Aug. 13, 1968 C. D. ALLEN 3,396,715

PORTABLE COMBUSTION DEVICE FOR SOLID FUELS

Filed Jan. 14, 1966 4 Sheets-Sheet 1

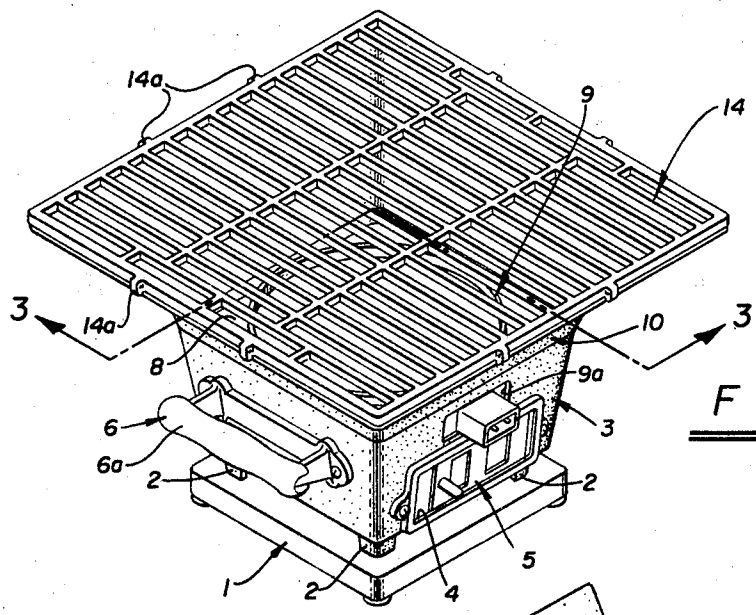
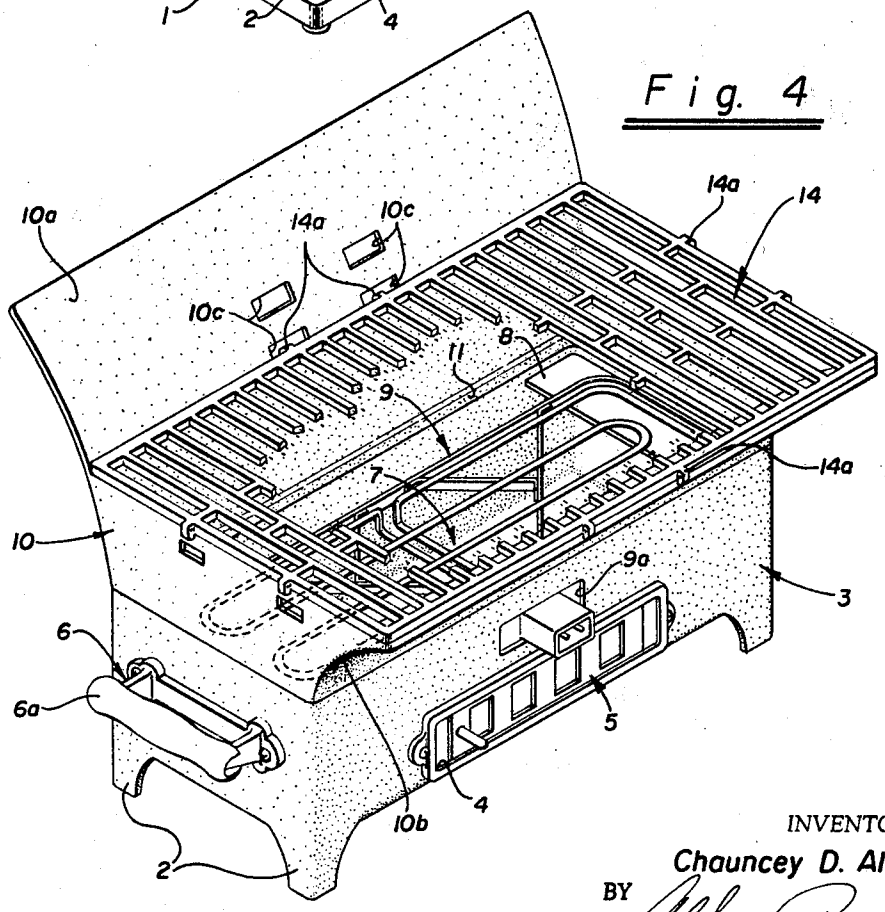


