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SPACE HEATER AND CONTROL MEANS THEREFOR
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Fig. 6

Fig. 8
Position 1

Fig. 9
Position 6

Fig. 7
Position 0

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The present invention relates to improvements in space heaters and control means therefor.

This application is a continuation in part of application S. N. 590,199, filed February 28, 1945, now abandoned.

Space heaters employing pot type oil burners are commonly operated on a substantially even draft setting for all types of firing, the parts being set so that the maximum amount of air is admitted at all firing rates. At lower firing rates an excess of air is usually present. Since a burner is commonly operated throughout a considerable portion of the time on the lower firing rates, this maximum amount of air results in lowered efficiency during a considerable portion of its time of operation. It is necessary, however, to have the maximum quantities of air at the highest firing rate in order to provide ample heating capacity during the coldest weather. It is impractical to damper off all of the air ports in the burner, because this slows down the air velocity. This is particularly important in the lower portion of the burner.

The present invention contemplates a heater provided with a novel mechanism for controlling the flow of air through all of the air ports except the lowermost thereof, this mechanism being connected to the fuel metering valve, so that as the flow of fuel is varied, the amount of air through said air ports is varied proportionately. In addition, the present invention contemplates a construction for synchronizing the dampering effect in the flue in response to changes in the firing rate.

Moreover, the present invention contemplates a heater in which any oil in the bottom of the burner may be readily burnt out.

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An object of the present invention is to provide improved controls for a heater by which the ratio of air to the fuel may be efficiently controlled.

A further object is to provide an improved mechanism applicable to stoves as now known and used whereby the efficiency thereof may be improved.

A further object is to provide a heater having means for regulating in a novel and efficient manner the amount of incoming air in proportion to the fuel delivered to said heater.

A further object is to provide an improved heater having means for dampering the flue in proportion to the fuel delivered to said heater.

A further object is to provide an improved heater having combined means for controlling the flow of incoming air and the dampering of the flue in proportion to the supply of fuel to said heater.

A further object is to provide an improved heater having a novel connection between the metering valve and the damper, whereby improved performance may be accomplished.

A further object is to provide an improved space heater well adapted to meet the needs of practical service.

Further objects, will appear as the description proceeds.

Referring to the drawings:

Figure 1 is a vertical view of a heater embodying the principles of the present invention;

Figure 2 is a sectional view taken along the plane indicated by the arrows 2—2 of Figure 1;

Figure 3 is a sectional view taken along the plane indicated by the arrows 3—3 of Figure 1;

Figure 4 and Figure 5 are views illustrating corresponding positions of the metering valve of the heater and the damper of said heater;

Figure 6 is a horizontal cross sectional view of a modification; and

Figures 7, 8 and 9 are fragmentary views illustrating the relationship of the damper to the associated portions of the heater corresponding to defined positions of the metering valve.

Referring first to Figures 1 and 2, the casing of a space heater is indicated by the numeral 10. Mounted within said casing 10 is the heating element or heating drum 11. Said heating element 11 is of smaller dimensions than the casing 10, whereby a heating space 12 is provided exteriorly of the element 11. The bottom portion of the casing 10 is provided with apertures 13—13 through which air is drawn into the space 12. Such air is heated by the heating element 11 as it progresses through the space 12, and is discharged through the perforated grille 14 at the top of the casing.

Disposed adjacent to the bottom of the heating element 11 is a burner 15, which is illustrated as being of the pot type, said burner 15 being provided at its bottom portion with the fuel feed tube 16. Said burner 15 preferably has a shallow bottom 17, said bottom being almost flat, whereby fuel which enters the burner 15 through the tube 16 will spread out to be readily vaporized by the radiant heat of the flame at the top of the burner 15.

The heating element 11 is provided with a perforated bottom 18 for admission of air from the casing 10 to the region of the bottom of the burner 15. The numeral 18a indicates a control aperture in said bottom 18. The burner 15 is of
less diameter than the adjacent portion of the element 11, and an annular diaphragm 19 is provided between said burner 18 and said element 11, dividing the annular space between said burner 18 and the element 11 into an annular region 20 below said diaphragm 19 and the annular region 21 above said diaphragm 19. Said diaphragm 19 is provided with an aperture controlled by the butterfly valve 22, which valve is controlled by linkage to be described presently, responsive to a fuel metering valve.

