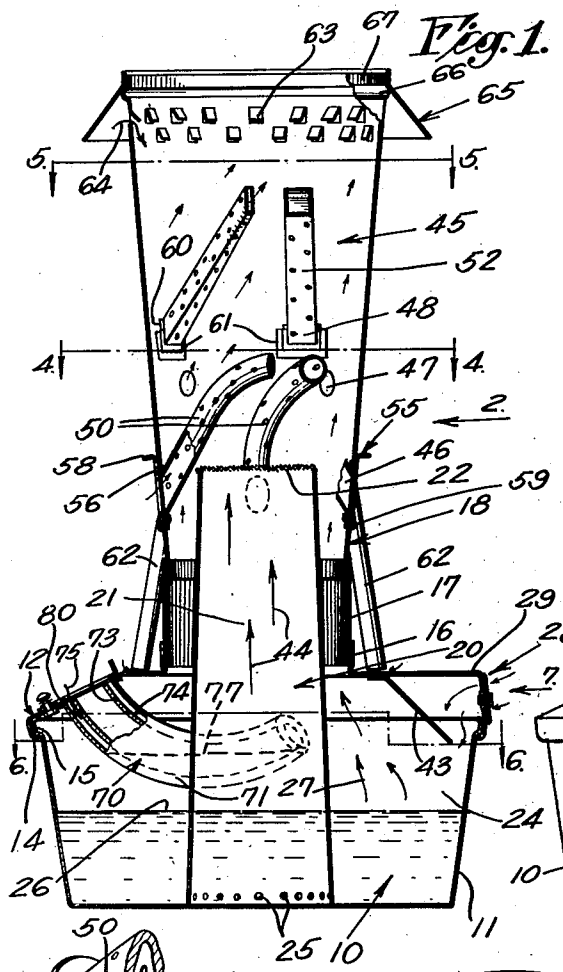


Fig. 2.

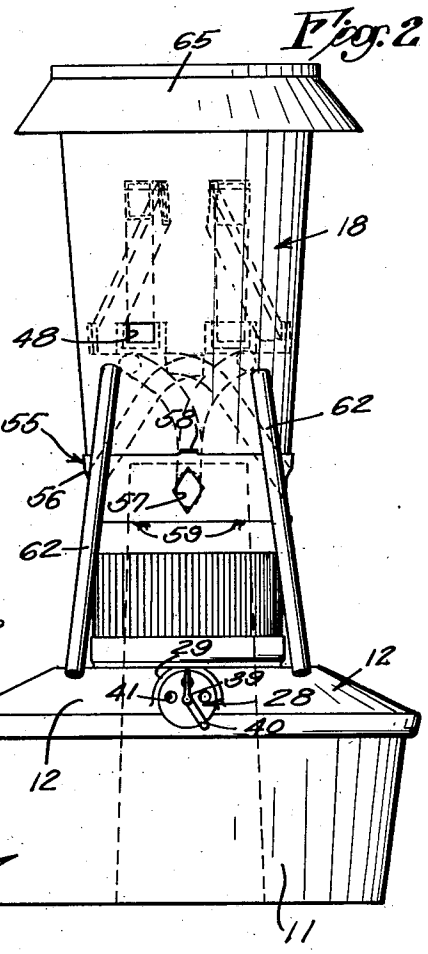


Fig. 3.

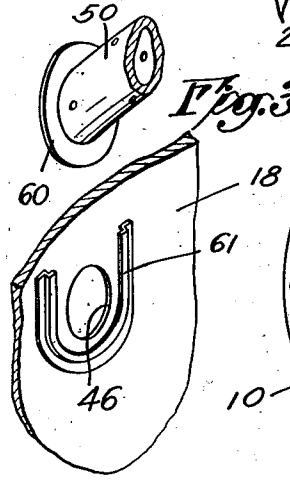
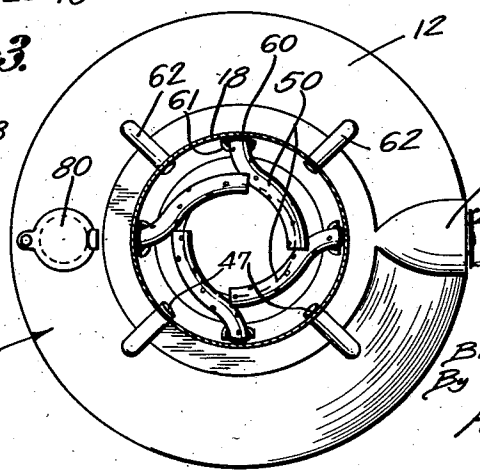


