Feb. 28, 1939. W. W. HALLINAN 2,148,617

OIL BURNER FOR RANGES

Filed May 17, 1937 3 Sheets-Sheet 1

Fig 1

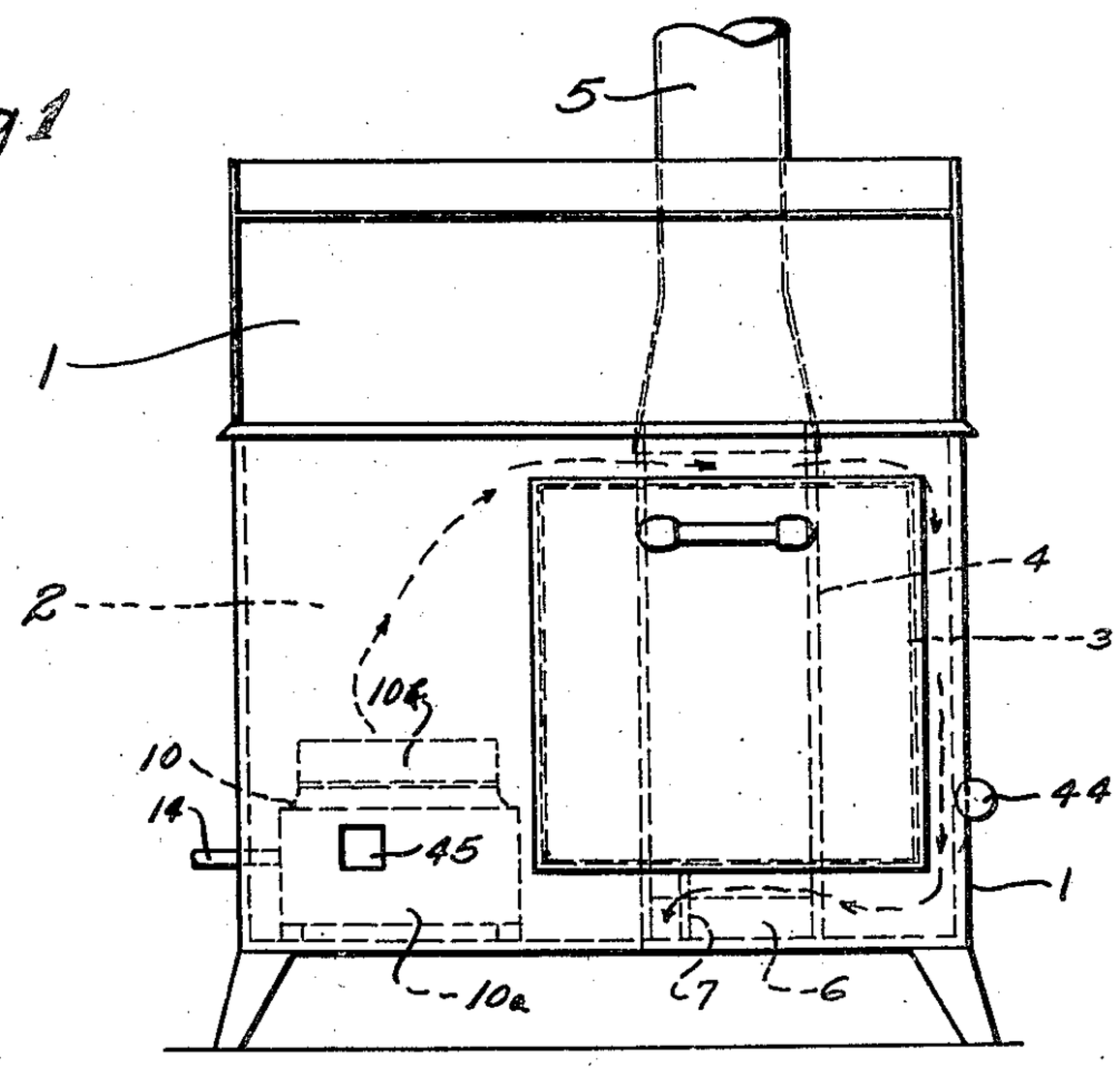
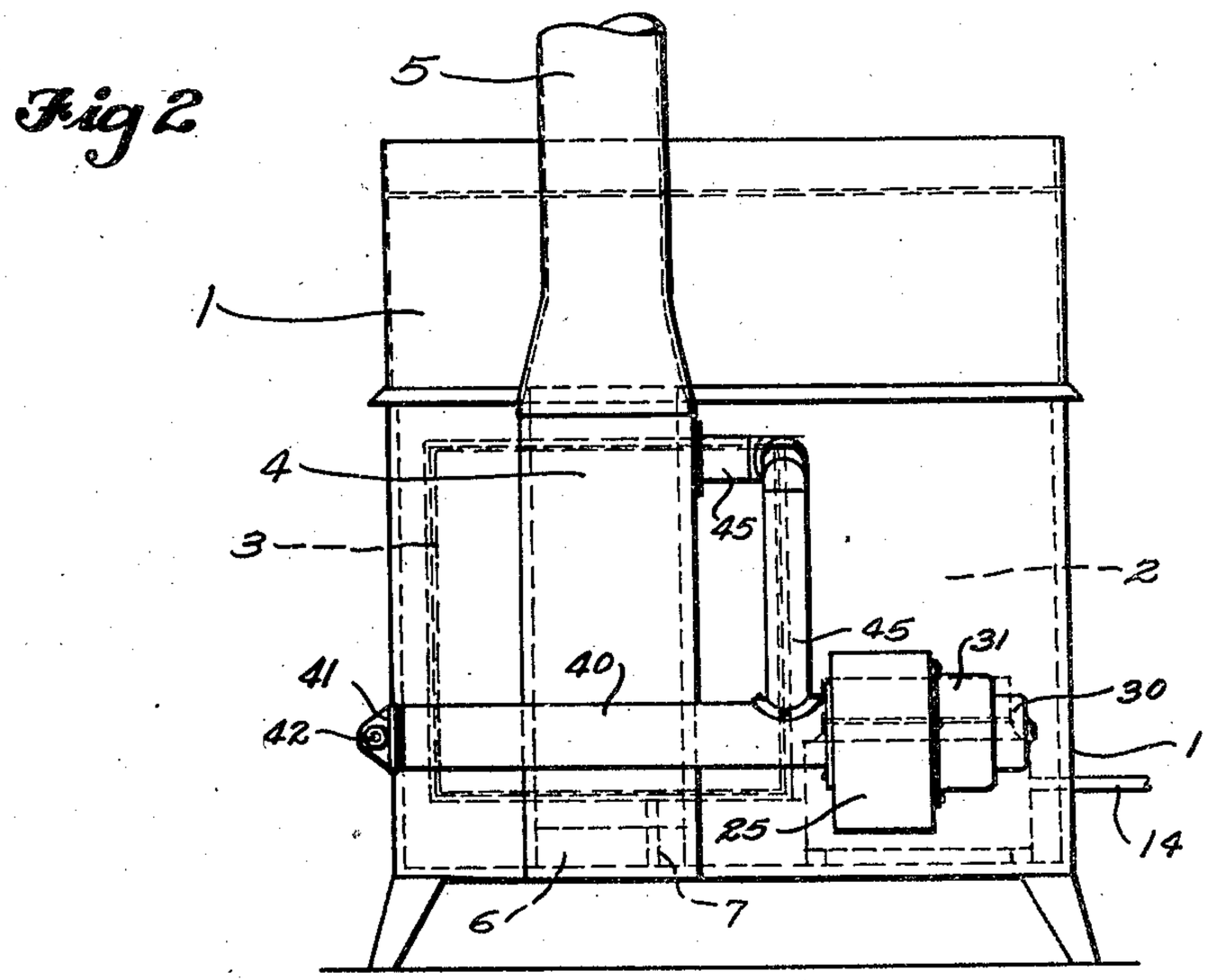



