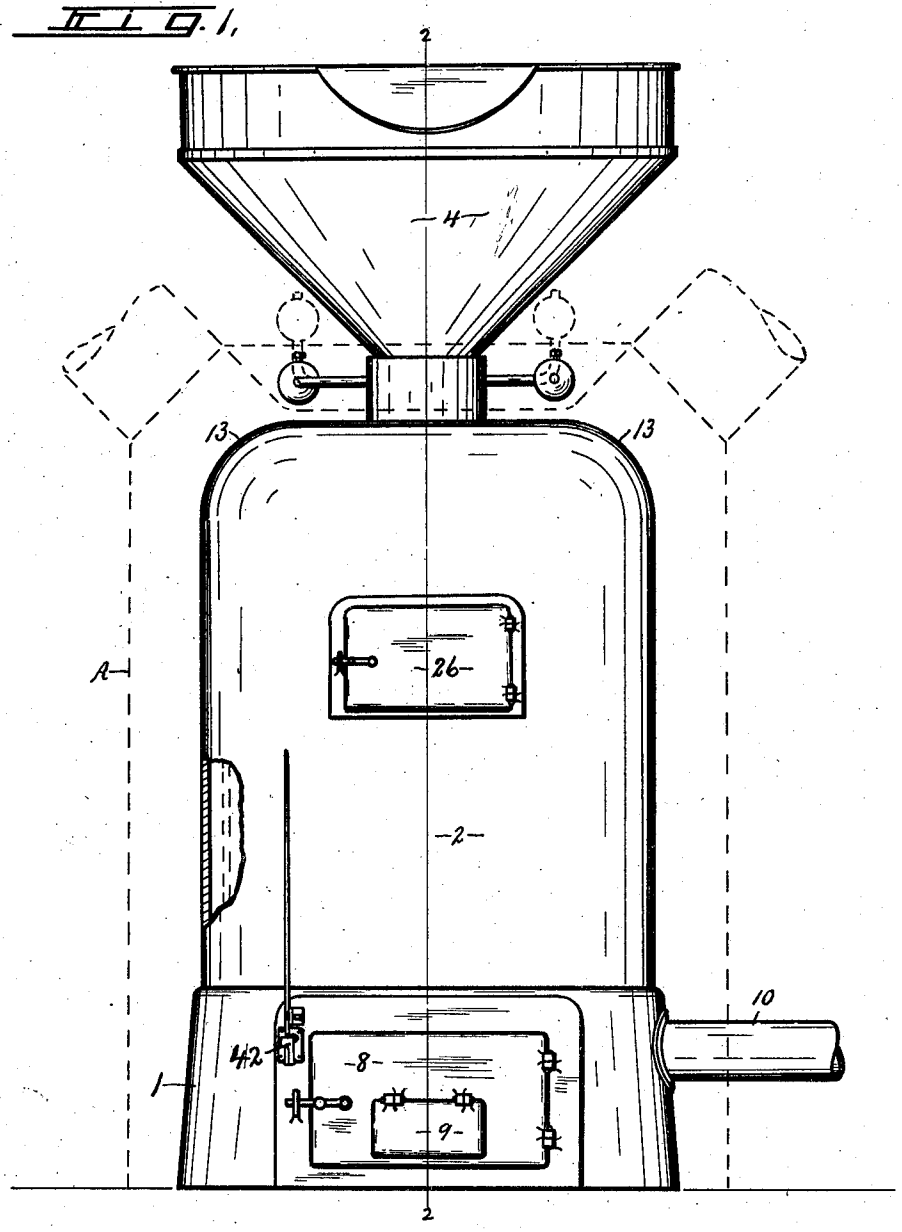
June 17, 1930. G. BORGESON 1,765,201

HEATER

Filed Jan. 28, 1929 3 Sheets-Sheet 1

FIG. 1.



