March 29, 1949. C. BRAMMING 2,465,572

PORTABLE STOVE FOR BURNING LIQUID FUEL

Filed April 15, 1943 4 Sheets-Sheet 1

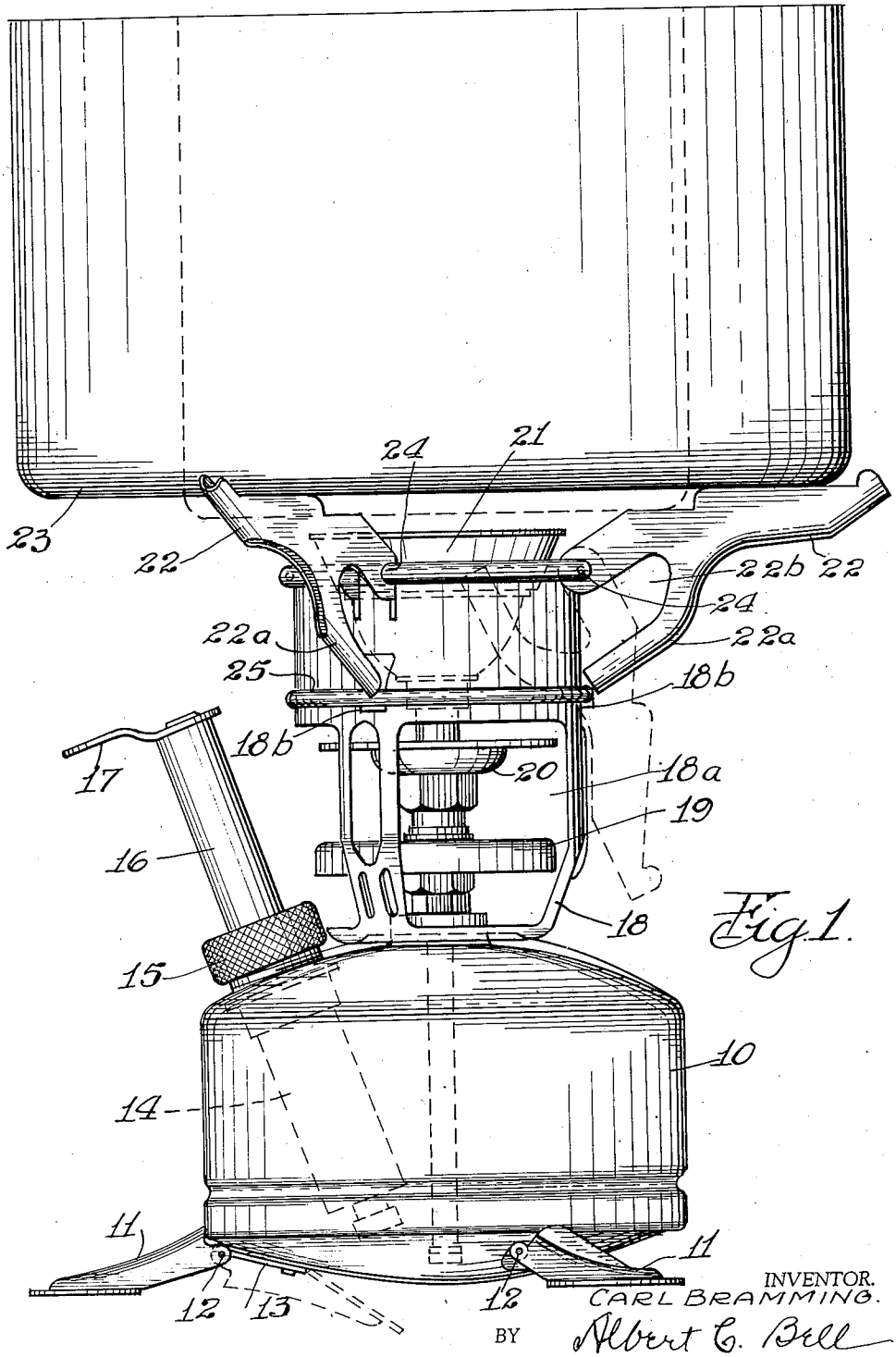


Fig. 1.

INVENTOR.
CARL BRAMMING.
BY Albert C. Bell
ATTORNEY.