Fig. 1

Fig. 4



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PORTABLE COMBUSTION DEVICE FOR SOLID FUELS

Filed Jan. 14, 1966 4 Sheets-Sheet 2

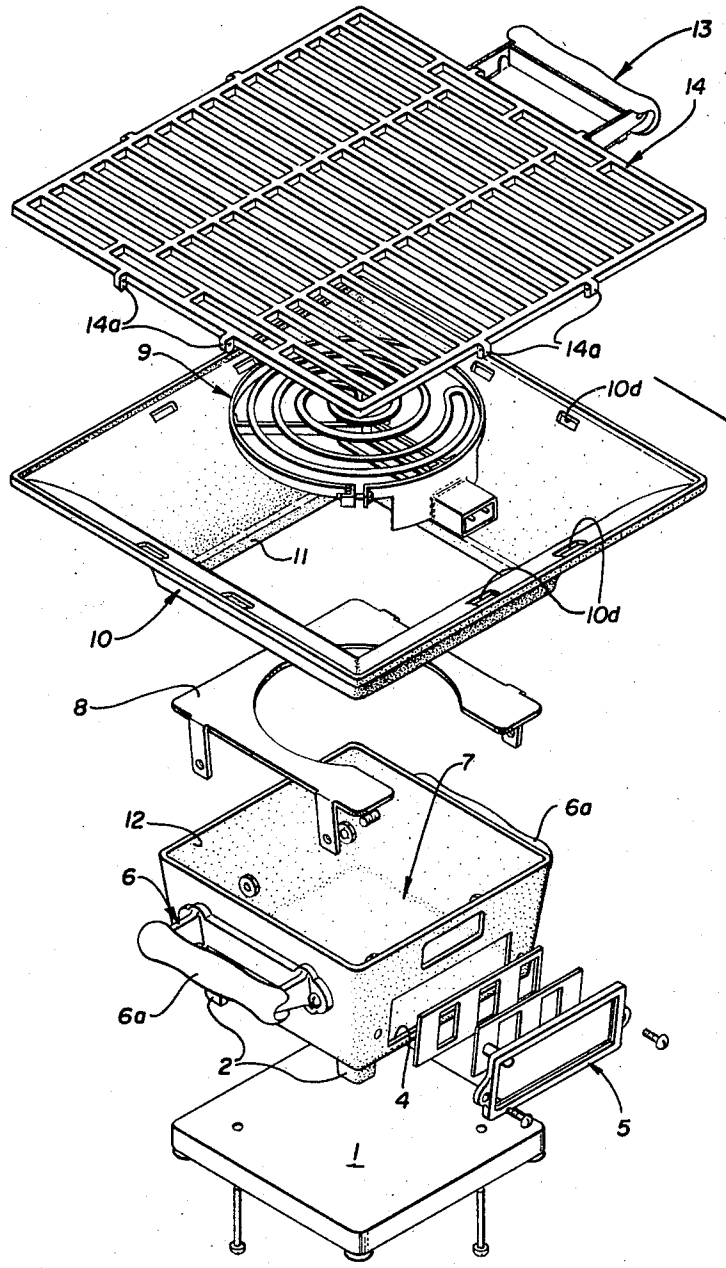


Fig. 2

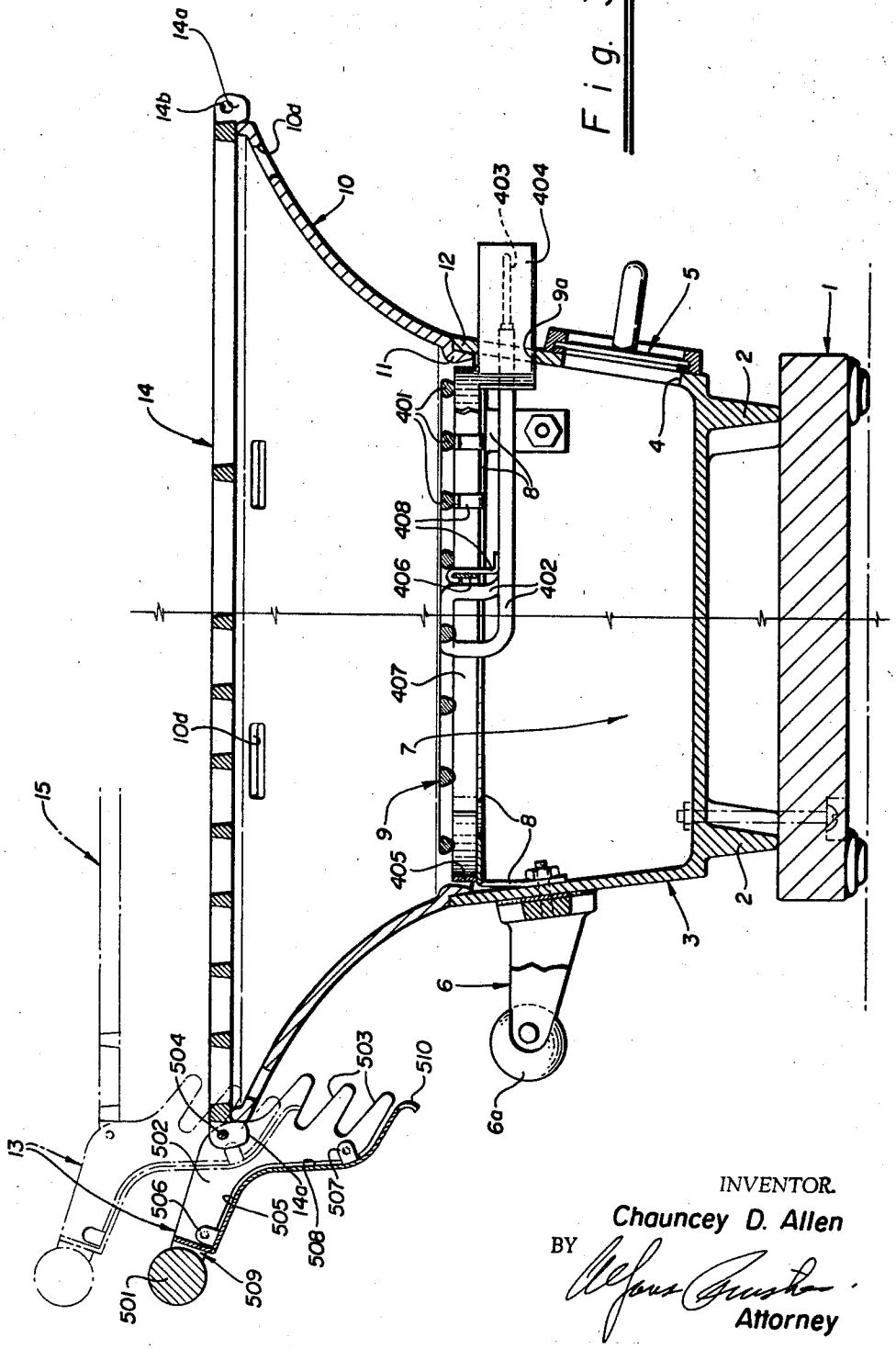
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PORTABLE COMBUSTION DEVICE FOR SOLID FUELS

