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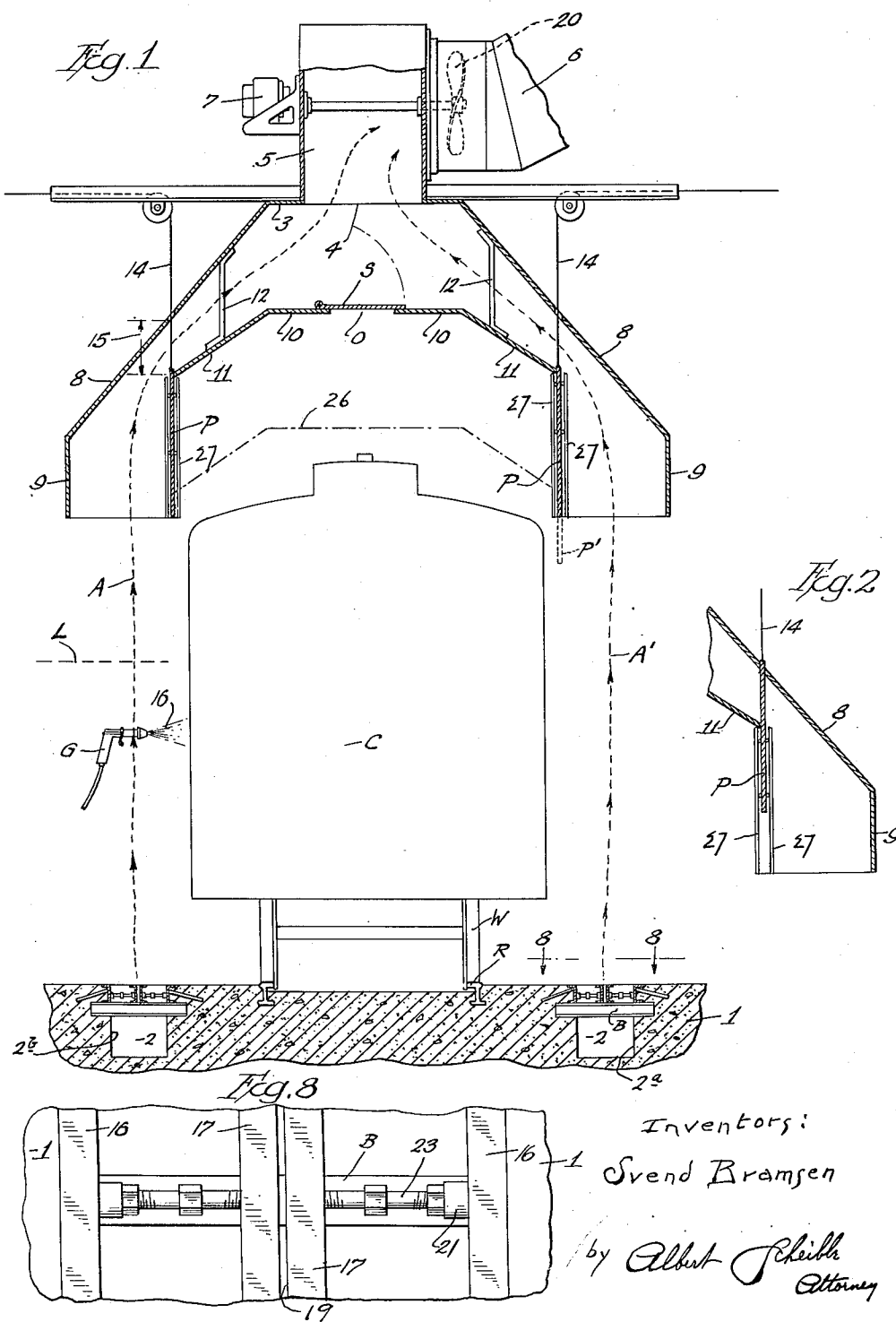
S. BRAMSEN