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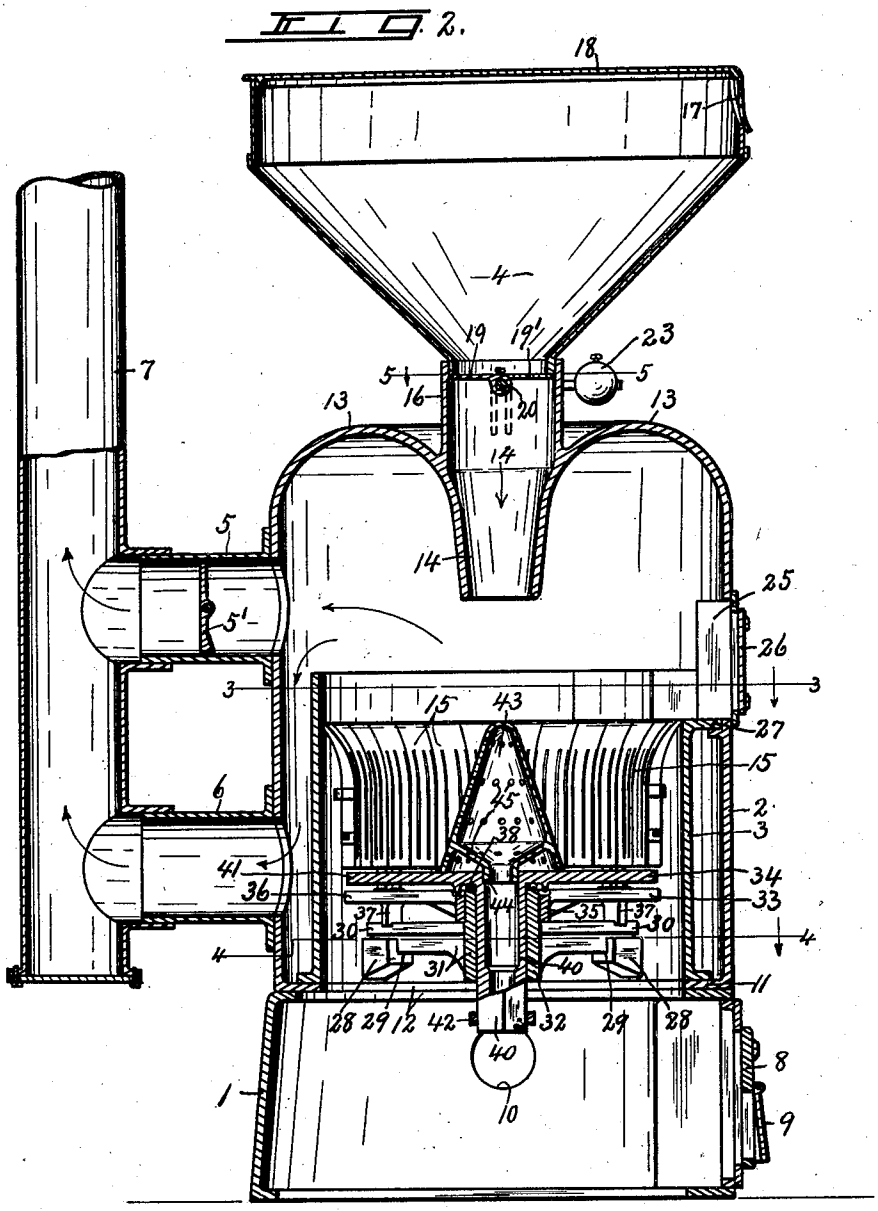
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FIG. 2.



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HEATER

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FIG. 3.

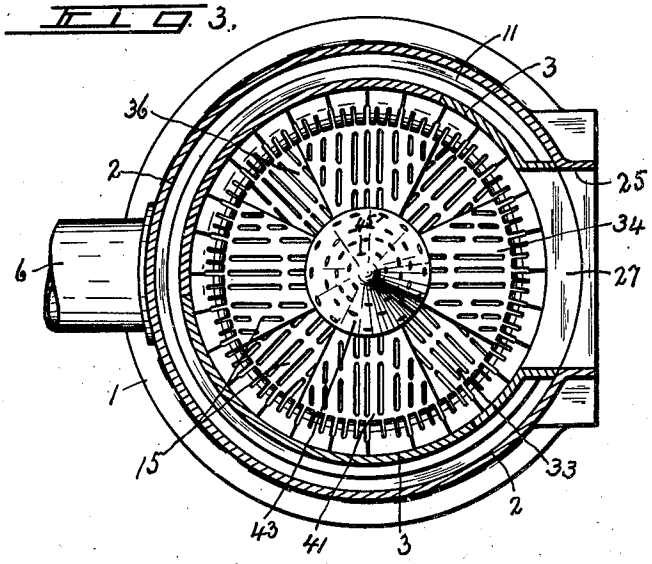


FIG. 4.