The burner 18 at the region thereof below the diaphragm 19 is provided with a plurality of ports 22—28. Above the diaphragm 19, said burner 18 is provided with a plurality of ports 24—26. Air entering through the perforated bottom 18 of the heating element 11 may pass through the ports 22—28 into the lower portion of the burner 18. Air through the perforated bottom 18 may pass through the opening in the diaphragm 19 controlled by the valve 22, which may enter the top portion of the burner 18 through the ports 24—26. Adjacent to the top of the burner 18 is an upper diaphragm 25, which may be imperforate and may direct secondary air through the ports 24—26, conveying the combustible mixture adjacent to the top of the burner 18. Flame issuing from the top of the burner 18 will discharge its heat to the wall of the heating element 11. A flue 26 communicates with the interior of the element 11 adjacent to the top portion thereof, which flue conducts gases from said element 11 through the rear wall of the casing 10. Heat communicated to the wall of the element 11 will be transmitted to the air in the housing 12 which is delivered through the grille 14 at the top of the casing 10.

The flue 26 is provided with a damper 27. The damper 27 is illustrated as having a diameter slightly less than the diameter of the flue 26. For reasons which will be explained hereinafter, there is a decided advantage in permitting the flow of combustion gases past the damper 27 at all times.

The numeral 28 indicates a fuel metering valve having a handle 29. Said handle 29 is connected to a rod 30, which extends to a region adjacent to the top of the casing 10. The top of said rod 30 is provided with a knob 31, whereby the fuel metering valve 28 may be controlled, if preferred, at the top of the casing 10. Said rod 30 is connected to the valve 22 for controlling the opening in the diaphragm 19 and to the damper 27 for controlling the flue 26. The connection between the rod 30 and the valve 22 is through an arm 32 joined to the connecting rod 33, which in turn is joined to a crank 34 secured to the shaft 35 of the valve 22. The connection of the rod 30 to the damper 27 is through an arm 36 connected to said rod 30, which arm 36 is joined to a connecting rod 37, the other end of which is joined to a crank 38 fast to the shaft 39 of the damper 27. When the rod 30 is turned either by means of the handle 29 or the knob 31 to meter the flow of fuel through the valve 28, corresponding rotary movements will be communicated to the valve 22 and the diaphragm 19 and to the damper 27 in the flue 26, whereby the supply of air through the valve 22 and the withdrawal of spent gases past the damper 27 will be increased or decreased substantially in proportion to increases and decreases in the supply of fuel.

It will be noted above, the damper 27 is of less diameter than the flue 26, permitting the flow of combustion gases past said damper even when said damper is located in a position diametrically across the flue 26. Moreover, the metering valve 28 is so connected with the damper 27 that when the valve 28 is in its off-position, or closed position, the damper 27 is definitely askew of the flue 26; that is, in a definitely open position.

Figures 4 and 5 illustrate certain preferred relationships between the metering valve 28 and the damper 27. Figure 4 shows that the handle 29, which is connected to the rod 30 leading to the metering valve 28, may have definite settings as follows: position 0 indicating the off-position or closed position of the valve, and positions 1, 2, 3, 4, 5 and 6 indicating progressively increased openings of said valve. Figure 5 indicates the positions of the damper 27 corresponding to the positions of the handle 29 of the metering valve. As shown in Figure 5, when the metering valve is in off-position; that is, the position completely stopping the flow of oil from the valve, the damper will be slightly askew from its diametrical position. When the handle 29 is in position 1, the damper 27 will be disposed diametrically across the flue 26 to provide the maximum restricting effect upon the flow of combustion gases through the flue 26 though, as indicated above, in this position, the damper 27 permits the flow of combustion gases through the flue 26.

As the metering valve 28 is progressively opened, the damper 27 is moved progressively through an arc to its maximum open position as indicated at position 6 in Figure 6.

Damper 22 will move with damper 27 when the handle 29 of the valve 28 is operated. In the off-position of the metering valve 28, the damper 22 will preferably be in a slightly open position just as the damper 27 will be slightly displaced from its maximum closing position. This will permit a certain amount of air to enter the pot burner 15 through the apertures 24—26 mingling with the products of combustion resulting from the passage of air through the apertures 24—26. The passage of air under the burner 5, and gas passages through the apertures 24—26 will perhaps allow a combustion of the fuel collected in the bottom of the burner 15 at a higher rate than necessary, but this will do no harm. In explanation, it may be stated after the metering valve 28 has closed, the accumulation of fuel in the bottom of the pot burner 15 will be consumed by combustion with an adequate amount of air thereby avoiding smoking, such as might result from lack of combustion air.

It will be noted that when the damper 27 is in its maximum closing position, that is, in its position diametrical with respect to the flue 26, air can still pass through the ports 23—23. This is advantageous for the reason that complete stoppage of the products of combustion should not take place; otherwise, the fire in the pot burner 15 would be extinguished for lack of air.