2,014,962

SPRAY FUME EXHAUST SYSTEM

Filed Feb. 21, 1935

2 Sheets-Sheet 1



Inventors:
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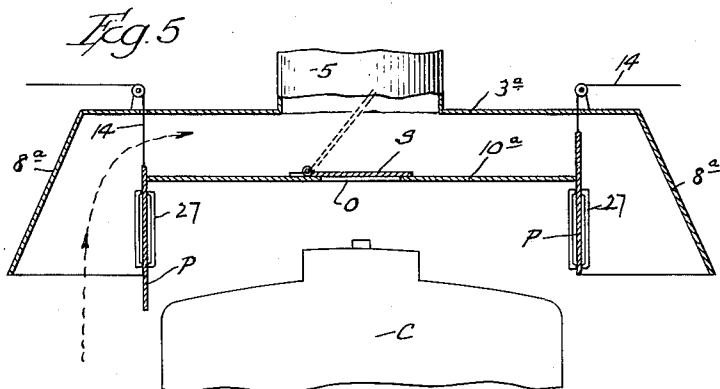
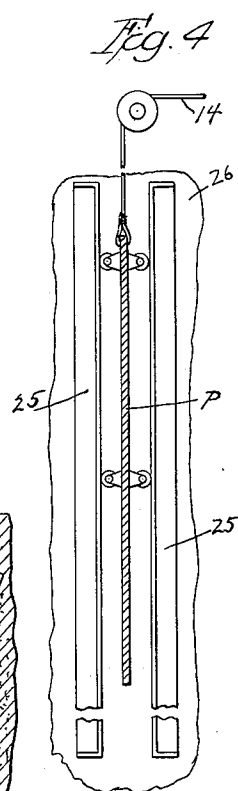
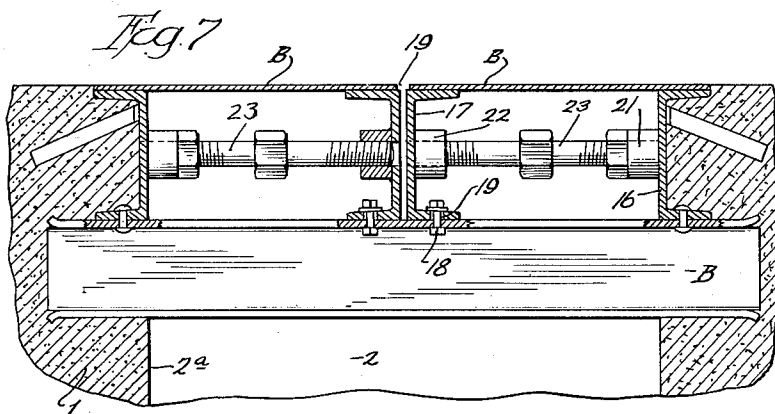
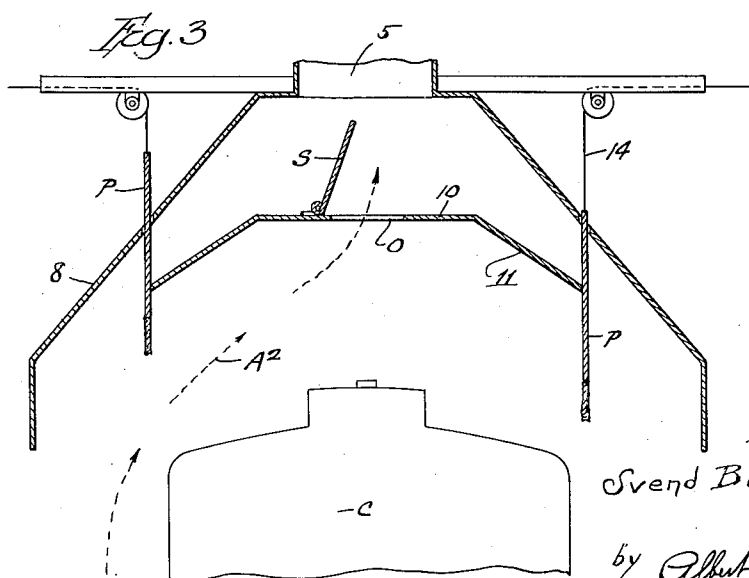
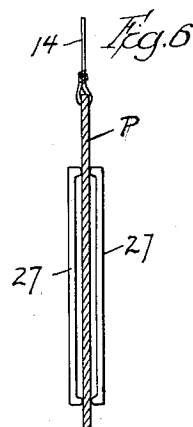
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SPRAY FUME EXHAUST SYSTEM

Filed Feb. 21, 1935

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,014,962

SPRAY FUME EXHAUST SYSTEM

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Application February 21, 1935, Serial No. 7,635

8 Claims. (Cl. 91—60)

My invention relates to spray-fume eliminating systems for protecting spray-gun operators during the spray-painting of the sides and the top of an object of large dimensions, as for example a

5 railway car, bus, or motor truck.