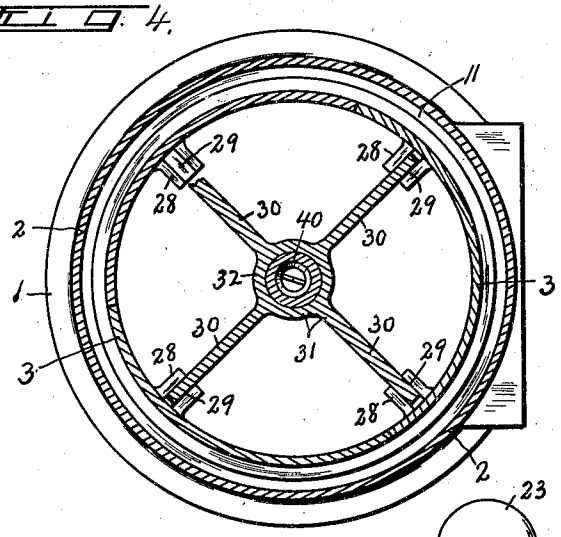
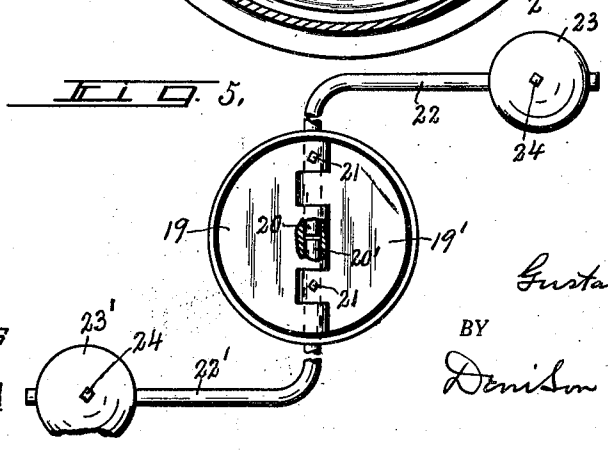


FIG. 5.



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Patented June 17, 1930 1,765,201

UNITED STATES PATENT OFFICE

GUSTAV BORGESON, OF SYRACUSE, NEW YORK

HEATER

Application filed January 28, 1929. Serial No. 335,613.

This invention relates to a heater for heating air or water or for the conversion of water into steam to be used in heating houses or other buildings and for any other purpose to which it might be applied and is constructed more particularly for the reception of and cooperation with basket grates or firepots of the character set forth in my pending application Serial No. 316,422, filed November 1, 1928.

These basket grates are constructed in such manner that air may be supplied to the fuel from the bottom upwardly and also from the outside inwardly at different levels of the fuel for the purpose of effecting a more complete distillation and liberation of the gases so that the latter may be entirely consumed within the combustion chamber resulting in a maximum degree of heat from a minimum quantity of fuel and also reducing to a minimum the escape of unburned gases or smoke through the smoke flue and chimney.

In heaters of this character the heater per se is usually surrounded or inclosed by a separate shell in more or less spaced relation thereto to form either an air jacket or water jacket in which the air or water is heated to the desired degree of temperature by the heat radiated from the shell of the heater, and the main object of the present invention is to associate the heat radiating shell with the fuel basket and combustion chamber in such manner as to obtain a greater amount of heat radiating surface and also a greater degree of heat radiation than has heretofore been practised.

Another object is to provide the heater with a fuel magazine arranged to automatically feed the fuel by gravity directly over and into the vertical center of the basket in quantities proportionate to the consumption of the fuel.

Another object is to provide the basket with means for automatically distributing the fuel more or less evenly throughout the interior and around the axis thereof.

Another object is to provide the heater with an interior supplemental shell surrounding the basket and in spaced relation to the outer shell of the heater whereby the highly heated products of combustion from the combustion chamber may be directed over the top and downwardly around the supplemental shell and then allowed to pass through the lower draft flue into the main flue or chimney so as to obtain a greater heating efficiency of the surrounding air or water than would be possible without the use of the supplemental shell.

