

Jan. 3, 1928.

M. J. BINKS

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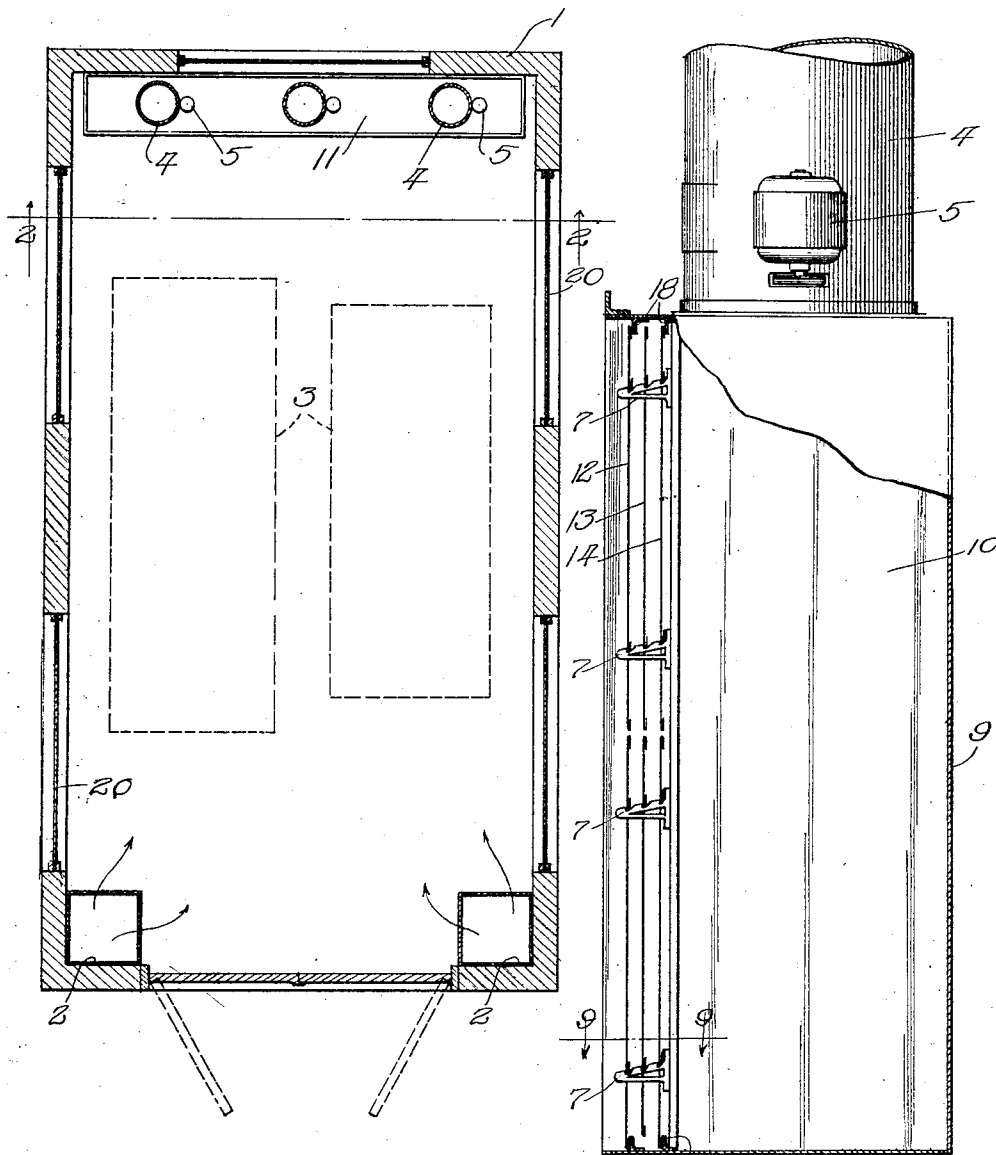
COATING MATERIAL SEPARATOR AND DRAFT EQUALIZER FOR SPRAY ROOMS

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3 Sheets-Sheet 1

Fig. 1.

Fig. 4.



