

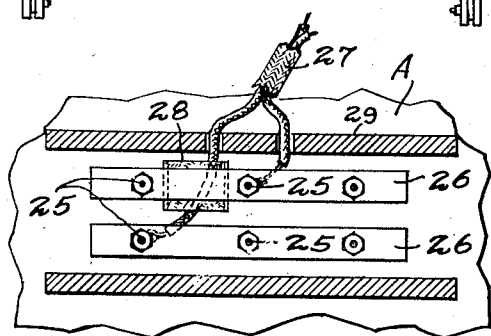
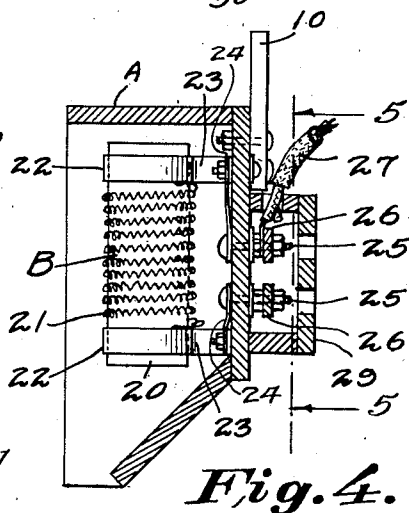
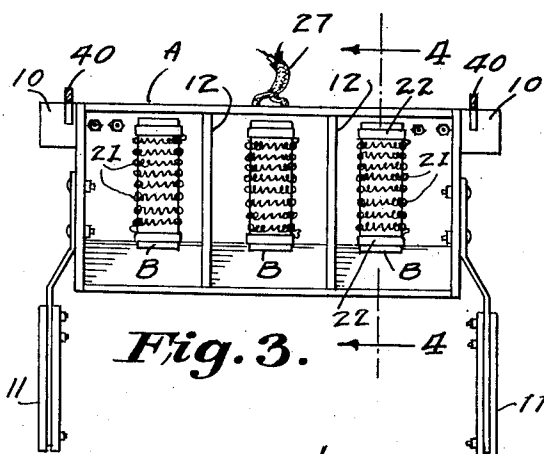
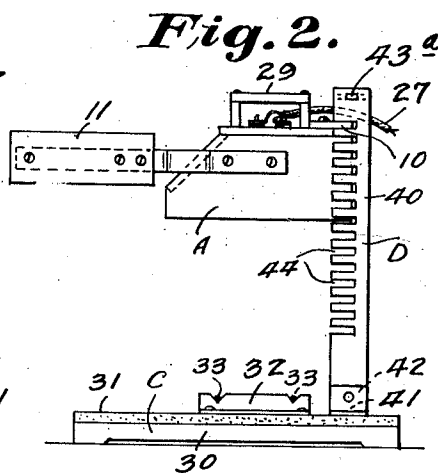
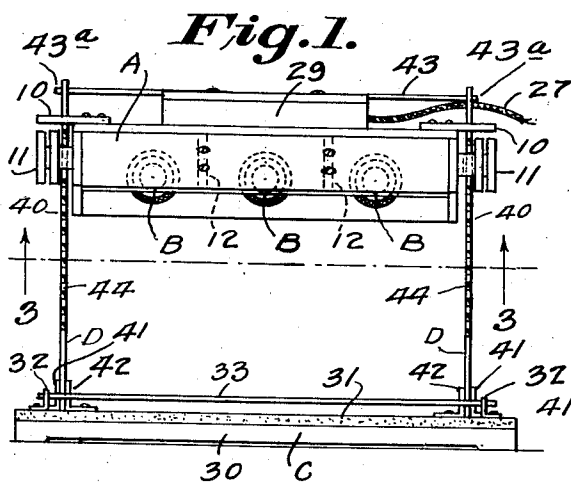
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2,333,683

LABORATORY HEATER

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LABORATORY HEATER

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3 Claims. (Cl. 219—34)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be made and used by and for the Government of the United States for governmental purposes without the payment to me of any royalty therefor.

The invention relates to laboratory heaters, and aims generally to improve the same.

