

Dec. 5, 1939.

R. A. CAMPBELL

2,182,143

ORCHARD HEATER

Filed May 6, 1937

Fig. 1.

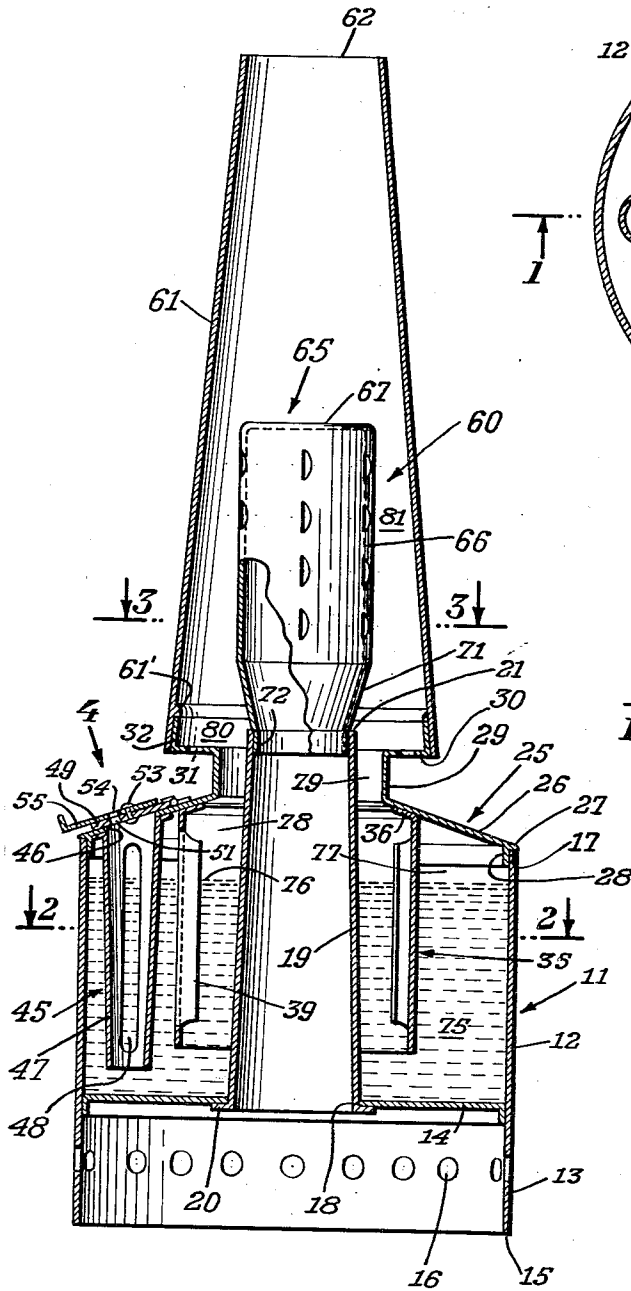


Fig. 2.

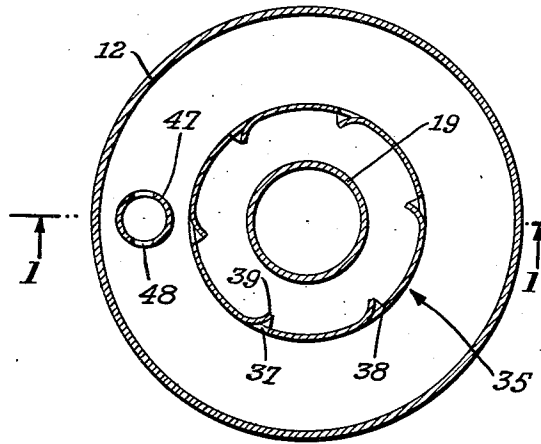


Fig. 3.

