Aug. 29, 1967 D. P. FRANKEL ET AL 3,338,191

INCINERATOR

Filed May 21, 1964 4 Sheets-Sheet 1

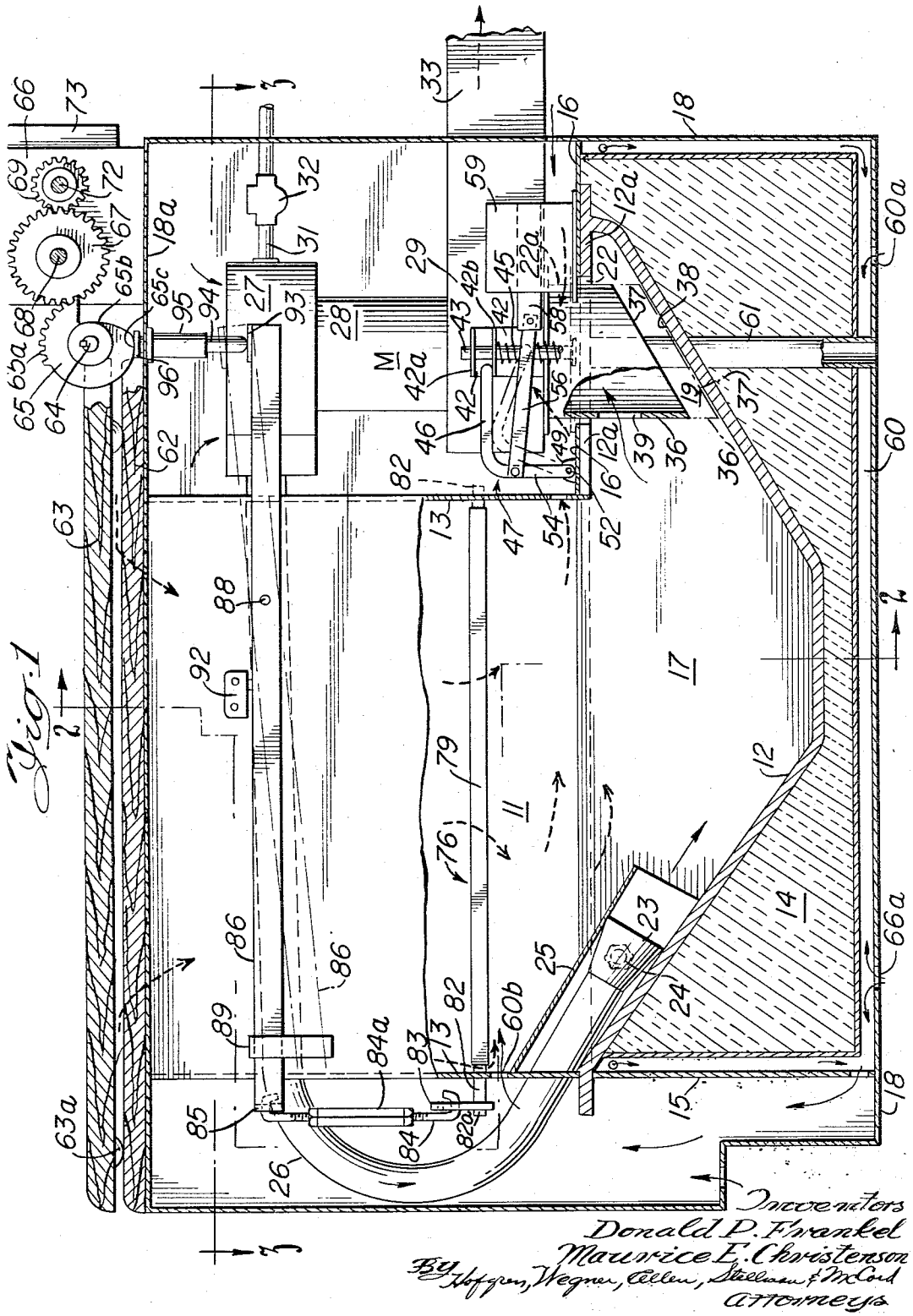


Fig. 1

Inventors
Donald P. Frankel
Maurice E. Christenson
By Hoffman, Wegner, Allen, Stellman & McCord
Attorneys

