June 24, 1941. M. H. KEATING 2,247,239

STOCK TANK HEATER

Filed Jan. 19, 1940

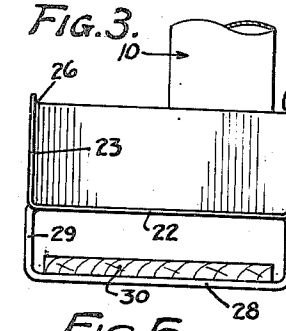


FIG. 3.

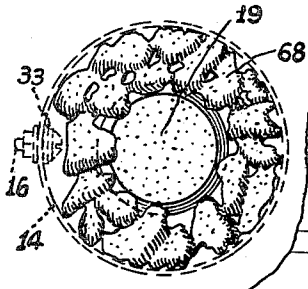


FIG. 6.

FIG. 1

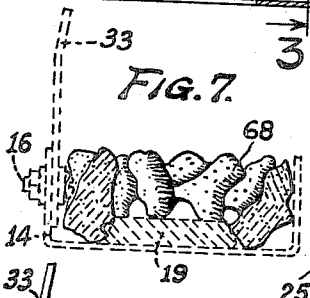


FIG. 7.

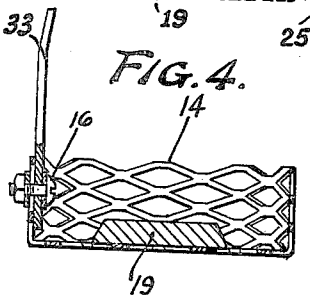


FIG. 4.

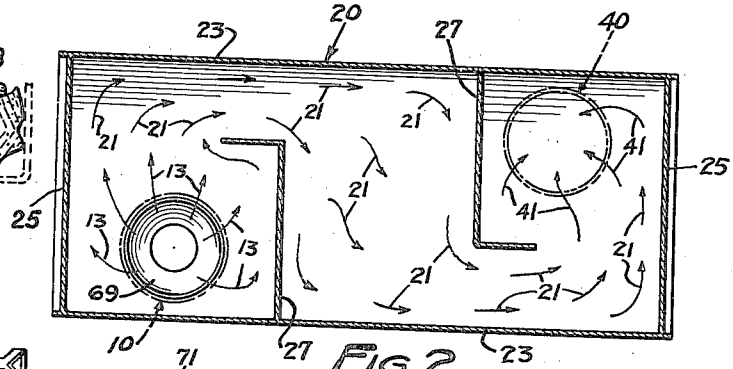


FIG. 2

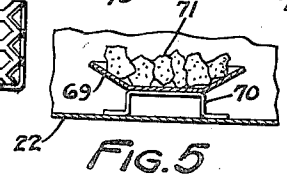


FIG. 5

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STOCK TANK HEATER

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9 Claims. (Cl. 126—360)

The present invention relates to a stock tank heater apparatus. In the raising of cattle in cold climates, an outside watering tank and outside feeding quarters are often used. Being exposed to the weather the water in the tank freezes over depriving the stock of necessary water. This markedly decreases the value of the stock feeding operations and provision must, therefore, be made to supply water in adequate quantities under all temperature conditions. Not only must the stock tank heater be capable of preventing ice formation in the tank, but this must be accomplished at low cost and with a minimum of attention.

It is accordingly an object of the invention to provide a stock tank heater device which is capable of being used under the most severe climatic conditions for preventing ice formation in stock tanks.

It is an object of the invention to provide an improved stock tank heater including an improved support for maintaining the stock tank heater submerged in a predetermined spacial relationship with respect to the bottom of the tank.

It is also an object of the invention to provide an improved burner capable of utilizing low cost normally non-volatile fuels.

It is also an object of the invention to provide an improved burner capable of being manufactured and maintained in operation at a very low cost.

It is a further object of the invention to provide an improved burner device capable of being utilized in a stock tank heater and for other heating operations.

Other and further objects of the invention are those inherent in the apparatus illustrated, described and claimed.

The apparatus of the present invention is illustrated with references to the drawing:

Figure 1 is a side elevational view partly in section of a stock tank heater shown in place in a stock tank.

Figure 2 is a sectional view of a portion of the stock tank heater shown in Figure 1 taken along the lines 2—2 of Figure 1.

Figure 3 is a fragmentary end view taken along the lines 3—3 of Figure 1.

Figure 4 is a fragmentary side elevational view partly in section of a portion of the burner apparatus of Figure 1.

Figure 5 is a fragmentary sectional view of a modified part of the burner apparatus.

Figures 6 and 7 show another modification in plan and elevation.