Objects of the invention, severally and collectively, are to provide a heater of the class described which may be produced more cheaply than such heaters heretofore employed by the art; in which much higher heats can be used than is ordinarily the case, thereby speeding up the work; in which the heating elements employed are of a common type easily and cheaply replaced at low cost; and in which operating temperatures can be attained in a matter of minutes, compared with hours for ordinary mufflers.

Further objects and advantages of the invention will be apparent from the following detailed description of the preferred embodiment illustrated in the drawing, in which—

Figs. 1 and 2 are front and side elevations of the complete heater device with a portion of the vertical height of the racks cut away; and

Figs. 3, 4 and 5 are sections taken as indicated by the arrows on lines 3—3, 4—4 and 5—5 of Figs. 1, 3 and 4, respectively.

Referring to the specific embodiment shown in the drawing, it will be seen that the laboratory heater of this invention is made up of four distinct parts, viz: the movable heat insulating deflector, A; bare resistance wire heating elements, B; a base with an evaporating rack, C; and special means for adjusting the height of the reflector above the base, D.

In the preferred form shown in the drawing, the reflector A is constructed as an inverted, sectioned, trough-like member formed of compressed asbestos-composition sheet such as that sold under the trade name "Transite," and is provided with fin-like means, herein comprising two metal rack fins 10, adapted to engage in any of the several slots between the teeth of the height adjusting comb, and with two heat insulated laterally positioned, forwardly extending plow-type handles 11, herein formed with transite grips, suitably secured to the trough member as by the bolts or rivets shown. The heat reflecting trough, or hood, may be lined if desired, with non-corrosive metal, for example stainless steel or Monel metal, or with other refractory materials such as porcelain, fine clay, alundum, sillimanite, quartz or the like, or if desired, may be made entirely of such materials. In the form shown, the hood is assembled from top, side, back and inclined front

members all easily cut from flat sheet material, which members are secured together by screws or other suitable fastenings, as shown. If desired, the trough may be subdivided by partitions to form a ganged multiple unit heater, which decreases the cost of the individual heater units and increases the efficiency of the apparatus. Two such partitions (12, Fig. 3) are employed in the form shown, suitably secured to divide the trough with a three circuit embodiment.

The bare resistance wire heating elements B, lodged in the respective hood compartments, may be of any desired form, but preferably are in the form of self-contained commercial units capable of easy replacement as shown in Figs. 3, 4 and 5. In the form shown, these units consist of a porcelain or similar ceramic tube 20 (Fig. 4) having a spiral groove in which the coil 21 of resistance wire is received, and having terminal and supporting bands 22 electrically connected to the ends of coil 21 and provided with supporting legs 23 having inturned feet 24, which are secured to the top wall of the hood A by through-bolts 25, to which electrical connection is made in any suitable manner, bus-bars 26 being preferred in the ganged multiple unit embodiment shown, which in turn are connected to heater cord 27, a sheet of asbestos insulation 28 being employed if the cord passes under one bus-bar to connect with the other. In the form shown, the bus-bar 26 and connections thereto are housed in an insulating casing 29 the removable cover of which facilitates change of resistance units B.

The base C (Figs. 1 and 2) in the preferred form comprises a flat iron casting 30 covered entirely by an insulating sheet of "Transite" or the like 31, suitably secured, as by bolting to the casting, and carrying means for supporting specimen-containing dishes, herein comprising two notched metal supports 32 of angle form bolted to the base, on which are carried two removable heavy wires 33 making up the evaporation rack.

The special means D (Figs. 1 and 2) for adjusting the height of the reflector, cooperates in a simple and effective manner with the rack fins 10 and plow-type handles 11. It comprises comb-bar means extending vertically from the base 30, herein in the form of a pair of comb- or rack-members 40, having angled feet 41 secured to the base 30 and which may be provided with complementary angle-braces 42 to complete T feet for more rigid securement to the base. The two comb-members 40 are joined together at their tops by a cross brace 43, secured as by projection of reduced end sections of the brace through

slots in the comb members and peening them over, as at 43a, and are formed to present a series of pairs of cooperating slots 44 of such width and depth as to slidably receive the rack-fins 10 of unit A and hold the unit frictionally and firmly in the manner shown in Figs. 1 and 2 at any adjusted elevation thereof.

