May 6, 1969 C. C. DIEHL 3,442,602

METHOD AND MECHANISM FOR DEODORIZING POLLUTED ATMOSPHERIC AIR

Filed July 9, 1964 Sheet 1 of 2

FIG. 1.

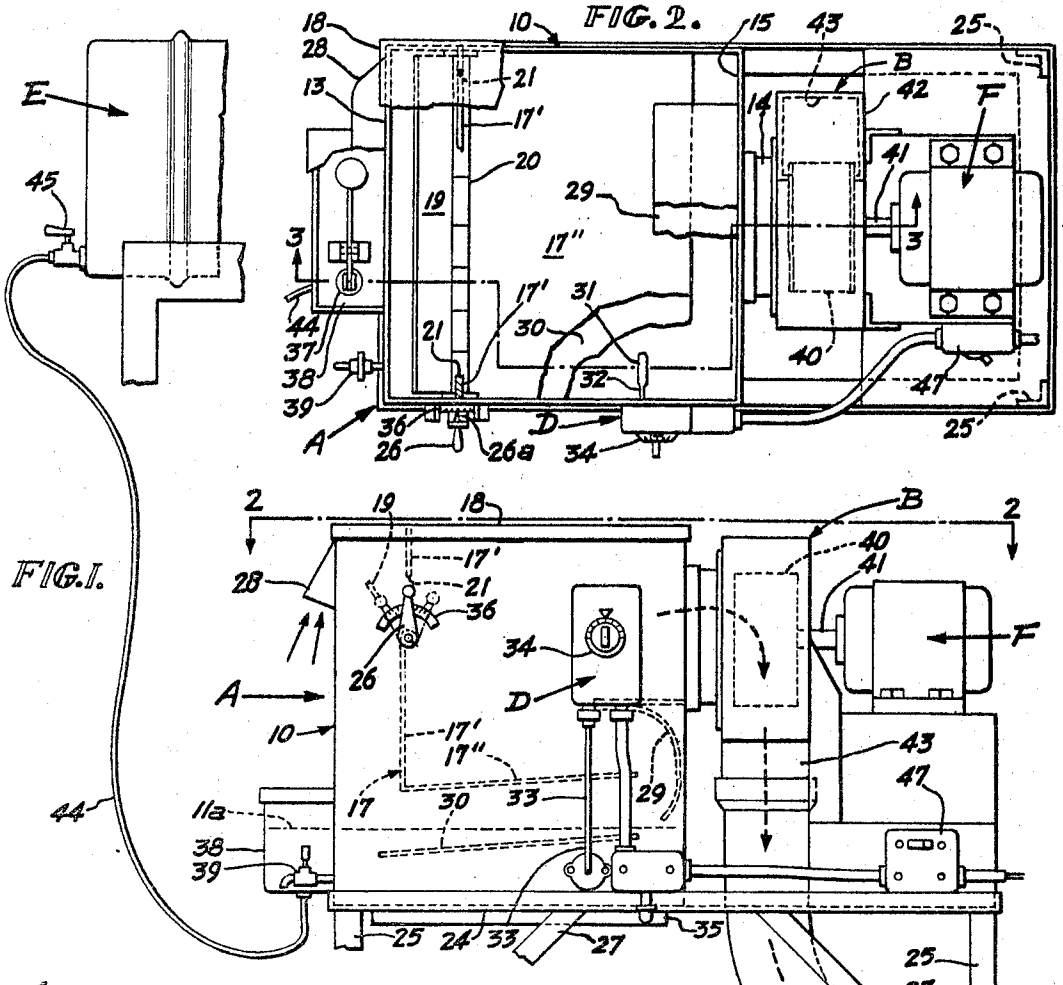
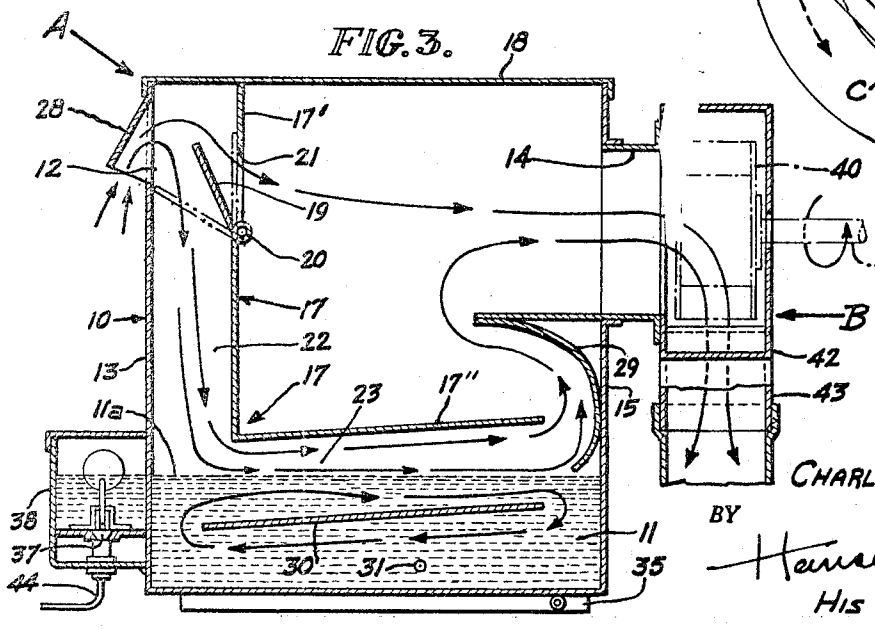