Fig 2

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OIL BURNER FOR RANGES

Filed May 17, 1937 3 Sheets-Sheet 2

Fig 3

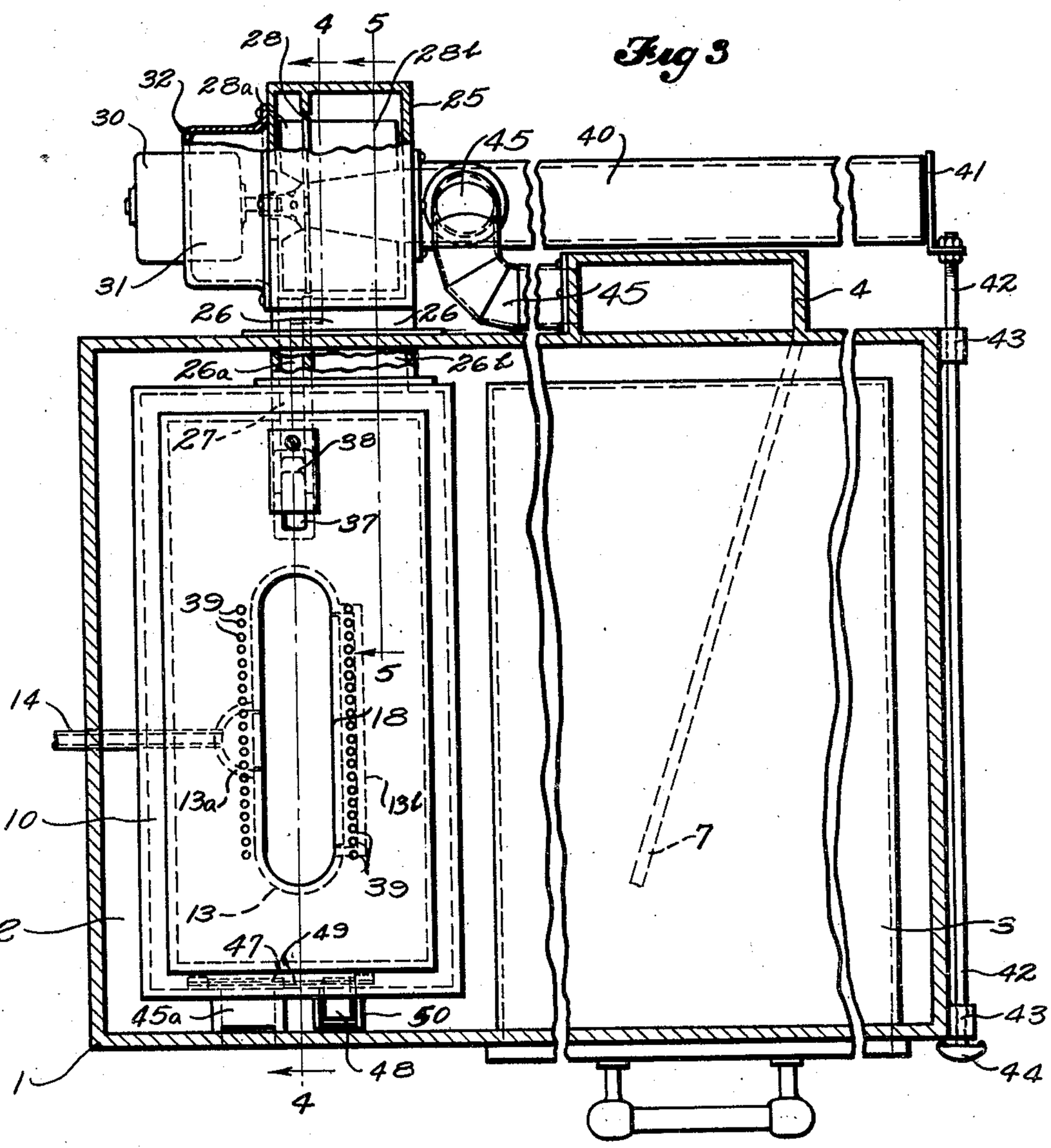
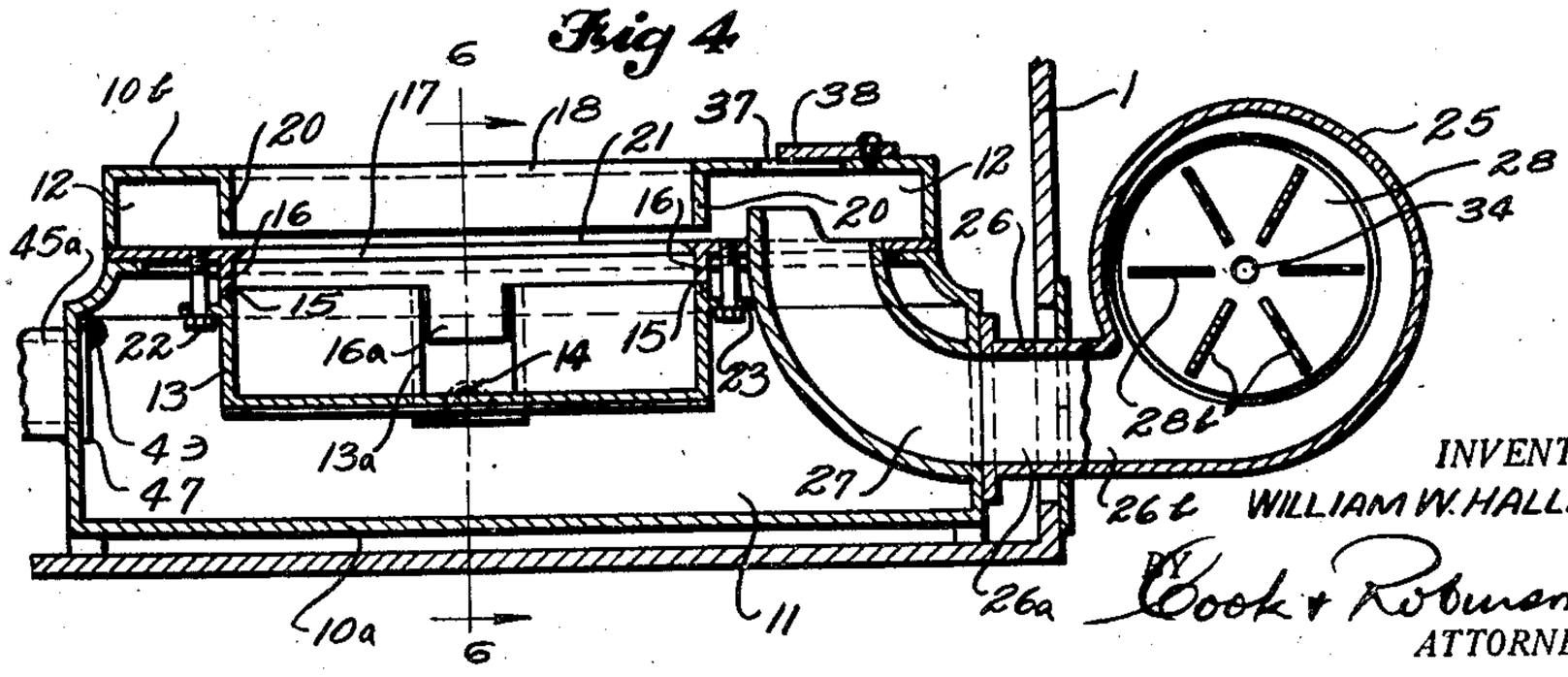



Fig 4

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Filed May 17, 1937 3 Sheets-Sheet 3