March 29, 1949. C. BRAMMING 2,465,572

PORTABLE STOVE FOR BURNING LIQUID FUEL

Filed April 15, 1943 4 Sheets-Sheet 2

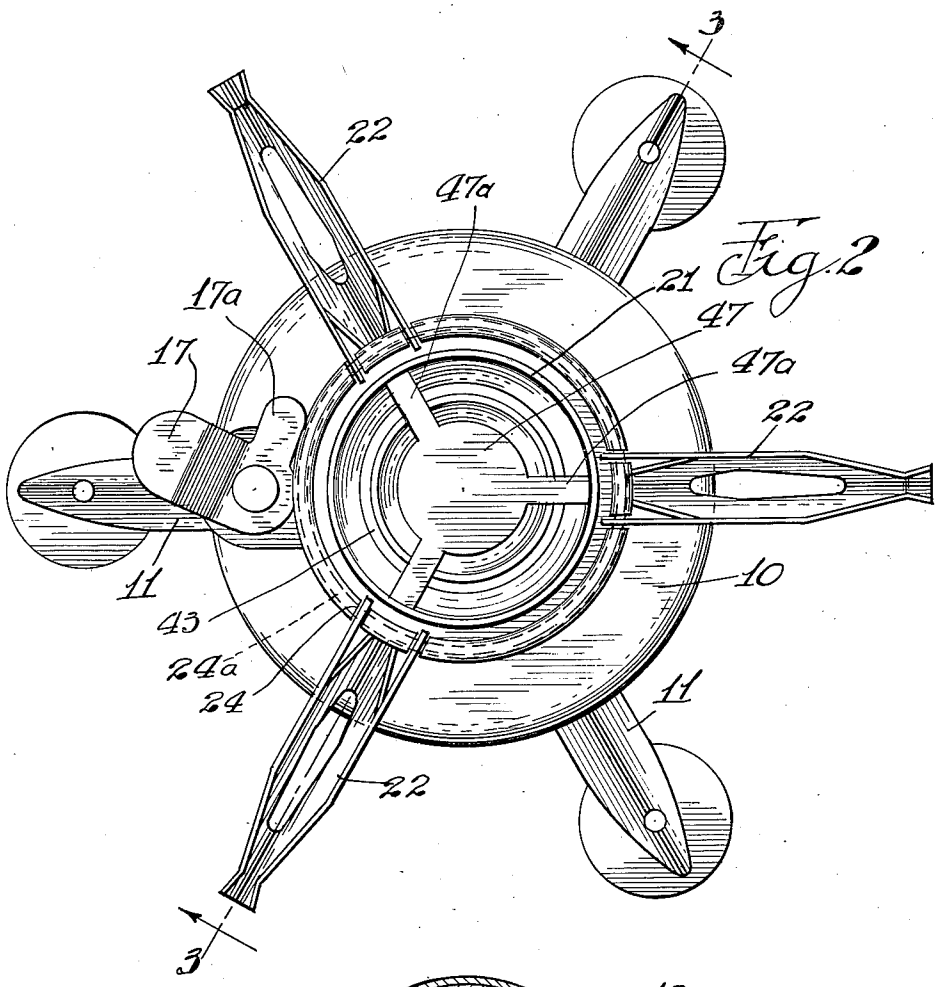


Fig. 2

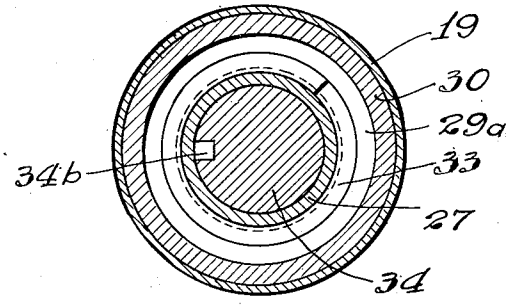


Fig. 7

INVENTOR.
CARL BRAMMING.
BY Albert C. Bell
ATTORNEY.

