April 10, 1951 E. W. GRAY 2,548,363

DRIER

Filed Jan. 10, 1950 2 Sheets-Sheet 1

FIG. 2.

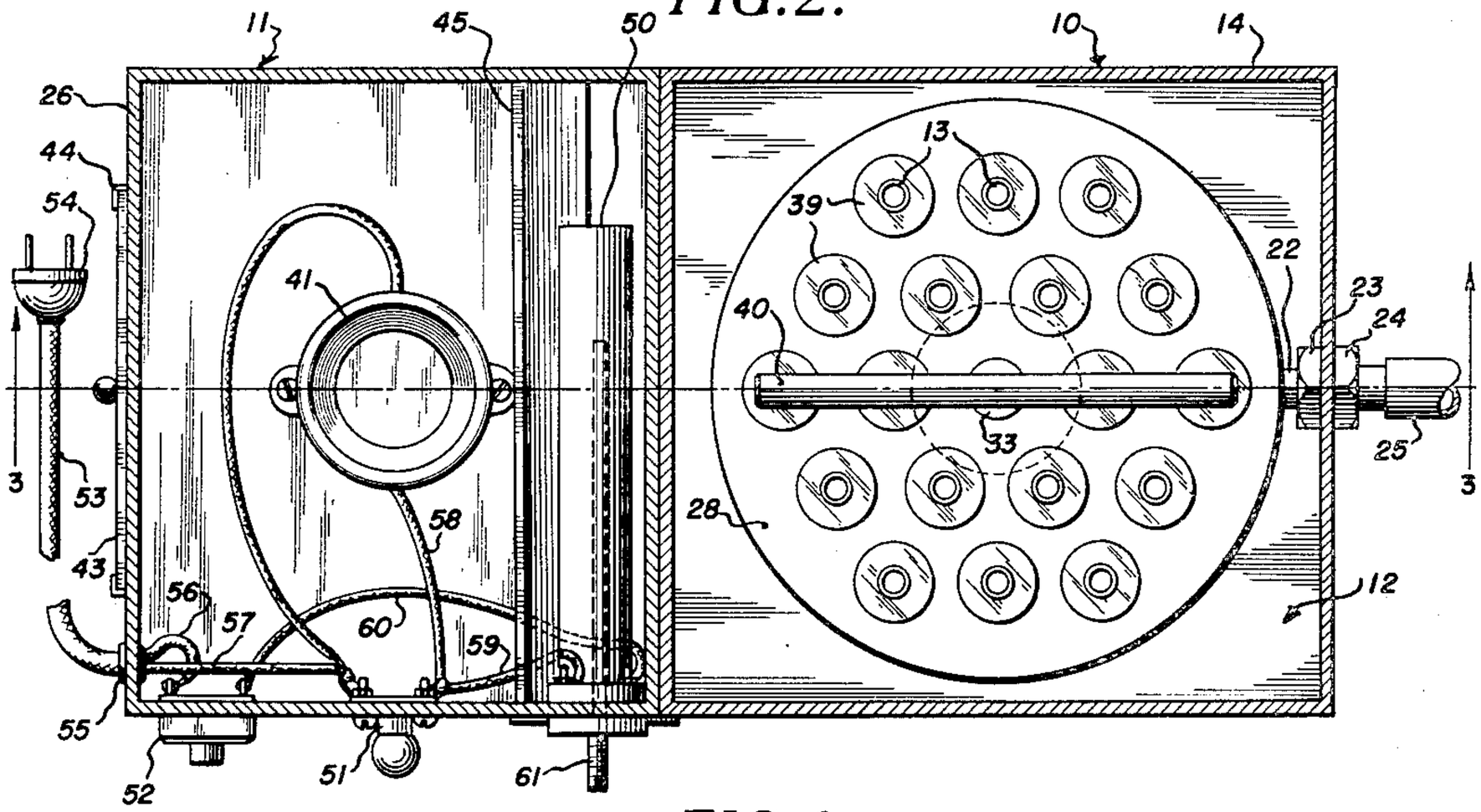

FIG. 1.