Fig 5

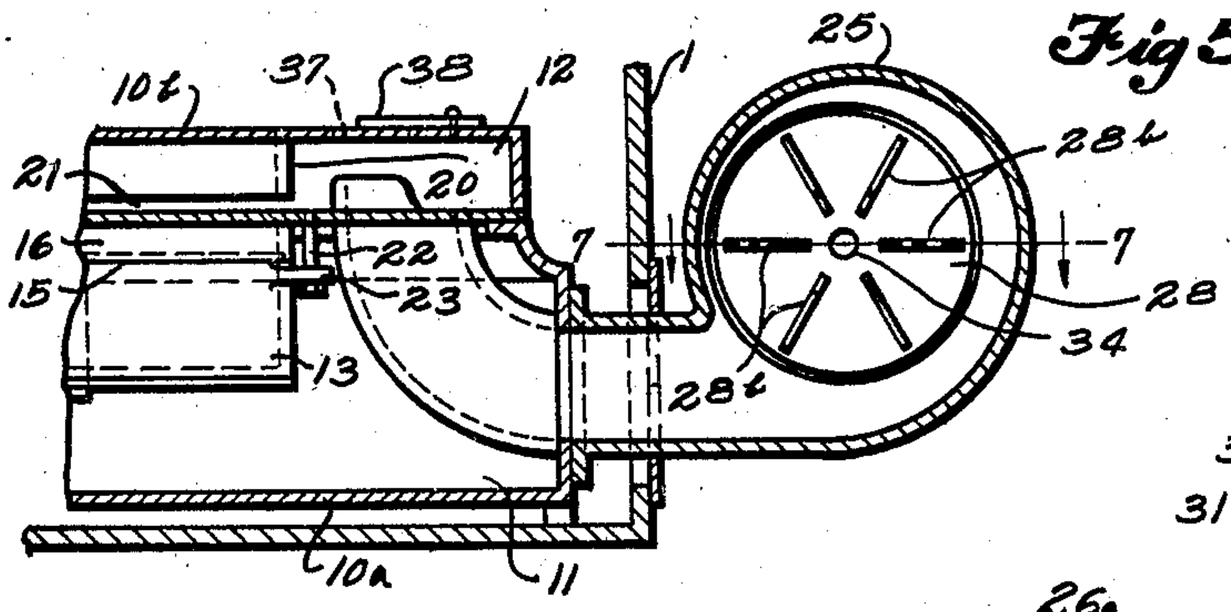



Fig 7

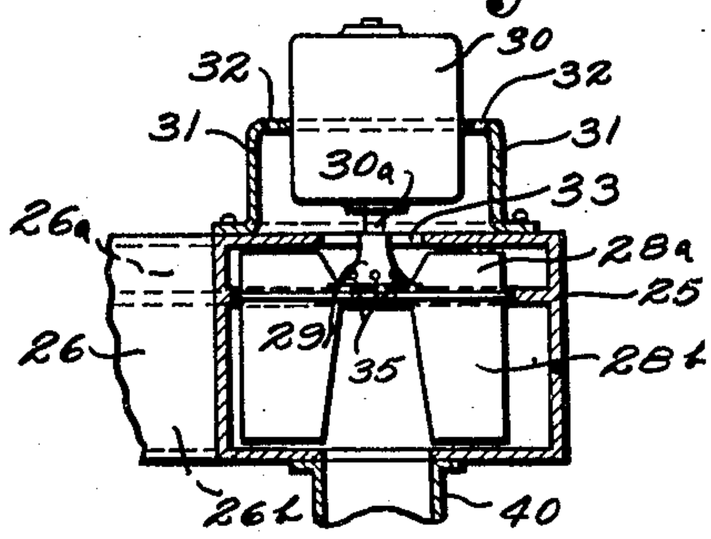



Fig 6

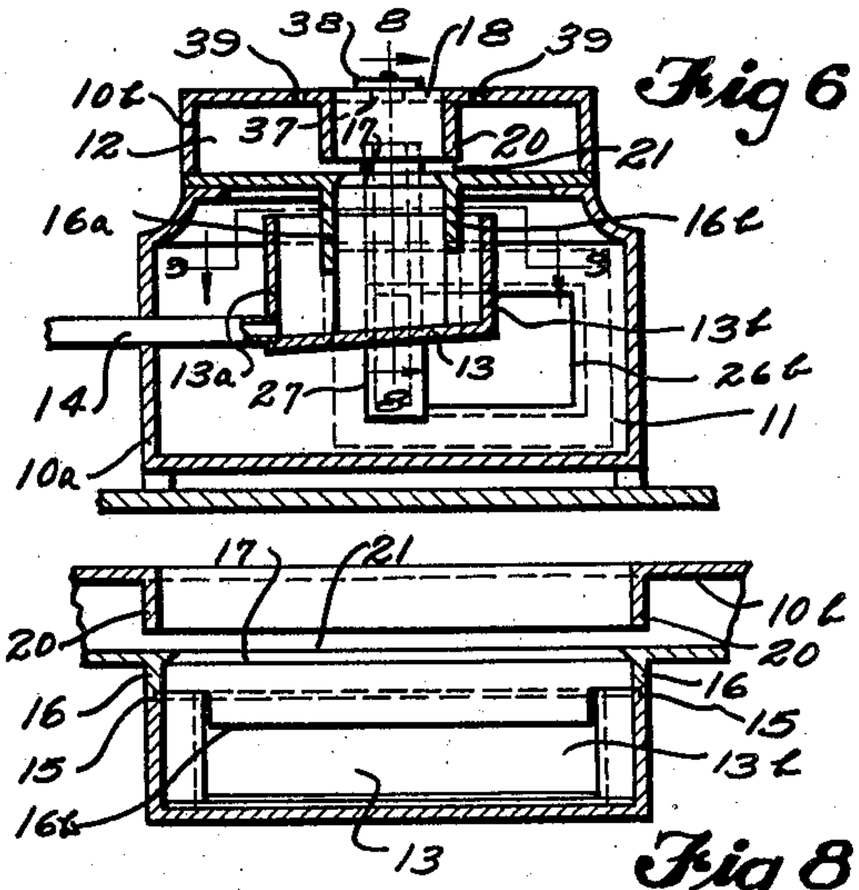



Fig 10

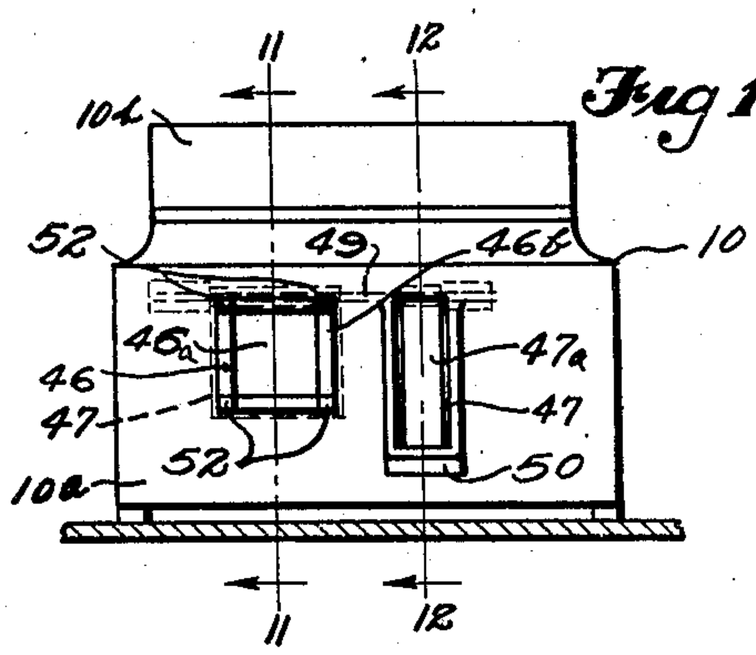



Fig 8

Fig 9

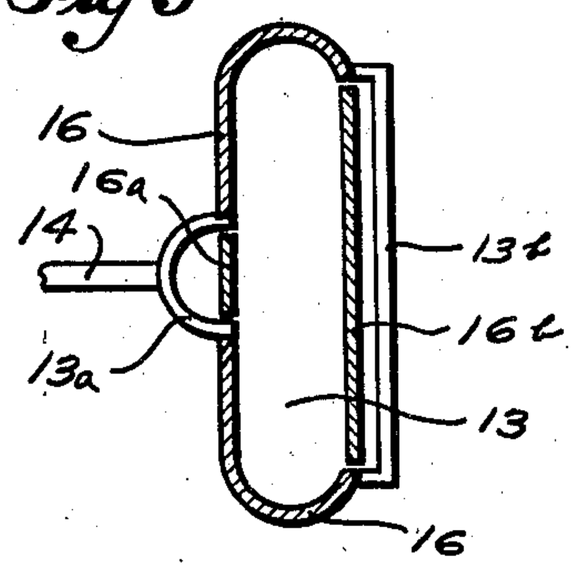



Fig 11

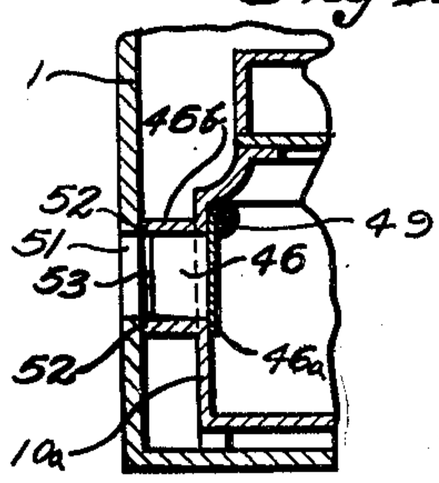
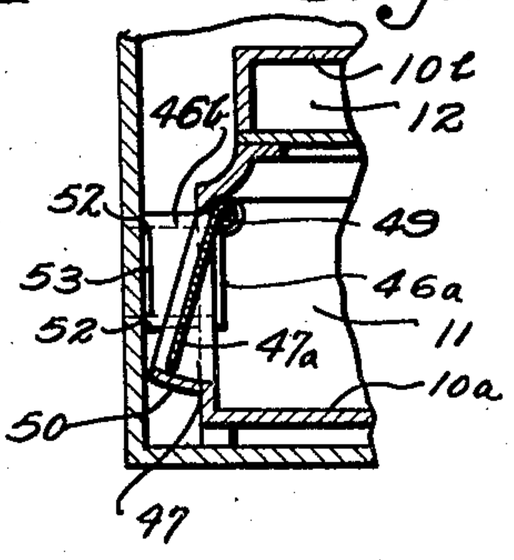



Fig 12

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2,148,617

# UNITED STATES PATENT OFFICE

2,148,617

## OIL BURNER FOR RANGES

William W. Hallinan, Seattle, Wash.

Application May 17, 1937, Serial No. 143,081

15 Claims. (Cl. 126—44)

This invention relates to improvements in oil burners, and it has reference more particularly to oil burners of a kind design for use with the ordinary types of cooking ranges and cooking stoves; it being the principal object of the invention to provide a burner and to so associate it with the stove, or range, that the oil admitted thereto will be consumed to the maximum extent, as well as all oxygen that may enter the range through the cracks or openings which are around the top and hot plates, and which cannot be avoided by reason of the necessity for allowing clearance in joints for expansion and contraction of the parts of the stove.

To those familiar with this particular art, it is quite well understood that it is impractical and practically impossible to design a range top that will prevent all air leakage. Therefore, in the burning of oil as fuel, this leakage of air must be