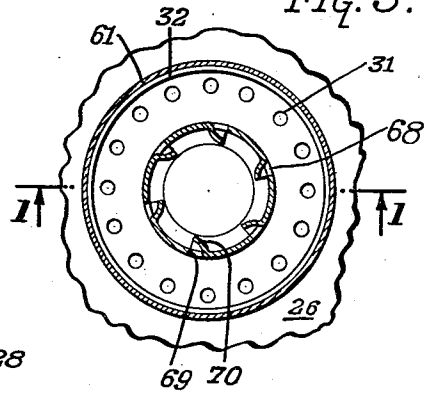
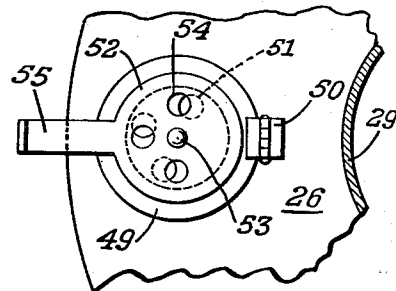


Fig. 4.



Inventor.
R. A. Campbell
By Hazard and Miller
Attorneys.

UNITED STATES PATENT OFFICE

2,182,143

ORCHARD HEATER

Robert A. Campbell, Los Angeles, Calif.

Application May 6, 1937, Serial No. 141,117

6 Claims. (Cl. 158—91)

My invention relates to an oil burning type of heater having some of the conventional features in that the oil in an oil receptacle is ignited and initially consumed by air admitted through a damper and what might be termed a secondary combustion takes place in the stack.

There are now on the market a number of more or less crude types of orchard heaters having the above mentioned characteristics in which due to incomplete combustion a great deal of smoke is developed and also most of the heat is lost by direct upward flow of hot air and the products of combustion. Another disadvantage of some of the present types of heaters is that these clog with soot and heavy carbon, thereby reducing the proper draft and causing smoky combustion or else sometimes entirely extinguishing the heater. Most of these types of heaters have a more or less contracted throat on a cover of the oil pot, this leading to the stack. Such stack is provided with perforations or air openings through which the air enters for a secondary combustion. A disadvantageous effect of this arrangement is that the secondary flame above the throat is forced to the center of the stack and hence does not adequately heat such stack whereby there is a transference of heat by radiation from the stack.

My invention comprehends a general feature of improvement by which there is a primary combustion of oil from the surface of the oil in the oil pot, this receiving the air for this primary combustion through a controllable damper much in the manner of the ordinary type of orchard heater. This air however is not sufficient to support complete combustion. In my construction the throat of the oil pot is contracted to form an annular passage by providing a central upward air flow pipe which draws air from below the oil pot. At the bottom of the stack I provide upwardly directed air ports which develop a secondary combustion of the hot gases and heavy oily vapors which pass upwardly through the throat. Even if the flame is extinguished in the throat by lack of sufficient air for combustion, the upwardly flowing oil products are sufficient with the heated air through the air ports to develop this secondary combustion.

An additional characteristic feature of my invention is in the employment of a combination flame spreader and additional air admission structure. This is located centrally in the stack which latter is supported above the throat. The flame spreader has a series of air openings receiving air which passes upwardly through the

air flow pipe located in the oil pot. This spreader directs the air outwardly into the combustible matter passing upwardly in the annular space between the spreader and the stack which is slightly tapered upwardly. This air develops a third type of combustion or combustion zone in the lower portion of the stack surrounding the flame spreader, this flame having a direct contact with the stack which may be heated to a sufficient degree for intense radiation of heat. Such radiation is substantially horizontally in a complete circle surrounding the stack and on account of the radiation of a considerable amount of heat, the products of combustion leaving the stack are comparatively cool compared with the ordinary orchard heater and therefore do not develop such a rapid upflow of hot gases and products of combustion.