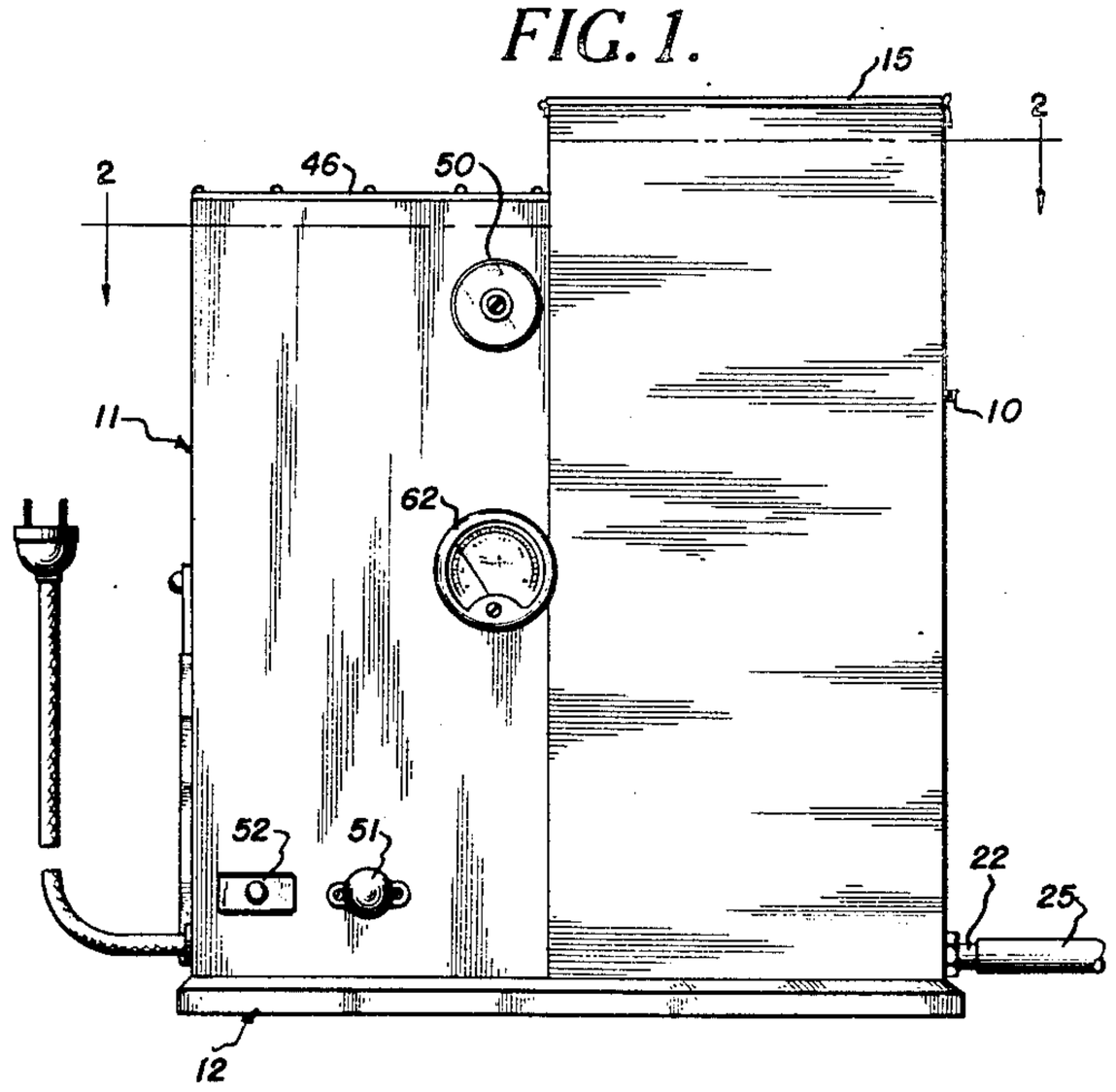

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