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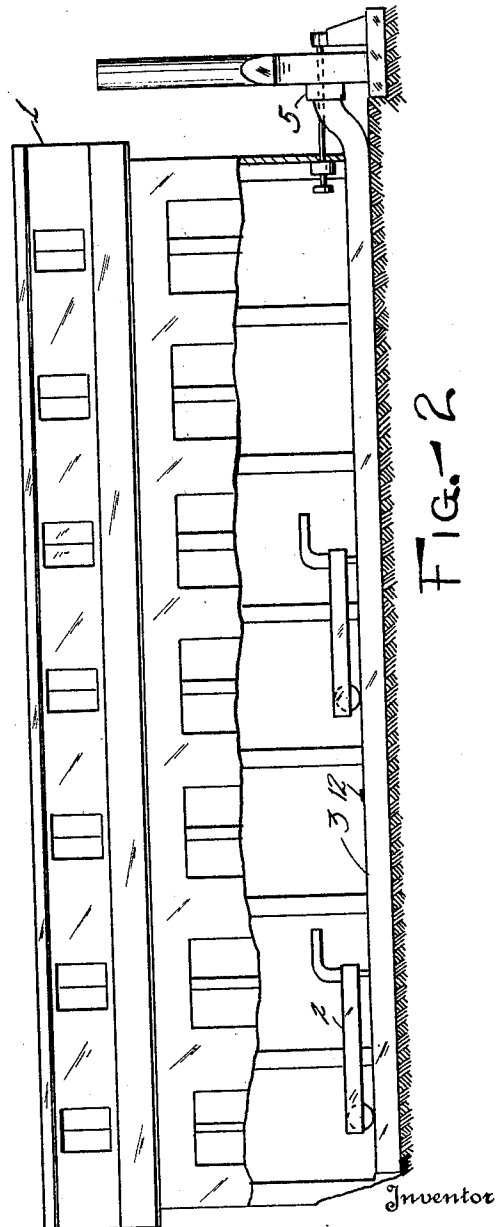
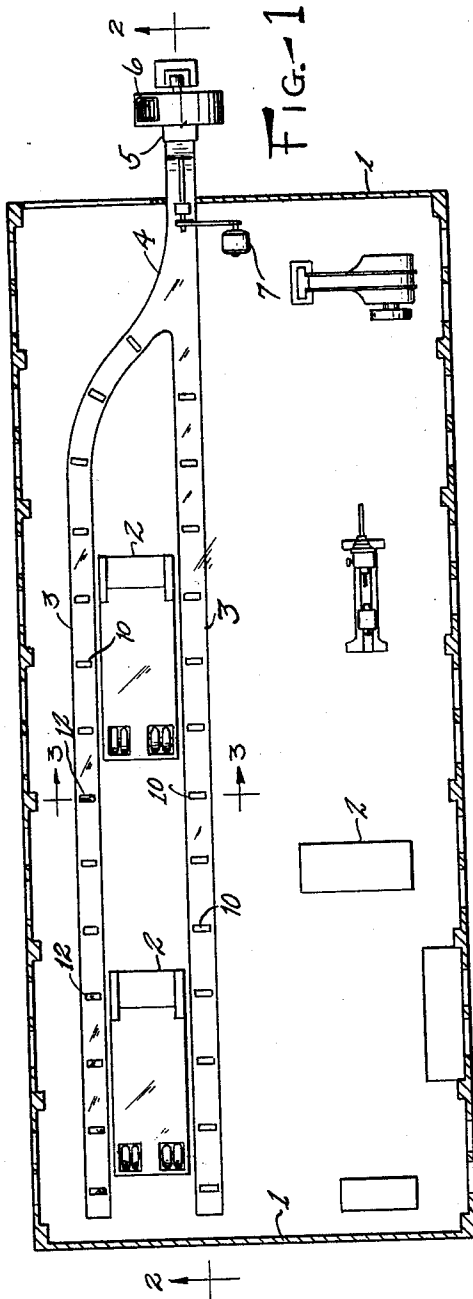
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METHOD OF AND APPARATUS FOR REMOVING FUMES FROM BUILDINGS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