When the dampers 27 and 22 are in their positions to provide maximum dampering functions (position 1, Figure 5), the metering valve 28 is in position for permitting a flow of oil in proportion to the air supplied through the ports 23—23. When the fuel valve 28 is in its off-position or closed position; that is, the position 0, the valves 27 and 22 have passed their maximum closing positions and are slightly open permitting the burning out of any fuel which has accumulated in the pot burner 15.

The valve 22, as illustrated in Figures 1 and 2, is simple and operates successfully in practice to avoid undue disturbance of the symmetry of the flame in the burner 15, but does not distribute the
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To provide more even distribution through said annular region 21 surrounding the burner above the diaphragm 19 with the uniformity afforded by this construction illustrated in Figure 6 may be used. According to the construction of Figure 6, the diaphragm 19 is provided with a plurality of apertures 45, which may be symmetrically spaced about the axis of the burner 15. Said apertures 45 may be controlled simultaneously by means of an annular valve 41 provided with a plurality of apertures 42. Said annular valve 41 carries a plurality of rollers 43 adapted to engage the interior wall of the heating element 11, whereby to minimize any possibility of jamming of the annular valve 41. Said valve 41 is adapted to be oscillated by means of the arm 44 projecting radially therefrom, which arm 44 extends through an aperture 45 in the heating element 11. Said arm 44 is joined to the connecting rod 45, joined to the arm 46 secured to the vertical flue 30.

The construction illustrated in Figure 6 has the further advantage that when the damper 27 is in partly closed position, corresponding to the offset position or closed position of the metering valve 28, the openings 42 will remain closed as illustrated in Figure 7. When the metering valve 28 is moved to position No. 1, the said openings 42 will be closed; at position 2 of the metering valve 28 the aperture 42 will be partly open; and at position 3 of the metering valve the aperture 42 will be opened. Therefore, by reason of the damper construction illustrated in Figure 6, not only is uniformity of distribution of the air about the burner 15 improved, but the further advantage is had that the apertures 42—42, being closed when the metering valve is in offset position, will not add to the flow of air for combustion through the apertures 24—24 to cause the burning of the fuel in the bottom of the burner 15 at too high a rate.

The present invention, according to either of the illustrated embodiments thereof, has the decided advantage over certain prior structures in that the air entering the burner 15 through the ports 24—24 is distributed peripherally with sufficient uniformity so that the symmetry of the flame within the burner 15 is preserved.

It will be noted that the valve cooperating with the diaphragm 19 in either of the modifications above described controls the flow of combustion air through the ports 24—24 above said diaphragm 19 but does not control the ports 23 below said diaphragm. Therefore, closing movement of said valve does not serve to reduce the velocity of air entering the lowermost ports in the burner 15.

As explained above, operation of the rod 30 which controls the metering of fuel through the valve 28 is accompanied by a corresponding operation of the valve cooperating with the diaphragm 19 and with the damper 27 in the flue 26. By using the two controls referred to, greater efficiency can be obtained than with either one taken by itself.

In practical operation it will probably be preferred to use a flue 26 of a size larger than is absolutely necessary for the highest fire operation. A slight closing of the damper 27 under these circumstances will have no adverse effect on the spent gases escaping through the flue. However, when the burner 15 is operated at the lower stages of fire, the damper 27 acts very readily to check the draft pull and to reduce the velocity of the air entering the ports of the burner 15 to produce a balanced flame condition.

Though certain preferred embodiments of the present invention have been described in detail, many modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is:

1. In a space heater, in combination, a heating drum, a burner disposed interiorly of said heating drum and providing with said heating drum a passageway for combustion air, a diaphragm located in said last mentioned passageway, said burner having peripherally spaced air inlet ports communicating with said passageway on one side of said diaphragm and other peripherally spaced inlet ports communicating with said passageway on the other side of said diaphragm, a flue for conducting gases from said burner, and means connecting said metering valve and means connecting said metering valve to said valve means and to said damper whereby said valve means and said damper move in unison with said metering valve, said damper being in a position to provide less than its maximum dampering effect when said valve is in closed position.

2. In a space heater, in combination, a heating drum, a burner disposed interiorly of said heating drum and providing with said heating drum a passageway for combustion air, a diaphragm located in said last mentioned passageway, said burner having peripherally spaced air inlet ports communicating with said passageway on one side of said diaphragm and other peripherally spaced inlet ports communicating with said passageway on the other side of said diaphragm, a flue for conducting gases from said drum to the exterior of said casing, valve means for controlling the passage of combustion air through said diaphragm, damper means for said flue, a valve for metering the flow of fuel to said burner, means for operating said metering valve and means connecting said metering valve to said valve means and to said damper whereby said valve means and said damper move in unison with said metering valve, said damper being in a position to provide less than its maximum dampering effect when said valve is in closed position.

