

March 15, 1960

D. E. KEYT ET AL
PORTABLE COOKING STOVE

2,928,386

Filed March 22, 1957

2 Sheets-Sheet 1

Fig. 1

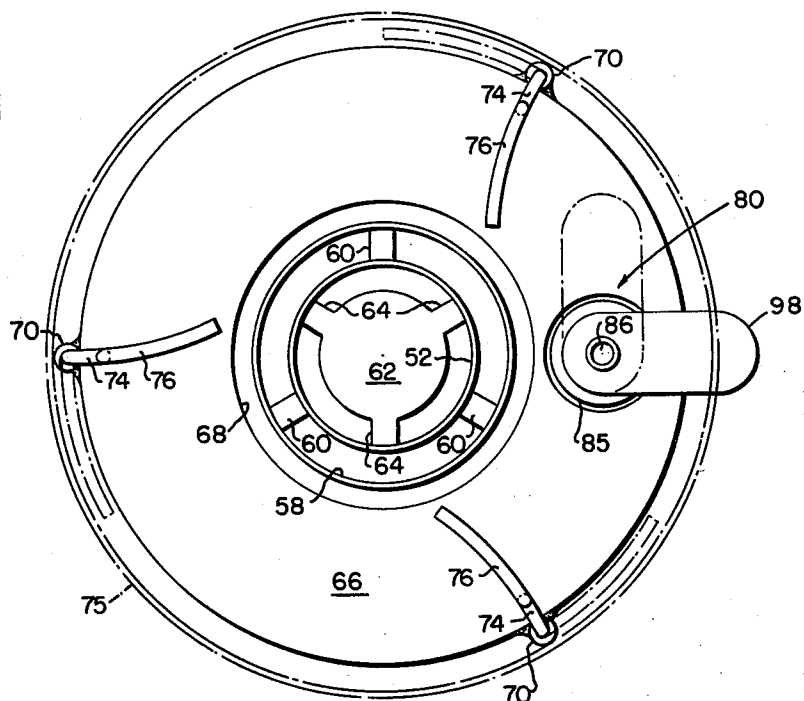
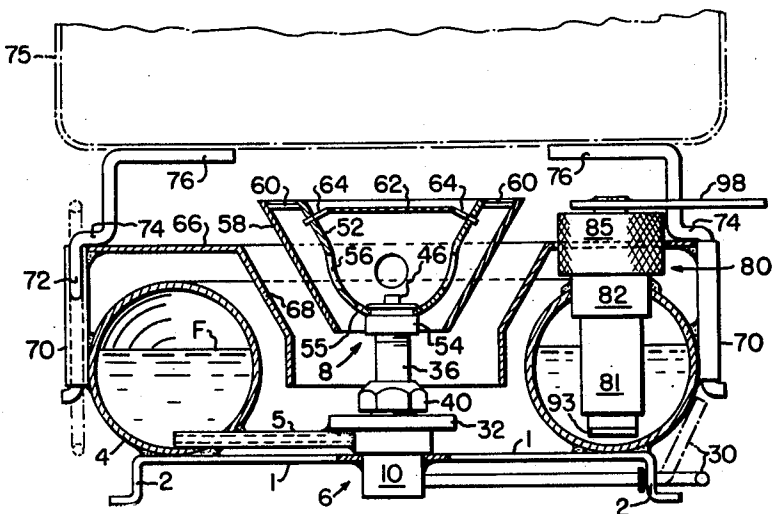