March 29, 1949. C. BRAMMING 2,465,572

PORTABLE STOVE FOR BURNING LIQUID FUEL

Filed April 15, 1943 4 Sheets-Sheet 3

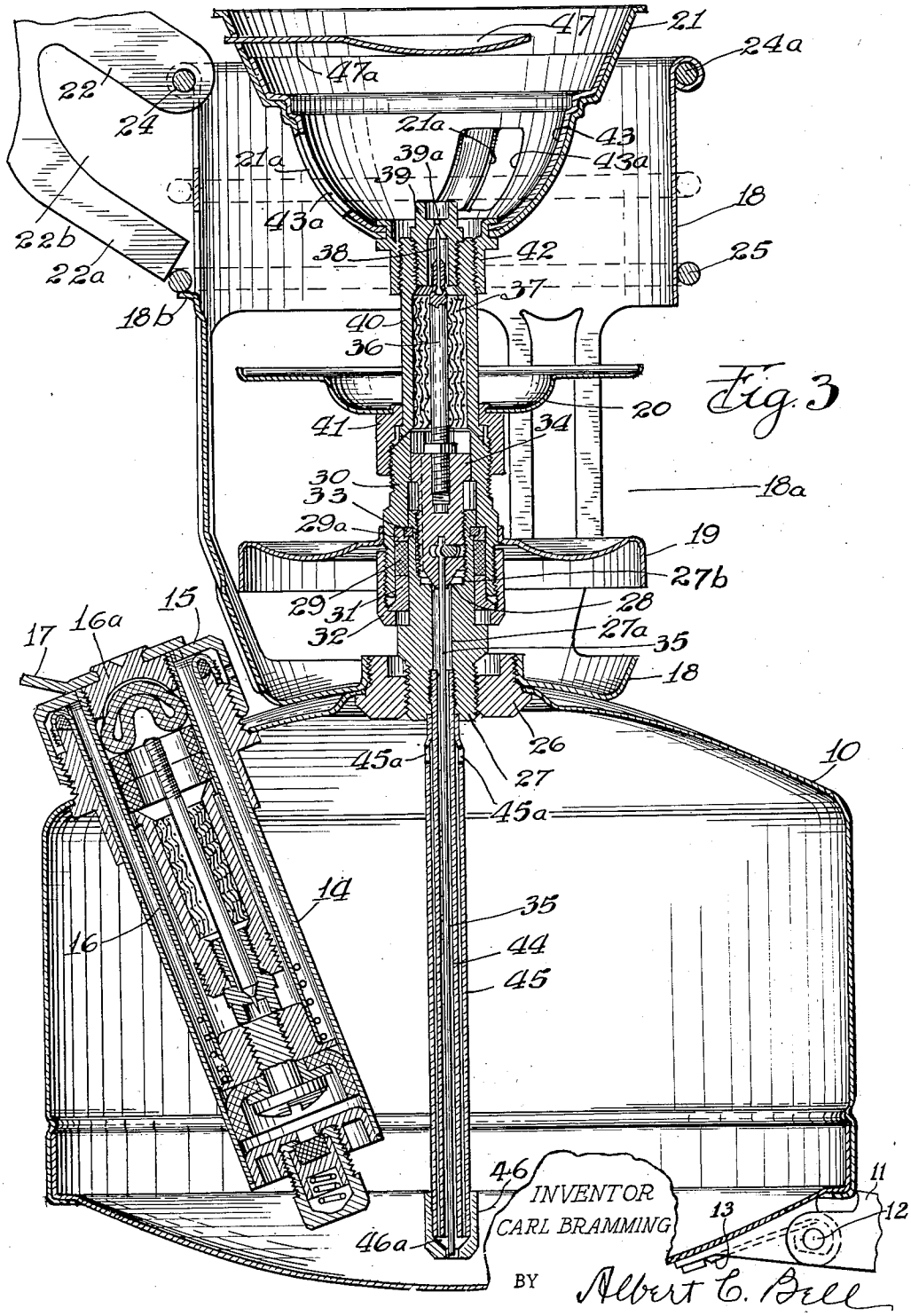


Fig. 3

March 29, 1949. C. BRAMMING 2,465,572

PORTABLE STOVE FOR BURNING LIQUID FUEL

Filed April 15, 1943 4 Sheets-Sheet 4

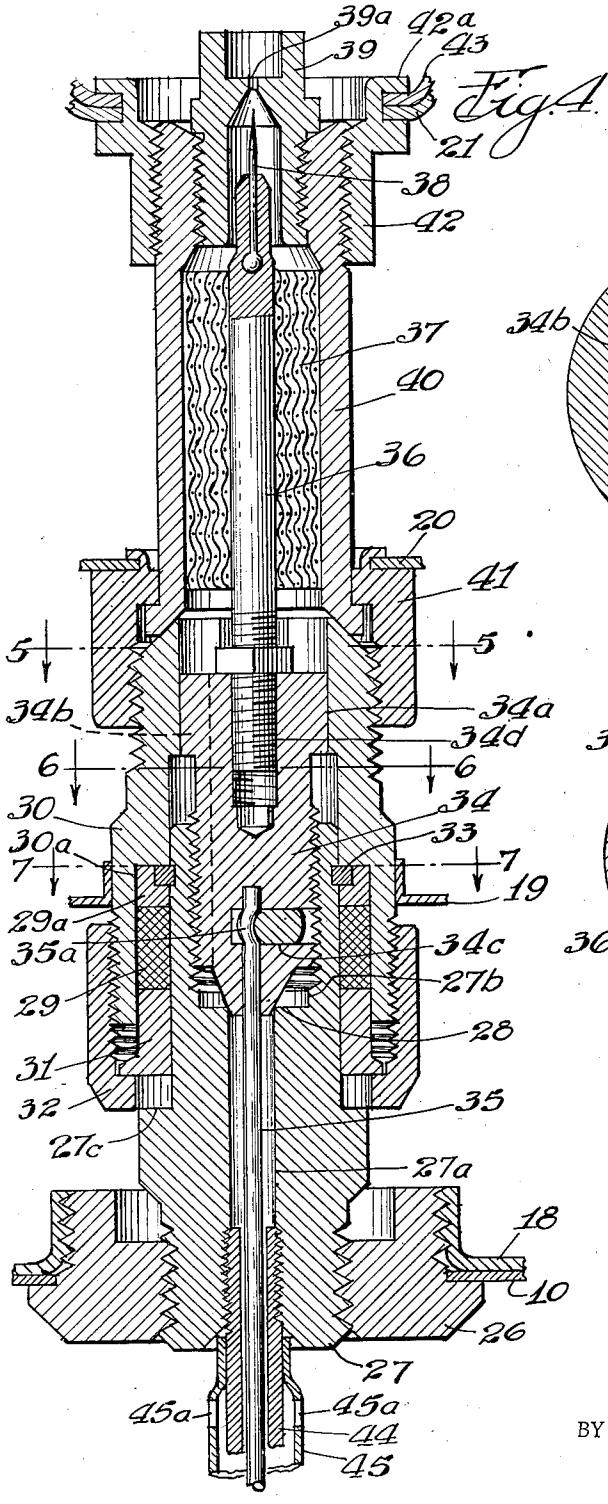


Fig. 4.

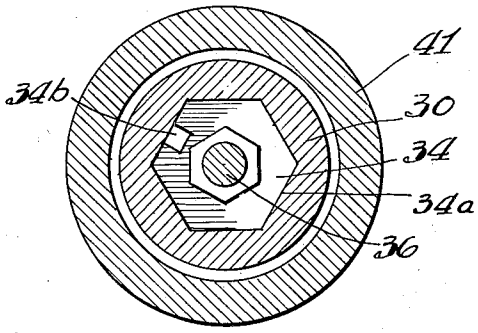


Fig. 5.

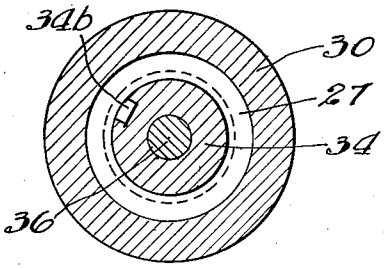


Fig. 6.

INVENTOR.
CARL BRAMMING.
BY Albert C. Bell
ATTORNEY.

Patented Mar. 29, 1949 2,465,572

UNITED STATES PATENT OFFICE

2,465,572

PORTABLE STOVE FOR BURNING LIQUID FUEL

Carl Bramming, Anderson, Ind., assignor to The Mantle Lamp Company of America, Chicago, Ill., a corporation of Illinois

Application April 15, 1943, Serial No. 483,107

13 Claims. (Cl. 158—33)

1

This invention pertains to an improved construction of portable stoves for burning liquid fuel, in which the entire structure is of very small size and weight so that it may readily be made a part of traveling or portable kits used by soldiers, hunters, explorers and the like.

The following considerations are involved in the construction of the stove, which are included in the objects of the present invention: (1) that the stove shall be of minimum size and weight compatible with producing a flame of substantial size for cooking and heating purposes; (2) that the structure shall be sufficiently rugged to stand hard usage without injury; (3) that all of the devices heretofore found necessary for controlling the operation and regulation of such a stove, shall be included in the stove structure notwithstanding its small size; (4) that the parts of the stove shall consist practically in their entirety of punch press parts made of sheet metal, and screw machine parts to lighten the structure and cheapen its production; (5) that projecting portions of the stove which are desirable for stable operation of the same, may be folded or collapsed when not in use to reduce the bulk of the stove to a minimum for transportation; (6) that the fuel reservoir of the stove shall be provided with a hand-pump serving not only as a means for subjecting the fuel in the reservoir to pressure, but also as a means for storing within it, spare parts of the stove that may be required from time to time; (7) that in conjunction with providing the necessary height of the burner of the stove above the reservoir thereof, an operating member or wheel shall be disposed practically at the top of the reservoir, for controlling the operation of the burner of the stove, and that above and spaced from the operating wheel, a combined starting cup and shield is located, which protects the operating wheel from the major portion of the intense heat of the burner; (8) the mounting of a central, rotary and vertical column on the reservoir of the stove, which column forms a rigid support for the burner and mixing chamber connected therewith, as well as for the starting cup and shield, and which column is rigidly secured to said operating member or wheel, said column and the parts carried thereby constituting a unitary structure mounted for rotary movement on a fixed tubular support carried by the reservoir so that rotation of said operating wheel and said column, will operate valve mechanism which is contained within said column to adjust the amount of fuel supplied to the burner and to shut off said fuel flow when desired, the upper portion of said column serving as the vaporizer of the stove when the stove is in operation.