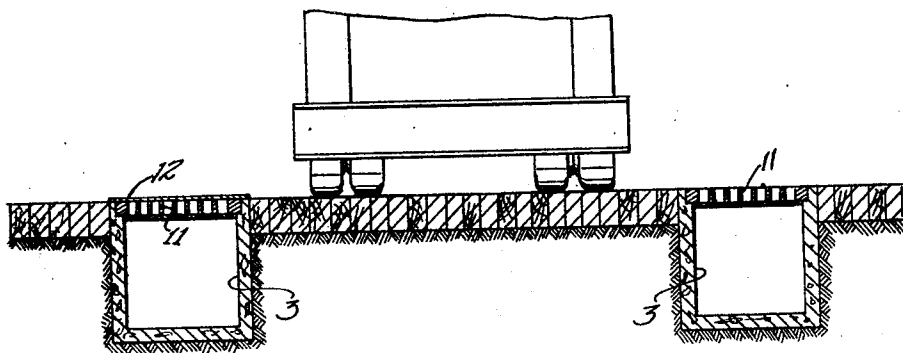


FIG. 3

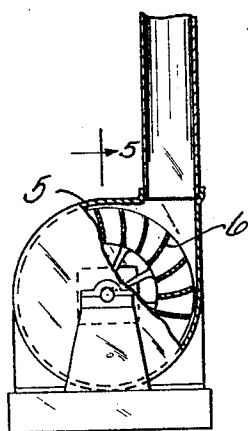
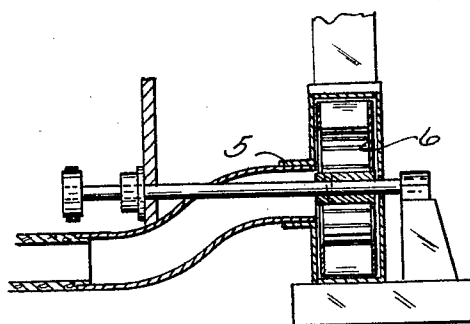


FIG. 4

FIG. 5



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METHOD OF AND APPARATUS FOR REMOVING FUMES FROM BUILDINGS

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This invention relates to a method and apparatus for ventilating buildings, and is particularly concerned with conveying away from the interior of the buildings, objectionable fumes and vapors, atomized matter, dust or other form matters suspended in the air therein. My invention has, for one of its primary objects the protection of workmen, and reduction of fire hazards by the removal from buildings of fumes or suspended matter in the air.

In painting by the spraying method, for example, a heavy mist of paint and chemicals is formed a short distance from the spray nozzle and upon impact of the sprayed paint mixture with the apparatus or machine being coated. This mist and the resultant vapors are not only injurious to the health of the operator, but also constitute a serious fire hazard and are otherwise objectionable.

In spraying small objects and the like, the fumes are controlled by enclosing the object in a compartment through which a large volume of air is forced and exhausted to the outside. In such a case, the spray operator may stand outside of the compartment.

In the painting of large vehicles and apparatus, however, this method is impractical and expensive. For instance, in the case of heavy duty trailers and such large apparatus, it is difficult to reach all parts of the vehicle from the outside. Further, proper illumination is impossible. Since in such compartments the flow of air is partially obstructed, eddy currents and air pockets develop and retain much of the vapor and atomized mixture suspended therein.

The size of apparatus would require that the operator enter the compartment and be exposed to this suspended matter. Further, the danger of serious explosions is very great in a compartment largely filled with such gases, etc. Again, a compartment large enough to contain such a vehicle and permit its ingress and egress or handling of the vehicle therein requires a large amount of floor space. Furthermore, eddy currents and swirls about the large irregular objects result when the draft is heavy.

With these factors in mind, one object of

my invention is a method and apparatus for removing the fumes and chemical mist from about large apparatus which is being sprayed with paint, while such apparatus is unenclosed and unseparated from the remainder of the shop or room in which it is being painted.

Still another object of my invention is to eliminate the fire and explosion hazard by removing such gases, without confining them temporarily in the building, thus permitting sufficient room for expansion in case of fire.

Still another object of my invention is an apparatus for accomplishing these results, which does not require extra floor space, but permits the use of such space for other purposes when not being used for painting, and which may be economically constructed and operated.

In accomplishing these objects, my invention permits free and easy handling of large and bulky objects while being painted, and free access to all their parts.

In the drawings:—

Fig. 1 is a plan view of a work or assembly shop in which my invention is incorporated.

Fig. 2 is a section through such a shop, taken on a plane indicated by the line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross sectional view of the exhaust tunnels taken on a plane indicated by the line 3—3 of Fig. 1.

Fig. 4 is an enlarged end view of the fan illustrated in Figs. 1 and 2.

Fig. 5 is a cross sectional view of the fan illustrated in Fig. 4, taken on a plane indicated by the line 5—5.