Throughout the drawing, the corresponding elements of the apparatus are designated by the same numerals.

Referring now to the drawing, 1 designates a stock tank for the watering of stock. As normally used the bottom 2 of the stock tank is placed directly upon the earth or upon a slight foundation and the tank may be circular or somewhat rectangular in shape and provided with rounded ends. Stock tanks are normally about 22 to 24 inches high and are provided with an upper beaded edge 4.

The stock tank heater apparatus of the present invention consists of a downdraft flue 10 which is welded or otherwise affixed in water-tight relationship to a substantially horizontally disposed cross flue or heat dissipator generally designated 20. At the end of the heat dissipator 20, opposite to the point of connection of flue 10 there is affixed a stack generally designated 40, which may be provided with a removable supplemental stack portion generally designated 50. The down-draft flue 10, heat dissipator 20, and stack 40—50 provide for the carrying of air and the products of combustion along the path of arrow 11 in the downdraft flue, thence through the burner apparatus generally designated 12 along the path of arrow 13 and arrows 21 (see Figure 2) to the stack 40 whereupon the flue gases rise along the path of arrows 41 and finally emerge to atmosphere under the rainshield 51 of stack 50.

The downdraft flue 10 and the stack 40 are welded or otherwise affixed in water-tight relationship to the water-tight heat dissipator 20. The heat dissipator 20 may conveniently be made by folding a flat rectangular piece of metal in a broad U-shape so as to have a bottom 22 and sides 23 as shown in Figure 3. The top walls of heat dissipator may be made by utilizing a piece of metal having a width equal to the distance between the side walls 23 and bending it so as to provide a top 24 and downturned end walls 25. The seams 26 between the bottom-side wall piece and the top-end wall piece are then welded so as to provide a water-tight box.

Prior to the closure of the heat dissipator box 24, however, there may be provided a pair of internal baffles 27, shaped as shown in Figure 2 so as to provide a circuitous path for the flow of gas through the heat dissipator, the purpose being to scrub the gas against the side walls and thereby achieve maximum heat dissipation.

Adjacent each end of the heat dissipator section 20, there is provided a downwardly extending loop which is preferably made of stiff metal

such as channel iron. The loop has horizontal part 28 and vertical legs 29, which are welded or otherwise affixed to the heat dissipator 20. The vertical legs 29 have a length sufficient to maintain the dissipator 20 in spaced relationship to the bottom 2 of the stock watering tank.

Since the stock tank heater has a large interior, the buoyancy of the unit is normally considerably greater than the weight of the unit. Provision must accordingly be made to maintain the stock tank heater in a submerged condition. In order to achieve this, a plank 30 is inserted between the horizontal portion 28 of the supporting member and the bottom 22 of the heat dissipator section, the length of the plank being sufficient to extend outwardly at each end as shown at Figure 1. Upon the upper surface of each end of the plank, there is placed a concrete block or other weight 31, which is made sufficiently large to overcome the buoyancy of the stock tank heater and thereby maintain the horizontal portion 28 of supporting loops against the bottom 2 of the stock tank. In this way, the stock tank heater is stabilized against displacement.

The upper edge of the downdraft flue is notched as shown at 14, and the stack 40 is provided with a bracket 42 to receive an oil supply reservoir 60. The reservoir is preferably a stout can having a length so that it fits snugly between the edge 15 of the notch 14 and the stack 50 with the weight of the reservoir on the notch 14 and bracket 42. The reservoir 60 may, if desired, be provided with a clip 61 for embracing the supplemental stack 50 thereby to stabilize the reservoir against displacement. A handle is provided at 62 and a filler opening and vented cap at 63. Upon the front edge of the reservoir, there is an outlet pipe 64 having a valve 65 affixed thereto. The valve is provided with a nozzle 66 shaped to form relatively small drops of the fuel 67 as it emerges from the reservoir.

Within the downdraft flue 10, there is positioned a stout wire basket 14, which is preferably made of expanded metal. The basket is made of a size and shape approximately the same as that of the downdraft flue 10. Where the flue 10 is circular, as herein illustrated the basket 14 would accordingly be circular and slightly smaller than the flue.

The basket 14 is supported within the downdraft flue by means of a carrying rod 33, the rod and basket being bolted together by means of bolts 16. The upper end of the carrying rod 15 is bent over as shown at 17 and the bent-over portion is hooked into a notch 18 in the upper edge of the downdraft flue.