reckoned with. It will be also recognized that to obtain the most satisfactory combustion and maximum efficiency in this burner, when using oil as fuel, there should be no more than two parts of oxygen to one part of carbon. With oil burner devices of those kinds now generally known, this proportion of gases cannot be maintained because of other gases in the air which prevent, or at least retard, complete combustion, and also absorb heat. Furthermore, by reason of expansion, these other gases cause the whole volume of gas in the stove to move more rapidly, and thus decrease the heating efficiency. Of course the above condition cannot be completely brought about, because of other inert gases in the air, and in ordinary practice there are many more parts oxygen admitted to the burner than are necessary, because of the burner design and its application to the range. As a result thereof, the heat absorbed by the excess oxygen and inert gases of the atmospheric air admitted to the burner and the corresponding expansion thereof, the efficiency of the range and burner is reduced. Where it is possible to completely burn all oil, using only two parts oxygen and one part carbon, the temperature of the gas generated will be much higher and less in volume. Thus, more heat will be available for use by reason both of higher temperature and slower movement of gases over the surface or through the area to be heated.

In view of the above, it has been an object of this invention to so design a burner equipment that the excess oxygen admitted to the range or stove through the expansion joints, may be utilized to the fullest extent in aiding combustion and producing heat.

More specifically stated, it has been an object of this invention to attain the above stated results by limiting the intaking of outside air for combustion purposes and by drawing off hot gases from those passing into the flue or chimney, and recirculating these gases through the burner and range to promote a more complete combustion, and thereby not only to reclaim that heat which is available in the hot gases passing to the flue, but also to utilize the excess oxygen leaking into the range, because the gas mixtures flowing under the top plates are carrying excess carbon and insufficient oxygen and their leakage around the top plates mix with the excess carbon and in this manner a prolonged and gradual combustion is brought about throughout the range.

It is a further object of this invention to provide for a controlled admittance of fresh air for initial starting and an automatic admittance of air in the event power is temporarily cut off.

Still other objects of the invention reside in the details of construction, in the combination of parts and in their mode of operation, as will hereinafter be fully described.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Fig. 1 is a front elevation of a range of conventional type, with which a burner embodied by the present invention is associated.