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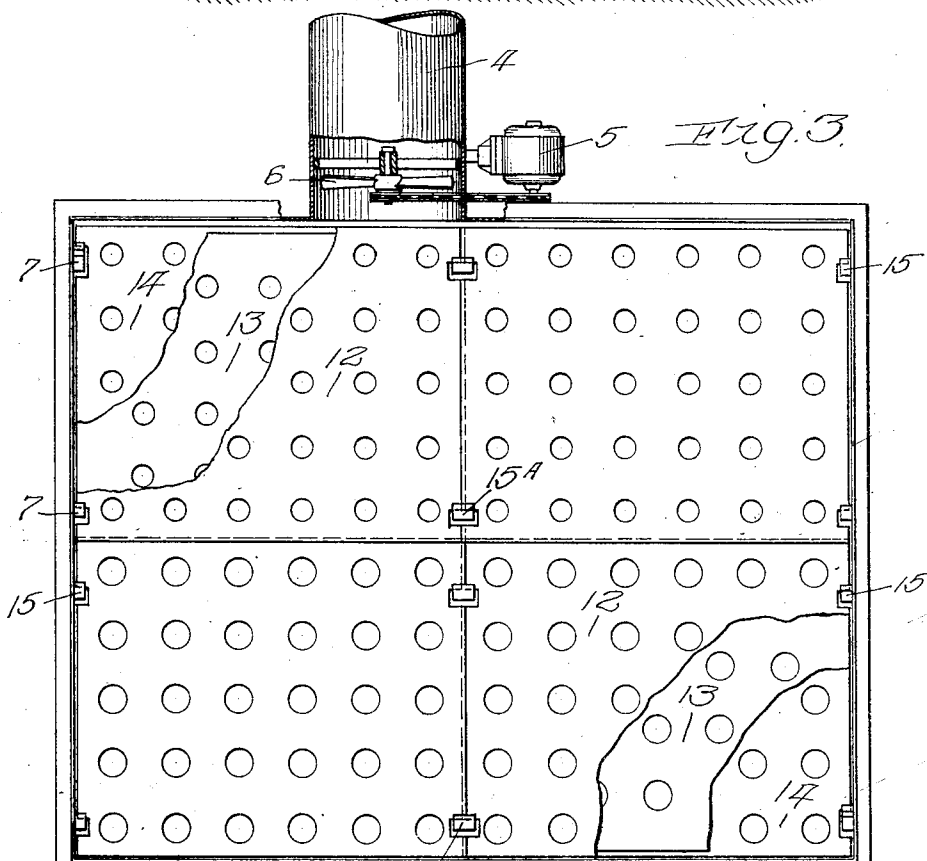
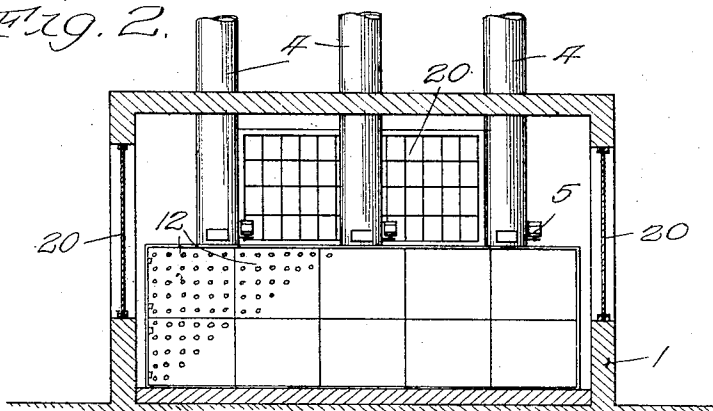
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3 Sheets-Sheet 2

Fig. 2.



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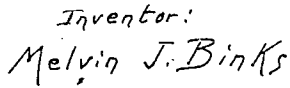
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COATING MATERIAL SEPARATOR AND DRAFT EQUALIZER FOR SPRAY ROOMS

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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE.

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COATING-MATERIAL SEPARATOR AND DRAFT EQUALIZER FOR SPRAY ROOMS.

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My invention relates to means for exhausting air from rooms in which paints, varnishes or other coating materials are applied to objects, and for separating such coating material from the exhausted air.

Owing to the deleterious effects of the fumes of such coating materials (and of the solvents for these materials) on the health of the men who apply the same, an effective ventilation of the rooms in which such materials are employed is important, and all the more so with the kinds of coating materials and solvents which are employed when the coating material is applied in the form of a spray. Hence it has heretofore been customary to conduct such spraying operations within so-called spray booths, which are usually constructed of metal and provided with an outlet at one end of the booth through which the air is exhausted, with slats or the like as baffles in the exhaust passages for separating coating material from the air of the exhaust.