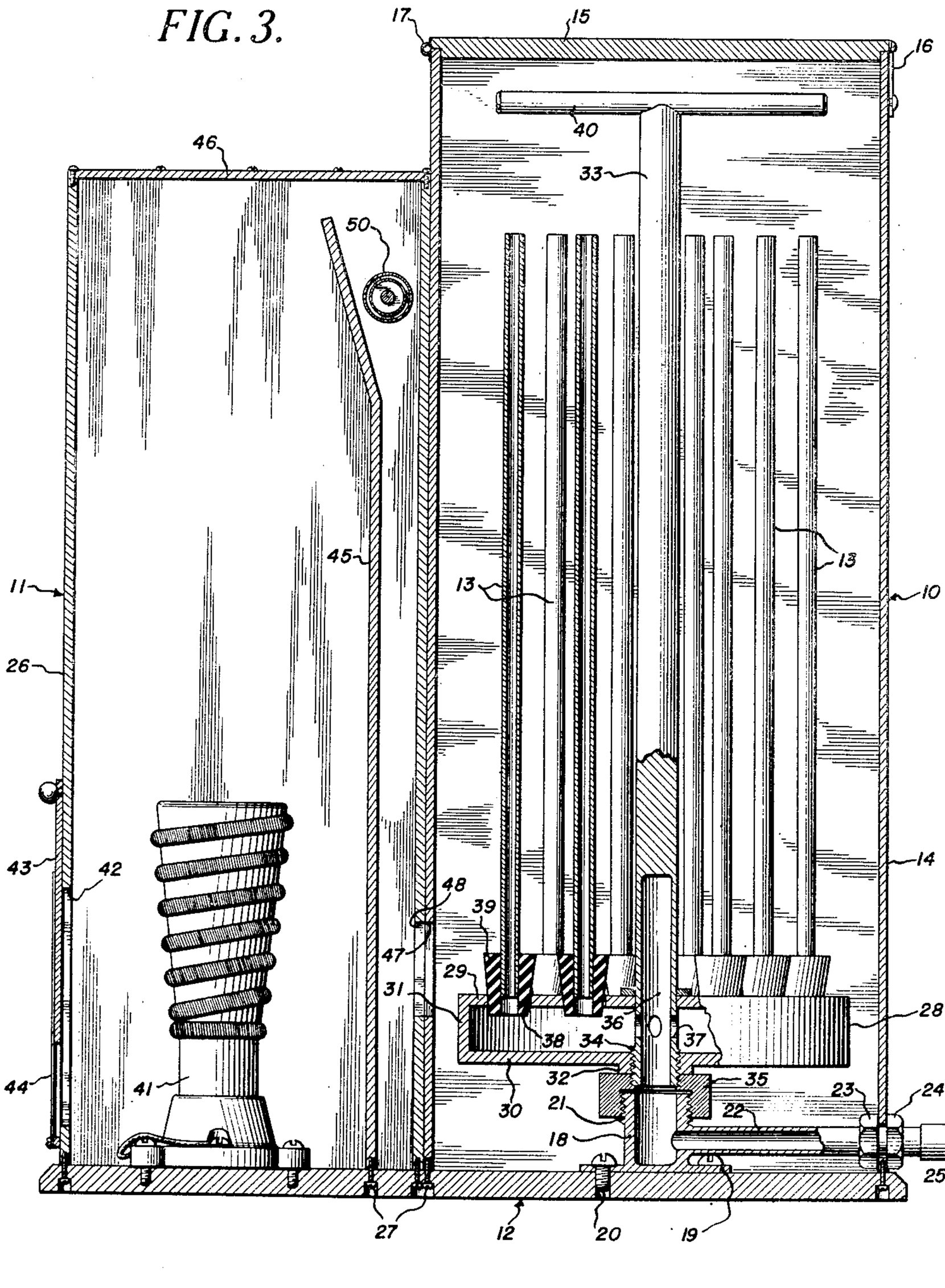
FIG. 3.