FIG. 2.

FIG. 3.



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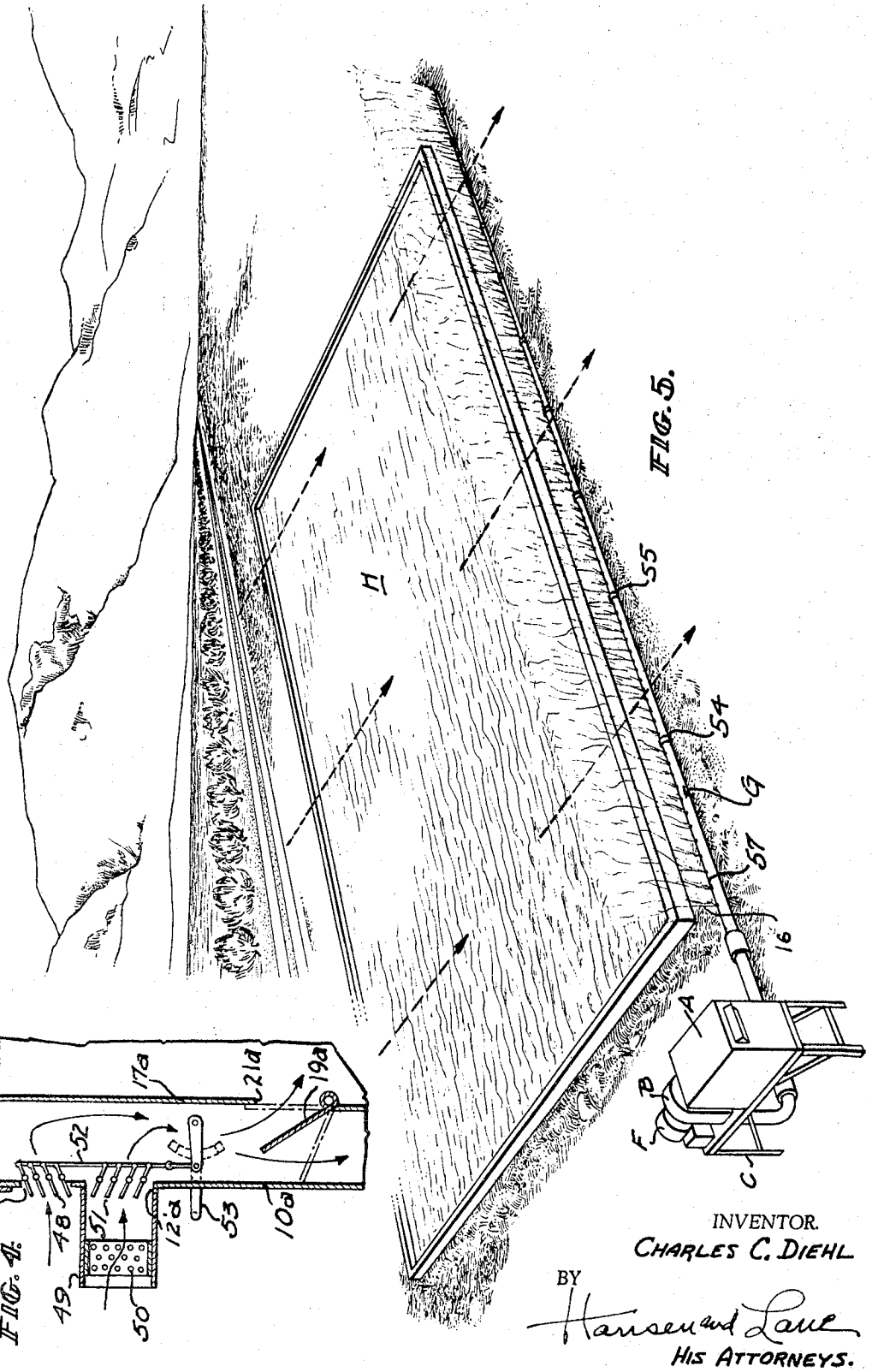