Aug. 29, 1967 D. P. FRANKEL ET AL 3,338,191

INCINERATOR

Filed May 21, 1964 4 Sheets-Sheet 2

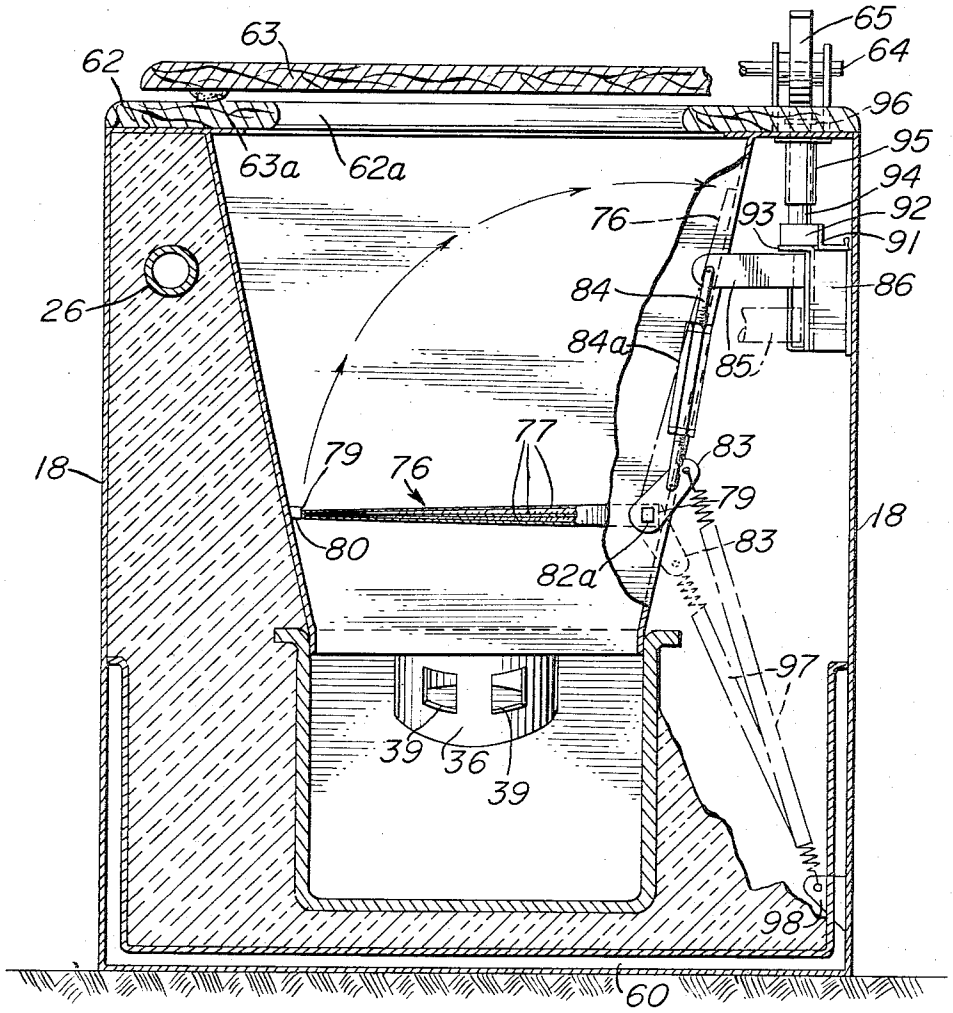
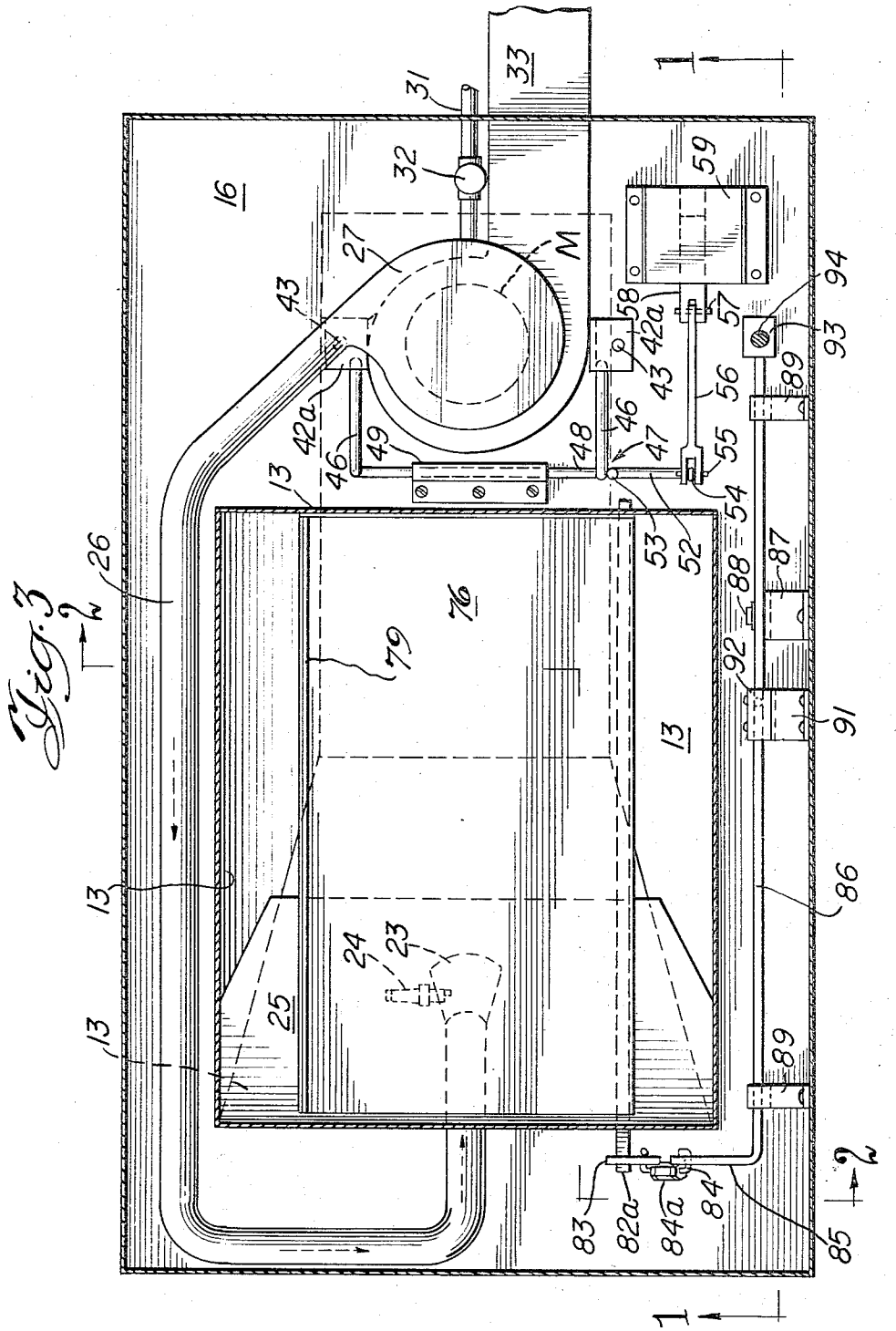