2

The above and other objects of my invention will more fully appear by reference to the accompanying drawings illustrating a preferred embodiment thereof in which:

Fig. 1 shows the stove in front elevation and in practically full size, in its position of use and supporting a pan to be heated;

Fig. 2 is a plan view of the stove shown in Fig. 1 and to the same scale, with the pan removed;

Fig. 3 is a vertical, sectional view of the parts shown in Fig. 2 taken along the line 3—3 in the latter figure, this view being to an enlarged scale;

Fig. 4 shows in a view similar to Fig. 3, and to a further enlarged scale, the structure of the column supporting the burner of the stove; and

Figs. 5, 6 and 7 are horizontal, sectional views through the structure shown in Fig. 4 taken, respectively, along the lines 5—5, 6—6 and 7—7 in Fig. 4.

Similar numerals refer to similar parts throughout the several views.

As shown in Fig. 1, the stove includes a reservoir 10 for liquid fuel, provided with supporting feet 11 which are hinge-connected to the bottom of the reservoir at 12 so that they may have opened positions as shown in Fig. 1 to support the stove, or closed positions against the bottom of the reservoir 10 when the stove is not in use, for example for carrying or transporting the stove from one place to another. Flat springs 13 are provided in connection with the feet 11 to resiliently hold said feet in their opened and folded positions, as desired, in any manner known to the art. The reservoir 10 is provided with a hand pump including a pump barrel 14 mounted in the top wall of the reservoir and extending into said reservoir, in which position it is secured by a threaded sleeve 15, so that by undoing the sleeve, the pump may be removed from the reservoir. The pump also includes a

plunger 16 provided at its outer end with a radially extending handle 17 so that by moving the plunger in the pump barrel, desired air pressure may be produced in the reservoir 10 on top of the liquid fuel contained therein.

The reservoir 10 has rigidly connected with the central portion of its top wall, a casing 18 having large apertures 18a in its lower portion for convenient access to the operating member or wheel 19 and starting cup 20, above which apertures the casing continues to just below the top of the burner 21 of the stove, to support the arms 22 provided to in turn support a pan 23 or similar container for cooking purposes. The arms 22 are pivotally connected at 24 with the upper end of the casing 18, said arms being provided with locking fingers 22a engaging a locking ring 25 for the open position of the arms to support a pan 23 or other device, at which time the ring 25 which is loosely mounted around the upper end of the casing 18, rests upon lugs 18b extending outwardly from the casing. When the stove is not in use, the ring 25 may be raised on the casing 18, freeing the inner ends of the fingers 22a so that the arms 22 may be turned on their pivotal supports 24 to the position indicated for one of said arms in dotted lines in Fig. 1, for example when it is desired to store the stove or transport it from one location to another. A clearance space 22b is provided in each arm 22 between its pivotal portion and its finger 22a to clear the locking ring 25 when the latter is in its raised or releasing position and the arms 22 are in their folded or collapsed position.

The relation of the feet 11 and arms 22 to each other and to the reservoir 10, around the vertical axis of the stove, is more clearly shown in Fig. 2. As shown in this figure, the handle 17 is provided with a laterally extending lug 17a which, when the plunger 16 is in its lowermost position, may be turned under the wheel 19 by turning the handle 17 and plunger 16, so that the handle 17 is in a position above the top wall of the reservoir 10. In this manner, the plunger 16 of the pump may be held in its innermost position in the pump barrel 14 when the stove is not in use.

As shown in Fig. 3, the casing 18 is provided at its upper edge with a reinforcing wire 24a upon which the arms 22 are pivotally mounted so that said wire constitutes the support for said arms. The locking ring 25 is shown in this figure in its lower or locking position supported by the lugs 18b, and also in dotted lines in its raised or releasing position to enter the clearance spaces 22b above the fingers 22a. The casing is provided with suitable clearance apertures to mount the arms 22 as described, and also to permit the fingers 22a to pass through the casing to its interior when the arms are in their folded position.

As shown in Fig. 3, the pump barrel 14 is provided with a check valve at its inner end in a manner common to such devices, and the pump plunger 16 is not much smaller in diameter than the bore of the barrel 14, thus providing a substantial space within the plunger for the storing of spare parts of the stove, for example spare valve parts, spare packing, and similar parts small enough to be contained in the pump plunger, the parts being held therein by screwing into the end of the plunger, a threaded plug 16a rigidly secured to the handle 17.

As shown in Fig. 3, the top wall of the reservoir 10 has rigidly secured to it, an internally threaded bushing 26 to which the casing 18 is rigidly secured. A stationary tubular member 27 is tightly screwed into the bushing 26, which tubular member is provided with a bore 27a terminating at its upper end in a valve seat 28, said valve seat being at the lower end of a counterbore 27b in the upper end portion of the tubular member 27, which counterbore is of substantially larger diameter than the bore 27a in the lower portion of said tubular member. The member 27 is capable of neither rotary nor axial movement, being rigidly attached to the reservoir 10.

As shown in Fig. 4, the stationary tubular member 27 just above its connection with the bushing 26, is provided with a shoulder 27c above which the external surface of the tubular member 27 is cylindrical and of somewhat reduced diameter to engage a metal ring 29a and a ring 29 of packing material contained in a counterbore 30a in the lower end portion of a rotary tubular member 30. A compression ring 31 is mounted on the member 27 below the ring 29, and is flanged outwardly at its lower end to engage an internally threaded sleeve 32 having threaded engagement with external threads on the lower end of the rotary tubular member 30, so that turning the threaded sleeve 32 on the rotary member 30, to press the ring 31 against the ring 29, will pack the outer surface of the member 27 against the flow of liquid fuel between the packing and the adjacent surfaces of the stationary tubular member 27 and of the rotary tubular member 30. The operating member or wheel 19 is rigidly secured to the rotary tubular member 30 so that turning said wheel will rotate the tubular member 30 around the vertical axis of the stove and on the upper external surface of the stationary member 27. The upper end portion of the external surface of the stationary member 27 adjacent the ring 29a is provided with an annular keyway for receiving a split ring 33 which is also partly contained in a suitable annular recess in the ring 29a, and which split ring is also in engagement with the upper end of the counterbore 30a in the rotary tubular member 30 (see Fig. 7). The split ring 33 thus restrains the rotary tubular member 30 against axial movement relatively to the stationary member 27, without interfering with rotary movement of the tubular member 30 on the member 27.