FIG. 5.

FIG. 4.

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METHOD AND MECHANISM FOR DEODORIZING POLLUTED ATMOSPHERIC AIR

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ABSTRACT OF THE DISCLOSURE

A method and apparatus for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation, which method comprises injecting transversely into the stream of polluted air a plurality of high velocity jets of deodorant fluid, said injection taking place on the downward side and close to said industrial installation.

An object of the invention is to provide an improved mechanism for entraining controlled amounts of deodorant vapor emanating from a pool of vaporizable deodorant liquid in a high velocity air stream, and for discharging the thus vaporized air stream in the form of a plurality of high velocity jets transversely through a moving mass of polluted atmospheric air to deodorize it.

The foregoing objects and advantages of the invention, will be apparent from the following description and the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a vaporizing mechanism for entraining deodorant vapors in a high velocity air stream, baffles and a control gate being shown in dotted lines.

FIG. 2 is a top plan view looking in the direction of the arrows 2—2 of FIG. 1 with the top cover of the housing tank removed, portions being broken away.

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2, the arrows indicating air and liquid flow paths.

FIG. 4 is a fragmentary sectional view taken similarly to FIG. 3 and showing the air inlet portion thereof, an air heater being mounted to heat a portion of the incoming air.

FIG. 5 is a perspective view showing an operational installation embodying the present invention.

Briefly, the illustrated embodiment of the invention comprises a vaporizer A having a housing tank **10** adapted to hold a quantity of vaporizable, deodorant liquid **11** therein, for example, to the depth indicated by the broken line **11***a* of FIG. 3. The temperature of the liquid **11** is controlled by a thermostat D.

An air inlet opening **12** is provided in the front wall **13** of the housing tank **10**, while an air outlet **14** in the rear wall **15** of the housing tank **10** is coincident with the inlet of a sirocco type blower B. An upright portion **17'** of a baffle **17** extends downwardly from a housing tank top closure cover **18**, and a horizontal portion **17"** of this same baffle extends rearwardly from the lower end of the upright portion **17'** a short distance above the top surface of the liquid **11** in the housing tank **10**, terminating short of the rear wall **15** thereof.

An air proportioning control gate **19** is hingedly mounted at **20** adjacent an opening **21** in the upright baffle portion **17***a* to control the amount of incoming air which is bypassed through the opening **21** to the blower, and that which is deflected downwardly through a passage **22** between the upright baffle portion **17'** and the housing tank front wall **13**, and thence through a continuing passage **23** between the horizontal baffle portion **17"** and the top surface of the liquid **11**.

These portions of the divided air stream again unite

within the housing tank above the baffle portion **17***b* and are drawn into the blower B, whence they emerge in the form of a high velocity vapor laden air stream. This vapor laden air stream is discharged by the blower B into a pipe G, laid along the leeward side of an installation, such as a sewage effluent pond H (FIG. 5), from which undesirable odors are being emitted. A plurality of apertures are provided at spaced intervals along the exposed upper side of this pipe to discharge jets **16** of vapor laden air into and through the wind-borne mass of polluted air from the pond, to commingle with, and thereby to deodorize this polluted air mass.