Fig. 2

Aug. 29, 1967 D. P. FRANKEL ET AL 3,338,191

INCINERATOR

Filed May 21, 1964 4 Sheets-Sheet 3



INCINERATOR

Filed May 21, 1964 4 Sheets-Sheet 4

Fig. 5

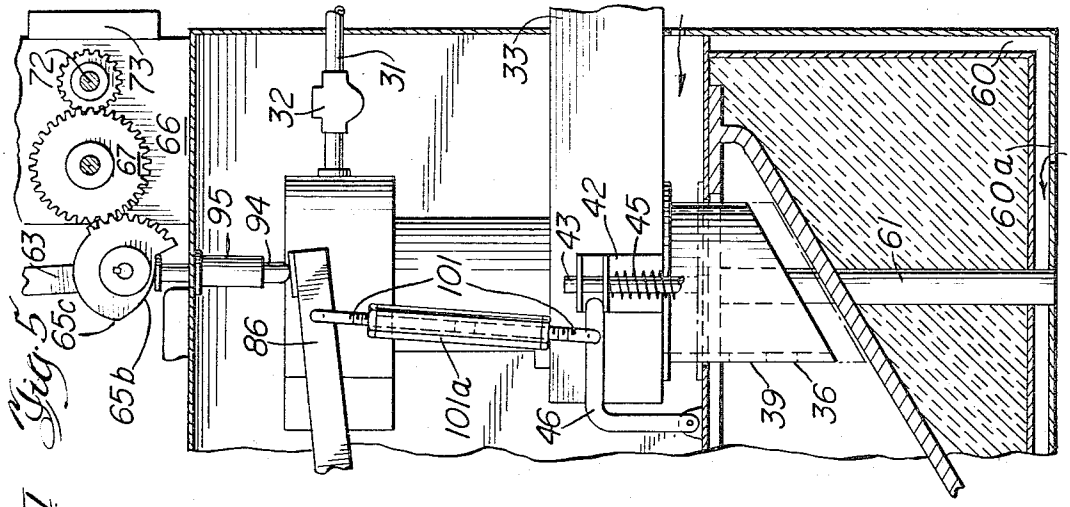
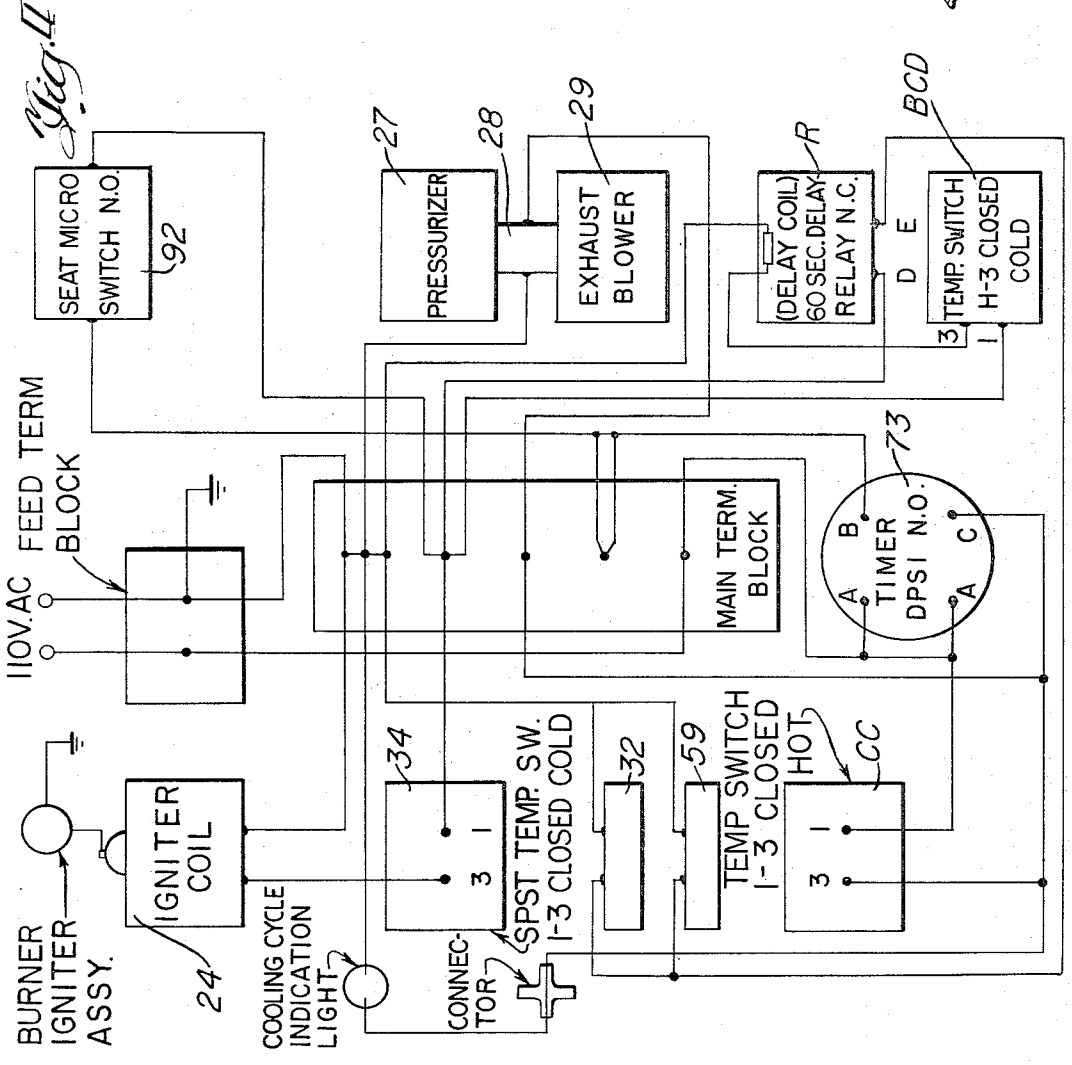



Fig. 4



United States Patent Office 3,338,191 Patented Aug. 29, 1967



3,338,191

# INCINERATOR

Donald P. Frankel, Lake Geneva, and Maurice E. Christenson, Walworth, Wis., assignors to La Mere Industries, Inc., a corporation of Delaware

Filed May 21, 1964, Ser. No. 369,056
25 Claims. (Cl. 110—9)

This invention relates to devices in which burning and cooling cycles are utilized, e.g., for purposes of sterilizing materials, destroying waste products, etc. More particularly this invention relates to the control of air flow in such a device during a burning cycle and a consecutive or subsequent cooling cycle.

Devices such as dry latrines, sterilizers, and other heating or burning devices, are often operated through a plurality of cycles, such as a timed burning or heating cycle and a subsequent or consecutive timed cooling cycle. Where the device is a sterilizer or a dry latrine, it will usually include a receptacle having an inlet and an openable and closable cover on the inlet, and the receptacle is heated during the heating or burning cycle and thereafter cooled during the cooling cycle. In the case of the sterilizer, the receptacle may be heated by an exterior burner, and materials placed in the receptacle through the inlet may be sterilized by heat exchange with the burner through the receptacle walls. In such case, the combustion chamber is separate from the receptacle. Where the device is a dry latrine, the burner is usually disposed within the latrine in a lower portion of the receptacle or bowl, commonly known as the firepot. In such case, the firepot constitutes the combustion chamber which is within the waste products receptacle so that the burner may be trained upon the waste products for destroying the same.

During the burning cycle, the burner is used to obtain the desired heat for the desired purpose, and during the cooling cycle a volume of air is circulated through the combustion chamber and exhausted therefrom, e.g., using the combustion gas exhaust system for exhausting to cool the combustion chamber and the receptacle. The blower or other means for impelling air through the combustion chamber during the cooling cycle may also be used for supplying combustion air to the burner during the burning cycle.

However, in such systems using the burning cycle and cooling cycle, the optimum combustion conditions for heating the receptacle to high temperatures are different from the optimum cooling conditions. Too much air flow through the combustion chamber during the burning cycle inhibits the complete burning of odors or odor components in the combustion chamber. Too little air flowing during the cooling cycle is not conducive to good cooling. Therefore, it has been a practice to provide designs in which some intermediate air flow rate is achieved.

It is the general object of this invention to provide a new and useful device of the character described.

More particularly, it is the object of this invention to provide such a device in which the duration of burning and cooling cycles may be reduced by regulating air flow conditions.

Further, it is the object of this invention to provide such a device in which an air flow is used during both burning and cooling cycles and the air flow path through a combustion chamber or the fire pot is controlled for a low rate of flow during the burning cycle; it is another object to provide such a system in which cooling is improved during the cooling cycle, e.g. by controlling the flow path for a high rate of flow through the fire pot and/or by providing good cooling flow around the fire pot.

It is also the object of this invention to provide a device including a combustion chamber in which heat is retained during burning by a restricted exhaust system to provide temperatures sufficient to burn odors and increase the burning rate of waste products and in which good cooling can also be provided by permitting full flow of cooling air through the exhaust during the cooling cycle.



A further object of this invention is to provide a device in accordance with any of the foregoing objects which includes a control system for cycling the device through timed heating and cooling cycles responsive to operation of the device and which may include an override system for altering, cancelling, or resetting the cycles of operation.

Another object is to provide a new and useful control system for a dry latrine or the like by which a burning cycle and subsequent cooling cycle are established.