The counterbore 27b in the stationary member 27 is internally threaded to engage corresponding external threads on the lower end portion of a valve member 34 arranged at its lower end to engage the valve seat 28 so that movement upwardly of the valve member 34 will open the valve and movement downwardly of the valve member will close the valve. The upper exterior portion of the valve member 34 is flat-sided, for example hexagonal, at 34a and in axial, sliding engagement with a bore in the upper end of the rotary tubular member 30 of similar shape (see Fig. 5), as a result of which rotary movement of the tubular member 30 also imparts rotary movement to the valve member 34, and the axial movement of the valve member 34 resulting from its rotary movement in engagement with the internal screw threads in the upper end of the stationary member 27, is readily permitted, relatively to the rotary tubular member 30.

As described below, the bore 27a is in communication with the fuel in the reservoir 10 and opening and closing the valve member 34 controls the flow of the liquid fuel to the burner of the stove. The valve member 34 is provided at

its outer surface with a longitudinal groove 34b through which the liquid fuel may flow from the valve seat 28 upwardly in its passage to the burner. (See Fig. 6 and also Figs. 5 and 7.)

The lower end portion of the valve member 34 is provided with a central axial bore to receive the upper end of a valve rod 35, for a purpose below described. The upper end of the rod 35 extends across a transverse bore 34c in which, after it is mounted in the valve member 34, the upper end portion of the rod 35 is indented as shown at 35a by a suitable tool, as a convenient means for securing the rod 35 to the valve member 34. After this is done, the bore 34c is preferably filled with suitable compound to prevent seepage of the liquid fuel around the valve member 34 when the valve is closed.

Still referring to Fig. 4, the upper end of the valve member 34 is provided with a threaded bore 34d for engagement with the lower threaded end of an upwardly extending rod 36 which passes centrally through a screen 37 and carries at its upper end a needle 38 for entering the aperture 39a in a nozzle 39 when the valve member 34 is raised to its uppermost position, so that when desired, the aperture 39a may be cleaned of foreign matter that may accumulate and interfere with the proper operation of the nozzle 39. The screen 37 is cylindrical and is housed in a second rotary tubular member 40 secured at its lower end to the upper end of the rotary tubular member 30 by an internally threaded sleeve 41 engaging corresponding external threads on the upper end portion of the rotary tubular member 30. The starting cup 20 is rigidly secured to the upper end of the sleeve 41 as illustrated in Fig. 4. The upper end of the rotary tubular member 40 is externally threaded to engage corresponding internal threads in a sleeve 42 on which the burner 21 is mounted. As below described, the burner 21 is shaped to also form the mixing chamber of the stove, and is provided with an air valve 43 engaging the inner surface of the lower portion of the burner structure 21 with a sliding fit, the lower edge of the burner 21 and the lower edge of the air valve 43 being contained with a sliding fit in a groove in the upper external surface of the sleeve 42, for example by forcing the upper end 42a of said sleeve over against the lower portion of the air valve 43, the fit of the parts 21 and 43 in the groove so formed, being such as to permit angular movement of the air valve 43 relatively to the burner structure 21. The nozzle 39 is externally threaded and supported by engaging corresponding internal threads in the upper end of the rotary tubular member 40.

From the above, and as shown in Figure 3, it will appear that the rotary tubular member 30 and the rotary tubular member 40 in their assembled relation, together constitute a central, vertical, tubular column of the stove, to which column the operating member or wheel 19, the cup and shield 20 and the burner 21 are secured, which column is rotary as a unitary structure relatively to the reservoir 10, when the operating member or wheel 19 is turned to operate the valve member 34; it will also appear that said column extends upwardly from and is supported by the reservoir 10, since said column is mounted for rotary movement on the stationary, tubular supporting member 27 which is rigidly secured to and extends above the reservoir 10, and it is also apparent that the split ring 33 restrains said unitary column structure against axial movement relatively to said stationary supporting member 27, as well as relatively to the reservoir 10.

As more clearly shown in Fig. 3, the fixed member 27 has screwed into the lower end of its bore 27a, a tube 44 having a bore somewhat larger in diameter than the diameter of the rod 35, which tube is imperforate and extends nearly to the bottom of the reservoir 10. Around the tube 44 a second tube 45 is disposed having a bore of slightly larger diameter than the outside diameter of the tube 44, the upper end of the tube 45 being contracted so that it engages the upper portion of the tube 44 by which said tube 45 is supported from the tube 44 in concentric relation therewith. The tube 45 has secured thereto at its lower end, a cap member 46 extending slightly below the lower ends of the tubes 44 and 45 and providing a compartment 46a at the lower ends of said tubes 44 and 45 connecting the space between the tubes 44 and 45 and the space between the tube 44 and the rod 35. The lower end of the cap member 46 is provided with an aperture in which the lower end of the rod 35 is disposed, for the closed condition of the valve member 34, said aperture being slightly larger than the diameter of the lower end of the rod 35 to permit fuel flow in restricted amount from the reservoir 10 into the compartment 46a, when the lower end of the rod 35 is in said aperture. The upper end portion of the tube 45 is provided with apertures 45a above the uppermost fuel level in the reservoir 10 and communicating with the space between the tubes 44 and 45. As a result of this construction, when pressure has been developed on the air in reservoir 10 above the liquid fuel therein by operation of the pump plunger 16, and it is desired to start the operation of the stove, the valve member 34 is raised slightly from its valve seat 28, for which condition the lower end of the rod 35 is still in the aperture in the end of the cap member 46. This causes fuel flow upwardly around the rod 35 in the tube 44, of restricted amount, to and through the nozzle 39, which fuel may be permitted to flow and drip into the starting cup 20 by holding the operator's hand over the burner 21, until a desired amount has been there collected, and then the fuel so collected in said cup is lighted and the preheating of the vaporizer or generator 40 begins. In a very short time the generator 40 is sufficiently heated to vaporize the fuel passing upwardly through the screen 37, and the fuel is ignited at the burner 21 from the fuel burning in the cup 20. The heating action continues until the generator and burner have become sufficiently heated to vaporize a larger volume of fuel, and then the wheel 19 is further turned to separate the valve member 34 to a greater degree from the valve seat 28, which draws the rod 35 upwardly from the aperture in the cap 46 and permits free flow of the liquid fuel into the cap and up through the tube 44 around the rod 35, which is the running condition of the stove. The provision for producing a lean mixture of fuel during the starting condition as described, is found to be advantageous in initially heating the generator 40 and burner 21. During said preheating, air flows through the apertures 45a and downwardly between the tubes 44 and 45 and mixes with the limited amount of fuel flow into the compartment 46a, because of the small clearance between the rod 35 and the aperture in the cap member 46, producing the lean condition of mixture referred to for starting purposes. When the operating member or wheel 19 is turned to establish the running condition of the rod 35 relatively to the