Filed Jan. 14, 1966 4 Sheets-Sheet 3

Fig. 3



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PORTABLE COMBUSTION DEVICE FOR SOLID FUELS

Filed Jan. 14, 1966 4 Sheets-Sheet 4

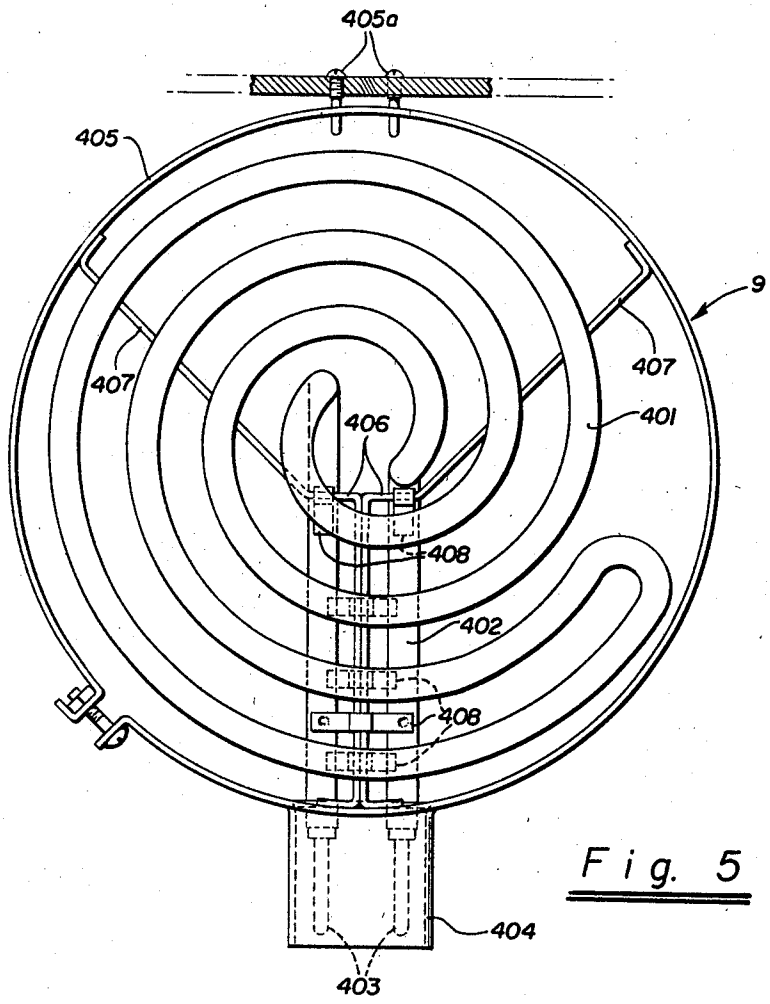


Fig. 5

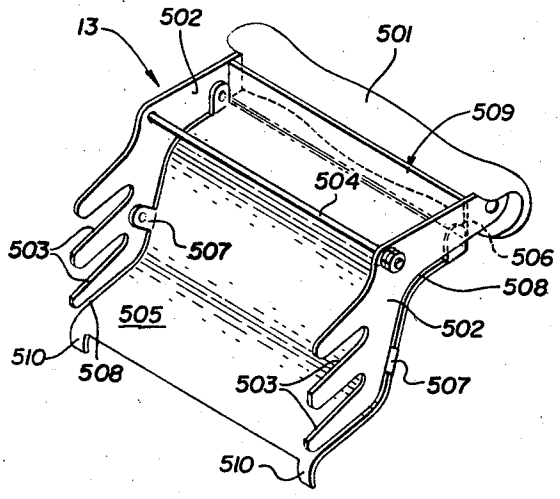


Fig. 6

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United States Patent Office 3,396,715
Patented Aug. 13, 1968

3,396,715

PORTABLE COMBUSTION DEVICE FOR SOLID FUELS

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Filed Jan. 14, 1966, Ser. No. 520,616
7 Claims. (Cl. 126—25)

ABSTRACT OF THE DISCLOSURE

A device for efficient operation of barbecuing and similar operations which makes possible rapid and efficient ignition and combustion of solid fuels. An electric igniter element is so constructed and installed as to act also as a grate for fuel. The device further is constructed to permit rapid assembly, disassembly, and adjustment while hot with complete safety.