For this general purpose it has long been customary to dispose such an object under a canopy leading to an exhaust flue, and to reduce the spreading of the spray fumes below the canopy by projecting a curtain of air upwardly parallel to, but spaced somewhat from, the side of the object which is being sprayed. It has also been customary to produce the needed (initially sheet-like) air curtain for this purpose by causing compressed air to issue from a longitudinal slot in the top of an air conduit extending parallel to, and lower than, the object portions which are to be coated.

In one of its major aspects, my invention aims to provide effective means for selectively guiding the air which is drawn in by a suction fan associated with a flue leading from this canopy, so as to reduce the amount of air drawn from above the top of the object while a side of the object is being sprayed, and so as to concentrate the effect of the flue suction on the air above the top of the object when this top is being sprayed. In this aspect, my invention provides a simple arrangement of a baffle, a shutter and a pair of partitions below the canopy, whereby the user can adjust the position of the shutter and one or both of the partitions so as to concentrate the flue suction on one or the other side of the object, or on one or the other side halves of the top of the object, while in each case limiting the amount of outer air drawn into the flue along with the fumes.

Heretofore it has been customary for this purpose to use wings pivotally supported at their upper edges, which wings can depend vertically in one operative position, but are swung outwardly about their upper edges in another position. When thus outwardly swung, such partitioning wings greatly increase the amount of outer air drawn into the flue, thereby correspondingly reducing the effect of the flue suction on fumes from material which is being sprayed on the car. Moreover, hinges or other pivoted joints are apt to bind and stick, thereby introducing operating difficulties which we avoid by using an arrangement in which continuously upright partitions are merely raised or lowered for adjusting them.

With such pivoted wing arrangements, it has also been customary to depend (at least partly) on having each wing deflect the curtain of air when the wing is swung outwardly. Since such

a deflection of air can only occur when the sheet-like air curtain is projected upwardly at sufficient velocity to blow the air upwards past the entire height of the object while a side of this object is being coated, the air must pass the spray at such a velocity as to deflect and scatter the spray. Consequently, this arrangement wastes considerable of the coating material, and makes it difficult for the user of the spraying appliance to direct the coating material accurately against the intended parts of the object side. In addition, the curtain of air moving upward at such a high velocity draws an undesirable amount of other air along with it in to the flue, thereby wasting the power required for moving this excess of air and perhaps even requiring the canopy to have a larger outlet flue than would otherwise be needed. Moreover, outward swinging of a wing (in the heretofore customary manner) greatly enlarges the inlet through which air can enter the canopy, thereby in itself greatly increasing the amount of excess air which must be drawn into the flue.

My present invention aims to overcome all of the above recited objections to the use of pivoted air-deflecting wings, by providing a canopy, shutter and twin partition arrangement in which the partitions are continuously upright and are merely adjusted as to their elevation; in which each of the partitions is continuously adjacent to the plane of one side of the object which is being coated, thereby greatly reducing the amount of excess air which is drawn into the canopy along with the upwardly projected air curtain; and in which this air curtain only needs to be projected at so low a velocity as not to interfere with the easy and economical spraying of the coating material against a side of the object.

Moreover, my invention aims to provide an arrangement of two continuously upright partitioning members, respectively adjacent to the planes of the two sides of the object, which will allow each of these members to serve in one adjusted position merely as an air-flow guiding partition, and in another position as a shutter to prevent the flow of air into the one side of the canopy; and in which an additional shutter (associated with the baffle) cooperates with suitable adjustments of the partitioning member for permitting a suction fan in the flue to draw air into the canopy only from along one or the other side of the object, or from above the object, according to the object portion which is being sprayed.

Illustrative of my invention,

Fig. 1 is a transverse vertical section through a spray-fume exhaust installation embodying my

invention, showing the two upright partitioning members and the pivoted shutter on the baffle as positioned during the simultaneously spraying of both sides of the also illustrated railway car, with the air conduct covers omitted as too small to illustrate on the same scale.

Fig. 2 is a section allied to the lower right-hand portion of Fig. 1, showing the right-hand partitioning member as raised so as to serve as a shutter preventing the flow of air into the flue from over the right-hand edge of the baffle, as desirable when the left-hand side of the car alone is being sprayed.

Fig. 3 is a section allied to Fig. 1, showing both partitioning members and the baffle-opening controlling shutter positioned for advantageous use during the spraying of the left-hand half of the top of the car.