cap member 46, and of the valve member 34 relatively to its seat 28, the needle 38 is still below the nozzle aperture 39a, so that it does not in any way interfere with the discharge of the vaporized fuel from the nozzle. As shown in Fig. 3, the shell of the burner 21 and the air valve 43 contain registering openings 21a and 43a so that by turning the air valve 43 relatively to the burner 21, said air openings may be increased or decreased in effective size permitting air flow to the vaporized fuel delivered by the nozzle 39, to establish proper combustion of the fuel, the space within the air valve 43, serving as the mixing chamber of the stove. The burner 21 supports in its upper portion, a baffle 47 having a plurality of radial arms 47a extending through apertures therefor in the wall of the burner 21. The baffle is of substantially the same shape and smaller than the corresponding portion of the burner, leaving an annular space between the baffle and the burner for the flow of fuel mixture to the burner flame. The baffle 47 is centrally disposed in the burner 21 and said burner is substantially coaxial with the nozzle 39, so that the vapor stream from the nozzle is projected against the baffle and this materially aids in effecting intimate mixture of the fuel vapor with the air admitted into the mixing chamber through the air valve 43.

The openings 21a and 43a are placed in angular alignment with the fingers 22a, so that in folding the arms 22, said fingers may enter the burner through said openings.

From the above, it will be noted that the invention provides a novel construction of central supporting column, by which all of the parts of and carried by said column are mounted for rotary movement by means of an operating member or wheel rigidly secured to said column, and relatively to a short vertical and column supporting member rigidly secured to the reservoir 10, and that said rotary column has rigidly secured thereto the starting cup and shield structure of the device, and that excepting for purposes of air adjustment, the burner 21 and air valve 43, as well as the baffle 47, are also carried by said column as a unitary structure and rotate with said column. This arrangement obviates difficulties in construction that would otherwise be present if it were attempted to provide a non-rotary and non-movable central column in connection with which only the valve itself were rotary and axially movable. It will also be noted that although the parts referred to as mounted on the rotary column are rotary with said column in adjusting the flow of the liquid fuel, all of these parts are surrounded by a casing 18 which is rigidly secured to the reservoir 10 and has no movement relatively to the reservoir, the casing serving as a protection for the rotary parts, and at the same time providing a stationary support for the arms 22. It will also be observed that the apertures in the lower part of the casing provide ready access to the starting cup 20 and to the operating member or wheel 19 so that said wheel may be rotated as required to adjust the flow of the liquid fuel. A further important advantage of the construction is that most if not all of the parts may be made from sheet metal by punch press operations or from metal bars by screw machine operations, which operations are recognized as among the cheapest in connection with the manufacture of any device. It will also be observed that although the stove is of very small size, the structure described provides for all of the requirements of effectively burning liquid fuel and with any size flame that may reasonably be required. The stove described is intended for operation with relatively light liquid fuel such as gasoline, although I do not limit myself to the use of such fuel as other liquid fuels susceptible of being burned with devices of the kind described, may be used with the stove, if preferred.

It will also be noted that the described construction of the central, rotary column of the stove, simplifies the assembly of the stove, as well as facilitating disassembling the parts for cleaning and renewal, as may be desired.

While I have shown my invention in the particular embodiment above described, it will be understood that I do not limit myself thereto as I may employ equivalents thereof without departing from the scope of the appended claims.

Having thus described my invention, what I claim is:

1. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular column carried by and extending upwardly from said supporting member and capable of rotary movement relatively to said supporting member, an operating member secured to said column, a burner carried by said column, said two cooperating parts having coaxial cylindrical surfaces one around the other, one of said two cooperating parts having an annular recess in its said cylindrical surface, annular packing material in said recess for engaging the said cylindrical surface of the other of said two cooperating parts, said recess having opposed end walls adjustably exerting axial pressures on said packing material, said end walls for any said pressure adjustment having fixed relation to and being carried by said recessed cooperating part and disposed at opposite ends of said packing material, whereby for any axially compressed condition of said packing material opposed and balanced axial pressures are exerted on said recessed cooperating part independently of said other cooperating part and said packing material is pressed against said other cooperating part thereby forming a seal, said two cooperating parts having registering annular keyways, a key member in said keyways restraining said two cooperating parts against relative axial movement independently of said packing material and of the axial pressures thereon, and a shut-off valve member in said column and having axial movement controlled by rotary movement of said column.

2. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a key member and cooperating annular keyway carried by said two cooperating parts and restraining said column against axial movement relatively to said tubular supporting member, a burner-regulating and shut-off valve member in said column having threaded engagement with one of said two cooperating parts and having flat surface sliding engagement axially of said column

with the other one of said two cooperating parts restraining said valve member from angular movement relatively to said other one of said two cooperating parts and permitting axial movement of said valve member relatively to said tubular supporting member, and packing means between said two cooperating parts and including a ring of packing material, one of said two parts having a cylindrical recess containing said packing ring, said recess having two opposed end walls both of which are supported by the one of said two parts containing said recess and disposed at opposite ends of said packing ring, one of said end walls being axially movable on its support and thereby exerting axial pressure on said ring of packing material and producing a corresponding opposing axial pressure on said packing material by the other of said end walls, whereby compressing said packing material axially produces opposed pressures axially on the one of said two parts containing said recess independently of the other of said two parts and presses said packing against said other of said parts thereby forming a seal.

3. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a key member and cooperating annular keyway carried by said two cooperating parts and restraining said column against axial movement relatively to said tubular supporting member, a burner-regulating and shut-off valve member in said column having threaded engagement with one of said two cooperating parts and having flat surface sliding engagement axially of said column with the other one of said two cooperating parts restraining said valve member from angular movement relatively to said other one of said two cooperating parts and permitting axial movement of said valve member relatively to said tubular supporting member, packing means between said two cooperating parts and including a ring of packing material, one of said two parts having a cylindrical recess containing said packing ring, said recess having two opposed end walls both of which are supported by the one of said two parts containing said recess and disposed at opposite ends of said packing ring, one of said end walls being axially movable on its support and thereby exerting axial pressure on said ring of packing material and producing a corresponding opposing axial pressure on said packing material by the other of said end walls, whereby compressing said packing material axially produces opposed pressures axially on the one of said two parts containing said recess independently of the other of said two parts and presses said packing against said other of said parts thereby forming a seal, an apertured fuel nozzle supported by the upper end of said column, a rod secured to and extending upwardly from said valve member, and a pricker needle carried by the upper end of said rod for entry into the nozzle aperture when said valve is in its upper position.

4. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a key member and cooperating annular keyway carried by said two cooperating parts and restraining said column against axial movement relatively to said tubular supporting member, a burner-regulating and shut-off valve member in said column having a valve surface at its lower end and having threaded engagement with said tubular supporting member and having at its upper end portion a flat-sided longitudinal outer surface in axially sliding engagement with a similarly shaped inner surface of said column, said tubular supporting member having a valve seat for cooperation with said valve surface, and packing means between said two cooperating parts and including a ring of packing material, one of said two parts having a cylindrical recess containing said packing ring, said recess having two opposed end walls both of which are supported by the one of said two parts containing said recess and disposed at opposite ends of said packing ring, one of said end walls being axially movable on its support and thereby exerting axial pressure on said ring of packing material and producing a corresponding opposing axial pressure on said packing material by the other of said end walls, whereby compressing said packing material axially produces opposed pressures axially on the one of said two parts containing said recess independently of the other of said two parts and presses said packing against said other of said parts thereby forming a seal.

5. A portable stove for burning liquid fuel, including in combination a fuel reservoir, a stationary support extending from said reservoir, a tubular column mounted vertically upon said stationary support for rotary movement relatively to said reservoir, a key member and cooperating keyway carried by said stationary support and said column and restraining said column against axial movement relatively to said reservoir, a burner supported by said column, and fuel-controlling valve mechanism in said column including an axially movable valve member and a stationary valve seat below said valve member, there being operating connection between said column and said valve member, said stationary support and said column having coaxial cylindrical surfaces, said cylindrical surface of said column being outside of and around said cylindrical surface of said stationary support, said cylindrical surface of said column having an annular recess therein, annular packing material in said recess for engaging said cylindrical surface of said stationary support, said recess having opposed end walls adjustably exerting axial pressures on said packing material, said end walls for any said pressure adjustment having fixed relation to and both being carried by said column and disposed at opposite ends of said packing material, whereby for any axially compressed condition of said packing material opposed and balanced axial pressures are exerted on said column independently of said stationary

support and said packing material is pressed against said stationary support thereby forming a seal.

6. A portable stove for burning liquid fuel, including in combination a fuel reservoir, a stationary member carried by said reservoir, a tubular column mounted vertically on said stationary member for rotary movement relatively thereto, a key member and cooperating keyway carried by said stationary member and said column and restraining said column against axial movement relatively to said stationary member, a burner supported by said column, and a valve member in said column for controlling fuel flow and having threaded engagement with said stationary member and having also non-rotary and axially sliding engagement with said column, whereby rotary movement of said column imparts rotary movement and also axial movement vertically to said valve member, thereby moving said valve member to its open and closed positions as desired, said stationary member and said column having coaxial cylindrical surfaces one around the other, the outer one radially of said cylindrical surfaces having an annular recess therein, annular packing material in said recess for engaging the inner one of said cylindrical surfaces, said recess having opposed end walls adjustably exerting axial pressures on said packing material, said end walls for any said pressure adjustment having fixed relation to and both being carried by said recessed part and disposed at opposite ends of said packing material, whereby for any axially compressed condition of said packing material opposed and balanced axial pressures are exerted on said recessed part independently of the part having said inner cylindrical surface and said packing material is pressed against said inner cylindrical surface thereby forming a seal.

7. A portable stove for burning liquid fuel, including in combination a fuel reservoir, a stationary member carried by said reservoir, a tubular column mounted vertically on said stationary member for rotary movement relatively to said reservoir, a key member and cooperating keyway carried by said stationary member and said column and restraining said column against axial movement relatively to said reservoir, a burner supported by said column, fuel-controlling valve mechanism in said column including a movable valve member and a stationary valve seat below said member, said valve member having a valve surface at its lower end and having flat-surface engagement with said column permitting vertical axial movement of said valve member and having threaded engagement with said stationary member permitting angular movement of said valve member, said stationary member and said column having coaxial cylindrical surfaces, said cylindrical surface of said column being outside of and around said cylindrical surface of said stationary member, said cylindrical surface of said column having an annular recess therein, annular packing material in said recess for engaging said cylindrical surface of said stationary member, said recess having opposed end walls adjustably exerting axial pressures on said packing material, said end walls for any said pressure adjustment having fixed relation to and both being carried by said column and disposed at opposite ends of said packing material, whereby for any axially compressed condition of said packing material opposed and balanced axial pressures are exerted on said column independently of said stationary member and said packing material is pressed against said stationary member thereby forming a seal.

8. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a key member and cooperating annular keyway carried by said two cooperating parts and restraining said column against axial movement relatively to said tubular supporting member, a valve member in said column having threaded engagement with one of said two cooperating parts and having flat surface sliding engagement axially of said column with the other one of said two cooperating parts restraining said valve member from angular movement relatively to said other one of said two cooperating parts and permitting axial movement of said valve member relatively to said tubular supporting member, said tubular supporting member having a cylindrical external surface at its upper portion, and said column having a counterbore around said cylindrical surface, upper and lower metal rings in said counterbore, packing material in said counterbore between said metal rings and engaging said counterbore and said cylindrical external surface, and means for compressing said packing material between said metal rings and pressing the same against said column and against said tubular supporting member.

9. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a valve member in said column having threaded engagement with one of said two cooperating parts and having flat surface sliding engagement axially of said column with the other one of said two cooperating parts restraining said valve member from angular movement relatively to said other one of said two cooperating parts and permitting axial movement of said valve member relatively to said tubular supporting member, said tubular supporting member having a cylindrical external surface at its upper portion, and said column having a counterbore around said cylindrical surface, upper and lower metal rings in said counterbore, packing material in said counterbore between said metal rings and engaging said counterbore and said cylindrical external surface, means for compressing said packing material between said metal rings and pressing the same against said column and against said tubular supporting member, said upper metal ring having a first annular keyway in its inner surface and said tubular supporting member having a second annular keyway in its outer surface registering with said first annular keyway, and a key member comprising a

split ring in said annular keyways and restraining said column against axial movement relatively to said tubular supporting member.

10. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a key member and cooperating annular keyway carried by said two cooperating parts and restraining said column against axial movement relatively to said tubular supporting member, a valve member in said column having threaded engagement with one of said two cooperating parts and having flat surface sliding engagement axially of said column with the other one of said two cooperating parts restraining said valve member from angular movement relatively to said other one of said two cooperating parts and permitting axial movement of said valve member relatively to said tubular supporting member, said tubular supporting member having a cylindrical external surface at its upper portion, and said column having a counterbore around said cylindrical surface, upper and lower metal rings in said counterbore, packing material in said counterbore between said metal rings and engaging said counterbore and said cylindrical external surface, and a threaded sleeve on the lower end of said column for compressing said packing material between said metal rings and pressing the same against said column and against said tubular supporting member.

11. A portable stove for burning liquid fuel, including in combination a fuel reservoir, two cooperating parts comprising a tubular supporting member rigidly secured to and extending above said reservoir and a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a valve member in said column having threaded engagement with one of said two cooperating parts and having flat surface sliding engagement axially of said column with the other one of said two cooperating parts restraining said valve member from angular movement relatively to said other one of said two cooperating parts and permitting axial movement of said valve member relatively to said tubular supporting member, said tubular supporting member having a cylindrical external surface at its upper portion, and said column having a counterbore around said cylindrical surface, upper and lower metal rings in said counterbore, packing material in said counterbore between said metal rings and engaging said counterbore and said cylindrical external surface, a threaded sleeve on the lower end of said column for compressing said packing material between said metal rings and pressing the same against said column and against said tubular supporting member, said upper metal ring having a first annular keyway in its inner surface and said tubular supporting member having a second annular keyway in its outer surface registering with said first annular keyway, and a key member comprising a split ring in said annular keyways and restraining said column against axial movement relatively to said tubular supporting member.

12. A portable stove for burning liquid fuel, including in combination a fuel reservoir, a tubular supporting member rigidly secured to and extending above said reservoir, a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a key member and cooperating annular keyway carried by said supporting member and said column and restraining said column against axial movement relatively to said tubular supporting member, a valve member in said column having threaded engagement with said supporting member and having flat surface axially sliding engagement with said column restraining said valve member from angular movement relatively to said column and permitting axial movement of said valve member relatively to said tubular supporting member, said tubular supporting member having a cylindrical external surface at its upper portion, and said column having a counterbore around said cylindrical surface, upper and lower metal rings in said counterbore, packing material in said counterbore between said metal rings and engaging said counterbore and said cylindrical external surface, and means for compressing said packing material between said metal rings and pressing the same against said column and against said tubular supporting member.

13. A portable stove for burning liquid fuel, including in combination a fuel reservoir, a tubular supporting member rigidly secured to and extending above said reservoir, a tubular central column carried by said tubular supporting member and extending upwardly therefrom, said column having bearing engagement with said tubular supporting member permitting rotary movement of said column relatively to said tubular supporting member, an operating member secured to said column, a burner carried by said column, a valve member in said column having threaded engagement with said supporting member and having flat surface axially sliding engagement with said column restraining said valve member from angular movement relatively to said column and permitting axial movement of said valve member relatively to said tubular supporting member, said tubular supporting member having a cylindrical external surface at its upper portion, and said column having a counterbore around said cylindrical surface, upper and lower metal rings in said counterbore, packing material in said counterbore between said metal rings and engaging said counterbore and said cyylindrical external surface, means for compressing said packing material between said metal rings and pressing the same against said column and against said tubular supporting member, said upper metal ring having a first annular keyway in its inner surface and said tubular supporting member having a second annular keyway in its outer surface registering with said first annular keyway, and a key member comprising a split ring in said annular keyways and restraining said column against axial move-

ment relatively to said tubular supporting member.

CARL BRAMMING.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
174,366	Jeffrey et al.	Mar. 7, 1876
197,749	Thorne	Dec. 4, 1877
496,450	Shedlock	May 2, 1893
631,792	Hoppe	Aug. 29, 1899
694,173	Newbold	Feb. 25, 1902
900,321	Sone	Oct. 6, 1908
954,703	Savage et al.	Apr. 12, 1910
1,078,578	Gehring et al.	Nov. 11, 1913
1,265,768	Fuller	May 14, 1918
1,271,923	Merle	July 9, 1918
1,310,938	Ballerstedt	July 22, 1919
1,556,644	Stichler	Oct. 13, 1925
1,586,489	Trow	May 25, 1926
1,893,598	Rasmussen	Jan. 10, 1933
1,915,141	Wiley et al.	June 20, 1933
1,935,410	Olsen	Nov. 14, 1933
1,970,237	Kramer	Aug. 14, 1934
2,139,819	Graetz	Dec. 13, 1938
2,248,037	Olsen	July 1, 1941
2,270,623	Camertoni	Jan. 20, 1942
2,366,605	Evans	Jan. 2, 1945

FOREIGN PATENTS

Number	Country	Date
395,623	France	Jan. 4, 1909
54,266	Germany	Nov. 6, 1890
36,815	Sweden	May 6, 1912