Referring to the drawings, my invention is shown installed in an assembly shop 1, in which various steps of assemblage of large trailers, such as indicated at 2, are in progress. The trailers to be painted are positioned in the shop, as illustrated in Figs. 1 and 2, between parallel tunnels 3, which are beneath the floor of the shop and are strong enough to support the weight of any vehicle which is placed on them. These tunnels converge at one end to an outlet tunnel 4, which opens to a fan hood 5 in which operates a rotary fan 6 driven by a motor 7. This fan

is preferably large enough to draw through the tunnels a volume of air equal to the cubic content of the shop in a very few minutes. These tunnels are closed at the end away
5 from the fan, and are preferably spaced far enough apart so that trailers 2 will lie therebetween with little or no overhang.

The surface of the tops of these tunnels should be even with the floor level so as to
10 permit unobstructed movement of the various heavy vehicles and materials across the floor. Along the top wall of the tunnels 3 are comparatively large openings such as 10, spaced at regular intervals along the entire
15 length of the tunnels. These openings may be provided with gratings 11, heavy enough to support large loads, the underside of the gratings being provided with a wire screening to prevent tools and other materials from
20 falling into the tunnel. It is desirable that the tunnels 3 converge by a comparatively gradual bend toward the discharge end, so that, in case of explosions therein, the resulting disturbance is freely vented to the out-
25 side.

For this same reason, the fan hood assemblage should join the tunnel 4 without any abrupt angles and the discharge passage of fan blades should be large.

30 In order that one or more of the openings may be selectively opened as desired, suitable closure means, such for instance, as plates 12 may be provided to cover these openings to form a substantially airtight closure. The
35 plates 12 may be flat sheet metal strips adapted to lie over openings and be supported in such position by the flat upper wall of the tunnel or floor. Obviously, by partially opening or closing these openings, the rate of flow
40 of the air into any or all of them may be controlled.

Fresh air is supplied into the shop through the usual windows and doors in the side walls of the shop for replacing that withdrawn by
45 the ventilating system.

When it is desired to spray paint on the trailers 2, they are placed between the tunnels 3, as described, and a number of the adjacent openings 10 are uncovered, the remainder of the openings being left closed.
50 The fan is then operated to exhaust the air from the tunnels. This fan, as described, is capable of withdrawing a very large volume of air. The openings are likewise large.

55 Thus, a general flow of all the air in the shop toward the openings and in and about the trailer being sprayed and into the tunnels at these points is obtained. Since the natural tendency of the mist from the spraying machines is to move downward, the draft into
60 the openings 10 need not be exceedingly great. The vapors formed by spraying usually result because of exposure of the mist to the air. By moving this mist downward and
65 drawing it immediately into the tunnel, very

little light vapor is formed, and if formed, is so close to the tunnel that the draft is sufficient to withdraw it from the room.

Numerous arrangements of open and closed
70 ports in the tunnel may be used, as well as numerous velocities of the fan, depending upon weather conditions and the direction of the wind on the outside of the shop, and consequent changes in the natural ventilation of the building resulting therefrom. However,
75 these are regulated so that there is a slow movement of the entire body of air in the building toward these openings. This eliminates the tendency of the outgoing stream of air to localize into a direct stream into the
80 tunnel from some source of ventilation such as a window or door, with a consequent drawing out of fresh air without removing the fumes and stale air.

When desired, this movement may be supplemented by uncovering a number of the
85 openings close to the vehicle, but only one adjacent the position at which the spray is operating. This gives a somewhat heavy localized outdraft without affecting the general
90 movement of the air in the room, and carries out a large amount of the heavier atomized matter, so that it will not settle on the floor of the room.

It should be noted that the tunnel is preferably made of concrete or some unburnable
95 material. In case the gases become ignited in the shop, they would be free to expand and so result in a localized flash without serious danger of explosive violence as when confined.
100 If they became ignited in the tunnel the remainder of the shop would be protected from fire and concussion vented to the outside air.

By slowly drawing out such a large volume
105 of air and causing a general flow toward the openings, as described, none of the fumes or mists spread throughout the shop, nor are local currents or swirls formed which tend to hold the mist suspended in the shop or stir up dust clouds formed. In this manner,
110 the air above the level of the spray is kept fresh and clean and the operator protected.

While in the illustration of my invention I have shown only two tunnels, obviously more
115 than two such tunnels may be used, since the floor space is not obstructed thereby. However, experience has proven that two such tunnels about 3 feet square inside and having openings or ports spaced about 10 feet apart and about 1 foot wide and extending entirely
120 across the tunnel, give very satisfactory results. The fan used in such case was about 72 inches in diameter, the room being about 50 feet by 120 feet.