My invention relates to improvements in portable combustion devices which utilize solid fuels. More particularly, my invention relates to improvements in such devices as fireplace grates, grills, barbecuing, food smoking, cooking and open heating devices, and devices known in the art as "hibachis."

Existing devices for the utilization of solid fuels for combustion are accompanied by a great many problems and disadvantages. All of the devices of the classes mentioned above have a common fault in that they are difficult to start or to initiate the combustion, especially when utilizing smokeless fuels as described below. They are also inclined to produce a substantial amount of smoke and fumes with ordinary fuels. This, of course, is a considerable problem with indoor installations.

Various expedients have been utilized to overcome these problems such as utilization of inflammable chemicals to initiate the combustion and the application of electric heating or ignition devices to the bed of fuel long enough to initiate combustion or, as is commonly stated, to "start the fire." None of these, however, have been completely successful in that considerable amount of time is still required to start the fire, the volatile chemicals are accompanied by considerable hazard and have a tendency to spoil the flavor of the foods in application where the device is used for cooking, and in most cases resort must still be had to the use of paper, wood, and similar materials as kindling. The delay, inconvenience, hazard, and inferior quality of existing devices and methods is well known to those skilled in the art.

The problem of smoke and fume prevention by the use of special solid fuels, as well as the utilization of slow burning fuels is further aggravated by the greater difficulty in getting these started.

Additional disadvantages of existing devices are a lack of flexibility or mobility, as well as versatility. In those devices where some of the foregoing features are provided, it is difficult to make alterations in the configuration or utilization of the device such as removal of grills, etc., without the hazard of burning the operator's hands.

It is therefore a general object of my invention to provide a combustion device for solid fuels in which combustion may be swiftly, safely, and efficiently initiated.

It is another object of my invention to provide a device of the class described which would be flexible and versatile and facilitate ease of operation and adjustment.

It is still another and very important object of my invention to provide a device of the class described which would eliminate the use of existing external or artificial means and methods of initiating combustion, while at the same time provide for efficient continued combustion, removal of ashes, and conservation of fuel.

It is a more specific object of my invention to provide a device or devices of the class described which would permit the efficient and economical utilization of smokeless fuels.

It is yet another and more specific object of my invention to provide a device, or devices of the class described, which would permit operation and handling of the component parts while the device is in operation without hazard of burning the operator's hands.

It is finally an object of my invention to provide a device of the class or classes described which would overcome all of the objections to existing devices and result in greater operating efficiency, convenience, safety, and quality of results.

I have discovered that by utilizing an electrical resistance heating device, together with a special and unique supporting structure, I am able to provide a grate for a combustion device utilizing solid fuels, which remains in position, functioning both as an igniter and as a grate throughout the entire period from the initiation of combustion and until completion. When used in combination with the special configurations and geometries disclosed herein, I am able to overcome all of the objections to existing devices and produce the methods, results and advantages described more fully below.

An understanding of the construction and operation of my invention may be had from the description which follows and the accompanying drawings which form a part of the specification.

In the drawings:

FIG. 1 is an isometric view showing an assembly and general construction of an embodiment of my invention which may be utilized primarily for outdoor cooking.

FIG. 2 is an exploded view of FIG. 1 showing the component parts and their relation to each other.

FIG. 3 is a longitudinal section through the embodiment of FIG. 1.

FIG. 4 is an isometric view of an assembly and construction of a preferred embodiment of my invention which may be used inside of an indoor fireplace or table high kitchen open stove.

FIG. 5 shows the details of the element which comprises the combined igniter and grate of my invention.

FIG. 6 shows the detail of the portable heat shielded handles used in combination with the other elements of my invention.

Referring now to the figures and particularly to FIG. 1 and FIG. 3, there is seen the base **1** which may be made of wood or other suitable material, or may be dispensed with entirely depending on the particular operation to which the device will be put. The legs **2** support a lower body section **3** which is equipped with an opening **4**. The opening **4** many have positioned within it a suitable damper **5** for opening and closing and thus regulating the rate of combustion if desired. This element, however, may be dispensed with in some applications. The handles **6** are permanently secured to the lower body section **3** in any desired manner depending on the materials of construction utilized and may be equipped with grips **6a**, which may be of wood or other suitable material. These are provided for the convenience of the operator in changing the location of the device from one spot to another, or placing it in position initially for use.