Another object of this invention is to provide a dry latrine in accordance with any of the foregoing objects and wherein air flow is provided through the fire-pot portion of the latrine bowl, with control of air flow during the burning cycle to restrict the burning rate and assure more complete burning of odors and the like.

Still another object of this invention is to provide a dry latrine device in accordance with any of the foregoing objects in which a cooling and exhausting cycle is provided during use of the latrine for removal of volatiles prior to initiation of a burning cycle, thereby decreasing flashing tendencies upon ignition of the burner and preventing momentry and damaging increases in flue temperature due to such flashing.

Yet another object is to provide a device in accordance with any of the foregoing objects in which the exit of smoke, steam and gas from the bowl inlet is inhibited by direction of air through the inlet into the bowl during the burning cycle.

Another object is to provide a new and useful insulating trap door for use in a dry latrine; still other objects include the provision of a new and useful trap door drive system responsive to opening a dry latrine cover and adapted to also drive a timer to set a predetermined time interval for control of burning and cooling operations, as well as the provision of a new and useful controllable valving system for regulating air flow in a device of the character described.

Other objects of this invention will be apparent from the following description and the drawings in which:

FIGURE 1 is a vertical section through a dry latrine along line **1—1** of FIGURE 3, illustrating an embodiment of the present invention;

FIGURE 2 is a section generally along line **2—2** of FIGURES 1 and 3;

FIGURE 3 is a section along line **3—3** of FIGURE 1;

FIGURE 4 is a wiring diagram illustrating a form of wiring for a conrol system usable with the dry latrine of FIGURES 1–3; and

FIGURE 5 is a fragmentary section of another or modified form of device along the same section line as FIGURE 3 and showing portions which differ from the form of device of FIGURE 3.

While this invention is susceptable of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a specific embodiment and modification thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment or modification illustrated.

In FIGURES 1–3, there is illustrated a dry latrine structure, the elements of which will be identified here to the extent deemed necessary for understanding the present invention. Reference may be made by those in the art

to other latrine structures, e.g. the latrine structure described in copending application of Donald P. Frankel, Ser. No. 278,015, entitled, "Latrine or Toilet Apparatus," filed May 6, 1963, and details of such other structures may be used as desired in the present dry latrine.

The form of dry latrine illustrated is one in which a receptacle, in the form of a bowl **11**, is defined generally by a fire pot or combustion chamber bottom wall **12** and sheet metal walls **13** upstanding therefrom. Bottom wall **12** is surrounded by suitable insulation **14**, support plate **15** at the front end, and a flange **16** at the rear end of wall **12**. The latrine includes an outer casing wall structure **18**, generally of hexahedral configuration. Flange **16** and upstanding plate **15** are secured to side and bottom walls, respectively, of casing **18**.

The fire pot or combustion chamber portion of bowl **11** is identified by reference numeral **17** and includes an outlet chamber portion **19** which communicates exteriorly of the fire pot through a port **22** in an inwardly projecting top portion **12***a* of wall **12** and in flange **16**.

A burner nozzle **23** is mounted through wall **13** for directing a flame into fire pot **17**. Nozzle **23** lies against bottom wall **12** and is equipped with an igniter **24**. A burner protecting plate **25**, secured at one edge to wall **13**, is provided over the burner and extending beyond the nozzle end to protect the burner from materials being deposited in bowl **11**. Burner **23** is supplied through an air and fuel supply line in the form of conduit **26** which directs a mixture of air and gas from a mixer in the form of a pressure blower or pressurizer **27**, driven by motor **28**. Motor **28** also drives an exhaust blower **29**. Pressurizer **27** is supplied with gas through gas supply line **31** provided with a solenoid control valve **32** of the "on-off" type so that the supply of gas through line **31** can be shut off. Pressurizer **27** draws in air from its environment and charges air through conduit **26** and burner **23** during both burning and cooling cycles.

During the burning cycle, valve **32** is open and the air-gas mixture at nozzle **23** is ignited by igniter **24**, a bimetallic swich **34** (FIGURE 4) being provided, mounted in heat receiving proximity to nozzle **23** for deenergizing igniter **24** responsive to heat after ignition of the burner. The combustion flame and combustion gases are forced downward through fire pot **17** and are directed for venting from the latrine through outlet **33**. During the cooling cycle, valve **32** is closed and pressurizer **27** functions to force cooling air through conduit **26**, nozzle **23**, fire pot **17** and to exhaust **33**, thereby cooling fire pot **17**. During both cycles, exhaust blower **29**, also driven by motor **28**, exhausts air or combustion gases through the outlet **33**.

For control of air flow, including flow of combustion gases during the burning cycle, an air flow valve member **36** is provided in the form of a large diameter tube. Valve member **36** includes a lower edge **37** having an incline parallel with the inclined surface **38** of bottom wall **12** immediately below valve member **36**. Valve member **36** is also provided with a pair of ports **39** through the tubular wall thereof.

Referring now especially to FIGURES 1 and 3, two brackets **42** are secured to the valve member **36**. Each bracket **42** includes a pair of spaced legs **42***a* and **42***b* impaled by and slidable on a rod **43**. Each rod **43** is supported by a bracket **44** secured to flange **16**, with rods **43** upstanding on each side of blower **29**, valve member **36**, and port **22**. A compression coil spring **45** is provided on each rod **43** biasing against bracket leg **42***b* to normally urge bracket **42**, and the valve member **36** secured thereto, upward as viewed in FIGURE 1. Thus, brackets **42**, carrying valve member **36**, are vertically reciprocable on rods **43** and are normally urged to a raised position by springs **45**.

In order to lower valve member **36** to a restricted position with surface **37** lying against surface **38**, a crank arm **46** of a lever **47** is provided in engagement with the upper surface of leg **42***b* between leg **42***b* and leg **42***a* of each bracket **42**. Lever **47** pivots with a shaft portion thereof identified by reference numeral **48**. Shaft portion **48** is rotatably secured against flange **16** by bracket **49**. The shaft **52** is secured to shaft portion **48** as by way of an upstanding arm **53** on one end of shaft **52** welded to lever **47**. Shaft **52** is coaxial with shaft portion **48**, rotates therewith and, in effect, defines an axial extension of shaft portion **48**. Shaft **52** terminates at its other end in an upstanding lever arm **54**, which is pivotally connected by a pin **55** to a bifurcated end of a link **56**. The other end of link **56** is pivotally connected by a pin **57** to a bifurcated end of the armature **58** of a solenoid **59**. Solenoid **59** is mounted on flange **16**.