By way of illustration I have described
125 above the application of my method to the removal of paint fumes from a building and an apparatus suitable for that particular purpose. However, I do not intend to limit my invention to the specific use and appara-
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tus above described but intend to include numerous other uses thereof. As examples, the invention may be easily applied to flour mills, cement mills, cotton weaving mills and in fact any building in which in the course of manufacture, dust, lint, objectionable vapors or other foreign matter tends to be suspended in the air throughout portions or all of the building.

Again, while in the case of painting large machinery or other apparatus, it is desirable to place the tunnels beneath the floor or nearer to the floor surface, this is for the purpose of permitting free movement of the apparatus about the floor. It is not necessary in all cases that the exhaust openings or ports be kept even with the floor level, though the desirability of such a position for many purposes is apparent, especially where the suspended matter, because of its own weight, tends to settle gradually downward out of the air.

For instance, to assist in heating the shop properly, especially where overhead heating means are used, as the cold air naturally moves downwardly it may be drawn off easily, thus drawing the warmer air toward the floor without causing hot or cold drafts or localized currents.

Obviously, in all these adaptations, the primary object is to cause a slow general movement of a very large volume of air in the building to suitably positioned ports so as to eliminate the eddy currents or other localized currents of air, at the same time to take advantage of the natural direction of movement of the suspended matter. For example, if the foreign matter is in the form of a very light vapor naturally tending to rise in the air, the exhaust ports would be positioned preferably near the ceiling or at least above the level at which the workmen were engaged.

Having thus described my invention, I claim:

1. An apparatus for removing atomized paint and chemical fumes from a room including a plurality of subterranean tunnels spaced from the walls of said room and from each other and converging into a communicating common passageway by gradual curves, fan means to withdraw the air from said tunnels through the common passageway and discharge it outside of said room, each of said tunnels having ports in the top communicating with said room, means to change the size of each of said port openings independently of the other port openings, whereby a general flow of the air in said room toward and into said tunnels is obtained and air currents greatly reduced.

2. The method of ventilating a general workshop to permit spray painting operations to be done therein unenclosed except for the weather shelter walls and roof of the

shop, comprising withdrawing the air from the shop at separated points about the floor of said shop and below the level of the apparatus being painted, said air being withdrawn in a large quantity and at a slow rate of speed for causing a slow general downward movement of the air in said shop toward the points of withdrawal and maintaining air substantially free from eddy currents, and concurrently causing a natural inflow of outside air into the shop at points about the walls of said shop remote from the openings, and concurrently withdrawing another large quantity of air from said room at points near to the point at which the spraying operation is being carried on, whereby a slow general movement of a large part of said air past the apparatus being painted is obtained and eddy currents are eliminated.

3. The combination with a general workshop in which apparatus is to be spray painted unenclosed from the remainder of the shop, of a ventilating system for said shop for removing the paint fumes therefrom including a plurality of comparatively large tunnels having the upper surface of their walls near the floor level and below the level of the apparatus being painted the top walls of said tunnels having spaced openings communicating with the inside of said tunnels respectively and being large in proportion to said tunnels, said tunnels being spaced apart laterally for receiving in the space therebetween the apparatus to be painted, means to introduce air into said shop remote from said openings and means to withdraw the air from said apparatus and from said tunnels and exhaust it outside of said rooms, said means including a fan capable of discharging at slow speed a quantity of air equal to the cubic content of said entire shop in a comparatively short time whereby a slow gradual movement of all the air in said shop past the apparatus being painted is obtained.

4. An apparatus for removing atomized paint and chemical fumes from a room including a subterranean tunnel spaced from the walls of the room and discharging outside of the room, and fan means to withdraw air from said tunnel, said tunnel having a plurality of ports in the top wall communicating directly with said room and the interior of the tunnel, said tunnel and fan being capable of removing from the room in a relatively short time and at a slow rate of speed a volume of air equal to the cubic content of the room for maintaining the air substantially free from eddy currents during withdrawal from the room.

5. The method of ventilating a general workshop to permit spray paint operations to be done therein unenclosed except for the weather shelter walls and roof of the shop, comprising the steps of withdrawing the air from the room in large volume and at a slow

rate of speed in a comparatively short time at
separated points near the floor and below the
level of and near to the article being painted
and concurrently passing a natural inflow of
5 air into the shop about the walls thereof and
remote from said points of withdrawal for
causing a slow general movement of all the
air in said shop toward said points of with-
drawal and maintaining the moving body of
10 air substantially free from eddy or localized
currents, whereby paint fumes are kept below
the level of the face of the spray operator at
all times.

In testimony whereof, I hereunto affix my
15 signature.

LOUIS J. ROGERS.

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