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Patented Apr. 10, 1951 2,548,363

UNITED STATES PATENT OFFICE

2,548,363

DRIER

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Application January 10, 1950, Serial No. 137,797

4 Claims. (Cl. 34—48)

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This invention relates to driers and more particularly to a drier for air drying tubular articles, such as pipettes, by passing air through the bores of the articles and around the exteriors thereof.

In chemical and biological laboratories pipettes are commonly used to measure small quantities of reactive substances in liquid form and after use the pipettes are carefully washed to remove all traces of the reactive substances therefrom. After the pipettes have been washed they must be thoroughly dried, particularly to remove water from the bores and internal cavities thereof where it tends to accumulate in sufficient quantity to falsify the measurements obtained by the pipettes if such water is not removed.

It is among the objects of the invention to provide an improved drier for tubular articles, such as pipettes, which will support a large number of articles for simultaneous drying and against accidental breakage and will dry both the exteriors and the bores and internal cavities of such articles quickly and effectively, which drier is simple and durable in construction, economical to manufacture and operate, and particularly arranged for the quick and easy mounting of the articles therein and removal of the dried articles therefrom.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings wherein:

Figure 1 is a side elevation of a drier illustrative of the invention;

Figure 2 is a transverse cross sectional view on the line 2—2 of Figure 1; and

Figure 3 is a longitudinal cross sectional view on the line 3—3 of Figure 2.

With continued reference to the drawings the drier generally comprises two receptacles 10 and 11 disposed in juxtaposed, side by side relationship and mounted at their bottom ends on a common base or bottom wall 12.

Both receptacles are preferably of rectangular cross sectional shape so that one wall of the receptacle 11 can be placed against and in contact with one wall of the receptacle 10 and the receptacle 10 has a length or depth somewhat greater than the length of the tubular articles, such as the pipettes 13 to be dried in the drier.

The receptacle 10 has a side wall 14 formed of some suitable, preferably corrosion resisting material such as stainless steel, aluminum or synthetic resin plastic. The side wall 14 preferably has a thickness corresponding to the thickness

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of sheet metal ordinarily used in commercial production and the base 12 may be formed of the same material as the side wall 14, but is preferably much thicker than the side wall to provide a firm support for both of the receptacles 10 and 11.

A cover 15 is hinged at one edge to the side wall 14 at the upper end of the latter to close the upper end of the receptacle 10 and a suitable latch 16 may be provided at the side of the cover opposite the hinge 17 to releasably secure the cover in receptacle closing position.

A hollow fitting 18 having at one end an end wall marginally extended outwardly of the fitting to provide a base 19 is mounted on the base or bottom wall 12 within the receptacle 10 and is secured to the base 12 by suitable means such as the screws 20 extending through apertures in the fitting base and threaded into tapped holes provided in the receptacle base. At its end opposite the base 19 the fitting 18 is provided with external screw threads 21 and a tubular formation 22 extends from the fitting 18 through an aperture provided in one side of the receptacle 10, this formation 22 communicating interiorly with the interior of the hollow fitting and being clamped to the side wall of the receptacle by the clamp nuts 23 and 24 threaded onto the tubular formation at respectively opposite sides of the side wall of the receptacle. When the drier is in use a suction device, such as a water flow operated vacuum pump, is connected to the tubular formation 22 outside of the receptacle by a flexible conduit 25.

The side walls 14 and 26 of the receptacles 10 and 11 are secured at their bottom ends to the base or bottom wall 12 by any suitable means, such means being illustrated as screws 27 extending through apertures in the base 12 and threaded into tapped holes provided in the bottom edges of the side walls. The tubular articles 13 are supported during the drying operation on a hollow body 28 which is releasably mounted on the fitting 18 and disposed in the lower portion of the receptacle 10. This hollow body 28 may have any desired shape, such as circular, rectangular or polygonal, the body being illustrated as circular in shape, and has a top wall 29, a bottom wall 30 spaced from and substantially parallel to the top wall 29 and an annular side wall 31 marginally joining the top wall 29 and the bottom wall 30. The thickness of the hollow body 28 is small in comparison with the height or depth of the receptacle 10 so that when the hollow body is mounted on the fitting 18 there is ample space

between it and the cover 15 for the tubular articles, such as the pipettes 13.