Fig. 2



INVENTORS
DONALD E. KEYT
MICHAEL M. DUBITZKY
NORTON T. PIERCE
BY
KENWAY, JENNEY, WITTER & HILDRETH

ATTORNEYS

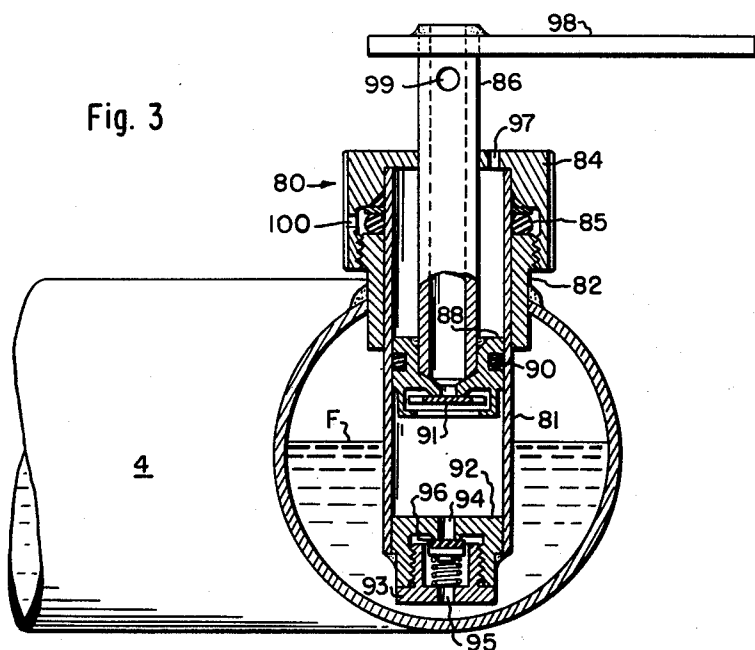
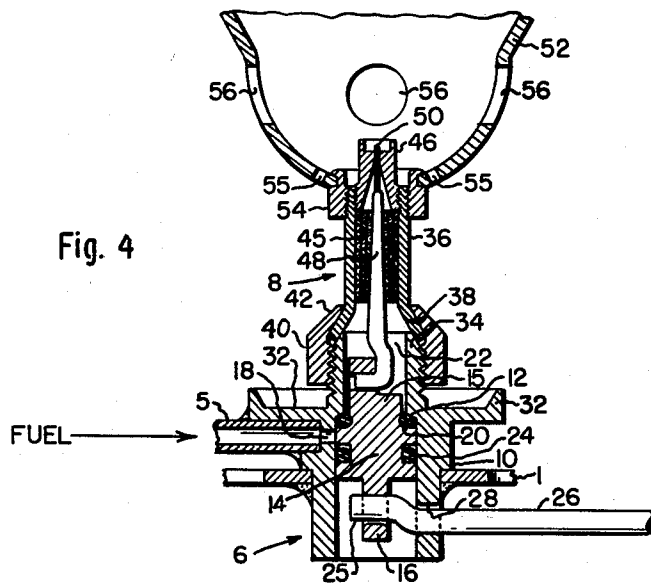
March 15, 1960

D. E. KEYT ET AL
PORTABLE COOKING STOVE

2,928,386

Filed March 22, 1957

2 Sheets-Sheet 2



INVENTORS
DONALD E. KEYT
MICHAEL M. DUBITZKY
NORTON T. PIERCE
BY
KENWAY, JENNEY, WITTER & HILDRETH

ATTORNEYS

1

2,928,386

PORTABLE COOKING STOVE

Donald E. Keyt, Bedford, Michael M. Dubitzky, Stoneham, and Norton T. Pierce, Concord, Mass., assignors to Arthur D. Little, Inc., Cambridge, Mass., a corporation of Massachusetts

Application March 22, 1957, Serial No. 647,763

6 Claims. (Cl. 126—38)

Portable cooking stoves used by the Armed Forces, campers and exploration parties are usually objectionably bulky, heavy and cumbersome, and hence cannot be conveniently carried on the person. Portable stoves which use solidified alcohol, although overcoming these objections, nevertheless present the difficulty of requiring the transportation of an adequate supply of fuel which has a relatively low caloric value as compared with gasoline and motor fuels which are usually readily available in all transportation vehicles.

The principal object of the present invention is to provide a compact, light-weight efficient cooking stove suitable to supply the needs of a man in the field and designed so that it can be conveniently carried either on the person or in a pack, thereby overcoming the aforementioned objections.

Further objects relate to features of construction and will be apparent from a consideration of the following description and the accompanying drawings wherein:

Fig. 1 is a top plan view of a stove constructed in accordance with the present invention;

Fig. 2 is a vertical section through the stove shown in Fig. 1;

Fig. 3 is an enlarged section through the priming pump and tank; and

Fig. 4 is an enlarged section through the control valve and associated burner assembly.