Fig. 4.



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ORCHARD HEATER

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Fig. 5.

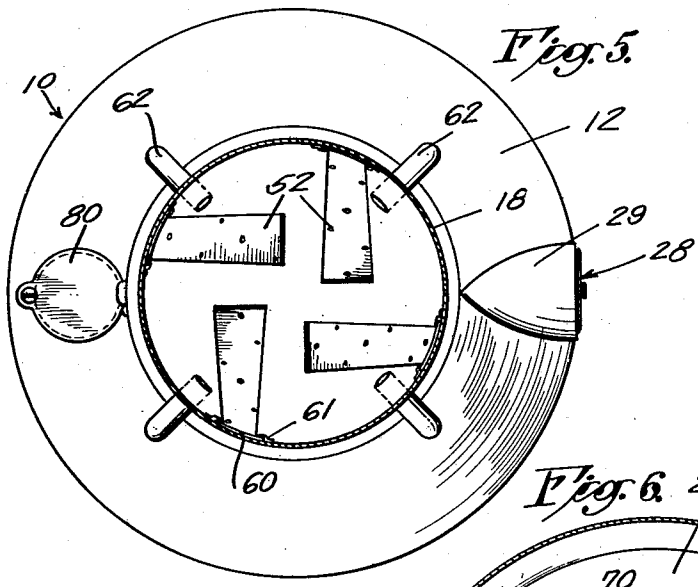


Fig. 6.

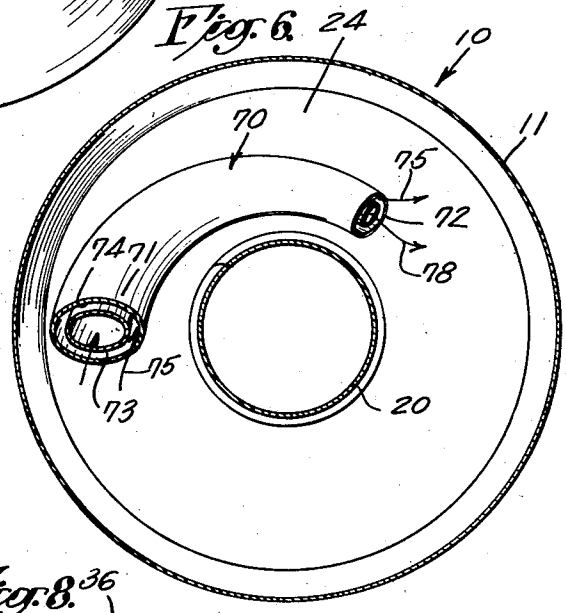


Fig. 9.

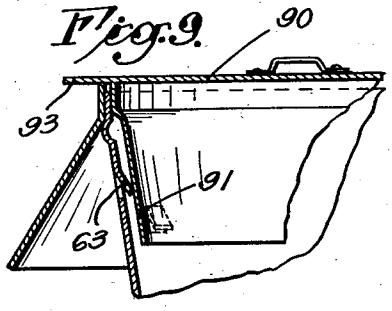


Fig. 7.