The top wall 29 and bottom wall 30 of the hollow body are provided with registering, centrally located openings and the opening in the bottom wall is surrounded by an internally screw threaded boss 32. An elongated handle post 33, having a length greater than the length of the tubular articles 13 and only slightly less than the depth of the receptacle 10 extends through the central openings in the top and bottom walls of the hollow body 28 and is provided at one end with external screw threads 34 which are threaded through the boss 32. A hollow, internally screw threaded union nut 35 is threaded onto the screw threaded portion of the handle post 33 at the outer end of the boss 32 and serves as a lock nut to firmly lock the handle post relative to the tubular body 28 and the union nut or formation 35. The union nut 35 is threadable onto the externally screw threaded upper end of the hollow fitting 18 to mount the handle post and the hollow body on this hollow fitting and connect the interior of the fitting with the interior of the union nut. The handle post is provided in its lower end with a bore 36 opening to the end of the post on which the union nut 35 is threaded and is also provided with ports 37 which lead from the bore 36 into the interior of the hollow body 28 for pneumatically connecting the interior of the hollow body through the fitting 18 with the tubular formation 22 so that suction can be applied to the interior of the hollow body.

The top wall 29 of the hollow body 28 is provided with a plurality of apertures 38 and apertured corks 39 are mounted in these apertures, one cork in each aperture, and receive end portions of the tubular articles 13 to support the articles in spaced apart, substantially parallel relationship to each other and to the handle post 33 on the hollow body and pneumatically connect the bores of these hollow articles with the interior of the hollow body.

A cross member 40 is mounted on the upper end of the handle post 33 opposite the end on which the union nut 35 is threaded and the post and cross member together constitute a handle for mounting the hollow body 28 in the receptacle 10 and removing it therefrom.

When a group of hollow articles supported by the corks 39 on the hollow body 28 have been dried in the receptacle 10, the cover 15 is raised and the handle rotated by the cross member 40 to thread the union nut 35 off of the fitting 18 whereupon the handle, the hollow body and the tubular articles carried thereby can be removed as a unit from the receptacle. The dried articles are then removed from the corks 39 and wet articles mounted in the corks and the assembly including the handle, the hollow body and the wet articles is then placed in the receptacle 10 and the handle rotated to thread the union nut 35 onto the fitting 18. The cover 15 is then closed and the wet articles subjected to a drying operation.

An electrically operated heating element 41 is mounted on the base 12 within the receptacle 11 and the wall 26 of the receptacle 11 is provided in its side opposite the receptacle 10 with an opening 42 of sufficient size to pass the heating element therethrough when it is necessary to replace the latter. An adjustable slide 43 is mounted on the side wall 26 over the opening 42 to restrict the size of this opening and provide a restricted air passage opening at the bottom end of the opening 42 when the device is in operation. The slide 43 may be supported against the outer side of the wall 26 by suitable means such as the flanged guides 44.

A baffle wall 45 is disposed in the receptacle 11 adjacent to and spaced from the side of the receptacle wall 26 which is in contact with the receptacle 10. This baffle wall 45 extends downwardly to the bottom wall or base 12 but terminates short of the top wall 46 of the receptacle 11 so that air can flow over the top edge of this baffle wall and downwardly through the space between the baffle wall and the adjacent side of the side wall 26 of the receptacle 11. The baffle wall 45 extends transversely from one side to the other of the receptacle 11 and the upper end of this baffle wall is bent outwardly away from the adjacent side of the receptacle to provide an enlarged space at the upper end of the baffle wall. The contacting sides of the receptacles 10 and 11 are provided near the lower ends of the receptacles with registering openings 47 and 48 through which air may flow from the space between the baffle wall and the adjacent wall of the receptacle 11 into the interior of the receptacle 10 near the bottom end of the latter receptacle.