Referring to the drawings in greater detail, the vaporizer A comprises a supporting frame C (FIG. 1) which may be of suitable structural material, such as, for example, angle iron. The illustrated frame comprises a top frame **24**, support legs **25**, and diagonal bracing members **27**. The housing tank **10** mounted on the frame C may be fabricated from suitable material, such as, for example, stainless or galvanized sheet steel. The illustrated housing tank **10** is of rectangular shape, although the shape and proportions thereof are not material to the invention.

The tank closure cover **18**, which may also be of sheet metal, has flanged, overlapping relation with the upper end of the housing tank **10**, and rests on the upper edge of the tank, and the upright portion **17'** of the baffle **17**. Since during operation of the vaporizer the interior of the housing tank **10** is under reduced pressure due to the suction of the blower B, the cover **18** provides an effective closure seal for the upper end of the housing tank **10** and the upper edge of the baffle **17**. However, if desired, the tank cover **18** may be sealed to the housing tank walls and to the baffle **17** by conventional rubber or other seals (not shown). The housing tank inlet opening **12** preferably is shielded from the elements by an awning-like hood **28** of sheet metal, since the illustrated mechanism is intended for outdoor installation.

As shown in FIGS. 1–3, the air proportioning control gate **19** is hingedly mounted on the baffle **17** at the bottom of the baffle opening **21**, and is secured to the pin of the mounting hinge **20**. The position of the gate **19** is controlled by a lever arm **26**, which is secured to a projecting portion of the hinge pin. A notched quadrant **36** is secured to the side of the tank housing **10**, and engages a detent **26***a* on the lever arm **26** to retain the latter, and the control gate **19** attached thereto, in adjusted position. The control gate **19** is arranged to swing from its dash-one-dot line position of FIG. 3, in which position the baffle opening **21** is closed, and the passage **22** between the upright baffle portion **17***a* and the forward tank wall **13** is fully open; to its dash-two-dot line position of FIG. 3, wherein the baffle opening **21** is fully exposed, and the passage **22** is closed off.

In the dash-dot line position (FIG. 3) of the gate **19**, all of the air entering the inlet opening **12** in the tank wall **13** is directed downwardly through the passage **22**, thence laterally through the continuation **23** of this same passage, and thence is deflected upwardly and forwardly around the rear edge of the horizontal baffle portion **17"** by a curved deflector **29** provided for this purpose and is drawn into the inlet of the blower B.

When the gate **19** is in other than its fully closed, dash-dot line position of FIG. 3, at least a portion of the air entering the inlet opening **12** is by-passed through the baffle opening **21** and into the inlet of the blower B through the opening **14**. Adjustment of the angular position of the control gate **19** between the two extreme positions illustrated in FIG. 3 controls the proportionate amounts of incoming air which passes along these two routes.

An immersed baffle **30**, which may be slightly inclined from the horizontal, is provided transversely across the

lower portion of the housing tank **10** below the liquid level **11***a* therein. The baffle **30** preferably extends the entire width of the housing tank **10**, and terminates short of its forward and rear walls **13** and **15**. Surface friction of the air flowing through the passage **23** on the liquid surface **11***a* induces a current flow in the liquid **11** in the housing tank **10** about the baffle **30** as indicated by the arrows in FIG. 3.

A suitable velocity of air flow through the passage **23** is at a rate of approximately 1000 lineal feet per minute, and at this speed the surface of the liquid is whipped into waves, and spray droplets are thrown up into the air stream. Most of these droplets impinge on the deflector **29**, and then flow back into the tank, although some of them may remain entrained in the air stream, which does no harm since they eventually evaporate. The reduction in air pressure within the housing tank **10** caused by the operation of the blower B assists in the evaporation of the deodorant liquid **11**.