Fig. 2 is a rear elevation of the range, particularly showing the location of the fan, motor and pipe connections with the range.

Fig. 3 is a top, or plan view of the range with a portion of the top removed for better illustration.

Fig. 4 is a vertical, cross section of the burner on the line **4—4** in Fig. 3.

Fig. 5 is a vertical section, on the line **5—5** in Fig. 3.

Fig. 6 is a cross sectional detail of the burner and oil pan, as seen on the line **6—6** in Fig. 4.

Fig. 7 is a sectional detail of the motor and fan housings, as seen on the line **7—7** in Fig. 5.

Fig. 8 is a cross section on line **8—8** in Fig. 6.

Fig. 9 is a horizontal section on line **9—9** in Fig. 6.

Fig. 10 is an elevation of the burner housing, showing the arrangement of automatic dampers.

Fig. 11 is a cross sectional detail on the line **11—11** in Fig. 10.

Fig. 12 is a cross sectional detail on line **12—12** in Fig. 10.

Referring more in detail to the drawings—

**1** designates, in its entirety, a range, or stove, of a type generally used for cooking and baking and which may be any of the conventional designs now in common use. This stove is constructed so as to include, at one side, a fire box **2**, and at the other side to include an oven **3**. At the rear of the range is a vertical flue **4** with which a pipe **5**, leading to the chimney, or stack, is to be connected. The arrangement of the firebox walls and the oven walls within the outer walls of the

range proper are such as to provide passages through which the hot gases of combustion may flow from the firebox across the top of the oven, then down along the far side thereof, then to return toward the firebox beneath the oven, and then to an outlet or opening 6 which is formed through the back wall of the range, adjacent the lower edge of the wall and connects with flue 4; the direction and path of travel of the hot gases of combustion being indicated by the arrows in Fig. 1.

It is preferred also that a baffle plate or partition 7 be located beneath the oven between the bottom wall thereof and the bottom wall of the range, as shown in Fig. 3, to prevent short-circuiting of the hot gases to the opening 6.

The present oil burner utilizes that space in the stove that is ordinarily occupied by the firebox and ash grates. It comprises a rectangular, box-like housing 10, the construction of which is best understood by reference to Figs. 3, 4 and 6. This housing is located symmetrically within the range fire grate and ash box area, as shown in Fig. 3, and rests directly upon, or may have supporting legs that rest upon, the bottom wall of the range. The burner housing 10, considered in its entirety, is a rigid unit, comprising a hollow lower section 10*a* forming a relatively large rectangular compartment or chamber 11 and a hollow, upper section 10*b* forming a compartment or chamber 12. These two sections, 10*a* and 10*b*, are fastened together in the relationshinp seen in Fig. 4, and in the assembly, the upper section serves as a top wall, or closure means for the lower section, which is open at the top.

Suspended from the bottom wall of the top section 10*b*, symmetrically within the chamber 11, is an elongated generating pan 13 into which fuel oil may be admitted from a supply pipe 14. This pipe, as will be noted in Figs. 3 and 6, opens into the side of the pan near the base wall, and the base wall is sloped toward the pipe so that a small pool of oil may be formed. The pan, a few inches in depth, has its end top edges tightly joined, as at 15, to the bottom edges of the depending flange 16, which encircles an elongated opening 17 in the bottom of the top section 10*b*. The opening 17 registers in vertical alignment with a similar opening 18 in the horizontal top wall of the housing 10*b*, and about which latter opening a depending flange 20 is formed to extend downwardly and almost to the bottom wall, leaving only a narrow slot 21 as an air passage for outflow of the air from the chamber 12.

It will here be stated that the pan 13 is suspended by means of bolts 22, which are passed upwardly through perforated ears 23 on the end walls of the pan, and are threaded into the bottom wall of the housing 10*b*, as shown in Figs. 4 and 5. Baffle plates 16*a* and 16*b* which are formed of extended portions of the depending flange 16 along the longitudinal edges thereof depend substantially into the outwardly formed recesses 13*a* and 13*b* respectively, of the pan 13, as will be noted by reference to Figs. 4, 6, 8 and 9. These baffle plates are so spaced from the side walls of the recesses 13*a* and 13*b* that when air is drawn into the pan between them and the baffles 16*a* and 16*b* it must flow downwardly into the pan over the oil, and then will be caused to flow upwardly through the opening 17, by the incoming air or gas from the blower.

At the back side of the range, as seen in Fig. 3, a fan housing 25 is located, and from which an outlet pipe 26 extends. This outlet is longitudinally divided, forming separate ducts 26*a* and 26*b*. The pipe 26 connects with the end wall of housing 10*a*, with the duct 26*a* in registration with an upwardly directed duct or channel 27 in the housing 10*b*, whereby air from the fan housing may be delivered into the compartment 12, as shown in Fig. 4.

Tandem fans 28*a* and 28*b* are mounted upon a circular dividing plate 28 in the housing 25 on a supporting and driving hub 29, which hub connects operatively with the driven shaft 30*a* of an electric motor 30, as shown in Fig. 7. The motor is partially enclosed by a housing 31, attached to the side of the fan housing 25 and which is provided with a plurality of small perforations 32 permitting admittance of outside, or cool air as a cooling medium for the motor. There is also a small space or opening 33 about the motor shaft 30*a* and fan hub 29, providing for flow of air from the motor housing into the fan housing, and also providing that when the fans are in operation, suction will operate to draw outside cool air into the motor housing, and then into the fan housing, thus to keep the motor shaft and fan hub cool. It might well be stater that this air taken into the motor housing 31 is, in reality, detrimental to the operation of the burner, and is handled accordingly, as will now be described:

In the circular dividing plate 28, a hole 34 allows the admittance of hot gases into the inside of the fan hub 29, in which there is a plurality of small holes 35, allowing these hot gases to pass through intermingling with and diluting the fresh air, and serving also to preheat this air.