With this arrangement, air flows into the receptacle 11 through the lower portion of the opening 42, past the heating element 41, over the upper edge of the baffle wall 45, downwardly through the space between the baffle wall 45 and the adjacent side of the receptacle 11, and through the openings 47 and 48 into the interior of the receptacle 10 near the lower end of this receptacle. The air then flows upwardly through the receptacle 10 and into the upper ends of the tubular articles 13, downwardly through the bores of these tubular articles into the hollow body 28 and from the hollow body 28 through the bore 36 in the handle post 33, through the hollow fitting 18 and thence through the tubular formation 22 to the flexible conduit 25 through which it is drawn to the suction device used for applying suction to the drier.

A temperature responsive switch 50 is mounted in the receptacle 11 and disposed in the enlargement at the upper end of the space between the baffle wall 45 and the adjacent side of this receptacle, a pilot light 51 and a manually operated switch 52 are also mounted on the side wall of the receptacle 11. A two wire extension cord 53 has at one end a convenience outlet plug 54 and is carried at its opposite end through a grommet 55 mounted in an aperture in the wall 26 of the receptacle 11. One wire 56 of the extension cord is connected to one side of the manually operated switch 52 and the other wire 57 of the extension cord is connected to one side of the pilot light 51 and to one side of the heating element 41. A wire 58 connects the opposite side of the heating element to the opposite side of the pilot light 51 and a wire 59 connects the wire 58 to one side of the temperature responsive switch 50. A wire 60 connects the opposite side of the temperature responsive switch back to the side of the manually operated switch 52 opposite that to which the wire 56 is connected. With this arrangement the manually operated switch 52, the heating element 41 and the temperature responsive switch 50 are connected in series with each other, but the pilot light 51 is connected in series with the manually operated switch 52 and the temperature responsive switch 50 but in parallel with the heating element 41 so that, while it will be exten-

guished upon opening of either the manually operated switch or the temperature responsive switch its resistance is not included in the energizing circuit for the heating element.

The temperature responsive switch 50 is adjustable by suitable means such as the set screw 61 but, as it may be of a construction well known to the art, a detailed description thereof is considered unnecessary for the purposes of the present disclosure.

A temperature indicating device or thermometer 62 is mounted in the wall 26 of the receptacle 11 and exposed to the air flowing through the space between the baffle wall 45 and the adjacent side of the receptacle 11 to indicate the temperature of the drying air.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. A drier comprising a first receptacle having a side wall, a bottom wall at one end and a hinged cover at its other end, a hollow fitting secured to said bottom wall within said first receptacle and having an open upper end and external screw threads thereon, a tubular conduit extending from said fitting to the exterior of said first receptacle for connecting a suction device to said fitting, a hollow body having a small thickness relative to the depth of said first receptacle and having a bottom wall and a substantially flat top wall provided with a plurality of apertures, a handle extending through said hollow body and having a length slightly less than the depth of said first receptacle, an internally screw threaded union nut on said handle adjacent the bottom wall of said hollow body, said union nut being threadable onto said hollow fitting for supporting said handle and said hollow body in said first receptacle with said hollow body adjacent the bottom wall of the receptacle, said handle having a fluid passage therein connecting said hollow fitting to the interior of said hollow body, apertured corks mounted in the apertures in the top wall of said hollow body for receiving ends of tubular articles and supporting such articles with their bores in communication with the interior of said hollow body, a second receptacle having one side disposed against one side of said first receptacle and having an opening therein adjacent its bottom end and at a location spaced from said first receptacle, an electric heating element in said second receptacle near the bottom end of the latter, a baffle wall in said second receptacle adjacent to but spaced from said one wall of the second receptacle and extending from a location near the upper end to the bottom end of said second receptacle, said one wall of said first receptacle and said one wall of said second receptacle having registering openings therein near the bottom ends of said receptacles for the passage of air through the first mentioned opening in said second receptacle, past said heating element, over the top end of said baffle wall and downwardly through the space between said baffle wall and

said one wall of said second receptacle into said first receptacle through said registering openings, a temperature responsive switch exposed to the air in the space between said baffle wall and said one side of said second receptacle, a pilot light and a manually operated switch mounted on said second receptacle, and an energizing circuit for said heating element connecting said temperature responsive switch and said manually operated switch in series with said heating element and said pilot light in series said switches but in parallel with said heating element.