The valve member **36**, normally urged to an open position for permitting free flow of air drawn by exhaust blower **29** for exhausting through outlet **33**, is moved to its lowered or restricting position, shown in phantom in FIGURE 1, by actuation of solenoid **59**. Solenoid **59** pulls arm **58** which pivots shaft **52**, via lever arm **54** and link **56**, in a clockwise directon to the position shown in phantom in FIGURE 1. Shaft portion **48** and crank arms **46** are also pivoted clockwise to the position shown in phantom. The crank arms **46** of lever **47** urge brackets **42** downward against the biasing of springs **45** to dispose the tubular end surface **37** of valve member **36** against surface **38**, stopping flow of combustion gases into the lower end of valve member **36** and limiting flow of combustion gases to the cross-sectional area defined by ports **39**. With the valve member **36** thusly moved to flow restricting position, the ports **39** permit substantially less flow directly through fire pot **17**, e.g. 5% of total air flow than that occurring when the valve member **36** is in its raised or open position, e.g. 100%. However, total air flow is not diminished since air is circulated across the bowl **11** above fire pot **17** in the general direction of the dotted shank arrows of FIGURE 1, through gap **22***a*.

A space between casing **18** and insulation **14** defines an air flow chamber **60** having a plurality of air inlets which are indicated schematically at **60***a* and an outlet **60***b* so that air is drawn by pressurizer **27** and blower **29** through inlets **60***a*, chamber **60** and outlets **60***b*, partially by-passing fire pot **17** or passing through fire pot **17** depending upon whether the burning or cooling cycle is in operation. A standpipe **61** opens to the outside and extends upward into the center of air valve **36** so that air is drawn directly into the central portion of valve **36** during both the burning and cooling cycles. With valve **36** in its lowered or restricted position, air draws across bowl **11** and by-passes fire pot **17**, and air enters through standpipe **61** and is drawn through a small gap **22***a*, e.g. ¾ inch, between the top of valve **36** and the housing of blower **29**.

In the preferred form, when the valve member **36** is in the restricted position, the amount of air permitted to flow through fire pot **17** and ports **39** is only about 5% of the total amount of air which is flowing through the system. When valve **36** is in its open position, most or all of the air flows through the fire pot **17** to exhaust. As will be seen, the valve **36** is in restricted position during the burning cycle so that heat is retained in the bowl **11** permitting increase in temperature to higher severity levels within bowl **11**. During the cooling cycle, the valve member **36** is moved to open position permitting full flow of cooling air through blower **29** for exhausting of hot gases through outlet **33**.

A seat member **62**, having a large central port **62***a* defining the inlet to bowl **11**, is hingedly secured to top wall **18***a*, top wall **18***a* including an inlet port registering with port **62***a*. A cover **63** for seat **62** is secured to a shaft **64** which is rotatably mounted through suitable mounting brackets secured to and upstanding from wall **18***a*. Cover **63** and shaft **64** are pivotally movable between a position with cover **63** closing inlet **62***a*, as shown in FIGURE 1,

and a position approximately 90° clockwise from the position shown in FIGURE 1 with inlet **62***a* uncovered. In its closed position, cover **63** is supported, spaced slightly from seat **62**, by a plurality of spacers **63***a* secured to the bottom face thereof and disposed to engage and rest on the upper surface of seat **62**. Seat **62** may be provided with similar spacers (not shown) for spacing it from top wall **18***a*. The spacers **63***a* permit entry of air between seat **62** and cover **63** into the latrine during operation of blowers **27** and **29** for supplying blower **27** with combustion air and cooling air and blower **29** with cooling air. Generally, the same volume of air is moved through bowl **11** regardless of the position of valve **36**. Thus, the flowing air may be considered a generally constant volume stream circulating through the latrine with valve **36** controlling flow through the fire pot. Even when the device operates on burning cycle, air is drawn in from between the seat and cover in substantial quantities. Such operation prevents escape of steam, smoke and gas during the burning cycle through the seat opening.

A gear and cam sector **65** is mounted on shaft **64** for rotation therewith. Sector **65** includes a gear portion **65***a*, a cam low **65***b* and a cam high **65***c*. A channel bracket **66** is provided secured to and upstanding from casing wall **18***a*. A gear **67** is in mesh with the gear portion **65***a* of sector **65**. Gear **67** is mounted on shaft **68** which is rotatably mounted through upstanding legs of bracket **66**. Gear **67** is in mesh with a timer gear **69** on timer shaft **72**, also rotatably supported by bracket **66**. Timer gear **69** is linked to shaft **72** for a lost motion link permitting gear **69** to rotate shaft **72** clockwise approximately 180° and to return 180° without rotating shaft **72** counterclockwise. Such a linkage is more particularly described in our copending application Ser. No. 369,057, entitled "Timer Assembly for Dry Latrine or the Like," filed May 21, 1964, now Patent No. 3,304,559.

As cover **63** is moved to its open position, sector **65** is rotated approixmately 90° clockwise as viewed in FIGURE 1; and because the gear train from sector **65** through gear **67** to gear **69** provides a 2:1 gear ratio, gear **69** is rotated approximately 180° clockwise, carrying shaft **72** therewith. Although the timer may be capable alone of timing a greater interval than that desired, the lost motion link and gear train can be adjusted to give an amount of rotation to shaft **72** corresponding to the desired time interval. When cover **63** is again moved to its closed position, the gears reverse their rotation but shaft **72** remains in its clockwise rotated position. The rotation of timer shaft **72** clockwise 180° winds timer **73**, but timer **73** is held against timing by gear **69** so long as cover **63** remains in raised position. Upon lowering seat **62**, shaft **72** is free to unwind through the lost motion linkage, thereby permitting timing by timer **73**.

As already indicated, timer **73** is of the type which is wound by turning a shaft and which times an interval while unwinding the shaft back to its original position. Referring particularly to FIGURE 4, a control system is provided for controlling the actuation of the burner supply gas valve solenoid **32**, the air flow control valve solenoid **59**, the igniter **24** and the blower motor **28**. One of the control elements of the system is the timer **73** which is a mechanism of conventional design having terminals A, B and C. The timer in its expired time position breaks the circuit between contacts A and both B and C. Timer **73** is adapted to time a total time period, e.g. twenty-one minutes, comprised of two consecutive time intervals. Upon setting the timer to its fully set position, e.g. for timing a total time period of about twenty-one minutes, circuitry is completed from contact A to both B and C and the gas valve solenoid **32**, igniter **24** and air valve solenoid **59** are energized, as is blower motor **28**, to supply fuel and air mixtures to the burner **23** and to ignite the fuel mixtures issuing from the burner nozzle. Upon ignition of the fuel mixture, the temperature-responsive bimetallic switch **34** deenergizes igniter **24**, while the solenoid valve **32** remains open and the air valve **36** is held in restricted position by solenoid **59**. Blower motor **28** remains energized. Upon expiration of the first time interval, predetermined by the timer **73**, e.g. after expiration of fifteen of the twenty-one minutes, the circuit from A to B is broken and the circuit from A to C remains completed until expiration of the remainder of the total time period constituting the second timed interval, e.g. six minutes.