Another improvement embodied in my invention which may be applicable to the ordinary oil pot with the conventional stack consists in confining the major portion of the initial combustion in an annular space surrounding the air upflow pipe which is centrally positioned in the oil pot. This is accomplished by providing a skirt or cylinder depending from the cover of the oil pot positioned outwardly from the throat and such skirt has a plurality of vertical slot-like louvers. These louvers permit the initial ignition applied through a conventional filling port and as this is started, air enters through the louvers so that the hottest oil is confined by the skirt surrounding the air upflow pipe. This develops hotter gases and hotter vapors which pass upwardly through the throat to the position of secondary combustion adjacent the bottom of the stack. In addition, on account of the hot burning oil and its products of combustion surrounding the central air flow pipe, such air is highly heated before being discharged by the flame spreader. However, even with the conventional oil pot, the depending cylindrical skirt improves the combustion. It will be understood that the air for the central supply may be derived by supporting the oil pot above the ground in any suitable manner and providing air inlets to the air upflow pipe.

My invention is illustrated in connection with the accompanying drawing, in which:

Fig. 1 is a vertical section, part of the flame spreader being shown in elevation and may be considered as taken substantially on the line 1—1 of Fig. 2 or 3.

Fig. 2 is a horizontal section on the line 2—2

of Fig. 1 in the direction of the arrows through the oil pot and the parts assembled therewith.

Fig. 3 is a horizontal section on the line 3—3 of Fig. 1 through the stack and the flame spreader.

Fig. 4 is an enlarged plan taken in the direction of the arrow 4 of the filling port with its closure cap and air inlet damper.

In my invention my oil pot designated by the assembly numeral 11 preferably has a cylindrical wall 12 which continues, forming an annular supporting base 13 with the oil pot bottom 14 positioned above the bottom edge 15 of the base which rests on the ground. Such circular base is provided with a series of air inlet openings 16. The circular wall has an upper circular edge 17 intended to be positioned in a horizontal plane. The base has a circular opening 18 through which extends upwardly an air flow pipe 19, this preferably having a flange at the bottom 20 which may be welded or otherwise secured to the bottom 14 outside of the opening 18 by welding or the like. This air flow pipe is of quite large diameter compared with the diameter of the oil pot and has an upward slight taper terminating in the upper edge 21.

The cover designated by the assembly numeral 25 has an upwardly sloping cover wall 26 with an annular shoulder 27 and an internal rim 28, the shoulder engaging the upper edge 17 of the peripheral wall of the oil pot and the flange 23 extending downwardly inside of the wall 12. The cover is thus readily removable. A cylindrical neck 29 extends upwardly from the apex of the sloping cover wall 26 and at the top of the neck there is a horizontal diverging wide flange 30 with a series of air inlet openings 31, these preferably being circular perforations. A rim 32 extends upwardly from the outer periphery of the flange 30. A cylinder or annular skirt 35 has an intumed flange or the like 36 which is secured by welding to the sloping cover wall 26 whereby the skirt is positioned between the vertical line of the neck 29 and the peripheral wall 12. This cylinder or skirt has a series of louvers 37 formed by vertical slits 38 and inwardly bent louver edges 39. These are preferably all directed in the same way so that the flow of air entering the skirt develops a somewhat circular motion inside of such skirt.

A conventional circular filler and ignition assembly 45 is provided by a circular opening 46 in the sloping cover wall 26 and below this there is a slightly converging tube 47 secured to the underside of the cover wall and this has a plurality of vertical slots 48. A cap 49 may be formed of a disc having a hinge 50 connecting to the sloping cover wall 26. The disc is provided with a series of air ports 51 and above the cover there is a circular damper plate 52 having preferably a central pivot 53 connecting with the damper plate and also having complementary ports 54 to register with the ports 51. The damper may be turned by the outwardly extending handle 55 which is also operative to tilt the cap upwardly for filling the oil pot with oil and for igniting such oil, the filling being through the slotted tube 47 and the ignition is also at such tube.