A further object is to extend the discharge nozzle of the fuel feeding magazine downwardly some distance into the center of the combustion chamber where it is surrounded by the highly heated products of combustion for preheating the fuel as it discharges into the basket and thereby to accelerate the conversion of the fuel into combustible gases.

Other objects and uses relating to specific parts of the heater will be brought out in the following description.

In the drawings:—

Figure 1 is a front elevation, partly in section, of a heater embodying the various features of my invention, the dotted lines indicating an external jacket surrounding the heater for the reception of air or water which is to be heated.

Figure 2 is a vertical sectional view, taken in the plane of line 2—2, Figure 1.

Figures 3, 4 and 5 are horizontal sectional views taken respectively in the planes of lines 3—3, 4—4 and 5—5, Figure 2, Figure 5 being enlarged, partly in section and partly broken away.

As illustrated, this heater comprises a hollow base or ash box —1—, a main upright shell —2—, an inner supplemental shell —3— and a fuel magazine —4— together with direct and indirect outlet conduits —5— and —6— leading to an upright stack —7— which, in turn, is adapted to be connected to a suitable chimney flue.

The front side of the ash box —1— is provided with the usual main door —8— upon which is mounted a suitable draft door —9—, one side of the ash box being provided with an air inlet conduit —10— for attachment to an air blower (not shown), if desired.

The lower end of the main shell —2— is provided with an inturned flange —11— bolted or otherwise secured to the top wall of the ash box —2—, the adjacent ends of the ash box —1 — and shell —2— being provided with registering openings —12— of relatively large diameter to permit the passage of air therethrough, and also the placing and removal of interior parts.

The ash box —1— and shells —2— and —3— are preferably made of cast iron, but obviously may be made of boiler iron or other suitable material, the shell —2— being extended upwardly a considerable distance above the upper end of the inner shell —3— and formed with an inwardly and downwardly turned top wall or crown sheet —13—.

The central portion of the top wall of the shell —2— is depressed some distance below its remaining portions to form a delivery nozzle —14— communicating with the lower end of the magazine —4— to direct the passage of fuel from the magazine to the center of the combustion chamber and into an underlying fuel basket —15— hereinafter more fully described.

The top wall —13— of the shell —2— is also provided with an upwardly extending tubular nipple —16— forming an extension of the nozzle —14— for receiving and supporting the lower end of the magazine —4—. The lower end of the magazine —4— is removably fitted within the upper end of the tubular extension —16— while the remaining superposed portions are flared upwardly and outwardly to form a hopper of relatively large capacity for receiving and retaining a considerable quantity of coal or other solid fuel.

The upper portion of the hopper or magazine —4— is substantially cylindrical and the front portion thereof is cut away at —17— to form an inlet for the fuel and for convenience of introduction of the fuel into the hopper at a lower level than the top of said hopper when the lid is opened, said inlet being normally closed by a pendant portion of the lid.

The top of the hopper is normally closed by a cover or lid —18— which may be opened and closed at will to permit the entrance of fuel through the inlet —17— and also to seal the top of the hopper against escape of gases therethrough into the room in which the heater is located.

The fuel feed from the magazine —4— into the nozzle —14— is controlled by a suitable damper or dampers consisting of in this instance two, substantially semi-circular plate sections —19— and —19′— having their inner edges secured to a pair of coaxial shaft sections —20— and —20′— which extend diametrically across the interior of the extension —16— and are journaled in the outer walls thereof in about the same plane as the lower end of the hopper —4— within said extension as shown more clearly in Figure 2. Each damper section —19— and —19′— is secured to its corresponding shaft —20— and —20′— by any suitable means such as set screws —21— to cause the shafts with their respective dampers thereon to rock in unison.

The outer ends of the shafts —20— and —20′— are provided with crank arms —22— and —22′— extending radially therefrom in opposite directions, the outer ends of said crank arms being provided with suitable weights —23— and —23′— for normally holding the dampers —19— and —19′— in their closed positions with their outer edges in engagement with the lower end of the hopper —4— as shown in Figure 2.

The weights —23— and —23′— are adjustable along their respective crank arms —22— and —22′— to substantially counterbalance the weight of the damper sections —19— and —19′— and in part, the fuel which may rest thereon, said weights being held in their adjusted positions by set screws —24—, or equivalent fastening means, Figure 5.