In accordance with the present invention we provide a portable cooking stove comprising an annular-shaped fuel tank for holding a supply of gasoline or other motor fuel, the tank having a feed line that extends radially inwardly, and within the confines of the fuel tank is a valve, the lower part of which is connected with the feed line and its upper part carries a burner assembly which may be of conventional design and construction. The upper end of the burner assembly is above the level of the fuel tank. At a level below the upper end of the burner assembly but above the level of the tank, is an annular shield having a depending skirt secured to or integral with its inner periphery and positioned between and in spaced relation to the burner assembly and the inner periphery of the tank. This shield provides a reflective insulation which effectively prevents overheating of the fuel in the tank and also enhances the efficiency of the burner. The outer periphery of the shield is preferably provided with a depending flange extending about and secured to the outer periphery of the tank and this flange may support a plurality of circumferentially spaced sockets in which are mounted retractable legs for holding a cooking utensil above the burner assembly, thereby insuring complete combustion of the fuel.

The fuel tank may be provided or connected with a priming pump for maintaining sufficient pressure to insure proper feeding of the fuel and the valve may be provided with a suitable actuator for controlling the flow of fuel to the burner assembly. If desired, the tank and valve may be mounted on a spider-like base which insures a ready flow of air to the burner assembly and the

2

entire apparatus may be conveniently packed in a shallow cylindrical container which provides a cooking utensil. Due to the construction and arrangement of the above parts the entire stove may have a diameter as small as five inches and an overall height of the order of 2 to 2½ inches, and yet be adequate to satisfy the needs of an individual.

Referring to the drawings which show what is now considered a preferred embodiment of the invention—the numeral 1 designates a spider-like base having depending legs 2 and mounted on the base is a toroidal-shaped fuel tank 4 having a feed line 5 which extends radially inwardly. Mounted on the base 1 and concentrically disposed relative to the tank 4 is a control valve 6 (Fig. 4), the upper part of which supports a burner assembly designated by the numeral 8 (Figs. 2 and 3).

The valve 6 comprises a sleeve 10, the lower part of which is brazed or otherwise secured within an opening in the base 1 and its inner periphery adjacent to its upper end is formed with a conical shoulder 12 (Fig. 4). A valve member 14 is axially slidable within the sleeve 10 and the upper part of this member is formed with a reduced end 15, and its lower part is formed with a depending stem 16. The side wall of the sleeve is formed with an inlet opening 18 which receives the end of the feed line 5, and the construction and arrangement of the parts are such that the reduced end 15 is above the inlet 18 when the valve member is in closed position.

At the junction of the reduced end 15 and body portion 14 there is a circumferential groove in which an O-ring 20 fits so that its outer periphery engages the shoulder 12 to seal off fluid flow from the inlet 18 to the chamber 22 above the valve member 14. The lower part of the valve member below the inlet 18 is formed with a circumferential recess which receives a second O-ring 24 and its outer periphery tightly fits the sleeve 10 so as to seal off fluid flow from the inlet 18 to the lower end of the sleeve. The stem 16 is formed with an opening which receives the offset end 25 of an operating crank 26 which projects through an opening 28 formed in the sleeve. The opposite end of the crank 25 extends outwardly beneath the base 1 and its outer end portion projects through an opening in one of the legs 2 and is bent so as to provide a handle 30 by means of which the crank may be conveniently manipulated. By swinging the handle 30 through an angle of 180° the valve member 14 may be raised and lowered to and from closed position.

The upper end of the sleeve 10 is secured to or formed integral with a dish-like pre-heating reservoir 32 (Figs. 2 and 4) and above this reservoir the sleeve is formed with a threaded portion which terminates in a beveled end 34. A supply tube or generator 36 having a flaring lower end 38 fits the upper end of the sleeve and its upper end is both interiorly and exteriorly threaded, the tube being rigidly secured in position by a nut 40 formed with a converging upper end 42 which clamps the end 38 in position.

The upper end of sleeve 10 and the tube 36 define a fuel chamber which communicates with the supply line 5 when the valve member is lowered and within this chamber is a roll of metallic screen 45 which provides, in effect, a heating coil or distributor for insuring vaporization of the fuel after the parts have been pre-heated, as hereinafter more fully described. Threaded within the upper end of the tube 36 is a fuel nozzle 46 having a central opening through which the fuel is metered.

The lower end of a needle-like tapered pin 48 is suitably secured to the upper end of the valve member 14 and the body portion of this pin extends upwardly through the heating coil 45, its upper end carrying a wire or "whisker" 50 which projects into the opening in the nozzle.