The flame spreader and stack assembly 60 employs a tapered stack 61 which is imperforate and has its lower edge fitting outside of the rim 32 of the cover 25 and a bead 61' resting on the horizontal rim 32. The stack is thus readily removable. The discharge opening 62 at the top of the stack is concentric with the center of

the oil pot and the air flow pipe 19. A flame spreader 65 consists of a cylinder 66 with a closure top 67. The cylinder has a plurality of air outlet openings 68 formed by slight short vertical slits 69 and inwardly bent or flared sections 70 to develop a somewhat circular motion of the air in the stack after leaving the flame spreader. Below the cylinder there is a tapered section 71 and a lower annular ring 72. This ring fits in the upper part of the air flow pipe 19 and as the upper edge of the pipe engages the tapered or converging part 71, it holds the flame spreader in position and such spreader may be readily removed after removing the stack. In the illustrations the body of oil is indicated by the numeral 75 and the oil level is shown by the line 76. This leaves an annular space 77 defined by the outside wall 12 of the oil pot, the skirt or cylinder 35 and a portion of the sloping cover 26. There is a second annular space 78 defined by the skirt or cylinder 35 and the air upflow pipe 19 and also by a portion of the sloping wall 26 between the skirt and the neck 29. An annular throat 79 is formed by the space inside of the neck 29 and outside of the air upflow pipe 19. A secondary combustion chamber 80 is immediately above the throat and receives air for combustion admitted through the air openings 31 in the horizontal flange 30 and is defined by the outer lower portion of the stack and the tapered section 71 of the flame spreader. What may be termed a third combustion chamber or space 81 is the annular space surrounding the flame spreader and limited by the tapered stack. The air for this combustion enters the openings 16 in the base 13, flows upwardly through the air flow pipe 19 into the flame spreader where such air is heated additionally and the air flows outwardly through the air opening 68 being directed somewhat in a circular flow around the flame spreader.

In the operation of my orchard heater the equipment is assembled as illustrated and described presuming the oil pot is empty, this is filled by lifting the cap 49 and pouring the ordinary type of oil used in this type of heater into the pipe 47 whence it flows through the bottom and the vertical slots 48, filling the oil pot to the desired level. Manifestly the oil should never be sufficiently high to entirely block the louver openings 37 and there should be sufficient space for the initial combustion of fuel in the oil pot. This oil is ignited either by inserting an inflammable material in the tube 47 and igniting this or by utilizing a readily burnable oil such as kerosene or gasoline or, as is the common practice, by jetting the flame of a blow torch through the opening 46, the cap being raised for this purpose. The cap is then closed and the damper is adjusted to secure the desired initial air flow through the registering ports 51 and 54. This causes an initial combustion of oil from the surface of the oil in the oil pot in the chamber or space 77 and 78. As the oil becomes hot from this burning, apparently most of the combustion takes place in the chamber 79, air and flames from the space 77 entering through the louvers 37. This initial combustion heats the air in the air flow pipe 19, the products of combustion from the space 78 flow upwardly through the contracted throat 79. This throat may partially or almost completely quench the flame which arises directly from the oil so that the products of combustion carry gases and heavy oil vapors which have a high temperature.

As soon as this combustible product enters the secondary combustion chamber 80, it receives air through the air ports 31 in the horizontal flange 30, this being sufficient to ignite and burn a considerable amount of the lighter gases and the more readily ignitable vapors which burn in a circular flame confined by the lower portion of the stack and spread outwardly by the tapered portion 71 of the flame spreader 65. This secondary combustion heads the less readily consumable oil vapors and gases to a still higher temperature to which air is fed through the air openings in the flame spreader. When the heater is in operation for but a short time the air flowing upwardly through the air flow pipe 19 and distributed by this flame spreader has developed a high temperature so that it readily causes practically complete combustion with the gases and oil vapors in this third combustion space or chamber 81. As above mentioned, the air entering through the flame spreader is given a swirl around the inside of the stack which tends to retard the speed of upward flow of the products of combustion and causes the flame to have an intense heating action on the stack. The stack thus becomes highly heated and manifestly radiates heat, most of this being substantially horizontal and through a complete circle. This radiation has a distinct advantage in orchard heating for in such heating it is necessary to place the heaters outside of the sweep or range of the foliage of individual trees, usually spaced between adjacent trees or sometimes equi-distant from four trees. The heat is thus radiated to the foliage of the trees, the trunks, branches and to the air more or less confined underneath the foliage. Due to the tapering form of the stack, the flame and the hot products of combustion are kept in close contact with the stack until they issue from the discharge opening 62 at the top. On account of losing so much heat to the stack and by direct radiation, the products of combustion are cool compared with the products of combustion from the present typical orchard heater. Thus there is not such a violent upflow of the hot products of combustion and there is not such a decided upward draft of warmed air developed but the heated air is confined more or less to the immediate surroundings of the orchard and the air above the trees.