When fuel is present in the hopper —4— its weight will be sufficient to open the damper sections —19— and —19′— sufficiently to allow limited quantities of the fuel to pass from the magazine —4— through the nozzle —14— and into the underlying fuel basket —15— but it is evident that when the basket is filled and the surface of the fuel therein assumes a definite angle of repose with its apex in the lower end of the nozzle —14— the downward feed of the fuel through the nozzle will be retarded thereby relieving the pressure of the fuel upon the damper sections —19— and —19′— and allowing the latter to be more or less closed by the weights —23— and —23′—.

It is evident, however, that the weights may be adjusted to overcome the weight of the fuel upon the damper sections in which case the weights may be raised by hand at any time desired to allow the fuel to feed downwardly through the chute or nozzle —14— into the underlying fuel basket —15— but as soon as the lifting force upon the weights is withdrawn they will automatically return their dampers to their closed position.

The outlet conduit —5— is disposed in a plane between the upper end of the inner shell —3— and dome —13— of the shell —2— while the indirect outlet conduit —6— is disposed in a plane between the lower and upper ends of the inner shell —3— so that when the conduit —5— is closed the products of combustion are caused to circulate over the upper edge of the shell —3— and

then downwardly around the same before passing out through the indirect outlet conduit —6— thereby increasing the temperature of the adjacent portion of the outer shell —2— which, added to the intense heat of the portion of the outer shell —2— above the inner shell —3— greatly increases the heat radiating area of the outer shell resulting in a more expeditious heating of the air or water in the surrounding jacket as —A— as shown by dotted lines in Figure 1.

These outlet conduits —5— and —6— preferably lead from the rear side of the heater shell —2— which is provided in its front side with a fuel inlet opening —25— and door —26— therefor to be used for the insertion of fuel into the fuel basket particularly when starting the fire in the heater.

The lower end of the inner shell —3— rests upon the inturned flange —11— of the outer shell —2— and is preferably made in two or more sections to permit them to be installed through the ash box and opening —12— leading therefrom to the inside of the heater shell —2—.

The front portion of the upper end of the shell —3— on a level with the fuel inlet opening —25— is cut away and flanged outwardly at —27— coincident with the bottom of the opening —25— to form a shelf along which the fuel may be directed from the opening —25— into the basket —15—.

The remaining portions of the upper end of the shell —3— extend above the upper end of the basket —15— to a level between the bottom of the fuel opening —25— and bottom of the direct draft outlet —5— as shown in Figure 2 to assist in confining the upper portions of the fuel within the basket, it being understood that the front side of the upper portion of the shell —3— above the ledge —27— will be flanged against the outer shell —2— at opposite sides of the opening —25— for guiding the fuel into the basket.

The lower end of the inner shell —3— is provided with a series of, in this instance four, inwardly projecting lugs —28— arranged in uniformly spaced relation circumferentially around the axis of said shell and provided with grooves —29— in their upper sides for receiving a corresponding number of arms —30— of a grate-supporting spider —31— similar to that shown in my pending application previously referred to.

That is, the arms —30— are T-shaped in cross section and their lower upright flanges are seated in the grooves —29— to hold the spider —31— against relative rotary movement while permitting it to be placed in operative position and removed at will.

The grate supporting spider —31— is provided with a central hub —32— extending some distance above and below the level of the arms —30— for receiving and supporting lower and upper grate sections —33— and —34— similar to those shown in my pending application referred to.

The lower grate —33— is provided with a central hub —35— fitted over and upon the upper end of the hub —32— and is also provided with a series of, in this instance four, radial segments —36— having openings therein for the passage of air therethrough, the outer ends of the segments —36— being provided with pendant lugs —37—, the lower ends of which are grooved or recessed to fit upon the top portions of the arms —30— for locking the grate —33— to the supporting member —30— against relative rotary movement and at the same time permitting said grate sections to be removed or replaced at will.

The upper grate section —34— is journaled upon the upper end of the hub —32— through the medium of ball-bearings —38— and is provided with a central hollow hub —40— projecting downwardly through and below the hub —32— for relative rotary movement therein.

This upper grate —34— is also provided with a plurality of, in this instance four, radially projecting segments —41— having apertures therein for the circulation of air therethrough, said segments —41— being movable into and out of registration with the segments —36— of the lower grate —33— and with the spaces between the last-named segments for shaking and dumping purposes as described in my pending application previously mentioned.