Upon breaking the circuit from A to B, it is apparent that the supply of gas to pressurizer **27** will be discontinued and the burner will become extinguished, and solenoid **59** is deenergized permitting opening of valve **36** for full flow of air through the air exhaust system. For the second timed interval, the blower motor **28** operates to pump air by means of pressurizer **27** through conduit **26** and nozzle **23** across fire pot **17** where the air is drawn through the open valve **36** and exhausted by blower **29** through outlet **33**. Upon expiration of the second timed interval, blower motor **28** is deenergized and the air circulation ceases. During both burning and cooling cycles, cooling air is circulated around the mechanical linkages in the system for operating valve **36**, to cool such linkages.

Still referring to FIGURE 4, a temperature-responsive override switch is provided in the form of floating cooling cycle switch CC, mounted at exhaust blower **29**, and is normally open when cold and closed when heated to a predetermined elevated overheat temperature above which it is desirable to provide or continue cooling cycle operation even after expiration of the timed cooling cycle. Closing switch CC overrides timer **23** to assure cooling cycle operation until the temperature decreases below the response temperature of switch CC.

Temperature sensitive switch BCD operates as follows: When the igniter and solenoid valve circuits are energized by circuit AB, a heater coil of a delay relay is also energized by switch BCD. This is a normally closed switch. If, within 60 seconds, the switch does not open up, the delay relay energizes an internal solenoid which breaks contacts DE of delay relay R.

A trap door **76** is provided in bowl **11** between inlet **62***a* and combustion chamber **17**. Trap door **76** is comprised of three generally rectangular sheets **77** of cold rolled steel or other heat-resistant material, preferably reflective, spaced from each other to provide an air space between each pair of sheets **77**. The trap door **76** has a pair of triangular end edges **78** and rectangular side edges **79** to which the sheets **77** are secured. Sheets **77** are in contact only along one of the side edges **79**. Riveted under the trap door is a piece of asbestos tape **80** which extends over the three sides of the trap door to give sealing between the trap door and hopper to prevent residual gases and smoke from coming up after shut-down. The hinged side or fourth side does not have any tape **80**.

Trap door **76** is secured to a shaft **82** for pivotal movement therewith. Shaft **82** is journalled through opposing walls **13** and includes a square end **82***a* beyond wall **13** received in a square opening in a crank **83**. Crank **83** pivots with shaft **82** and trap door **76**.

A link **84**, provided with length adjustment in the form of a turn buckle **84***a*, is pivotally secured at one end through the arm of crank **83** and at the other end through an arm or flange **85** projecting outwardly from one end of a lever **86**. Lever **86** is in the form of a walking beam.

Lever **86** is pivotally mounted on a pin **88** secured to a bracket **87** which is in turn secured to wall **18**, pin **88** functioning as the fulcrum of lever **86**. A pair of guide members **89** are also secured to wall **18** and define limits of upward and downward movement of lever **86** during pivoting thereof about pin **88** while also containing lever **86** against undue side movement.Another bracket **91** is also secured to wall **18** and mounts a normally closed

limit switch **92** in disposition to be triggered to open position each time lever **86** is pivoted counterclockwise to the position shown in phantom.

On the opposite end of lever **86** from arm **85**, a follower plate **93** is provided on the top of lever **86**. A plunger **94** engages plate **93** and extends through a sleeve **95** secured at its upper end to top casing wall **18***a*. Plunger **94** is slidable axially through sleeve **95**. The upper end of plunger **94** is provided with a disc-like follower surface **96** disposed for engagement with the low **65***b* and high **65***c* of sector **65**. A spring means in the form of a tension spring **97** is provided for normally biasing trap door **76** to open position. Spring **97** is secured at one end to the arm of crank **83** and is grounded at the other end to a bracket **98** secured to casing wall **18**.

In the operation of the above described linkages associated with trap door **76**, it will be seen that raising cover **63** disposes the low **65***b* against follower surface **96**, permitting plunger **94** to slide upward through sleeve **95**. Spring **97** urges trap door **76** to the open position shown in phantom in FIGURE 2, thereby also pivoting crank **83** clockwise pulling the arm end **85** of lever **86** downward to the position shown in phantom. Plate **93** is thereby urged upward and maintains the follower surface **96** of plunger **94** against surface **65***b*. The limit switch **92** is opened overriding the entire burner igniter circuit in the event such circuit was energized. Movement of cover **63** to the closed position causes follower plunger **94** to be forced downward as surface **96** travels from the low **65***b* to the high **65***c*. Plunger **94** forces plate **93** downward to pivot lever **86** clockwise to its full line position in FIGURE 2, thereby raising end **85** and pivoting crank **83** and trap door **76** counterclockwise as viewed in FIGURE 2 to the full line position or closed position of trap door **76**. Switch **92** is reclosed.

In an alternative system for controlling valve **36**, referring to FIGURE 5, in lieu of the solenoid control system described above, a link **101**, including an adjustable turnbuckle **101***a*, is pivotally connected at spaced ends to lever **86** and arm **46** to open air valve **36** each time cover **63** is raised and to close valve **36** each time cover **63** is lowered. In such alternative system, when cover **63** is raised, e.g. during use of the latrine, full flow is permitted through fire pot **17**; however, while the lid is lowered, the air valve **36** is closed restricting direct flow through the fire pot as described above. Such operation results in somewhat less, e.g. 5% of total, cooling air flow through the fire pot **17**, but the unit is still satisfactory in performance, particularly because the other 95% of the cooling air is moved around the fire pot as described above. In the system using link **86**, the electrical wiring may be the same with the exception of the elimination of solenoid **59**.

As has been seen above, each time cover **63** is moved to its open position, timer **73** is wound but does not start timing an interval until cover **63** is relowered. With cover **63** in the open position, trap door **76** is also in its open position, the contacts A, B and C of timer **73** are all closed but the burner does not ignite because switch **92** is open.

Although the open switch **92** prevents actuation of gas valve solenoid **73** and air valve solenoid **59**, thereby blocking flow of fuel to the burner and retaining air valve **36** in its full flow position, motor **28** is permitted to operate with cover **63** open. Thus, prior to the burning cycle, a venting and odor preventing cycle is provided so long as cover **63** is open, i.e., during any use of the latrine. Blower **29** and pressurizer **27** are operated by motor **28** to supply the full flow of air through the combustion chamber **17**. Such cooling cycle operation precedes the burning cycle of operation to be triggered by switch **92** and timed by timer **73** upon closing cover **63** after use of the latrine and thereby provides a ventilating cycle during use of the latrine for venting volatiles from combustion chamber **17** through outlet **33**. When cover **63** is returned to closed position, switch **92** closes, air valve **36** moves to restricted position and the burner is ignited and supplied with fuel to initiate the burning cycle. The timed burning cycle then proceeds unless interrupted by raising the seat, in which case switch **92** immediately turns off the burning cycle and provides another ventilating cycle with only cooling cycle operation as described above.