When the burner is in operation, the fan 28*a*, which is relatively narrow in comparison to the other fan, will operate to drive air through the duct 26*a* and 27, under pressure, into the chamber 12, and when this pressure is built up in the chamber, the air will be discharged into the range itself through an opening 37 in the upper section 10*b* of burner, which is equipped with a shutter 38 of such a size that it will not completely close the opening 37 at any time. Also there is a plurality of small holes 39 on each side of the opening 18 in the upper section 10*b* of the burner, opening from chamber 12 into the range itself. It is obvious that with the open end of the duct 27 extending into the chamber 12 and registering with the opening 37, and considering the openings 39, that only a small portion of the mixture of heated air and hot gases delivered thereto will actually enter the combustion chamber through the slot 21. This is of course dependent upon the altitude of the location where the burner is used. In low altitudes where the atmosphere is very rich with oxygen, the shutter 46 is adjusted to a nearly open position, while in higher altitudes, it will be then adjusted to a nearly closed position, so as to supply more oxygen directly through the slot 21 into the combustion chamber.

It will be observed that a return pipe 45 leads from the flue 4 and opens near the fan housing into a pipe 40 that opens into the fan housing at the side opposite to the motor. By the provision of this return pipe, hot gases and the air that leaked into the range through the top plates will be drawn from the flue 4 and returned into the circuit.

By reference to Figs. 3 and 7, it is to be understood that the fan 28*b* is fixed on circular dividing plate 28, in close relation to fan 28*a*, and it is operable to forcibly deliver and recirculate the

gases from the flue back into the housing 10*a* through the duct 26*b* under pressure into chamber 11. This returned gas is then additionally heated in chamber 11 and forced over the top edges of pan 13, downwardly, then upwardly, through passages 17 and 18 into the firebox of the stove.

In order to insure a supply of outside air when the fan is temporarily stopped due to a power interruption or failure, there is provided in one end of the housing 10*a*, two dampered outlets 46 and 47, as will be understood best by reference to Figs. 10, 11 and 12. The outlet 46 opens through a duct 46*b* to the side wall of housing 10, and through outside of the range wall, while opening 47 opens to the space inside the range wall. Dampers 46*a* and 47*a* are suspended in these openings respectively from a cross rod 49 to which they are fixed in such angular relation, that without any pressure inside the stove, the weight of damper 47*a* and the suction thereon due to the natural draft of the flue or chimney will cause the damper 46 to open slightly admitting oxygen to the burner. However, when the fans are in operation, air pressure is built up inside of the chamber 11 of housing 10*a*, and will cause damper 47*a* to swing outwardly in its air restricting flange 50 as in Fig. 12, thus to hold damper 46*a* in closed position, as in Fig. 11. Any air that may escape around damper 47*a* will be within the stove and cause no undesirable effect. It will be observed that the inside duct of the duct 46*b* leading from the chamber 11 to the outside of the range is of the same size as the opening 51 in the outside of the range wall. It will be seen that duct 46*b* has its four corners provided with raised areas 52, allowing a clearance 53 between the front wall of the range itself and all four sides of the duct 46*b*. This allows a small amount of air to be drawn into the range, which will draw or carry back into the range any escaping fumes that might leak from around the damper 46*a*.

For starting or generating the burner, fresh outside air is supplied to the fan through the air intake pipe 40. This pipe has an open outer end adapted to be closed by a sliding damper 41 that is attached to and operated by a rod 42, slidable in guides 43—43' fixed to side wall of the range. This rod is equipped, at the front of the range, with a handle 44, and movement of the rod adjusts the damper 41 to open and close the air inlet pipe 40, thus to regulate the admittance of outside air to the fan housing, for generating purposes only.

To start or generate the burner, oil is admitted through the supply pipe 14 into the bottom of the burner pan 13 and is ignited. Then the fan is set into operation, and fresh air is admitted as necessary through the air intake pipe 40 by opening damper 41, to provide a more rapid generation with fresh air.

While the burner is heating, the draft tube 40 is left open, for approximately two minutes, and then is closed by the damper 41. Oil is retained in the burner pan 13 to approximately a ¼-inch depth, by any suitable type of constant level device, not shown, connected to the supply pipe.

The construction and arrangement of parts of this burner provide for consuming all excess air or oxygen entering the range through openings around and between the main top and hot plates, and all oil is completely burned. Thus, more heat is available because of the slower movement of gases over the surfaces to be heated.

One of the important features of this invention is provided in the recirculation of the already heated gases back into the combustion chamber, thus to reclaim all excess oxygen or unused gases of combustion that otherwise might flow to the stack, and to utilize the already heated gases to maintain a high temperature that facilitates combustion, and in this manner, the efficiency of the burner, as applied to a range, is increased many times.

It is not intended that the construction be limited to the details herein disclosed, but that they be given an interpretation commensurate to the spirit and scope of the claims.

Having thus described my invention, what I claim as new therein and desire to secure by Letters Patent is:

1. In combination, a stove having a combustion chamber and a passage for flow of gases of combustion from the chamber to an outlet, a burner located in the combustion chamber and comprising a closed housing with an opening therein, an oil pan in the housing, means for supplying fuel to the pan, a duct through which outside air may be supplied to the housing, and a by-pass from the said passage into the said duct for return of hot gases of combustion to the housing.

2. In combination, a stove having a combustion chamber and a passage for flow of gases of combustion from the chamber to an outlet, an oil burner located within the combustion chamber and comprising a closed housing with an opening therein, an oil pan in the housing, means for supplying fuel oil to the pan, a duct for supplying outside air to the housing, a by-pass from the said passage into the said duct for by-passing hot gases into the air delivered to the housing. and a damper for regulating the inflow of outside air through said duct.