Great difficulties encountered with prior attempts to employ overhead heaters for burning off of volatile inorganic or organic ingredients, charring and ashing, have resided in the inability to attach sufficiently high temperatures, and particularly in the inability to quickly and easily change the temperatures applied. With the present arrangement the device is extremely versatile in these regards. It gives temperatures from about 100° C. to over 500° C., in very small steps.

It evaporates liquids at high temperatures without boiling or spattering. Its "heating up" period is short; in two to five minutes temperatures up to 500° C., can be obtained with ease, with three 400 watt units, which all together use only about the same current, A. C. or D. C., as is used by an ordinary hot plate.

In the usual ashing procedure there are actually three steps involved; first, the removal of moisture; second, the removal of volatile organic matter and carbonization; and third, the actual ashing. With substances ordinarily difficult to handle, as sardines, accurate control of temperatures necessary to avoid losses may be accomplished with the present heater. Thus a 100 gram sample of sardine in a porcelain dish may be first be dried at a temperature of about 150° C., or less. The temperature may then be easily and quickly increased somewhat to burn or fume off the fats and oils, and leave the remaining organic matter completely charred. The temperature may then be further increased for ashing of this residue, if desired, which ashing will preferably be conducted at a low ashing temperature. All this may be done in a minimum of time without once removing the specimen, because the very easily movable heater and rack combination makes possible instantaneous temperature changes from the lowest to the highest or to any intermediate values of temperature.

In this connection pyrometric readings have shown that in an embodiment having a trough about 5" x 11" x 2½" deep, employing three 400 watt units of the type shown, and having rack-bars D about 9 inches tall provided with 16 slots from 2½ to 8½ inches above the surface 31, each of the 16 positions of the heating units represents a quite constant and reproducible temperature. Thus, by calibrating the rack positions, the temperature desired can be immediately attained.

The combination of the plow-type handles 11, with the manner of supporting the heater in rack D, is particularly advantageous. The handles are removed from the heated zone and are positioned in such manner as to make almost

instinctive the slight pulling forward of the heater A from rack D; the maintenance of a horizontal position of the heater A during transfer, either manually or by permitting the fins 11 to drop from slot to slot of the rack D, pair by pair, with slight fore and aft tilting of the handles; and the thrusting of the fins 11 into firm engagement in the slots 44 at the selected temperature level. Moreover, with the present arrangement the speed of ashing of materials which burn or ash more or less difficultly is greatly accelerated by the greater air supply, relative to the muffler procedure, and the ashing and burning proceeds at a much lower temperature than that in the usual muffle, a matter very important in the determination of lead, sodium and other substances which volatilize if heated excessively.

Evaporation may be made at much higher temperatures than the usual 100° C., or less of the water-bath, as the heating is almost entirely from above, and boiling from the bottom and splattering due to superheating cannot take place. For example, 100 cc. of water or water solution has been evaporated in platinum dishes in 25 to 30 minutes with this device, without any splattering; and the device in the form shown may thus handle three or four such samples, or different samples, at the same time.

Having described a preferred embodiment illustrative of my invention, what I claim is:

1. A laboratory heater for rapid evaporation, drying and charring of laboratory specimens, comprising a base provided with means for supporting specimen-containing dishes, comb-bar means extending vertically from said base, an inverted trough-like reflector having insulated, laterally positioned, forwardly extending plow-type handles and adapted to overly said specimen-dish supporting means, and bare resistance wire radiant-heating means within said trough-like reflector, said reflector having fin-like means adapted to enter any of the several slots between the teeth of said comb-bar means to position said heating means at various selected predetermined distances above said specimen-dish supporting means, whereby the specimens may be subjected to different predetermined temperatures and the temperatures applied thereto may be quickly and easily changed at will.

2. A heater according to claim 1, in which trough-like reflector means is subdivided by partitions into a plurality of compartments each opening downwardly, and in which said radiant heating means consists of a number of individual radiant heating elements separately removable for replacement.

3. A heater according to claim 1, in which said specimen-dish supporting means consists of parallel heavy wires removably supported in notches presented by angle-member flanges supported by and projecting somewhat above the level of the base.

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