It will be apparent that should I wish to use the ordinary type of oil pot with my flame spreader, I may omit the cylindrical skirt 35 but I find that I obtain improved combustion and less deposit of soot and carbon by using this skirt than having an oil pot without such skirt. It is to be understood that my invention comprehends also an improvement in the ordinary oil pot burning from the surface and having no central air flow pipe or flame spreader, by providing the cylindrical skirt 35 with its louvers, thus dividing the space above the oil in the oil pot into two distinct annular chambers. This in itself gives an improved combustion and makes a simple addition to the ordinary orchard heater and such skirt may be readily attached to the covers of heaters now in use at very little expense.

While I have designated the structure 65 as a flame spreader, this in reality has the function of being a relatively large diameter pipe for the flow and the distribution of air internally in the stack. The air thus keeps the structure cool preventing its burning out from the intense heat and the air jetting out on all sides from the cylindrical portion 66 forces the flame against the inside of

the stack. Therefore the major portion of the hot flame does not come directly in contact with the cylindrical portion 66 of this so-called flame spreader. Also, on account of the structure forming the flame spreader 65 being centrally positioned above the throat of the cover and of the fire pot, any flame coming through the throat or the combustion immediately above the throat has the flame spread outwardly in contact with the lower portion of the stack. The flames from the various places of combustion follow up the side of the stack practically completely to the top. Due to the shape of the air outlet openings 68 it will be noted that air develops a circular motion on the inside of the stack which carries practically to the top of the stack, thus although there are certain eddies of the products of combustion above the flat top 67 of the flame spreader, the major portion of the flame is in close contact with the stack. A further feature in regard to the circular motion of the products of combustion and the flame is that in the oil pot the louvers in the skirt develop a circulation of the air in a counter-clockwise pipe 19. This swirl is continued upwardly through the throat and the air being discharged from the flame spreader also maintains this counter-clockwise circulation around the flame spreader. This general direction of circulation continues more or less to the top of the stack.

Various changes may be made in the details of the construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A heater comprising in combination an oil pot having a bottom with an opening, imperforate sides and a top cover with a contracted neck extending upwardly therefrom, an air flow pipe connected to the bottom at the opening and extending upwardly through the contracted neck and defining therewith an annular throat, an imperforate stack, means to support said stack above the neck, a skirt secured to the top cover and extending downwardly towards the bottom of the oil pot positioned between the neck and the outside walls of the pot, said skirt having vertical louvers with inwardly extending edges from one side of each louver to direct the flow of air for the primary combustion into a somewhat circular motion in the space between the skirt and the air flow pipe.

2. A heater comprising in combination an oil pot having a bottom, sides and a top cover terminating in a vertical contracted neck, a flange extending outwardly from the neck and an imperforate stack extending upwardly from the flange, a skirt secured to the cover and extending downwardly towards the bottom of the oil pot but spaced from such bottom, the skirt also being spaced outwardly from the neck and thus located between the neck and the outside walls of the oil pot, the skirt having vertical louvers with inwardly extending edges from one side of each louver to direct the flow of air for primary combustion into a somewhat circular motion in the space inside of the skirt, there being an air inlet opening in the cover located between the skirt and the outside walls of the oil pot.