The lower end of the hub of the grate section —34— is preferably angular in cross section to receive a suitable operating member —42— by which said section may be turned about its axis for shaking and dumping purposes.

The basket —15— is supported upon the lower grate section —33— and is composed of upright relatively narrow perforated bars arranged edge to edge circumferentially and interlocked with each other in the manner set forth in my pending application referred to, the upper end of said basket being disposed in a plane below the upper edge of the supplemental shell —3— and at about the same level as the bottom ledge —27— of the fuel opening —25—.

A hollow upright conical shell —43— is removably supported upon the upper grate section —34— coaxial therewith and with the axis of the magazine discharge nozzle —14— with its apex uppermost for the purpose of distributing the fuel discharged from said nozzle more evenly over and upon the surface of the grate within the basket —15—.

This shell —43— extends from the grate section —34— to about the level of the top of the basket —15— and tapers upwardly at

an acute angle at the apex, the base of said shell being provided with a reduced extension —44— normally seated in the upper end of the hollow hub of the section —34— and having the outer portions of its lower end resting upon the upper surface of said section.

The portions of the base of the shell connecting the reduced extension —44— with the outer walls thereof are inclined upwardly and outwardly in spaced relation to the upper surface of the grate section —34— and together with the peripheral walls of the shell are provided with perforations —45— to permit the passage of air therethrough to the fuel for increasing the combustion of the fuel and accelerating the distillation of the gases, it being understood that the hub of the section —34— is hollow from the bottom up to permit the air to pass from the interior of the ash box and thence through the perforated shell —43— to the fuel within the basket —15—.

It will be noted that the shell —43— is of considerably less diameter than the interior diameter of the basket —15— thus leaving a clear open space between the shell and outer wall of the basket for the reception of a relatively large body of fuel and also permitting a relatively large volume of air to flow from the bottom upwardly through the fuel in the basket in addition to the air which is admitted through the perforations in the sides of the basket at different levels from bottom to top, all of which accelerates the distillation of the gases from the fuel and assures a more perfect combustion of the gases.

The direct draft conduit —5— is provided with a suitable damper —5'— which, when opened, allows the products of combustion to pass directly from the combustion chamber of the heater into the smoke stack —7— but when closed causes the products of combustion to pass from the combustion chamber downwardly between the shells —2— and —3— and outwardly through the indirect conduit —6— to the stack —7—.

When assembling the parts of the heater within the shell —2— the sections of the shell —3— may be inserted through the ash box and opening —12— and placed in operative position upon the flange —11— of the shell —2— so as to form a complete cylinder, the sections of the shell —3— being bolted or otherwise secured to the flange —11— or to the top of the ash box —1— by bolts or any other conventional securing means.

The spider —31— is then placed in operative position upon the lugs —28— to be held in its operative position by its own weight after which the lower grate section —33— is placed in operative position upon the radial arms —30— of the spider —31— and is also held in operative position by its own weight and by the hub of the spider —31—.

The upper grate —34— is then placed in operative position upon the hub of the spider —31— to be supported therein by its own weight.

The sections of the basket —15— are then placed in operative position upon the lower grate section —33— in the manner shown in my pending application previously referred to after which the conical shell —43— is placed in operative position upon the upper grate section —34—.

When building the fire the fuel will be inserted through the opening —25— into the basket —15— and as usual the dampers —5'— and —9— will be opened for direct draft.

When the fuel is under proper combustion within the basket —15— the magazine —4— may be filled with fuel and the weight of the fuel acting upon the damper sections —16— will automatically open the same to a greater or less degree against the action of the counterweights —23— and 23' thereby permitting the fuel to drop by gravity into the basket —15— and upon the grate sections —34— and —33— around the central cone —43—.

When the fuel is sufficiently ignited for distillation of the gases one or both of the dampers —5'— and —9— may be closed to cause indirect draft of the products of combustion downwardly around the inner shell —3— and out through the indirect conduit —6— to the stack —7—.

When the fuel is ignited and under combustion air is supplied thereto through the openings in the grates —33— and —34— and also through the openings in the upright bars of the basket —15— thereby supplying a relatively large amount of air to the fuel to support combustion, it being understood that air may also flow through the tubular hub of the upper grate section —34— into and through the conical shell —43— for supplying air to the interior of the fuel at different levels from the grates —34— to the top of the basket —15—.