3

zle 46 when the valve is closed. Since the valve member 14, pin 48 and whisker 50 are movable as a unit, the whisker serves to prevent clogging of the nozzle by products of combustion of the fuel.

The burner assembly comprises a generally hemispherical burner 52 having an open upper end and a lower end formed with an opening tightly fitting about the peened over upper end of a nut 54 which is threaded to the upper end of the tube 36. That portion of the burner 52 which surrounds the peened over end of the nut is provided with a plurality of spaced weep openings 55 through which liquid fuel may pass so as to run down into the reservoir 32, and between these openings and its upper end the burner 52 is provided with spaced air-intake openings 56. Across the top of the burner 52 is a circular plate 62 carrying tabs 64 which are connected to the burner so as to provide a loose fitting cover for flame retention.

Surrounding the burner is a frusto-conical radiant heat shield 58 which is connected to the burner by a plurality of inwardly extending tabs 60. Extending about the radiant heat shield 58 and in spaced relation to the upper part of the tank is another annular radiant heat shield 66, the inner periphery of which is shaped to provide a depending frusto-conical skirt 68 which extends between and in spaced relation to the burner assembly 8 and the inner periphery of the tank 4. The two reflective shields partially isolate the fuel tank from the heat of the burner and prevent objectionable overheating of the fuel tank.

Depending from the brazed or otherwise suitably secured to the outer periphery of the shield 66 are a plurality of circumferentially spaced sockets 70, the lower ends of which are brazed to the tank 4. Each socket receives the lower end of a retractable arm 72 consisting of a length of stiff wire bent at its central portion to provide an offset 74 engageable with the upper face of the shield when lifted from retracted position, shown by the broken lines of Figs. 1 and 2, and then swung to cooking or utensil-supporting position, shown by the full lines of Figs. 1 and 2, in order to provide an adequate supporting surface for the cooking utensil 75. The upper ends of the arms are bent inwardly, as indicated by 76, so as to overlie the shield 66.

Since this apparatus requires fuel to be under pressure, any suitable pressurizing means may be employed and to this end a small priming pump 80 (Figs. 1-3) may advantageously be used. This pump comprises a cylindrical sleeve 81 which extends downwardly through suitable openings formed in the shield 66 and tank 4, the upper end of the tube 81 having a sliding fit within a collar 82 which extends into the tank. The collar 82 is brazed or otherwise suitably secured to the tank 4 and its upper end is threaded to receive a cap 84 which carries a sealing ring 85. The cap 84 has a sliding fit about the upper end of the sleeve, and the sleeve, cap and parts carried thereby may be removed as a unit when the tank is to be replenished because of the friction between the sleeve 81 and piston ring 90.

A tubular piston rod 86 loosely passes through the upper end of the cap and its lower end carries a piston 88 which may be of conventional design and construction, being provided with the usual piston ring 90 and a floating flap valve 91 which opens the air intake in the piston during the return or upstroke, but closes this opening during the pressure stroke. The lower end of the cylinder 81 is provided with a plug 92 which is brazed or otherwise suitably secured thereto and a bushing 93 is threaded into the end of the plug 92, the plug 92 and bushing 93 being provided with registering inlet openings 94 and 95, respectively. The inlet opening 94 is closed by a spring-loaded valve 96 seated on the lower end of the bushing 93, the loading of the valve 96 being such as to maintain it in closed position during the return or upstroke of the piston, but insufficient to hold it closed during the pressure stroke.

4

The cap 84 is provided with a small vent opening 97 (Fig. 3) so that the piston may be reciprocated without building up a positive or negative pressure within the chamber surrounding the rod 86. When the piston is reciprocated air is drawn into the cylinder through the rod 86 and valve 91 during the intake stroke and is forced through ports 94 and 95 during the pressure stroke into the interior of the tank to build up a pressure sufficient to force the fuel through the inlet 5, valve 6 into the burner assembly 8. The piston is reciprocated by means of an operating arm 98 secured to the upper end of the piston rod, and the piston 88 and parts carried thereby are rotatable within the cylinder so that the operating arm 98 may be swung from pumping position (full lines of Fig. 1) to non-operating position (broken lines of Fig. 1). An additional port 99 is located at in the pump piston rod 86 so that the inlet valve will not be inadvertently closed off by the finger of the operator, and a port 100 in the cap 84 is provided so that the pressure in the tank 4 can be released before the cap 84 is completely removed.