A conventional thermostatic control bulb **31** (FIGS. 2 and 3) is immersed in the liquid **11**, and is operatively connected by a conventional capillary tube **32** enclosed in a larger protective tube **33** to a conventional thermostat D having a manually adjustable dial **34** thereon to control the energization of an electrical heating coil **35**. The latter preferably is mounted directly beneath the housing tank bottom as shown in FIG. 3, and preferably is of a waterproof type, such as a well-known Calrod unit.

A conventional float-controlled valve **37** is mounted in a float chamber **38**, which communicates with the interior of the housing tank **10**, and controls the flow of vaporizable deodorant liquid from a supply thereof contained in an elevated reservoir E to maintain the liquid **11** in the housing tank **10** at a desired level, such as that indicated by the dotted line **11***a* in FIG. 3. A conventional drain cock **39** is provided at a low point in the housing tank **10** to permit the liquid to be drained therefrom when it is desired to clean the tank.

The blower B preferably is of a conventional sirocco type, having a multi-bladed, centrifugal impeller wheel **40** mounted on a shaft **41** and driven by suitable power means such as an electric motor F of suitable power and speed. The impeller wheel **40** is mounted in a conventional convolute housing **42** to draw air inwardly into the eye of the impeller wheel **40**, and to discharge it at high speed and substantial pressure through the outlet **43** of the blower housing **42**.

The operation of the vaporizer A is as follows: With the drain cock **39** closed, and with a supply of suitable vaporizable deodorant liquid **11** in the elevated storage reservoir E, the control cock **45** (FIG. 1) is opened, thereby allowing the deodorant liquid to flow into the housing tank **10**, whereupon the float valve maintains the required liquid level therein in a customary manner. The thermostat D is also adjusted by means of the control dial **34** to maintain the liquid **11** in the housing tank **10** at a desired temperature. A control switch **47** is then closed to energize the blower motor F, and also to provide energy for the heating coil **35** when called for by the thermostat D.

The air proportioning control gate **19** is adjusted to a desired angular position to control the proportion of air entering the inlet **12** which is deflected through the passages **22** and **23** to entrain vapors from the liquid **11**, and that which is bypassed through the baffle opening **21**. These two air streams are again commingled as the vapor laden air stream is discharged upwardly into the housing around the rear edge of the baffle portion **17''**, and the commingled vapor bearing air mass is then drawn into and through the blower B, and is discharged thence at high velocity and substantial pressure through the discharge outlet **43** of the blower housing.

In the modified arrangement shown in FIG. 4 a portion of the air is heated as it enters the housing tank **10**, and this modified arrangement may be used either in addition to, or in place of the heating means for the liquid shown in FIGS. 1–3. The parts of the structure shown in FIG. 4 which correspond to those shown in FIGS. 1–3 are designated by the same reference numerals with the suffix *a* added.

In FIG. 4 an upper air inlet opening **12***a* has a plurality of louvers **48** mounted therein to control the flow of air inwardly therethrough. A second, hot air inlet opening **12***a'* has a short, rectangular pipe **49** extending outwardly therefrom, and air heating means **50**, consisting of a plurality of conventional, finned heating elements, such as, for example, Calrod elements, are mounted transversely across the interior of this pipe **49**. Energization of these heating elements is controlled by conventional electric switch means (not shown).

A second set of louvers **51** is provided to control the flow of air into this second opening **12***a'*. A link **52** connects both sets of louvers **48** and **51**, and is so connected that as the upper set of louvers is closed, the lower set is opened, and vice versa. A control lever **53** is connected to the link **52** to permit manual adjustment of both sets of louvers as required. Thus by energizing the heating means **50**, and adjusting the louvers **48** and **51** to permit required proportions of air to enter the inlet openings **12***a* and **12***a'* the temperature of the incoming air can be closely controlled.