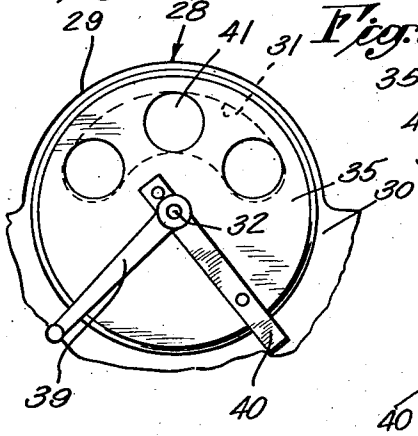
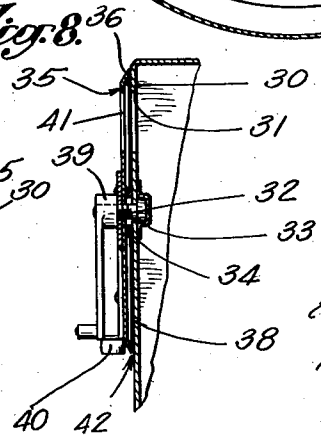


Fig. 8.



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UNITED STATES PATENT OFFICE

BIRDIE V. WITT, OF PASADENA, CALIFORNIA

ORCHARD HEATER

Application filed April 14, 1928. Serial No. 269,927.

My invention relates to an improved type of orchard heater.

Orchard heaters at present in use produce a very dense smoke, or smudge, which hovers over the orchard to protect the trees from frost. Such a smoke-covering acts to prevent radiation of heat from the ground during a period of lowering temperature, and also acts as a blanket to hold near the ground any heat generated by the heaters rather than to allow this heat to reach the upper atmosphere where it would be ineffective. It is ordinarily more effective, in preventing frost from reaching an orchard, to increase the amount of heat generated by the heaters and reduce the amount of smoke given off thereby.

It is an object of my invention to provide an orchard heater giving a large amount of heat with a relatively small amount of smoke.

If desirable, the heater of my invention may be so adjusted as to give off practically no smoke. This is accomplished by providing a vapor chamber adjacent the combustion chamber of the heater, the vapor issuing therefrom being intermixed with air in the stack to effect a complete combustion. Any combustible soot particles in the smoke are thus burned in the stack instead of forming the familiar dense smudge which is always extremely objectionable.

It is an object of my invention to provide an orchard heater having a vapor chamber communicating with the stack, the vapors passing therefrom being burned in the stack.

It is desirable to thoroughly intermix these vapors with preheated air supplied to the stack, in order to achieve a complete combustion.

It is an object of my invention to provide air tubes extending into the stack for supplying preheated air thereto.

A further object of my invention is to provide such air tubes, these tubes extending tangentially into the stack and being easily removable therefrom.

In starting the heater, and before the liquid in the vapor chamber has reached a vaporizing temperature, it is desirable to supply air-mixed vapors to the combustion chamber and stack from an auxiliary source.

It is an object of my invention to provide an orchard heater having an auxiliary source of vapor which is utilized in starting the heater.

Another object of my invention is to provide novel draft regulators for the combustion chamber and for the air tubes extending into the stack of my invention.

Still another object of my invention is to provide a heater which will not require priming when starting.

Further objects of my invention will be made evident hereinafter.

Referring to the drawings in which I illustrate one form of my invention,

Fig. 1 is a vertical medial cross-sectional view of my orchard heater.

Fig. 2 is a side view taken in the direction of the arrow 2 of Fig. 1.

Fig. 3 is a diagrammatic perspective view illustrating the air tube retaining means of my invention.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1.

Fig. 7 is an enlarged view taken in the direction of the arrow 7 of Fig. 1.

Fig. 8 is a vertical sectional view of the draft regulator illustrated in Fig. 7.

Fig. 9 is a fragmentary section showing an improved cover construction of the invention.

Referring particularly to Figs. 1 and 2, my invention comprises an orchard heater 10 provided with a fuel-retaining tank 11, the walls of which diverge as shown. A cover 12 is adapted to partially close the upper end of the tank 11, this cover having a plurality of inwardly clinched portions 14 which are engageable with ears 15 formed in the top end of the tank. The clinched portions 14 and the ears 15 cooperate to tightly secure the cover to the tank, this cover being easily removable by rotating it a small portion of a revolution relative to the tank so as to release the inwardly clinched portions 14 from the ears 15

whereupon the cover may be vertically raised from the tank.