3. In combination, a stove having a combustion space, a passage for flow of hot gases of combustion from said combustion space to an outlet; an oil burner associated with the combustion space and comprising a closed housing having a top opening, an oil pan in the housing, means for supplying oil to the pan, a duct for conduction of outside air to the housing, a fan in the duct and operable to create flow of air to the burner through the said duct, and a by-pass from the said passage opening into the said duct at such point that suction created by the fan facilitates the by-passing operation.

4. In a stove, a combustion space, a passage for flow of hot gases of combustion from the said space to an outlet, an oil burner in the combustion space, means for supplying fuel oil to the burner, a duct for supplying outside air therethrough to the burner, a by-pass between the said passage and the duct for a return of hot gases of combustion to the burner; said burner comprising a housing into which the said air duct opens and formed with a top opening communicating with the combustion space, and an oil pan disposed in the housing below said top opening and into which the fuel oil is delivered from the supply and means for delivering a part of the air supply into the combustion chamber.

5. In a stove, a combustion space, a passage leading from said combustion space for flow of hot gases of combustion to an outlet, an oil burner in the combustion space, means for supplying fuel oil to the burner, a duct for supplying outside air therethrough to the burner, a fan operable for effecting a flow of air to the

burner through said duct; said burner comprising a closed housing into which the air duct opens and formed with a top opening directed into the combustion space and an opening to outside air, an oil receiving pan disposed in the said housing below the said top opening thereof, and a swinging damper for the said opening to outside air adapted to be held in closed position by air pressure in the housing that is incident to operation of the fan, and to move automatically to open position when no pressure of air exists in the housing.

6. An oil burner, comprising a closed housing adapted to receive air thereinto, and formed with a top wall opening, an oil pan located in the housing and spaced below the top opening, means for delivering fuel oil into the pan for burning therein and deflectors depending from the top wall of the housing about said top wall opening into the pan and spaced inwardly from the side walls of the latter whereby to create a downflow of air into the pan prior to outflow through the top wall opening and to prevent combustible gases filling the housing.

7. In combination, a stove having a combustion space, an oil burner associated with the stove and comprising a closed housing formed with a top wall opening, an oil pan in the housing below the said opening, means for supplying fuel oil to the pan, a second housing surrounding the said top wall opening of the first mentioned housing and formed also with a top wall opening registering in alinement above with the top opening of the first housing, and means for delivering air to facilitate combustion into each of said housings, and whereby forced draft is created to carry the products of combustion, emanating from said oil pan, upwardly through said openings into the combustion space.

8. In combination, a stove having a combustion space, an oil burner associated with said combustion space; said burner comprising a closed housing having a top wall opening, an oil pan in the housing spaced below said opening, a second housing above and surrounding said top wall opening and having a vertical passage therethrough aligned with the said top wall opening and leading into the combustion space, a duct for supplying outside air therethrough into said housings, means in the first housing for causing a down-flow of air into the oil pan in its outflow to the top wall opening, and means in the second housing providing a restricted slot about the passage for flow of air from that housing into the said vertical passage.

9. In combination, a stove having a combustion space, an oil burner associated with the said stove and comprising a closed housing of relatively large capacity provided with a top wall opening; an oil pan in said housing spaced below said top wall opening, means for supplying fuel oil to said pan, a second housing located above the first housing and surrounding said top wall opening and having a vertical passage therethrough alined with the said top wall opening, and directed into the combustion space, means for effecting a forced delivery of air, to facilitate combustion, into said housings, means in the first housing for causing a downflow of air into the pan in its outflow through the top wall opening and vertical passage, means in the second housing providing a restricted slot opening into the vertical passage, a direct inlet for outside air leading in the first housing, a damper in said inlet and means in the housing to be acted on by air pressure therein to move said damper to closed position and whereby said damper is caused to open when air pressure is relieved.

10. In combination, a stove having a combustion space, an oil burner associated with the combustion space; said burner comprising a closed housing of relatively large volume formed with a top wall opening, an oil pan in the housing spaced below said opening, means for supplying fuel oil to said pan, a second housing surrounding the said top wall opening and having a vertical passage therethrough aligned with the said top wall opening, means for supplying air under pressure into said housings, for flow therefrom into the combustion space, with the products of combustion of oil in said pan; said second housing having means therein providing a restricted slot opening therefrom into the vertical passage, and said housing having openings in its top wall into the combustion space.

11. In combination, a stove having a combustion space and a passage leading therefrom to an outlet, and an oil burner comprising a closed housing of substantial volume having a top wall opening, an oil pan in the housing below and spaced from said opening, means for delivering fuel oil into the pan, a second housing surrounding the said top wall opening and having a vertical passage therethrough alined with the top wall opening and adapted to receive air thereinto from said housing, a duct for supplying air to said housings, and a by-pass from said passage into said duct for return of gases of combustion to the burner.

12. A combination as in claim 11 wherein the air duct has a damper adjustable to vary the proportionate amounts of outside air and by-passed gas that is returned to the burner.

13. A combination as recited in claim 11, wherein a fan operates to maintain a forced flow of outside air to said housings, and wherein a damper is applied to the outer end of said air supply duct and is adjustable to control the inflow of air and thereby to effect the by-passing of gas inversely in accordance with the amount of air admitted.

14. In combination, a stove having an enclosed area forming a combustion space and an oil burner in said enclosed area comprising a closed housing of substantial volume and formed with a top wall opening, an oil pan in the housing below said opening, means for supplying fuel oil to the pan, means for supplying air under pressure into the housing to facilitate combustion and delivery of products of combustion through said top opening, said housing having side oulets to the exterior of the stove and into the combustion area respectively, dampers for said openings, and means connecting said dampers whereby they operate together and whereby the damper in the opening to the combustion area operates by its weight to hold the other damper open, and is actuated by air pressure in the housing to move the other damper to closed position.

15. A combination as in claim 8 wherein a fan operates to deliver air from said duct under pressure through separate passages into the two housings.

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