Within the basket, there is provided a horizontally disposed drop intercepter splattering plate 19, which may be of metal or refractory material, and around the plate 19 there is provided a plurality of chunks of non-burnable material, preferably an absorbent refractory material such as that shown at 68. Very satisfactory results have been obtained when this refractory material is ordinary fire brick broken into chunks, approximately the size of a walnut. No particular care is utilized in obtaining evenly shaped chunks, for irregularly shapes give very good results. The number of chunks of material piled around the drop intercepter plate 19 is made sufficient to intercept the splattered oil, but the chunks of refractory material 86 are fitted loosely and therefore do not much impede the flow of flue gasses downwardly through the flue 10.

If desired the non-burnable material may be molded in one piece suitable projections being provided to intercept the splattered oil and suitable openings being provided for the passage of air and combustion products therethru. Likewise, the irregular pieces of non-burnable material may be sintered together into a whole by elevating them to a temperature above that normally reached by the burner, as shown in Figures 6 and 7.

The exact vertical position of the mass of non-burnable material 68 is not critical. While it is preferably within the downdraft flue 10, it may also be placed slightly below the lower edge of the downdraft flue in the path of the air emanating downwardly therefrom.

Below the downdraft flue 10, in the flame path thru the heat dissipator section 20, there is provided a dish 69, which may desirably be a metal dish. The dish 69 may be welded to the floor 22 of the heat dissipator section, or may be mounted in spaced relationship to the floor 22 by means of a bracket 70 as shown in Figure 5. The dish 69 is likewise loosely filled with a number of chunks of non-burnable material such as the absorbent refractory material 71. This may likewise be a molded block of material or a sintered block of irregular chunks of material as described above for the mass 68 of non-burnable material.

To the front part of the oil reservoir 60, there is hingedly attached a rain and snow shield 75, which has a sufficient dimension to cover the upper part of the downdraft flow 10. The rain shield 75 is bent downwardly at the edges shown at 76, and at the lip as shown at 77, but adequate air space is provided between the shield 75 and the upper edge of downdraft flue 10 for the admission of air into the burner.

In operation, the tank 60 is filled with low-grade fuel such as No. 1 or No. 2 fuel oil. Such fuel oil is normally non-volatile and will ignite with difficulty even when lighted material is thrown into it. For initiating the operation of the present apparatus, a wad of paper is lighted and thrown downwardly into the downdraft flue 10. The paper falls into the basket 14 and the top of the flue 10 is fanned or a breath or two of air is blown downwardly into the flue 10 to initiate the flow of gas downwardly along the path of arrows 11 and 13. The products of combustion then travel laterally through the heat dissipator 20 along the path of arrows 21, and then upwardly through the stack sections 40 and 50 along the path of arrows 41.

The valve 65 which is then slightly opened provides a flow of oil and drops of oil fall downwardly as shown at 77 in Figure 1. The drops fall upon the drop interceptor plate 19, and due to their relatively long travel in falling, splatter into many small droplets in hitting the plate 19. The small droplets splatter against the chunks 68 of refractory material and are ignited thereon by the burning paper. At the beginning of the burning operation a relatively smoky flame is produced but as the temperature of the chunks of refractory material 68 increases, a better vaporization of the splattered oil is achieved and more complete combustion obtained.

The downdraft through the flue 10 produces a hot flame on and immediately below basket 14. The flames travel downwardly and into the heat dissipator section 20 where they emerge and are

circulated against the sides of heat dissipator due to positioning of baffles 27. As a result, the heat of the products of combustion is dissipated to the water within the tank, and the temperature of the water is raised.

The flames emerge downwardly from down-draft flue 10 and impinge upon the chunks of refractory material 71 in dish 69 and accordingly increase the temperature of this refractory material. Ordinarily the refractory material 71 operates in a hot oilless condition since ordinarily no oil falls upon it, but as the rate of burning increases, or in some instances, at the beginning of the burning operation, or when some droplets of oil flow through the basket 14 without burning, the drops then fall downwardly on to the refractory material 71 with the result that the oil is vaporized thereon and burned. Accordingly, no oil is wasted in the burning operation and burning takes place efficiently.

The rate of operation may be varied from as low as one gallon of oil for each 24 hours to as high as 7 or 8 gallons per 24 hours. At low rates of burning, the temperature in stack 40—50 is low and accordingly the amount of air drawn through the apparatus is at a minimum. As the rate of operation increases, the stack temperature in stack 40—50 likewise increases with the result that additional air is drawn through the apparatus. Approximately the same ratio of air to fuel is thus inherently maintained at low rates of operation and at high rates of operation with resulting high efficiency in heat production since excess air is thus minimized.