Extending upward from the cover 12 is a flange 16 which retains a collar 17 therein. I prefer to form the collar 17 of corrugated structure. Fitting into the upper end of the collar 17, and retained thereby, is a stack 18, the walls of which diverge outward as shown. The lower end of this stack is crimped so as to securely fit in the collar 17.

Extending upward through the tank 11, the collar 17, and into the stack 18, is a chimney 20 providing a vapor chamber 21 therein, the upper end of this chamber being defined by a screen 22 or other perforated cover member. The lower end of the vapor chamber 21 communicates with a primary combustion chamber 24 surrounding the chimney and defined by the fuel retaining tank and cover, this communication being accomplished by holes 25 formed near the extreme lower end of the chimney.

The lower portions of the vapor chamber 21 and the primary combustion chamber 24 are adapted to be filled with a fuel, indicated by the numeral 26, the level of this fuel in both chambers being maintained the same by the holes 25. A primary combustion is instigated in the primary combustion chamber 24, the products of combustion rising as indicated by the arrows 27. This primary combustion is made possible by means of air supplied through a draft regulator 28.

This draft regulator is mounted on a saddle portion 29 of the cover 12, this saddle portion having a front face 30, best indicated in Figs. 7 and 8. An arcuate opening 31 is formed through this front face concentric with the axis of a bolt 32 passing through this face. The head of this bolt is clamped in a retainer 33 so as to be immovable relative to the front face 30. A lock washer 34 is slipped over this bolt. This washer is preferably of the split spring type, although other types of spring washers might be used. Pivoted to the bolt 32 in front of the spring washer 34 is a draft plate 35 having an inturned edge 36 which terminates a distance in front of the face 30. There is thus a space 38 between the draft plate 35 and the front face 30. The width of this space may be varied by turning a nut 39 threaded to the bolt 32 and bearing against a handle 40 secured to the draft plate 35.

The handle 40 offers a means of registering a plurality of openings 41 formed through the draft plate 35 with the arcuate opening 31 of the front face 30. Thus, the amount of air entering the primary combustion chamber may be roughly controlled by moving the handle 40 so as to register the opening 41 with the arcuate opening 31. Fine adjustments of this air supply may be obtained by turning the nut 39 to increase the space between the draft plate 35 and the front face 30, thus allowing more or less air to escape through this space in a direction indicated by the arrow 42 of Fig. 8. The atmospheric air is heated by the heat within the tank and cover 12 and, resultant of suction created in the combustion chamber 24, this preheated air is drawn through the space 42 and mingles with the products of combustion in the primary combustion chamber 24.

The air entering the draft regulator 28 is deflected by a baffle 43, this baffle spreading this air substantially uniformly over the surface of the burning fuel in the primary combustion chamber.

As the combustion in the primary combustion chamber 24 continues, the fuel in the lower portion of the vapor chamber becomes extremely hot and vapors rise therefrom through the vapor chamber in a direction indicated by the arrows 44 of Fig. 1, these vapors passing through the screen 22 and into the stack 18. These vapors are highly combustible, and I completely burn these vapors in a secondary combustion chamber 45 formed in the stack 18.

Air is supplied to the secondary combustion chamber through three series of ports respectively designated lower, intermediate, and upper series 46, 47, and 48.

In communication with the lower series of ports 46 are lower air tubes 50 formed of a shape indicated in Figs. 1, 2, and 4. These lower air tubes are preferably cylindrical in cross-section and extend tangentially into the stack 18 so that the air passing therethrough will first be preheated due to the high temperature of the walls of the tubes, and then will be delivered into the secondary combustion chamber with a swirling motion.