Such spray booths as now employed have numerous serious objections, one being their cost which is prohibitive in the case of the smaller establishments in which such coating materials are used. Another objection lies in the considerable amount of labor required for removing the collected coating material from the baffles on which it is deposited. A further objection lies in the distribution of the fume-laden air within the spray booth, as the customary exhaust arrangements permit the fumes to rise to a considerable height, so that the fumes are breathed by the men in the booth and damage the health of these men. Still another objection lies in the low efficiency of the usual baffle arrangements, since slats or similar baffles permit a considerable portion of the coating material in the fume laden air to be carried off through the exhaust duct.

Generally speaking, my invention aims to overcome all of these objections by interposing between the fume laden air and the usual exhaust fan a coating material separator which can be installed in an ordinary room without requiring a booth housing the materials to which the coating material is applied; which will equalize the draft transversely of the room so as to prevent an increased density of fumes in one or more parts of the room; which will intensify the draft near the floor of the room so as to

prevent the fumes from rising within the breathing range of men in the room, while also affording good ventilation for higher parts of the room; which will effectively collect a high proportion of the coating material from such fumes, which will cause the greater portion of such collected material to drop by gravity into a collecting pan, and which will facilitate the cleaning as well as the detaching and replacing of the material-collecting parts of the separator. Moreover, my invention provides a novel form of the separator parts arranged so that the collected material deposits on upright surfaces in the form of cones having horizontal axes, which cones break off and drop by gravity. It also provides separators having relatively few parts in proportion to their capacity, provides novel means for supporting the removable separator parts, and arranges these supporting means so as to insure their correct replacing.

Still further and also more detailed objects will appear from the following specification and from the accompanying drawings, in which

Fig. 1 is a plan view of an embodiment of my invention, together with a horizontal section through a spray room in which it is installed.

Fig. 2 is a transverse vertical section through the same room, taken from the line 2-2 of Fig. 1.

Fig. 3 is an enlarged front elevation of the same separator and exhaust cabinet, with portions broken away.

Fig. 4 is an enlarged side elevation of the same embodiment, taken from the right in Fig. 1 and with the major portion of the nearer end wall broken away.

Fig. 5 is an enlargement of a left-hand portion of Fig. 1, showing one of the supports for the detachable separator plates.

Figs. 6, 7 and 8 are fragmentary right-hand edge portions respectively of the front, middle and rear separator plates.

Fig. 9 is a fragmentary horizontal section taken along the line 9-9 of Fig. 4.

Figs. 10 and 11 are fragmentary elevations of baffle panels with other shapes of perforations.

These drawings show my invention as embodied in a tall and shallow cabinet approximating the length of the wall 1 which is spaced from the fresh air inlets 2 by a dis-

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tance considerably greater than the length of the objects which are to be coated, such as objects indicated in Fig. 1 by dotted outlines 3. For a room of considerable width, the cabinet is preferably built of counter-part units, each having a separate upper exhaust flue 4 and a separate electric motor 5 adjacent to each flue for propelling a fan 6 (Fig. 3) in the flue, although the laterally adjacent vertical panels of the several units may have common supports 7.

As illustrated, the cabinet includes as imperforate wall portions a bottom 8, a rear wall 9, and side walls 10, while its top 11 is perforated only for the inlets of the flues 4. The effective front wall of the cabinet consists of a series of perforated walls spaced behind each other and perforated so as to compel the entering air to pursue circuitous paths before reaching the relatively deep space behind the rear perforated wall, which space opens into the flues, these perforated walls being here shown as three in number. Each such perforated wall is preferably built of separately removable panels, thereby lightening the wall parts so that they can easily be detached and cleaned, and the panels which are behind each other are desirably supported by the same group of supporting brackets. In the drawings, there are three of these wall portions, each having upper and lower panels of a number corresponding to the width of the cabinet, namely two for each exhaust flue. The perforations in all of the upper panels are shown as of equal diameter and spacing, and those in the lower panels are similarly spaced but are larger in diameter so as to intensify the draft into the lower half of the cabinet. For convenience in manufacture, I preferably employ circular perforations, with the perforations in each panel in staggered relation to those in the panels in front and behind it, as shown in Figs. 3 and 5.