Many obvious variations may be made without departing from the spirit of the invention herein illustrated, described and claimed.

Thus other refractory materials, such as stone or metal may be utilized, if desired for chunks 68, and other shapes and configurations of flues, stacks and heat transfer sections may be used. In some instances it is desirable to dispense with the drop intercepter plate and merely allow the oil to drop downwardly on the blocks of material for ignition thereon and the basket 14 may if desired be replaced with a fixed grid. Likewise, the specific type of bracket for supporting the stock tank heater may be varied to meet the exigencies of any particular installation. The heat producing unit may be utilized in stock tank heaters or for other purposes, for example, in brooder stoves, space heaters, or the like, where it is desirable efficiently to burn low grade fuel with a minimum of attention.

These and many other variations will be obvious to those familiar with the art, and intended to be within the scope of the invention claimed.

What I claim is:

1. A heater comprising a downwardly extending flue, a plurality of lumps of solid refractory material supported in the path of gases flowing through said flue, said material being loosely packed so as to permit gases to flow downwardly therethrough and means for dripping oil downwardly onto the pieces of non-burnable material for ignition thereon, said pieces of refractory being positioned so that a central piece is in the path of the dripping oil so as to intercept and splatter the oil onto the surrounding pieces.

2. A heater comprising a downwardly extending flue, a plurality of lumps of solid refractory material supported in the path of gases flowing through said flue, said material being loosely packed so as to permit gases to flow downwardly therethrough and means for dripping oil downwardly onto the pieces of non-burnable material for ignition thereon, said pieces of refractory being positioned so that a central piece is in the path of the dripping oil so as to intercept and splatter oil on the surrounding pieces of refractory, and another mass of non-burnable material in the flame path and below said first mentioned non-burnable material.

3. A heater comprising a downwardly extending flue, means for dripping oil downwardly through said flue, a drip plate mounted transversely of the flue in the path of said dripping oil for intercepting and splattering the oil, and non-burnable material supported adjacent and around the drip plate in the path of the splattered oil, said non-burnable material being loosely packed to permit the passage of gases downwardly therethrough.

4. A heater comprising a downwardly extending flue, means for dripping oil downwardly through said flue, a drip plate mounted transversely of the flue in the path of said dripping oil for intercepting and splattering the oil and a first mass of non-burnable material supported adjacent and around the drip plate in the path of the splattered oil, said first mass being loosely packed to permit passage of gases downwardly therethrough, and another mass of non-burnable material below said first mass in the path of flames originating on the first mass of non-burnable material.

5. A heating device comprising a down draft flue, and oil conduit means for dripping oil down said flue, a drip plate supported transversely in said flue for intercepting and splattering the dripping oil, a plurality of chunks of absorbent refractory material positioned around the drip plate in positions to intercept most of the splattered oil, said chunks being loosely spaced to permit the passage of gases downwardly therethrough, a secondary oil catch basin below the end of said down draft flue in the path of flame travel therefrom for catching excess oil and a plurality of chunks of absorbent refractory material in said catch basin.

6. A heating device comprising a vertically disposed down-draft flue, oil supply and conduit means for dripping oil downwardly in said flue, and a metal basket of pertused material supported in said flue, said basket being provided with a drip plate for intercepting and splattering the oil dripping down the flue and a plurality of chunks of absorbent refractory material arranged around the drip plate for intercepting the splattered oil, said chunks being loosely spaced to permit the passage of gases downwardly therethrough.

7. A heating device comprising a vertically disposed downdraft flue, oil supply and conduit means for dripping oil downwardly in said flue, a metal basket of pertused material supported in said flue, said basket being provided with a drip plate for intercepting and splattering the oil dripping downwardly in the flue and a plurality of chunks of absorbent refractory material arranged around the drip plate for intercepting the splattered oil, said chunks being loosely spaced to permit the passage of gases downwardly therethrough, a secondary catch basin located beneath the basket in the path of gas travel therefrom and a plurality of chunks of absorbent refractory material in secondary catch basin.

8. A heater comprising a downwardly extending flue, means for dripping oil downwardly in the flue, and an oil dispersing means in the flue,

said means being of heat refractory material having a large number of projections thereon and a plurality of spaces therethrough for the passage of gases flowing through the flue, the size of said dispersing means being such that it extends practically across the flue, one portion of said means being positioned to intercept and splatter oil on the remaining portion of said means for burning thereon, so that the major part of the gases passing through the flue is forced to pass through the spaces in the dispersing and igniting means.

9. A device of the type set forth in claim 8 wherein the dispersing means is composed of a plurality of irregular chunks of firebrick sintered together.

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