3. A heater comprising in combination an oil pot having a bottom with a circular opening, an air flow pipe extending upwardly from said opening, means to support the oil pot above the ground and providing entrance for air to the lower end of the air pipe, a cover having a slop-

ing cover wall supported on and extending upwardly from the oil pot and having a contracted neck and an outwardly extending flange, the air flow pipe extending upwardly through the neck and defining therewith an annular throat, a tapered stack supported on the said flange and extending upwardly, a flame spreader having a cylindrical structure closed at the top and open at the bottom and supported on the upper end of the air flow pipe, said flame spreader having openings in its cylindrical structure for admission of air to the stack and a controllable air flow means in the cover for admitting air in the space above the level of oil in the pot whereby primary combustion may take place in said latter space and additional combustion in the stack surrounding the flame spreader by air admitted through said spreader, a skirt secured to the sloping cover wall spaced outwardly from the neck and extending downwardly towards the bottom of the oil pot, said skirt having vertical louvers with inwardly extending edges from one side of each louver to direct the flow of air for the primary combustion into a somewhat circular motion in the space between the skirt and the air flow pipe.

4. In an orchard heater in which an oil pot has a cover with a primary combustion air inlet and a cylindrical neck extending upwardly from the cover, a flange on the top of the neck and an imperforate stack extending upwardly from the flange comprising in combination the bottom of the oil pot having a central opening, an air flow pipe connected to said bottom opening and extending upwardly through the neck and defining therewith a contracted annular throat communicating with the oil pot, a combined flame spreader and air distributor connected to the top of the air flow pipe and extending upwardly a portion of the length of the stack, there being an annular space between the flame spreader and the inside of the stack, said space decreasing in area towards the top of the flame spreader, said flame spreader having air discharge openings in its side only to direct air for combustion into said space.

5. A heater comprising in combination an oil pot having a bottom with a central opening and an air flow pipe extending upwardly through the pot from said opening, means to support the pot above the ground level for flow of air to the lower end of said pipe, a stack with means to support the stack above the oil pot, a combined

flame spreader and air distributor connected to the upper end of the air flow pipe and having side openings only for admitting air to an annular space between the flame spreader and the stack and means to admit air to the oil pot above the level of oil therein for supporting initial combustion of the oil, the air admitted through the flame spreader being adapted to support additional combustion in the stack, the means supporting the stack including a contracted throat structure and an outwardly extending flange, the said flange having openings for admitting air to the bottom of the stack to be used in the combustion of fuel passing upwardly through the throat.

6. An oil heater comprising an oil pot having a bottom with a central opening, cylindrical outside walls and a cover with a cylindrical neck extending upwardly from the cover, an air flow pipe connected to the bottom at the said opening and extending upwardly through the said neck and defining with the neck a contracted annular throat communicating with the pot, a flange connected to the upper end of the neck extending outwardly, an imperforate stack extending upwardly from the outside of the flange, a flame spreader having a side wall closed at the top and having a bottom opening and connected at the said bottom opening to the top of the air flow pipe, the said flame spreader having in its side wall a series of air openings to discharge air flowing upwardly through the air flow pipe to the stack, there being an annular space between the stack and the flame spreader decreasing in area from bottom to top of the flame spreader, a cylindrical skirt secured to the cover and spaced outwardly from the neck and between the neck and the cylindrical outside walls from the oil pot, the said skirt terminating above the bottom of the oil pot, the skirt having a plurality of vertical louvers with edges bent in an offset manner to develop a rotational swirl of air and the primary combustion between the skirt and the air flow pipe and in the annular throat there being a controlled air inlet opening in the cover located between the skirt and the outside walls of the oil pot to support the primary combustion of oil, the primary combustion of oil being operative to heat the air passing upwardly through the air flow pipe.

ROBERT A. CAMPBELL.