When using three paneled walls behind each other, as in Fig. 5, I may leave a relatively short space between the top of the cabinet and the upper edge of the middle wall 13, so that some of the air may follow a circuitous path above that wall, but preferably prevent air from flowing below either the front wall 12 or the rear wall 14. The air entering through the perforations in the front wall then follows paths such as those shown by the dotted lines in Fig. 9 and, with a strong suction of the fans in the flue, this air is drawn through the perforations in the front and middle walls so as to impact it against the middle wall 13 and the rear wall 14 respectively, since the air drawn through each perforation is restricted in transverse section and hence increased in velocity. Consequently, coating material drawn through the front wall perforations is deposited by its momentum on the forward face of

the middle wall to form an initially circular film which gradually increases in thickness, while the air that carried this material divides along radiating paths to the perforations in the middle wall. These perforations again decrease the velocity of the air and with the rear wall sufficiently close to the middle wall, coating material still remaining in the air is deposited by its momentum on the rear wall. In each case, the deposit grows in thickness on the initially circular case and, with considerable coating material in the air, builds up into a forwardly pointing cone which breaks off by gravity when the adhesion of the material to the contiguous wall will no longer support it, so as to drop down upon the bottom of the cabinet, with very little of the coating material trickling down the middle and rear paneled walls.

By thus employing momentum and gravity for depositing the bulk of the separated coating material on the bottom of the cabinet (or in a pan placed on this bottom), the use of which will be obvious without requiring illustration, I greatly reduce the need of cleaning the material-catching parts of my separator, which is required frequently with the customary baffle slat arrangements. Furthermore, the amount of coating material left on the paneled wall parts is so small that its removal is easily and quickly effected.

To facilitate the detaching and replacing of the panels forming the said front wall portions 12, 13 and 14, I desirably support these by brackets of the general type pictured in Fig. 5 and form the said wall portions with bracket-engaging parts as shown respectively in Figs. 6, 7 and 8. In Fig. 5, the bracket 15 has its back bolted to an angle iron riser 16 and has a forwardly projecting longitudinal section, with the bottom horizontal and with its upper edge inclined. This upper edge has three notches 17 spaced according to the desired spacing of the three panels, and each panel has a notch 18 at one edge. At each support, the two upper brackets are spaced vertically from each other by a distance which differs to such an extent from the spacing of the two lower brackets that the upper baffle panels cannot be interchanged with the panels below them. In other words, the height of the panel notches 18 definitely determines whether the panel is an upper or a lower one, thereby preventing the wrong aperture areas to be presented either above or below, while the spacing of the notches on each panel determines whether that panel is to be attached at the front, middle or rear bracket notches 17.

The upper notch edges of the three panels seat respectively in the three notches 17 of the bracket; and each panel notch is slightly taller than the height of a transverse vertical section of the bracket adjacent to the

forward face of the panel, thereby permitting each panel to be raised so that its upper notch edge clears the bracket. In practice, each bracket notch 17 preferably slopes rearwardly upward and each panel has its upper notch edge stiffened by doubling back a part of the stock from which the notch was cut, as shown in Figs. 5 to 8. Owing to the differences in the heights of the notches, only the rear panel can be interlocked with the rear notch 17 and the forward panel cannot be interlocked with the medial notch 17. Likewise, an attempt to support the rear panel at the middle notch or the middle panel at the forward notch would be prevented by the engagement of the panel bottom with the bottom of the cabinet (in the case of lower panels) or in the case of upper panels by their engagement with the panels below them. Hence my arrangement effectively prevents a wrong attaching of the panels, such as might bring the perforations in one panel in axial alinement with those in the panel behind it.

In each perforated wall, the laterally adjacent panels preferably overlap, as shown in Fig. 9 and the upper panels similarly overlap the upper ends of the lower panels (as shown in dotted lines in Fig. 3), thereby making each group of panels effective as a single wall, while permitting the constituent panels to be sufficiently light for easy handling. To prevent air from passing above the upper front and rear panels, I preferably provide suitable strips depending from the cabinet top 11, such as the vertical webs of angle bars 18 against which the upper panel ends bear, leaving sufficient clearance between the tops of the panels and the cabinet to permit each bracket to be lifted out of the bracket notches which normally support it. Then I also provide similar angle bars 19 at the bottom to prevent air from passing below the front and rear paneled walls. However, a short space may be left above and below the middle paneled walls, as this will still afford a tortuous path for air and does not interfere with the functioning of my material-separating arrangement.

The number of supporting brackets may obviously be varied, but I have found it effective to employ two vertically spaced brackets at each edge of each panel. At panel edges adjacent to the side walls of the cabinet, the brackets are employed only for one section, but wider single brackets 15^A will suffice for the panels in laterally adjacent sections, as shown in Figs. 3 and 9. The latter figure shows such a wider bracket as supported by a vertical channel beam, but the supporting arrangement can obviously be varied.