Fig. 4 is a more detailed enlargement of a portion of Fig. 1, showing means for guiding one of the exhaust-directing members.

Fig. 5 is a section allied to the upper portion of Fig. 1, showing a different shaping of the canopy and the baffle below the canopy.

Fig. 6 is an elevation allied to a portion of Fig. 5, but drawn on a larger scale, showing a more simple guide arrangement than that of Fig. 4.

Fig. 7 is an enlargement of a lower portion of Fig. 1, showing the arrangement for adjustably controlling the thickness of the sheet of compressed air which is projected upwardly near a side of the car.

Fig. 8 is a fragmentary plan view, taken from the line 8-8 of Fig. 1 and drawn on a scale somewhat smaller than Fig. 7.

Fig. 1 shows part of an installation for removing the spray fumes during the spraying of the sides, ends and top of a railway car C, the wheels W of which car are on rails R partly imbedded in a concrete floor 1. This floor is provided at each side of the track with a channel 2, each of which channels has all except a longitudinally slit portion 19 (Fig. 7) covered by two parallel floor plates F. These spaced floor plates over each channel, together with the said channel, form a duct from which compressed air is discharged in an initially flat upright sheet parallel to a side of the car. In practice the location of each such duct is preferably such that the air sheet is projected upwardly between the outlet of a spray gun G (when this gun is held at a suitable distance from the side of the car for spraying that side) and the hand of the spray gun operator. Moreover, the air being desirably emitted at a sufficient pressure for projecting this air sheet forcibly to a distance greater than the midheight of the car side, but less than the extreme height of that car side—as for example to the level L of Fig. 1.

Overhanging the entire space between the two air ducts 2 is a double canopy and exhaust outlet arrangement of which a fragment is shown in Fig. 8. In Fig. 1, the canopy assembly includes an upper canopy having a horizontal top 3 provided with an outlet opening 4 leading to a flue 5 from which air and fumes are drawn into a flue outlet pipe 6 by a fan 20, this fan being here shown as rotated by an electric motor 7. The upper canopy also includes downwardly diverging top portions 8 which preferably spread to a greater width than the space between the outward sides 2a and 2b of the two air ducts in the floor. In addition, the upper canopy has a (desirably upright) side portion 9 depending from the outer side edge of each of the said diverging top por-

tions 8, which side portion desirably reaches downward approximately to the level of the upper side edge of the tallest car to be sprayed.

Underhanging and spaced downwardly from this upper canopy is a baffle of smaller spread, here shown as including a horizontal top portion provided with longitudinally spaced apertures (each of which is controlled by a pivoted shutter S), and two downwardly diverging portions 11 which spread to a somewhat greater width than the car. The two sloping portions 11 may be integral with the top portion 10 and suspended jointly with the latter from the upper canopy, as for example by suspending bars 12.

Depending alongside the outer longitudinal edge of each sloping portion 11 of the canopy is an upright and vertically movable partition P, these partitions being here shown as suspended by cables 14 which permit each partition to be raised and lowered, and each of these partitions is considerably taller than the vertical distance 15 (Fig. 1) between the superposed sloping parts of the canopy and the baffle in the plane of a face of that partition.

When a single side of the car is to be sprayed at one time, the shutters S are left closed, and the partition P at that side of the car is disposed with its upper end approximately at, but not lower than the corresponding side edge of the sloping portion 11 of the lower canopy, as shown in Fig. 1. At the same time, the partition at the other side of the car is raised, as in Fig. 2, so as to prevent the suction of the flue fan from drawing air from last named side of the car into the space between the baffle and the canopy. Compressed air is then supplied to the air conduit in the floor at the same side of the car, and the suction fan 20 in the flue is operated, this suction fan having a capacity for moving a much larger amount of air than that which is projected upwardly in a sheet form from the air duct at the same side of the car.

As the result of these provisions, the air intermingling with fumes from the paint spray 16 of the spray gun is forcibly drawn directly upwards (along one of the arrow line A in Fig. 1) into the space between the two canopies, and thereafter into the flue outlet pipe 6. However, with both of the partitions P in their lowered positions of Fig. 1, and with the motor-driven exhaust fan 20 of ample capacity, the spray fumes can thus be effectively exhausted while both sides of the car are sprayed simultaneously.

When the top of the car is to be sprayed, the shutter or shutters S above the car are opened, as in Fig. 3, and both of the partitions are raised from their positions of Fig. 1 so as to extend across the spaces between the two superposed partitions, thereby causing the suction of the fan 20 to be exerted only through the openings O. Consequently, this suction draws the fume-laden air approximately along the path indicated by the arrow line A² in Fig. 3, which will be effectively closer to the car top than to the head of the man spraying this car top.