A summary of the operation of the stove is as follows: Assuming that the tank 4 contains a supply of gasoline or the like motor fuel as shown in Figs. 2 and 3, that the legs 76 and operating arm 98 are positioned as shown in the full lines of Figs. 2 and 3, and that the valve 6 is closed, the piston 88 is reciprocated a few times so as to build up a pressure within the tank 4, after which the handle 30 is swung to open position to permit fuel to pass through the supply line into the burner assembly and then trickle down into the preheating reservoir 32. When the reservoir has been filled the valve 6 is closed and fuel in the reservoir is ignited. By the time the fuel in the reservoir has burned away, the generator 36 has been heated to fuel vaporizing temperature and the valve 6 may then be turned on. The heated generator 36 and screen 45 vaporize fuel passing from the chamber 22 so that vaporized fuel is discharged from the nozzle 46 and readily mixed with air drawn in through the openings 56. Both the inner and outer members 52 and 58 become heated and transmit enough heat to the tank 4 to maintain the fuel therein under sufficient pressure to insure continuous feeding of the fuel to the burner assembly. In order to shut off the burner it is merely necessary to turn the handle 30 to closed position, thereby cutting off the fuel supply.

Since an adequate amount of air is drawn in through the spider-like base 1 and the depending skirt 68, complete combustion is assured and the fuel burns with a blue flame. The legs 76 hold the cooking utensil at a level sufficiently above the burner assembly to prevent interference with the efficient burning of the fuel and hence the generation of carbon monoxide and the formation of soot is prevented.

When the burner is to be packed away or put aside, the operating arm 98 is swung inwardly and the legs 76 are retracted, as indicated by the broken lines of Figs. 1 and 2. When thus positioned the entire stove may be packed within a shallow cylindrical cooking utensil 75 which may be provided with a suitable cover (not shown).

A stove constructed in accordance with the present invention is adequate to supply the needs of an individual and may be conveniently carried on the person or within a pack. Since the stove uses gasoline which has a relatively high caloric value and which is usually readily available in all forms of transportation vehicles, it is unnecessary to carry a supply of a specially prepared fuel such as solidified alcohol.

While we have shown and described one desirable embodiment of the invention it is to be understood that this disclosure is for the purpose of illustration and that various changes and modifications may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

We claim:

1. A cooking stove comprising a fixed, shallow annular-shaped fuel tank having a vertical axis, a feed line extending from the bottom of said tank radially inwardly, a valve coaxially disposed relative to said tank and positioned between parallel planes passing through the upper and lower boundaries of said tank, the lower part of said valve being connected with said feed line, a burner assembly mounted on the upper part of said valve, an annular shield including a generally flat annular horizontal portion coaxial of and disposed above the tank in closely spaced relation thereto, the shield including a central annular portion coaxial of the tank depending from said horizontal portion into the region between the tank and the burner and extending around the burner, and means for supporting a utensil above the burner with the flat portion of the shield intermediate the utensil supporting means and the tank.

2. A stove according to claim 1 having the generally flat portion of the shield above the annular tank substantially coextensive with the outside configuration of said tank.

3. A stove according to claim 1 wherein the generally flat portion of the shield is supported in spaced relation on the tank by connecting means extending therebetween and wherein the utensil-supporting means are retractibly associated with said connecting means.

4. A stove according to claim 1 wherein the burner

portion comprises an outwardly-flaring cup-shaped configuration and wherein the depending portion of the shield includes a frusto-conical portion disposed in substantially equi-spaced relation to said cup-shaped portion of the burner.

5. A stove according to claim 1 wherein the depending central portion of the shield extends downwardly between the burner and the surrounding tank to a point lower than the mid-height of the tank.

6. A stove according to claim 1 wherein the utensil is adapted to be supported in closely spaced relation above the burner and at a distance above the top of the tank approximating the separation between the upper and lower boundaries of said tank.

References Cited in the file of this patent**UNITED STATES PATENTS**

1,315,302	Gross	Sept. 9, 1919
2,335,098	Anderson	Nov. 23, 1943
2,358,228	Hoof	Sept. 12, 1944
2,397,766	Tullis	Apr. 2, 1946
2,444,444	Howard	July 6, 1948
2,538,538	Stempel et al.	Jan. 16, 1951

FOREIGN PATENTS

46,303	Denmark	Sept. 29, 1932
--------	---------	----------------