In a room such as that of Fig. 1, the air inlet ducts 2 preferably have outlets near their lower ends, so as to emit the air near the floor of the room. Owing to the larger size of the perforations in the lower panels, this air will be drawn more strongly through the lower part of the room than at increased elevations, thus preventing fumes from rising into the breathing range of the spray operators, since the paint content is considerably heavier than the air. In passing the objects which are being coated, or which have already been coated but have not yet dried, the air absorbs some of the finely divided coating material. On entering the cabinet through a perforation in the front paneled wall portion 12, this air partly impacts against an imperforate portion of the middle wall portion 13, and the impact is greatest for the material-laden particles of the air owing to their higher momentum. Hence the depositing of such material on a part of the wall portion 13 in horizontal alinement with the said aperture. The lighter part of the air divides into four streams diverging from the entrance aperture toward four apertures in the middle paneled wall 13 and these diverging air currents apparently cooperate with the rebounding of some of the coating material from the said wall, so as to cause the material to be deposited in the form of cones which are detached by gravity when their weight reaches a point depending on the specific gravity of the coating material and on its adhesiveness. Since this production of self-detaching conical deposits is repeated on the rear perforated wall 14, though to a lesser extent, only a relatively small amount of the coating material which enters the cabinet with the air reaches the space behind the said wall 14. By making this space relatively deep—as for example in the proportion shown in Fig. 4—I greatly reduce the velocity of the air after it reaches this chamber, thus causing substantially all of the remaining coating material in the air to settle in this chamber.

By making my cabinet of a width approaching that of the wall adjacent to its back and admitting air at a considerable distance from this wall, I secure air currents through the room which are substantially uniform (at any given height) all the way across the room, so that I avoid a concentration of fumes at any point. And, since such an exhaust and separator cabinet can be built as a unit and installed in an ordinary room, I not only greatly reduce the cost over that of the usual spray booths but also secure the advantages of daylight from the usual windows, such as the windows 20 of Fig. 1. Moreover, I have found a height of about six feet sufficient for the cabinet proper, or much less than the usual height required

for spray booths, and of a size which is much more easily shipped and at less cost for transportation.

However, I do not wish to be limited to the details of construction and arrangement above disclosed, since many changes may obviously be made without departing either from the spirit of my invention or from the appended claims.

For example, the shape of the perforations in the baffle panels may be varied, as shown by the square perforations in Fig. 10 and the triangular perforations in Fig. 11. With such square or triangular perforations, the deposited material builds up on the middle and rear baffle panels in pyramids which also break off by gravity and drop to the floor 8 of the cabinet in a comparatively dry state so that the accumulated material can easily be scraped off this floor, particularly if the latter was previously cleaned. This also holds true as to the material which drops down within the settling chamber, as the relatively small portion which reaches that chamber has such prolonged contact with the air as to be practically dry before it reaches the floor.

Moreover, it will be obvious that the difference in the draft through the upper and lower baffle panels is due to the differences in the total perforation area, hence the same size of perforations might be employed in both the upper and the lower panels if the spacing is closer for the lower ones. So also, it should be understood that my invention is not limited as to the nature of the spray from which initially liquid material is to be separated, the term paint being used in the claims as a short term meant to include any coating material.

I claim as my invention:

1. Means for exhausting paint fumes from a room, comprising: a cabinet having a frontal baffle wall and an exhaust flue leading from the upper portion of the cabinet behind the baffle wall, the baffle wall comprising a plurality of parallel and spaced plates provided with perforations, the perforations in adjacent plates being in staggered relation; and means for creating upward suction through the flue.

2. Means for exhausting paint fumes from a room, comprising: a cabinet having an exhaust flue leading from its upper portion and having a vertical baffle wall forwardly of the connection of the flue to the cabinet, the baffle wall comprising a plurality of parallel and spaced plates provided with perforations, the perforations in adjacent plates being in staggered relation; and means for creating upward suction through the flue; the perforations in the lower portions of the plates being larger in diameter than those in the upper portions thereof, the depth of the cabinet behind the baffle wall being consider-

ably greater than the effective thickness of the baffle wall.

3. Means for exhausting paint fumes from a room and for separating the paint from the exhausted air, comprising: a cabinet having imperforate back and side walls, an exhaust flue leading from the top wall, and means for creating upward suction through the flue; the cabinet having its front including three perforate vertical wall portions spaced behind one another and all in front of the connection to the flue, the perforations in each wall portion being in staggered relation to those of the wall portion behind it, the medial wall portion terminating short of the top and bottom of the cabinet, the front and rear wall portions extending effectively to the top and bottom of the cabinet.