The upper series of ports 48 also communicates with air tubes extending tangentially into the secondary combustion chamber 45, these air tubes being termed upper air tubes and designated by the numeral 52. The inner ends of the upper air tubes are preferably cut on an angle as indicated in Figs. 1 and 5, and these tubes extend tangentially into the secondary combustion chamber 45 in the same direction as do the lower air tubes 50 so that these upper and lower air tubes cooperate to swirl the gases in the secondary combustion chamber so as to achieve an intimate intermixture of any gases in this chamber. Each of the tubes 50 and 52 may have perforations therethrough as shown, these perforations allowing a small amount of the gases in the stack to be intermixed with the heated air in these tubes.

The amount of air entering the secondary combustion chamber 45 through the upper air tubes 52 is not controllable in the form of my invention illustrated in Fig. 1. The air passing through the lower air tubes 50 is, however, controlled by a regulator 55 which is in the form of a sleeve 56 surrounding the stack

18 and having diamond-shaped openings 57 therein, as best shown in Fig. 2. These diamond-shaped openings are adapted to register with the lower series of ports 46 when the sleeve 56 is turned by means of handles 58.

This sleeve 56 is held in position by tongues 59 formed of the material of the stack 18, these tongues being bent outward to engage the lower edge of the sleeve 56 after this sleeve is in place.

I have found that it is desirable to have the upper and lower air tubes 52 and 50 easily removable from the stack 18. This I accomplish by forming flanges 60 on the lower end of each of these air tubes, as best indicated in Fig. 3. Each of these flanges is adapted to slide into a U-shaped channel formed by a channel member 61. This channel extends downward on each side of the port and across the bottom thereof so as to receive the flange 60 and hold the air tube in a proper position so as to be communicable with one of the ports through the stack.

Each of the intermediate series of ports 47 communicates with an external air tube 62, this air tube extending downward to a point immediately adjacent the upper surface of the cover 12, as best shown in Figs. 1 and 2. These external air tubes do not communicate with the primary combustion chamber 24, but are adapted to draw air through the lower ends thereof, this air being preheated due to a contact with the hot cover 12. This air is then delivered into the secondary combustion chamber 45.

I have found that the vapors rising from the vapor chamber 21 are very thoroughly mixed with air entering the air tubes 50, 52, and 62, these vapors being also intermixed with the products of combustion rising from the primary combustion chamber 24. This gas mixture is highly inflammable, and produces an intense heat. The vapors themselves are thus not only burned but also any combustible soot particles in the smoke are likewise burned due to the high temperatures attained in the secondary combustion chamber 45.

I supply a small amount of air to the extreme upper end of the secondary combustion chamber 45 by means of tongues 63 formed in the stack 18 and bent into the secondary combustion chamber 45, these tongues allowing air to pass into the chamber 45 in a direction indicated by the arrow 64 of Fig. 1. An apron 65 rests on a bead 66 formed at the upper end of the stack 18, and is securely retained by a crimped portion 67 of the stack which lies above the bead 66. This apron extends below the openings formed by the tongue 63 so that the air entering these openings is drawn from a space immediately surrounding the stack 18, this space being filled with very hot air due to the heat of the stack 18. This entrance of air is further aided by the fact that as the air in contact with the exterior of the stack 18 becomes hot it rises and is entrapped under the apron 65 and is forced to enter the secondary combustion chamber 45.

In first starting the operation of my orchard heater, there will be a tendency to smoke, due to the fact that the fuel in the vapor chamber 21 has not become sufficiently hot to give off vapors. To counteract this action I provide a distilling spout 70 which is secured to the cover 12 inside the primary combustion chamber 24. This distilling spout is substantially horn-shaped and comprises an outer tube 71 terminating at a point indicated by the numeral 72. Disposed inside this outer tube is an inner tube 73 also terminating at a point indicated by the numeral 72. The inner and outer tubes 71 and 73 are spaced a distance apart so as to form an air passage 74 therebetween, this air passage communicating with the exterior of the cover 12 so as to pass air therethrough, as indicated by arrows 75, this air entering the primary combustion chamber.