3. In a space heater, in combination, a heating drum, a pot-type burner located interiorly of said drum and providing with said drum a passageway for combustion air, a perforated diaphragm in said passageway, said burner having peripherally spaced air inlet ports located on one side of said diaphragm and other peripherally spaced inlet ports located on the other side of said diaphragm, means for admitting fuel to said burner, valve means for controlling the flow of said fuel and other valve means for controlling the passage with said first mentioned valve means for controlling the flow of air through said diaphragm, a flue for conducting spent gases from said heating drum, a damper in said flue and means connecting said damper to move in pro-
portion to movement of said valve means, said damper being in a position to provide less than its maximum dampering effect when said valve means is in closed position.

4. In a space heater, in combination, a heating drum, a burner for said drum, said burner and said drum having a space therebetween for the passage of air exteriorly of said burner to the top of said burner, said burner having peripherally spaced inlet ports for combustion air at different levels above the bottom thereof, a flue for conducting spent gases from said burner to the exterior of said drum, a valve for controlling the flow of fuel to said burner, means for operating said valve and means responsive to operation of said valve for controlling the flow of combustion air through the uppermost ports in said burner and for dampering said flue, said dampering means being in a position to provide less than its maximum dampering effect when said valve is in closed position.

5. In a space heater, in combination, a heating drum, a burner for said drum, said burner and said drum having a space therebetween for the passage of air exteriorly of said burner to the top of said burner, said burner having peripherally spaced inlet ports for combustion air at different levels above the bottom thereof, a flue for conducting spent gases from said burner and the flow of spent gases through said flue, said means for controlling the flow of spent gases through said flue, being operative to control said flow to permit more than minimum flow when said valve is in closed position.

6. In a space heater, in combination, a heating drum, a burner for said drum, said burner and said drum having a space therebetween for the passage of air exteriorly of said burner to the top of said burner, said burner having peripherally spaced inlet ports for combustion air at different levels above the bottom thereof, a flue for conducting spent gases from said burner to the exterior of said drum, a valve for controlling the flow of fuel to said burner, means for operating said valve and means responsive to operation of said valve for dampering said drum, said dampering means being in a position to provide less than its maximum dampering effect when said valve is in closed position.

7. In a space heater, in combination, a heating drum, a burner for said drum, said burner and said drum having a space therebetween for the passage of air exteriorly of said burner to the top of said burner, said burner having peripherally spaced inlet ports for combustion air at different levels about the bottom thereof, a flue for conducting spent gases from said burner to the exterior of said drum, a valve for controlling the flow of fuel to said burner, means for operating said valve and a damper for said flue, said damper in its maximum dampering position permitting the passage of spent gases through said flue, means connecting said flue to said damper whereby said damper will move proportionally to opening and closing movements of said valve, said damper being in a position to provide less than its maximum dampering effect when said valve is in closed position.

8. In a space heater, in combination, a heating drum, a burner for said drum, said burner and said drum having a space therebetween for the passage of air exteriorly of said burner to the top of said burner, said burner having peripherally spaced inlet ports for combustion air at different levels about the bottom thereof, a flue for conducting spent gases from said burner to the exterior of said drum, a valve for controlling the flow of fuel to said burner, means for operating said valve and a damper for said flue, said damper in its maximum dampering position permitting the passage of spent gases through said flue, said damper being in a position to provide less than its maximum dampering effect when said valve is in closed position, and means operating proportionally to opening and closing movements of said valve, said damper being in a position to provide less than its maximum dampering effect when said valve is in closed position, and means operating proportionally to opening and closing movements of said valve, said damper being in a position to provide less than its maximum dampering effect when said valve is in closed position.

REFERENCES CITED

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

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re. 15,000</td>
<td>Stafford</td>
<td>Dec. 7, 1920</td>
</tr>
<tr>
<td>2,204,694</td>
<td>Piehl</td>
<td>June 18, 1940</td>
</tr>
<tr>
<td>2,257,834</td>
<td>Behee</td>
<td>Oct. 7, 1941</td>
</tr>
<tr>
<td>2,313,568</td>
<td>Miller</td>
<td>Mar. 9, 1943</td>
</tr>
<tr>
<td>2,346,815</td>
<td>Breese</td>
<td>Apr. 18, 1944</td>
</tr>
<tr>
<td>2,357,587</td>
<td>Hammell</td>
<td>Sept. 5, 1944</td>
</tr>
</tbody>
</table>