Moreover, since each upright partition is separately suspended, this partition can readily be lowered to the ground and exchanged for a taller one such as indicated by the partition widening P at the right-hand side of Fig. 1. Consequently, my suspended partition arrangement enables the user to conserve power which would otherwise be wasted in drawing fresh air over the side or top of a less tall car or truck than that here shown.

To prevent a lateral swaying of the partitions, 75

I desirably guide each partition P by upright pairs of guides 25 (Fig. 4) fastened respectively to the two ends 26 of the canopy, the two guides of each pair being at the opposite sides of the partition.

Or I may use the simpler guides 27 of Figs. 1 and 6.

In another important aspect, my invention relates to an effective arrangement for accurately directing the upwardly projected sheet-like curtain of air which carries the spray fumes away from the operator, one which will permit the initial thickness of this air sheet to be adjusted according to the nature of the coating material that is being sprayed. When this air is projected through a slot of unchangeable width, the thickness of the air sheet may be inadequate for protecting the operator from the fumes of some materials, while for fumes of other coating materials the same slot will project such an excessively large quantity of air as to waste a considerable portion of the power required for furnishing the compressed air. Moreover, a considerable waste of compressed air will also occur when the issuing air is not adequately guided between slot walls which are both of ample height and parallel to each other. So also, the heretofore employed air conduits cannot readily be cleaned, for removing dust which, if allowed to accumulate, will be ejected with the air so as to mar the coating.

In this aspect, my invention aims to provide an air conduit and air outlet arrangement which will permit a convenient adjusting of the initial thickness of the projected curtain or sheet of air, which will insure an accurate upward directing of this air, and which will permit an easy cleaning of the conduit.

For this purpose, Fig. 1 shows the concrete floor 1 as provided with two upwardly open and parallel channels 2 respectively underhanging the two sloping portions 8 and 9 of the canopy, each channel having its axis in a vertical plane between a side web 9 of the canopy and the adjacent adjustable partition.

Extending transversely across each channel are spaced metal beams B, desirably of a figure H section, presenting horizontal upper webs. Seated upon and fastened to these beams are two channel irons 16, each of which may have its lower channel webs imbedded in the concrete floor at one side of the channel as shown in Fig. 7 while presenting the top of its upper channel web slightly below the upper face of this floor.

Extending freely between these channel irons 16, and seated also on the said beams, are two additional channel beams 17 which extend longitudinally of the floor channels 2 and present their flat and upright channel backs toward each other to define an outlet slot for the air in the conduit. These air-guiding channel beams 17 are detachably fastened to the upper flanges of each beam B by bolts 18 which extend through elongated slots in the lower webs of the channel beams 17 to permit the said air-guiding beams 17 to be moved toward or away from each other. Seated freely on the upper web of each channel beam 17 and of the channel iron 17 at the same side of the channel therewith is a flat metal floor plate 3, desirably of such a thickness as to present its upper face flush with the top of the floor 1, these plates being of such width as to leave them spaced by a slot 19 of a width at least as largely as the maximum thickness desired for the sheet-like air curtain.

Thus arranged, the floor channel 2 together

with the two floor plates 3 constitute an air duct from which compressed air can issue only between the opposed flat faces of the channel backs of the beam 17. When these beams are adjusted so that their said opposed faces are parallel, these opposed faces guide the projected sheet of air much more accurately than slits the heretofore proposed longitudinally slitted tubes in which the tube walls are of a thickness which is a quite minor fraction of the width of the opposed faces of the air-outlet defining beams 17.

Consequently, my just described air conduit arrangement enables me to project the air in a sheet which does not spread greatly by the time it reaches the level L of Fig. 1, and which can readily be such thereafter either along one of the lines A or A¹ of Fig. 1, or through the shutter-controlled opening along a line such as A² in Fig. 3, without also drawing an excessive amount of fume-free air with it. Moreover, by removing the floor plates 3, the user readily can reach the bolts 18 to adjust the width of the air outlet slot 19 (Fig. 7), or to clean the air conduit.

To facilitate the adjustment of this air outlet slot, I preferably weld nipples 21 and 22 respectively to each channel iron 16 and to the laterally outward face of the adjacent slot-defining beam 17, each pair of such nipples having oppositely threaded bores respectively fitting the two ends of a bolt shank 23 which can be rotated for positively moving the corresponding slot-defining beam.