Inside the bottom of lower body section **3** is located an ash pit **7**, the function of which will become evident to those skilled in the art from the description given below.

Within the interior of lower body section **3** are located the supports **8**. These may comprise simple integrally cast triangular supports in each of the four corners, or may take the form of a complete ring positioned on the in-

terior of body **3** and fastened to it by bolting, riveting, or any other convenient manner.

Removably positioned on top of supports **8** is the igniter grate of my assembly **9** which is seen in more detail on FIG. 5 and described more fully below. An end portion of assembly **9** protrudes loosely through slot **9***a* in lower section **3**, also described more fully below.

Positioned next on top of lower body section **3** is an upper body section **10** which is generally in the shape of a truncated pyramid to mate with the square cross-section of lower body section **3**, although I may use other geometries, such as circular or rectangular, if desired. Upper body section **10** is equipped with a reduced neck section around its lower periphery **11**. This is adapted to nest inside of the upper rim **12** of the lower body **3**. More than one size upper body section **10** may be utilized if desired for the sake of convenience and flexibility, ease of manufacturing, transportation, and cleaning. A grill or gridiron **14** is positioned on top of upper body section **10** and performs the function of holding the food in positin while it is being cooked, as is done with conventional barbecue devices.

When it is desired to remove the grill **14**, or the upper body section **10** while the device is in operation, I utilize my heat shielded handles **13**, which may best be seen in detail in FIG. 6 and are described more fully below.

The principal structural components of my invention described above may be made of cast-iron, but when desirable these may also be made of sheet metal fabricated in the manner familiar to those skilled in the art. The method of joining may be by bolting, riveting, or welding, depending on the material used and the convenience of the fabricator.

The actual dimensions may be varied to suit the needs of a given application. I have found that for a typical outdoor cooking or barbecuing application, a device in which the lower body section is approximately 7″ x 7″ in cross-sectional dimensions and about 4″ in height and the upper body section approximately 12″ x 12″, the overall height of the device being about 7″.

Referring now to FIG. 4, there is seen a preferred embodiment of my invention as applied for use in connection with a fireplace. The essential elements and principal of operation are the same except that rather than utilizing a square configuration of the dimensions similar to those given above, I utilize a rectangular configuration which may have cross-sectional dimensions of 8″ x 18″, or any similar size, depending on the dimensions of the fireplace into which it will be inserted for use. Also in this embodiment my upper body section has an elevated back-side **10***a* and a lower forward curved front-side **10***b* to facilitate the direction of heat from my device out of the fireplace and into the room.

This embodiment may likewise be equipped with a grill for cooking, as shown at **14**. To facilitate positioning of the grill, outer elevated back-side **10***a* is equipped with slots **10***c* and the grill **14** equipped with prongs **14***a* for positioning within slots **10***c*. In this embodiment also my igniter grate **9** is made of elliptical or oblong configuration to conform with the general configuration of the device.

Referring now to FIG. 5 there is seen the unique combination of an igniting element with structural members to comprise what I call my "igniter grate." The spirally shaped electrical resistance heater element **401** may be a commercially available product, such as "Calrod," a trademark of the General Electric Company, or of "Chromalox," a product of the Edwin L. Weigand Company, or other similar commercial products. I prefer to utilize this in the shape indicated and to use elements of circular cross-section, although other shapes and configurations may be used, as will be evident to those skilled in the art. Straight sections or feeder leads of my heater element **402** terminate in connecting prongs **403**. These are shielded for safety purposes by a protecting guard **404**, as is done with