2. A drier comprising an annular side wall having an opening intermediate its ends, a bottom wall secured to said side wall and closing one end of said receptacle, a removable cover closing the other end of said receptacle, a hollow fitting mounted on said bottom wall and disposed within said receptacle, conduit means extending from said fitting to the exterior of said receptacle and communicating interiorly with the interior of said fitting for the application of suction to said fitting, means providing a screw-thread connection at the end of said fitting remote from said bottom wall, air heating means outside of said receptacle and adjacent said side wall opening for supplying heated air to the interior of said receptacle in replacement of air drawn out of said receptacle through said hollow fitting, and a carrier disposed within said receptacle and mounted on said fitting, said carrier comprising a post threaded at one end into said screw-thread connection and extending from said hollow fitting to a location adjacent said removable cover, a handle extending transversely of said post at the other end thereof, and a hollow body mounted on said post adjacent said one end of the post and having a flat top wall disposed substantially perpendicular to said post and provided with spaced apart apertures, and apertured corks mounted one in each of the apertures in said top wall, said post having a fluid passage therein extending from said one end thereof to the interior of said hollow body placing the interior of said hollow body in communication with the interior of said hollow fitting.

3. A drier comprising an annular side wall having an opening intermediate its ends, a bottom wall secured to said side wall and closing one end of said receptacle, a removable cover closing the other end of said receptacle, a hollow fitting mounted on said bottom wall and disposed within said receptacle, conduit means extending from said fitting to the exterior of said receptacle and communicating interiorly with the interior of said fitting for the application of suction to said fitting, means providing a screw-thread connection at the end of said fitting remote from said bottom wall, air heating means outside of said receptacle and adjacent said side wall opening for supplying heated air to the interior of said receptable in replacement of air drawn out of said receptacle through said hollow fitting, a carrier disposed within said receptacle and mounted on said fitting, said carrier comprising a post threaded at one end into said screw-thread connection and extending from said hollow fitting to a location adjacent said removable cover, a handle extending transversely of said post at the other end thereof, and a hollow body mounted on said post adjacent said one end of the post and having a flat top wall disposed substantially perpendicular to said post and provided with spaced apart apertures, and apertured corks mounted one in each of the apertures in said top wall, said

post having a fluid passage therein extending from said one end thereof to the interior of said hollow body placing the interior of said hollow body in communication with the interior of said hollow fitting, and said air heating means comprising a second receptacle having a side wall contacting the side wall of the first-mentioned receptacle and provided with an opening registering with the opening in the side wall of said first-mentioned receptacle, a heating element in said second receptacle, a manually operated switch and a temperature responsive switch mounted on said second receptacle, and an energizing circuit for said heating element including said manually operated switch, said temperature responsive switch and said heating element in series.

4. A drier comprising a receptacle having a bottom wall and a removable cover, a hollow fitting mounted on said bottom wall, conduit means extending from said fitting to the exterior of said receptacle and communicating interiorly with the interior of said hollow fitting for the application of suction to the latter, said receptacle having an opening therein for admitting air thereto to replace air drawn out of said receptacle through said hollow fitting, air heating means disposed adjacent said opening, and a carrier disposed in said receptacle and detachably mounted on said hollow fitting, said carrier comprising a hollow body communicating interiorly with the interior of said hollow fitting and having one end wall disposed adjacent said fitting and a second end wall spaced from said one end wall at the side of the latter remote from said fitting and provided with spaced apart apertures, a handle extending from said hollow body in a direction away from said fitting, and means mounted in said apertures for receiving ends of tubular articles and supporting such articles with their bores in communication with the interior of said hollow body.

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