4. A paint-separating exhaust booth arrangement as per claim 3, in which the perforations in the several wall portions are substantially uniform in their spacing, the perforations in the lower parts of the wall portions being larger in total perforation area than those in the upper parts.

5. A front wall for an exhaust and separator cabinet used in a spray room, composed of a plurality of wall portions spaced behind one another, each such portion including an upper and a lower panel both provided with perforations, the area of the perforations in the lower panel being relatively greater than in the upper panel and the perforations in each panel being in staggered relation to those in the panel behind it.

6. For use in a spray room, an exhaust and separator cabinet having a plurality of perforated front wall portions spaced behind one another, the perforations being relatively staggered in the wall portions which are consecutively behind each other; each wall portion comprising upper and lower portions, with a relatively greater perforation area in the lower than in the upper portions, and means for detachably supporting the said wall portions in their said spaced relation.

7. A front wall part for an exhaust and separator cabinet, comprising perforated panels disposed behind one another and having the perforations in adjacent panels in relatively staggered relation; in combination with common means for detachably supporting all of the said panels, the said means being arranged to prevent an interchange in the position of the several panels.

8. A front wall for an exhaust and separator cabinet used in a spray room, composed of a plurality of spaced front walls; each wall including an upper and a lower panel both provided with perforations, the area of the perforations in the lower panel being relatively greater than in the upper panel and the perforations in each panel being in staggered relation to those in the

panel behind it; common means for detachably supporting the several upper panels, and separate common means for detachably supporting the lower panels, the said two means being arranged to prevent an interchange of upper and lower panels.

9. A front wall for an exhaust and separator cabinet used in a spray room, composed of a plurality of spaced front walls; each wall including an upper and a lower panel both provided with perforations, the area of the perforations in the lower panel being relatively greater than in the upper panel and the perforations in each panel being in staggered relation to those in the panel behind it; and separate common means for detachably supporting the upper panels and the lower panels, each such means being arranged to prevent an interchange of the panels supported by it.

10. A front wall for an exhaust and separator cabinet, comprising a plurality of perforated panels spaced behind one another, the perforations in consecutive panels being relatively staggered, and stationary brackets projecting through all of the panels, each bracket having spaced notches in which the said panels are respectively socketed.

11. A front wall for an exhaust and separator cabinet, comprising a plurality of perforated panels spaced behind one another, the perforations in consecutive panels being relatively staggered, and stationary brackets projecting through all of the panels, each bracket having spaced and upwardly open notches in which the said panels are respectively socketed, each panel having apertures through which the brackets extend, the shape of the brackets and the dimensions of the apertures in the several panels being such as to limit the attaching of each panel to definite notches in the brackets.

12. A cabinet wall construction as per claim 11, in which the brackets increase in height rearwardly from one notch to another, and in which the said apertures are taller in each panel than in the next forward one.

13. The combination with a forwardly open separator cabinet, of a front compris-

ing three perforated wall portions spaced behind one another and having the perforations in the intermediate wall portion in staggered relation to those in both the front and rear wall portion; each wall portion having its upper end spaced from the top of the cabinet; and means for closing the gaps between the cabinet top and the front and rear wall portions.

14. The combination with a forwardly open separator cabinet, of a front comprising three perforated wall portions spaced behind one another and having the perforations in the intermediate wall portion in staggered relation to those in both the front and rear wall portion, each wall portion having its upper end spaced from the top of the cabinet; and flanges depending from the cabinet top close to the upper portions of the front and rear wall portions for effectively closing the gap between the said top and the tops of the last named two wall portions.

15. A front wall for an exhaust and separator cabinet, comprising a plurality of perforated panels spaced behind one another, the perforations in consecutive panels being relatively staggered, and stationary brackets projecting through all of the panels, each bracket having spaced and upwardly open notches in which the said panels are respectively socketed, each notch having its rear edge sloping rearwardly upward.

16. A front for a separator cabinet including a pair of laterally adjacent wall portions each composed of a plurality of perforated baffles disposed behind one another, each baffle having a notch at each lateral edge with the notches at the same side of the baffles in each wall portion in substantial alignment; separate supports engaging the notches at the oppositely directed edges of the baffles of the two wall portions, and a single support engaging the notches at the adjacent edges of the baffles of the two wall portions.

Signed at Chicago, Illinois, December 22nd, 1926.

MELVIN J. BINKS.