conventional electrical appliances. Prongs **403** and guard **404** protrude through slot **9***a* as described above. To provide structural support and permit the unusual functioning of my device, I utilize first an outer structural support ring **405**. This is joined to an inner structural support piece **406** by spokes **407**, having a generally radial position. These elements may be fabricated from structural steel plate or even stainless steel and joined together in any suitable manner to form a rigid supporting structure. The successive rings of my heater element **401** are secured to the spokes **407** by means of U-shaped straps **408** which are likewise fastened to spokes **407** in any convenient manner. These fasteners are tight enough to hold the element to the spokes while permitting thermal expansion. The spokes in turn permit the element to retain its flexibility or springiness in a vertical direction. To prevent my igniter grate from falling out when body section **3** is dumped upside down as described below, I fasten ring **405** to body **3** by means of bolts **405***a*. The unusual grate action of an element so supported is thus obtained. When assembled as described above my igniter grate element is placed on top of the supports **8** which by means of their construction previously described permit the grate to be reciprocated, oscillated, or shaken back and forth in any desired manner. Thus when my solid materials of combustion such as briquettes or charcoal or special slow burning fuels are placed inside my device and on top of this grate, they may be rapidly ignited by making an electrical connection to the prongs **403**. For this purpose ordinary 110 volt or 120 volt AC is suitable. I have found that a standard 500 watt heater element will produce a temperature of 1500° F. quite rapidly and cause almost instant ignition of the fuel.

After the fuel is sufficiently ignited I remove the connection from the prongs and my igniter element continues to function as a unique grate. As the combustion progresses I may agitate this grate by grasping the outside of the guard **404** and shaking the entire assembly, slot **9***a* supplying sufficient clearance for this purpose. I have found that as so constructed my assembly has an unusual amount of springiness not possessed by any heating element or solid grate alone and only obtained by the construction which I have disclosed herein. This facilitates shaking the ashes down through the fuel bed, through the grate, and into the ash pit. Also, the close spacing of my assembly prevents wastage of fuel while permitting a high rate of combustion. This in turn may be improved by means of air flow in through opening **4** in bottom section **3** regulated by damper **5**, if desired.

When I am ready to commence cooking I place my grill **14** on top of upper body section **10** by utilizing my handles **13**. In some cases I may want to superimpose a different size upper body section as described above and I may utilize my handles **13** for this purpose too. This operation is best understood and is evident from a study of FIG. 2 and FIG. 3 without detailed description. The novel portable handles of my invention are best seen in FIG. 6. They comprise a grip **501** which may be made of wood or other heat insulating material on opposite ends of which are fastened end plates **502** which may be of sheet metal. End plates **502** are equipped with a plurality of slots **503** which may be any desired number. End plates **502** in turn are stiffened and spaced from one another by means of tie rod **504** which in turn engages holes **14***b* in grill prongs **14***a*. A heat shield **505** corresponding generally in configuration with the shape of end plates **502** is fixedly positioned in spaced relation to the said end plates in any convenient manner as by bolting, riveting, or welding as shown at **506** and **507**. Thus there is provided an air space **508** between the end plates and the shield. By this means, upper body sections **10** may be placed in position and removed while the device is hot without burning the hands of the operator. Curved hooks **510** positioned on opposite ends of heat shield **505** and forming an integral part thereof are disposed to engage slots **10***d* in section **10**. Both

the grill **14** and the top of upper body section **10** are of square configuration of approximately the same size. The slots **10***d* on opposite sides of section **10** located near the top of section **10** are therefore a distance apart on opposite sides which is only slightly less than the side of square grill **14**. The angular position and swivel action of handles **13** thus permit curved hooks **510** to fall into slots **10***d* on opposite sides of section **10**. By this means section **10** may be raised and removed simultaneously with grill **14** which may best be seen in FIG. 3. By resting any opposite pair of slots **503** in each handle **13** on the upper edge of section **10** I am able to adjust the height of my grill **14** above the fuel bed.

In fact, it should now be evident to those skilled in the art that the entire device of my invention may be completely disassembled while still hot, dumped upside down and cleaned out or repaired when so desired in complete safety and with great convenience to the operator.