However, while I have heretofore described the numerous novel features of my invention in connection with embodiments including numerous desirable details of construction, it is to be understood that many changes might be made without departing either from the spirit of my invention or from the appended claims; also, that my invention is not necessarily limited to the joint use of the cooperating features here disclosed.

For example, Fig. 5 shows the canopy as having a much wider horizontal top portion, so as to reduce the head room required for it, and as having no skirt (such as shown at 9 in Fig. 1) depending from the lower edge of each sloping portion 8a. With each of the illustrated canopies, the spread of the mouth end could also be reduced somewhat, in view of the more direct moving of the air curtains which we obtain by the use of the relatively tall air guiding faces of the channel beams 17 of Figs. 7 and 8.

I claim as my invention:

1. A fume exhaust system for use in spray-painting the sides and top of a railway car or the like, comprising a canopy of inverted trough-shape section overhanging the car and of considerably wider spread than the car; a generally horizontal baffle housed by the canopy and spaced both downwardly and laterally from the canopy, the baffle having an aperture; two continually upright and vertically adjustable partitions depending respectively along the side edges of the said baffle and each adapted to be raised so as to close the opening between the baffle and the canopy at the corresponding side, or lowered so as to uncover the said opening and so as to extend downward considerably below the lower edge of the said opening; a flue leading from the top of the canopy, a shutter controlling the aperture in the baffle, and an exhaust fan in the said flue; whereby the exhaust fan draws air into the flue only through the space between the baffle and the canopy along the outward side of one

- partition when the shutter is closed and the partition is lowered to depend below the lower edges of the said opening, while the other partition is raised into engagement with the canopy; and
- 5 whereby the said fan draws air into the flue only though the aperture in the baffle when the shutter is opened and both partitions are raised so as to extend across and effectively close the openings between the canopies.
- 10 2. A fume exhaust system as per claim 1, including means fast with respect to the canopy for guiding each partition to maintain the partition continuously upright.
- 15 3. A fume exhaust system as per claim 1, in which each outer edge of the top portion of canopy is at approximately the same elevation as the lower edge of the adjacent partition when the partition is lowered sufficiently to close one of the said openings between the canopy and the
- 20 baffle.
4. A fume exhaust system for use in spray-painting the sides and top of a railway car or the like, comprising a baffle of inverted trough-shaped section freely overhanging and of wider spread
- 25 than the said car, the said baffle having an aperture in its top; a canopy of inverted trough-shaped section freely overhanging and coaxial with the baffle; two continuously upright partitions each substantially contiguous to one side edge of the baffle and each adapted to be raised
- 30 until its upper edge contacts with the canopy, or lowered until the said upper edge is substantially flush with a side edge of the baffle; a flue leading from the part of the canopy between the portions of that canopy with which the two partitions contact when raised; a shutter controlling the aperture in the baffle; and an exhaust fan for drawing air upwards into the flue from the
- 35 space between the canopy and the baffle.
- 40 5. A fume exhaust system as per claim 4, including guide means fast with respect to the canopy for keeping each partition substantially

contiguous to the adjacent side edge of the baffle regardless of the raising and lowering of that partition.

6. A fume exhaust system as per claim 1, including means for controlling the position of the said shutter, and means for separately controlling the elevation of each of the partitions.

7. A fume exhaust system as per claim 1, including means for controlling the position of the said shutter, and means for separately controlling the elevation of each of the partitions; the elevation-controlling means associated with each partition comprising a plurality of flexible members extending downwards through the canopy and conjointly supporting the said partition.

8. A fume exhaust system for use in spraying the sides and top of an object, comprising two superposed, normally freely spaced members of inverted trough shape, both of the said members having their longitudinal axes in a common vertical plane with the longitudinal plane of the said object; the lower of the said members being of wider spread than the object which is to be sprayed and the upper member being of still wider spread; whereby the side edges of the

25 lower member and the parts of the upper member at the same elevation with these side edges define two air inlets, respectively outside the general planes of the two sides of the object; the lower member including a midwidth portion provided with a shutter-controlled aperture; two continuously upright partitions respectively extending substantially contiguous to the two side edges of the said lower member, each of the said partitions being movable with respect to both of

35 the said members, from a position in which that partition effectively depends from a side edge of the lower member, to a more elevated position in which the same partition upwardly engages the upper member.

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