We claim:

**1.** A heater or incinerator device comprising a receptacle having a support element for articles to be heated or incinerated, a burner directed at said element for heating said receptacle during a burning cycle, means for delivering fuel and combustion air through said burner during said burning cycle and for delivering cooling air through said burner and into said receptacle during a subsequent cooling cycle, an inlet to said receptacle, means defining a first flow path for directing combustion gases from said element during the burning cycle and directing cooling air from said element during the cooling cycle, means defining a second flow path for flowing gases and air from said burner through said receptacle, and flow restriction means across said flow path for restricting flow of air through said first flow path during the heating cycle to a flow rate substantially less than the flow rate through said second flow path.

**2.** A dry latrine or the like comprising a bowl defining a combustion chamber for receiving waste products, a burner mounted in said combustion chamber, blower means for delivering combustion air and cooling air to said combustion chamber, a flow path for directing exhaust gases and cooling air from said combustion chamber, valve means across said flow path for regulating flow therethrough, and control means establishing a burning cycle and a consecutive cooling cycle and controlling said burner and blower and valve means, said control means actuating said blower and burner means and moving said valve means to restrict flow of gases during the burning cycle for greater than normal combustion of waste products and deactivating said burner while actuating said blower and moving said valve means to permit full flow of gases during the cooling cycle for greater than normal cooling of the bowl.

**3.** The device of claim **2** wherein said control means includes means establishing a blower cycle for exhausting volatiles from said bowl during deposition of waste products in said bowl and prior to the burning cycle.

**4.** The device of claim **2** wherein said valve means in flow restricting position is adapted to decrease flow of exhaust gases through said flow path to an amount increasing combustion chamber temperature created by said burner to a temperature sufficient to burn odors in said combustion chamber.

**5.** The device of claim **2** including a cover for said inlet movable between open and closed positions, means reponsive to movement of said cover to open position for actuating said control means to establish said burning and cooling cycles, and means responsive to said cover in open position for delaying the burning cycle and establishing a cooling cycle until said cover is moved to closed position.

**6.** In a dry latrine having a bowl, an inlet to said bowl, a cover movable between open and closed positions for opening and closing said inlet, and a trap door mounted in said bowl below said inlet for movement between open and closed positions, in combination therewith a crank attached to said trap door, a lever having two ends pivotal about a fulcrum therebetween, a link between the first end of said lever and said crank, a plunger having a first end engaging said lever at the second end of said lever, a cam driven by said cover and having a high receiving the second end of said plunger with said cover in closed position and a low receiving the second end of said plunger with said cover in open position, and spring means urging said trap door toward open position and thereby urging said lever through said link toward a pivoted position for

urging said plunger against said cam, said cam being driven by movement of said cover to open position to a position disposing the low of said cam toward said second end of said plunger permitting following by said plunger for enabling said spring to urge said trap door to open position and said cam being driven by movement of said cover to closed position to a position with the high of said cam urging said plunger to close said trap door against the urging of said spring.

7. In a heater or incinerator device, a burner, an exhaust outlet, a flow path from said burner to said exhaust outlet including a combustion chamber, a valve system in said flow path for regulating air flow through said flow path comprising a valve member movable between open and closed positions and having a configuration for closing said flow path when in closed position, bypass means permitting limited flow through said flow path with said valve in closed position, a lever pivotally mounted and movable between positions for moving said valve member between open and closed positions, respectively, and means for driving said lever between said positions.

8. The heater or incinerator device of claim 7 wherein said bypass means comprises port means through said valve member.

9. A dry latrine or the like comprising a receptacle including a combustion chamber, seat means defining an inlet to said receptacle, a cover movable between open and closed positions for opening and closing said inlet, movable heat shield means for shielding said seat means and inlet means from said combustion chamber, burner means in said combustion chamber, selective means for supplying fuel and air or air alone to said burner means for delivery to said combustion chamber, means for receiving air and combustion gases from said burner means for exhausting from said combustion chamber and operable for high and low flow conditions, means for regulating said receiving means for high and low flow rates therethrough, means adjustable to a maximum timed inerval for controlling said burner, said selective supplying means and said receiving means through a timed burning cycle and a consecutive timed cooling cycle, said adjustable means actuating said selective supplying means and burner means for supplying fuel and air and for burining fuel and controlling said regulating means for low flow rate through said receiving means during the burning cycle and deactuating said burner while actuating said selective supplying means for supplying air only and controlling said regulating means for high flow rate therethrough during the cooling cycle, and override means responsive to movement of said cover to open position for overriding said adjustable means, blocking operation of said burner means, removing said shield from shielding said seat means, controlling said regulating means for high flow through said receiving means, adjusting said adjustable means to maximum timed interval, and blocking said adjustable means.

10. A dry latrine or the like comprising a bowl defining a combustion chamber, an inlet to said bowl, a cover movable between open and closed positions for opening and closing said inlet, a heat shield trap door mounted in said bowl between said inlet and said combustion chamber and movable between open and closed positions, a burner mounted in said bowl below said trap door for burning material in said combustion chamber, a blower for delivering combustion air and cooling air to said combustion chamber, a flow path for directing exhaust gases from said combustion chamber, valve means across said flow path movable between open and restricted positions, said valve means in restricted position substantially restricting passage of exhaust gases through said flow path, control means including a timer adustable to a mixmum timed interval for controlling said burner, said blower and said valve means through a timed burning cycle and a consecutive timed cooling cycle, said control means actuating said blower and burner and moving said valve means to restricted position during the burning cycle and deactuating said burner while actuating said blower and moving said valve means to open position during the cooling cycle, switch means responsive to movement of said cover to open position during the burning cycle for overriding said control means and for providing cooling cycle operation of said blower and valve while de-actuating said burner, and link means responsive to movement of said cover to open position for moving said trap door to open position and for adusting said timer to said maximum timed interval.

11. A dry latrine or the like comprisng a bowl including a combustion chamber portion and having an outlet, flow path means from said combustion chamber portion to said bowl outlet, by-pass means communicating said bowl with said outlet and by-passing said combustion chamber portion, a seat member having an opening defining an inlet to said bowl, a cover movable between open and closed positions for opening and closing said inlet, means spacing said cover from said seat in closed position defining an air flow gap therebetween, burner means for burning material in said combustion chamber portion, air chamber means surrounding said combustion chamber portion and having an inlet and outlet, means for delivering a stream of air from said air chamber outlet and from said air flow gap through said bowl to said bowl outlet, valve means movable between positions diverting the major amount of air flowing through said bowl selectively through said by-pass means or through said combustion chamber portion and flow path means to said bowl outlet, whereby said delivering means delivers air from said gap through said bowl to said bowl outlet in each position of said valve means to inhibit escape of smoke, steam and gases from said gap, and control means establishing a burning cycle and a consecutive cooling cycle for controlling said burner means and valve means.