It should also now be evident to those skilled in the art that by utilizing my device I am able to effectively and efficiently utilize a slow burning, smokeless fuel of any type. These are notorious for their difficulty in igniting and for difficulty in maintaining combustion. Fuels of this type are, however, noted for their long lasting and long and uniform burning qualities, and these I am able to utilize to best advantage in the device of my invention. This is especially significant in a fireplace application, such as I have described above. It is likewise important in barbecuing as the uniform temperature produced in contrast with the highly fluctuating temperatures encountered with conventional fuels makes frequent adjustment of the height of the grill or changing the location of the device unnecessary.

While I have described a preferred embodiment of my invention above, other embodiments will now be evident to those skilled in the art without departing from the scope of my invention and I do not limit myself to the description given herein except as I do so in the claims.

I claim:

1. A portable combustion device for solid fuels comprising:
- a hollow base container section;
- a grate and igniter member removably positioned within the upper portion of said base section,
  - said grate and igniter member comprising an electrical resistance heater in combination with a movable structural support;
- said grate and igniter member being further characterized by a plurality of flexible spring-like members disposed for freedom of individual movement in a vertical and in a horizontal plane;
- said structural support being characterized by means for vibrating said support and said flexible members;
- a hollow upper section removably positioned on top of said base section,
  - said upper section and said base section being disposed to hold solid combustible fuel on top of said grate member;
- a grill removably positioned on top of said upper section;
- means for removing and replacing said grill;
- means for removing and replacing said upper section,
- means for removing and replacing said grate and igniter;
- means for supplying a flow of electric current to said electrical resistance heater;
- means for interrupting the flow of said electric current to said electrical resistance heater;
- means for removing ashes from beneath said grate and igniter member.

2. The device of claim **1** in which said means for removing and replacing said grill and said upper section comprises a pair of removable handles each of said handles comprising:
- a grip member;
- a pair of parallel side plates fixedly positioned on opposite ends of said grip member;
- a plurality of parallel slots in the edge of each of said side plates remote from said grip member and so positioned that a center line through corresponding opposite slots in each side plate would be parallel to the longitudinal axis of said grip member,
  - said slots being disposed to engage the outer edges of said upper section;
- a shield plate fixedly positioned between said side plates in spaced relation thereto and disposed to deflect the flow of heat from said slots away from said grip member.

3. The device of claim **2** in which said shield plate is equipped with hooks positioned at opposite ends of its lower edge, said hooks being disposed to engage slots in said upper section.

4. The device of claim **1** including independent means for admitting air into said base section beneath said grate member.

5. The device of claim **4** including means for regulating the flow of air into said base section.

6. In a combustion device for solid fuels an igniter grate comprising:
- an electrical resistance heater comprising a plurality of horizontally disposed flexible, spring-like strips in spaced relation to each other so as to define apertures therebetween;
- a structural support fixedly positioned to said heater so as to permit substantial horizontal and vertical movement of said strips relative to said support and relative to each other;
  - said support and said heater being adapted to support a bed of said fuels;
- means for intermittently vibrating said support, thereby vibrating said strips and agitating said bed;
- means for supplying a flow of electric current to said electrical resistance heater;
- means for interrupting the flow of said electric current to said electrical resistance heater;
- means for removing ashes from said igniter grate.

7. In a combustion device having a solid fuel bed an improved portable detachable handle for handling components of said device located above said fuel bed while said fuel bed is hot comprising:
- a grip member;
- a pair of parallel side plates fixedly positioned on opposite ends of said grip member;
- a plurality of parallel slots in the edge of each of said side plates remote from said grip member and so positioned that a center line through corresponding opposite slots in each side plate would be parallel to the longitudinal axis of said grip member,
  - said slots being disposed to engage the edges of said components;
- a shield plate fixedly positioned between said side plates in spaced relation thereto and disposed to deflect the flow of heat from said slots away from said grip member;
- a horizontal tie rod engaging said parallel side plates;
  - said tie rod being disposed for mounting said handle upon one of said components in swivelling relation thereto;
- means for readily removing said tie rod from said handle.

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