Fuel is supplied to the primary combustion chamber through the inner tube 73, and the distilling spout 70 is so formed that a body of this fuel will be retained in the spout, this body being indicated by the numeral 77. When the body of fuel in the primary combustion chamber 24 is first ignited, the distilling spout 70 is quickly raised to a high temperature, so that the body of fuel 77 therein will give off vapors, these vapors passing outward from the spout as indicated by the arrow 78 of Fig. 6. As this vapor is drawn into the primary combustion chamber it is intimately intermixed with air passing through the air passage 74, as indicated by the arrows 75. Thus the distilling spout 70 performs the same function as the vapor chamber 21 except that this spout quickly generates vapors which are used when the heater is first started while the vapor chamber 21 takes a slightly longer time to become heated sufficiently to give off vapors. When, however, the chamber 21 has become sufficiently hot, it is unnecessary to further use the distilling spout 70, and this spout is closed by a closing plate 80 pivoted to the cover 12. This spout also permits the heater to be lighted directly without the usual priming necessary with other types of heaters.

An important part of the invention is the provision of a cover 90, shown in Fig. 9, which is used to extinguish the fire. This cover has an inner shield 91 which extends into the top of the stack 18 so as to shut off as much as possible all draft through the openings formed by the tongues 63; and it also has a horizontal flange 93 which makes easy the removal of the cover 90. The flange

93 also keeps out moisture from the top of the stack 18.

I claim as my invention:

1. In an orchard heater the combination of: a fuel-retaining tank; a stack extending upward from said tank; and air tubes extending tangentially into said stack for introducing preheated air thereinto.

2. In an orchard heater the combination of: a fuel-retaining tank; a stack extending upward from said tank; air tubes extending tangentially into said stack for introducing preheated air thereinto; and means for supplying combustible vapors of said fuel into said stack.

3. In an orchard heater the combination of: a fuel-retaining tank; a cover for said tank; a chimney extending through said tank and said cover, said chimney separating a vapor chamber and a combustion chamber adapted to receive a fuel; a stack extending from said cover and surrounding said chimney; and air tubes normal to the stack at the point of communication therewith.

4. In an orchard heater the combination of: a fuel-retaining tank; a cover for said tank; a chimney extending through said tank and said cover, said chimney separating a vapor chamber and a combustion chamber adapted to receive a fuel; a stack extending from said cover and surrounding said chimney; and air tubes extending tangentially into said stack to supply air thereto.

5. In an orchard heater the combination of: a fuel-retaining tank; a cover for said tank; a chimney extending through said tank and said cover, said chimney separating a vapor chamber and a combustion chamber adapted to receive a fuel; a stack extending from said cover and surrounding said chimney; and a distilling spout extending into said combustion chamber in a manner to supply vapors thereto, said spout including means for supplying air to said vapors where these vapors leave said spout.

6. In an orchard heater the combination of: a fuel-retaining tank providing a combustion chamber; a stack communicating with said combustion chamber, said stack having series of ports therein; upper air tubes extending tangentially into said stack from one series of said ports; and lower air tubes extending tangentially into said stack from another series of said ports, said tubes cooperating to supply swirling streams of preheated air to said stack.

7. In an orchard heater the combination of: a fuel-retaining tank providing a combustion chamber; a stack communicating with said combustion chamber, said stack having series of ports therein; a cover extending between said tank and said stack; external air tubes extending from one series of said ports to a point adjacent said cover; upper air tubes extending tangentially into said stack from another series of said ports; and lower air tubes extending tangentially into said stack from a third series of said ports, said tubes cooperating to supply swirling streams of preheated air to said stack.

8. In an orchard heater the combination of: a fuel-retaining tank; a stack extending upwardly from said tank; air tubes extending tangentially into said stack for introducing preheated air thereinto; and means for introducing preheated air into said tank.

9. In an orchard heater, the combination of: walls forming a combustion chamber; and a distilling spout extending into said combustion chamber and holding a body of fuel adapted to form combustible vapors, said distilling spout having double walls providing an air space therebetween adapted to supply preheated air to said combustion chamber for admixture with said combustible vapors.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 9th day of April, 1928.

BIRDIE V. WITT.