Referring now to FIG. 5, which shows the overall installation, the pipe G, which is coupled to the discharge opening of the blower housing **42**, is initially of substantially the same cross sectional area as the blower discharge opening, but is reduced in gradual increments as at **54** and **55** in order to maintain adequate internal pressure throughout its entire length. A plurality of jet discharge openings **57** are provided at spaced intervals along the exposed upper side of the pipe G, and through these openings are discharged the deodorizing vapor jets **16**. These vapor jets as shown in FIG. 5 have the appearance of spray, although obviously, being of vapor bearing air, they actually would be invisible. The long, transverse, dotted arrows in FIG. 5 indicate the direction of the prevailing wind, and in some areas the prevailing wind is so constant as to require a pipe G along one side only of the installation to be controlled. However, if the winds in an area where an installation is to be made are variable, similar pipes will necessarily be laid along each side of the installation toward which the winds are apt to blow, and in some instances it may be necessary to have duplicate vaporizers A, and a similar pipe along each side of the installation. In such cases, conventional deflector means for directing the high speed vapor bearing air stream into a selected one or more of such pipes will be provided so as to be able to project the jets **16** into the polluted atmospheric air on the leeward side of the installation regardless of wind direction. Since such duplicate vaporizers, pipes and deflectors can readily be provided by any ordinarily skilled person, it will be unnecessary to illustrate or describe such modifications herein.

The invention provides a simple and effective mechanism for deodorizing large atmospheric air masses which have been polluted by industrial installations.

While I have illustrated and described a preferred embodiment of the present invention, and one modified form thereof, it will be understood, however, that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims.

1. A mechanism for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation and comprising

a pipe laid along the leeward side of, and closely adjacent, such installation, the pipe having a plurality

of jet orifices therein distributed at spaced intervals throughout the length of the pipe, the jet orifices being directed toward, and transversely to the direction of flow of said polluted, wind-borne mass of atmospheric air,

means for introducing a high velocity air stream into the pipe for discharge therefrom through the jet orifices and transversely into the polluted air mass as it is wind-borne transversely across the pipe, and

means for entraining vaporized deodorant material in the high velocity air stream prior to its discharge from such orifices.

2. A mechanism for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation and comprising

a pipe laid along the leeward side of, and closely adjacent, such installation with the upper side of the pipe exposed and having a plurality of jet orifices therein distributed at spaced intervals throughout the length of the pipe, the jet orifices being directed toward, and transversely to the direction of flow of said polluted, wind-borne mass of atmospheric air,

means for introducing a high velocity air stream into the pipe for discharge through the jet orifices and transversely into the polluted air mass as it is wind-borne transversely across the pipe, and

means for entraining vaporized deodorant material the high velocity air stream prior to its discharge from such orifices.

3. A mechanism for deodorizing a mass of polluted wind-borne atmospheric air emanating from an industrial installation and comprising

an enclosed tank housing having an air inlet and an air outlet,

a pool of vaporizable deodorant liquid in the bottom of the tank housing,

a suction blower having a suction inlet and a pressure outlet mounted with its suction inlet fitted onto the housing tank outlet to draw air into the tank housing inlet, through the tank housing and to discharge it in a high velocity air stream from the blower outlet,

baffle means in the tank housing for directing air drawn into the tank housing inlet by the operation of the suction blower across the surface of the pool of deodorant liquid to entrain deodorant vapor emanating therefrom,

a pipe fitted onto the blower outlet and extending along the leeward side of such industrial installation, said pipe having a plurality of jet orifices therein distributed at spaced intervals throughout the length of the pipe,

for discharging such air with its entrained deodorant vapors through the jet orifices in the pipe in the form of jets directed transversely into the polluted air mass as it is wind-borne transversely across the pipe.

4. A mechanism for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation and comprising

a plurality of jet-discharging elements distributed at symmetrically spaced intervals along the downstream side, and throughout substantially the entire width of, such air-borne mass of polluted air, said jet-discharging elements being directed toward, and transversely of the direction of flow of, said airborne stream of polluted air, and

means for supplying deodorant fluid at pressures substantially above atmospheric pressure to the jet-discharging elements for discharging jets of the deodorizing fluid transversely into the polluted air stream to deodorize it.

5. The method of deodorizing a mass of malodorous, polluted, atmospheric air flowing in the form of a wind-borne stream in a known direction from an industrial installation, which method comprises injecting into the wind-borne stream of polluted air, on the downwind side thereof and close to said installation, a plurality of high velocity jets of deodorant fluid, said jets being directed into the mass of polluted air transversely of its direction of flow.

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