12. A heater or incinerator comprising a receptacle including a combustion chamber and having an inlet to said receptacle, a cover movable between open and closed positions for opening and closing said inlet, removable heat shield means for shielding said inlet means from said combustion chamber, burner means in said combustion chamber, selectively operable means for supplying fuel and air or air alone to said burner means for delivery to said combustion chamber, means for receiving and exhausting air and combustion gases from said burner means for exhausting from said combustion chamber, means for restricting said receiving means for lesser flow rates therethrough, means adustable to a maximum timed interval for controlling said burner and said fuel and air supplying means and said receiving means through a timed heating or burning cycle and a consecutive timed cooling cycle, said adustable means actuating said fuel and air supplying means and burner means for supplying fuel and air and for burning fuel and actuating said receiving and exhausting means for exhausting gases during the burning cycle and detactuating said burner while operating said fuel and air supplying means for supplying air only and while actuating said receiving and exhausting means for exhausting air therethrough during the cooling cycle, and control means responsive to movement of said cover to open position overriding said adustable means for blocking operating of said burner means and removing said shield from shielding said inlet means.

13. A heater or incinerator device for subjecting materials to consecutive heating or burning and cooling cycles comprising a receptacle for the materials to be heated or burned, a combustion chamber for the receptacle, a burner in the combustion chamber for heating the receptacle and materials during the heating cycle, an exhaust outlet for the combustion chamber, means for circulating air through the receptacle during both cycles including flow path means for directing combustion gases from said burner

and through the combustion chamber to the outlet, valve means in said flow path for restricting flow from the combustion chamber portion of the flow path to the outlet to a low rate of flow constituting a minor proportion of the total flow through the remainder of said receptacle, said valve means being movable to a low rate of flow position for providing the low flow rate and to a high rate of flow position for providing the total flow, means defining a bypass flow path from the receptacle to said outlet for bypassing said valve means and for accommodating the remaining major proportion of said total flow, and control means for establishing the heating and cooling cycles, for actuating said burner and for controlling said valve means to the low rate of flow position during the heating cycle and for deactuating said burner and controlling said valve means to the high rate of flow position during said cooling cycle.

**14.** The device of claim **13** including an inlet for said receptacle, a cover for said inlet movable between open and closed positions and means responsive to movement of said cover to open position during the heating cycle for overriding said control means to cancel the heating cycle, deactuating said burner and controlling said valve means for movement to cooling cycle position.

**15.** The device of claim **13** including an inlet for said receptacle, a cover for said inlet movable between open and closed positions, and means responsive to movement of said cover to open position for actuating said control means to establish the heating cycle and consecutive cooling cycle.

**16.** A dry latrine or the like comprising a bowl having a combustion chamber, a seat member having an opening defining an inlet to said bowl, a cover for opening and closing said inlet, burner means for burning material in said combustion chamber, means establishing a burning cycle and subsequent cooling cycle for actuating said burner means during said burning cycle and deactuating said burner means during said cooling cycle, means for increasing air flow through said combustion chamber for cooling said combustion chamber, and temperature responsive means for cancelling the burning cycle at a predetermined elevated temperature level including time delay means for delaying stopping of the burning cycle during a predetermined time interval and for blocking the cancelling of the burning cycle responsive to decrease in temperature below said level during said time interval.

**17.** A dry latrine or the like comprising a bowl having a combustion chamber, a seat member having an opening defining an inlet to said bowl, a cover for opening and closing said inlet, burner means for burning material in said combustion chamber, timer means establishing a burning cycle and a consecutive cooling cycle for actuating said burner during said burning cycle and deactuating said burner during the cooling cycle, means for flowing air through said bowl and combustion chamber, and valve means in an outlet to the combustion chamber responsive to said establishing means for increasing the amount of air flow through said combustion chamber during the cooling cycle.

**18.** The dry latrine of claim **17** wherein said flowing means comprises an exhaust blower for exhausting gases from the bowl and including exhaust conduit means extending from said combustion chamber outlet to said exhaust blower, and a second separate conduit means bypassing said exhaust conduit and extending from a position in said bowl above said combustion chamber to said exhaust blower for bypassing the exhaust conduit and valve means, said valve means comrises means for diverting the major amount of total air flowing through the bowl into said bypass conduit while permitting a minor amount of the total air to flow through said combustion chamber and exhaust conduit to the exhaust blower.

**19.** The dry latrine of claim **17** including temperature responsive means for cancelling the burning cycle at a predetermined elevated temperature.

**20.** The dry latrine of claim **17** including heat shield means disposed between said combustion chamber and said inlet and comprising a plurality of continguous and co-extensive facing sheets of heat reflective, heat resistant material capable of resisting temperatures of up to 1400° F. separated by and generally enclosing air pocket means between each facing pair of said sheets, and means mounting said heat shield means for movement between open and closed positions.

**21.** The dry latrine of claim **17** including a trap door in the bowl between the inlet and the combustion chamber mounted for movement between a closed position and an open position, transmission means for moving said trap door, and wherein said establishing means comprises movable timer and control means for actuating said burner to burn during the burning cycle, said dry latrine further including transmission means for moving said timer means, a common means driven by said cover for driving both of said transmission means, and separate means responsive to driving said common means and said transmission means by said cover for deactuating said burner.

**22.** The dry latrine of claim **17** including means separate from said establishing means and operable responsive to movement of said cover to open position during the burning cycle for overriding the establishing means to cancel the burning cycle.

**23.** The device of claim **22** wherein said override means is adapted to directly control said burner means and to provide cooling cycle operation of said cooling means and render said burning temperature establishing means inactive.

**24.** An incinerator device for subjecting materials to consecutive burning and cooling cycles, comprising a receptacle for the materials to be burned including a combustion chamber in the receptacle, a burner in the forward portion of the combustion chamber for burning the materials during the burning cycle, means for circulating air through the receptacle during both cycles including an exhaust blower, an exhaust outlet in the rear portion of the device for passing gases received from the combustion chamber into the exhaust blower, an exhaust conduit beginning at the rear portion of the combustion chamber for directing combustion gases from the combustion chamber to the exhaust blower, means at said exhaust conduit restricting flow through the exhaust conduit from a lower portion of the combustion chamber to the outlet to a low flow rate constituting a minor proportion of the total flow through the remainder of said receptacle, and means defining a bypass flow path at least partially openly exposed to and above said lower portion and separate from said exhaust conduit for bypassing said restricting means for accommodating a remaining proportion of said total flow to said outlet.

**25.** The device of claim **24** wherein said restricting means comprises manually operable means and means responsive to said manually operable means for maintaining the less than total flow rate through said combustion chamber during both cycles.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,706,959 | 3/1929 | Finnel et al. | 128—285 |
| 1,711,365 | 4/1929 | Summers. | |
| 1,995,039 | 3/1935 | Pickup | 126—190 |
| 2,165,488 | 7/1939 | Klimis | 236—1 |
| 2,882,534 | 4/1959 | Jauch et al. | 110—93 X |
| 3,092,049 | 6/1963 | Wood | 110—9 |
| 3,103,017 | 9/1963 | La Mere | 110—9 X |
| 3,189,020 | 6/1965 | Getman | 126—190 |

FREDERICK L. MATTESON, JR., *Primary Examiner.*

H. B. RAMEY, *Assistant Examiner.*