Under these conditions the gases will be thoroughly distilled from the fuel and ignited to burn in the combustion chamber of the heater.

The gases burning in the combustion chamber will, of course, rise and impinge against the curved portions of the top or crown sheet —13— of the heater and around the fuel discharge nozzle —14—, the residue of the burned gases passing down the space between the shells —2— and —3— and out through the indirect conduit —6— so as to heat the exterior shell —2— throughout practically its entire area to be radiated through the air or water jacket surrounding

the shell —2—, the heated air or water in said jacket being then conducted through the usual distributing pipes to the various parts of the building to be heated.

Impingement of the gases against the nozzle —14— serves to preheat the fuel therein to accelerate the distillation of the gases from the fuel as it is discharged into the fuel basket —15—.

As the fuel is fed from the magazine —4— into the basket —15— its upper surface will assume a definite angle of repose from the outer marginal edge of the basket upwardly to the mouth of the nozzle —14— and will assist in supporting the superposed body of fuel in the magazine against excessive down feed, under which conditions the weighted damper sections —19— and —19'— will tend to close to further retard the flow of the fuel to the nozzle —14— and will also operate to prevent escape of gases into the magazine.

The upper grate —34— may be oscillated about its axis by means of the operating member —42— and suitable connections at the front of the heater as shown in Figure 1 or the section —34— may be adjusted to register its segments with those of the grate —33— for dumping the fuel from the grate.

During this oscillation of the grate —34— about its axis the conical member —43— may or may not move therewith according to the amount of friction between the fuel and conical shell, it being understood that the basket —15— is held against rotation by connections with the non-rotatable grate section —33—.

I claim:

1. In a heater of the character described, an upright shell having a combustion chamber, the top wall of which is curved inwardly and downwardly from the outer walls toward the center to form a central pendant extension having a fuel inlet opening therethrough.

2. In a heater of the character described, an upright shell having a combustion chamber, the top wall of which is provided with a fuel inlet nozzle extending downwardly into the combustion chamber some distance below the remaining portions of the top wall, the portions of said top wall between the nozzle and outer upright walls of the shell being arched upwardly.

3. In a heater of the character described, an upright shell having a combustion chamber, the top wall of which is provided with a fuel inlet nozzle extending downwardly into the combustion chamber some distance below the remaining portions of the top wall, said top wall having a tubular nipple projecting upwardly from the nozzle, and a fuel-receiving magazine supported on said nipple.

4. In a heater of the character described, an upright shell having a combustion chamber provided with draft outlets in vertically spaced relation and an inner tubular shell supported within and in radially spaced relation to the first-named shell and extending some distance above and some distance below the lower draft outlet, the upper end of the inner shell being disposed in a plane below the upper draft outlet.

5. In a heater of the character described, an upright shell having a combustion chamber, the top wall of which is provided with a fuel inlet nozzle extending some distance above and below the remaining portions of said top, a fuel-receiving magazine connected to the upper end of the nozzle above said top wall, a self-closing valve controlling the passage of the fuel from the magazine into the nozzle and adapted to be opened by the weight of the fuel thereon to permit said fuel to pass through the nozzle into the combustion chamber.

6. In a heater of the character described, an upright shell having a combustion chamber, the top wall of which is curved inwardly and downwardly from the outer walls to form a central fuel inlet nozzle extending downwardly some distance below and upwardly some distance above the remaining portions of said top wall, a fuel-receiving magazine discharging into the upper end of said nozzle, a pair of self-closing dampers in the upper portion of said nozzle for controlling the passage of fuel from the magazine into the nozzle and adapted to be opened by the weight of fuel thereon.

7. In a heater of the character described, an upright shell having a combustion chamber and a fuel-inlet opening leading thereto, said combustion chamber having lower and upper outlet openings for the products of combustion, an inner tubular shell in radially spaced relation to the first-named shell and having its lower end disposed in a plane below the lower outlet opening and its upper end disposed in a plane between said outlet openings and a perforated fuel-receiving basket supported within the inner shell mainly in radially spaced relation thereto and between the lower and upper ends thereof to allow the air to circulate around the basket and through its perforations to the interior thereof.

In witness whereof I have hereunto set my hand this 21st day of January, 1929.

GUSTAV BORGESON.