

March 13, 1951

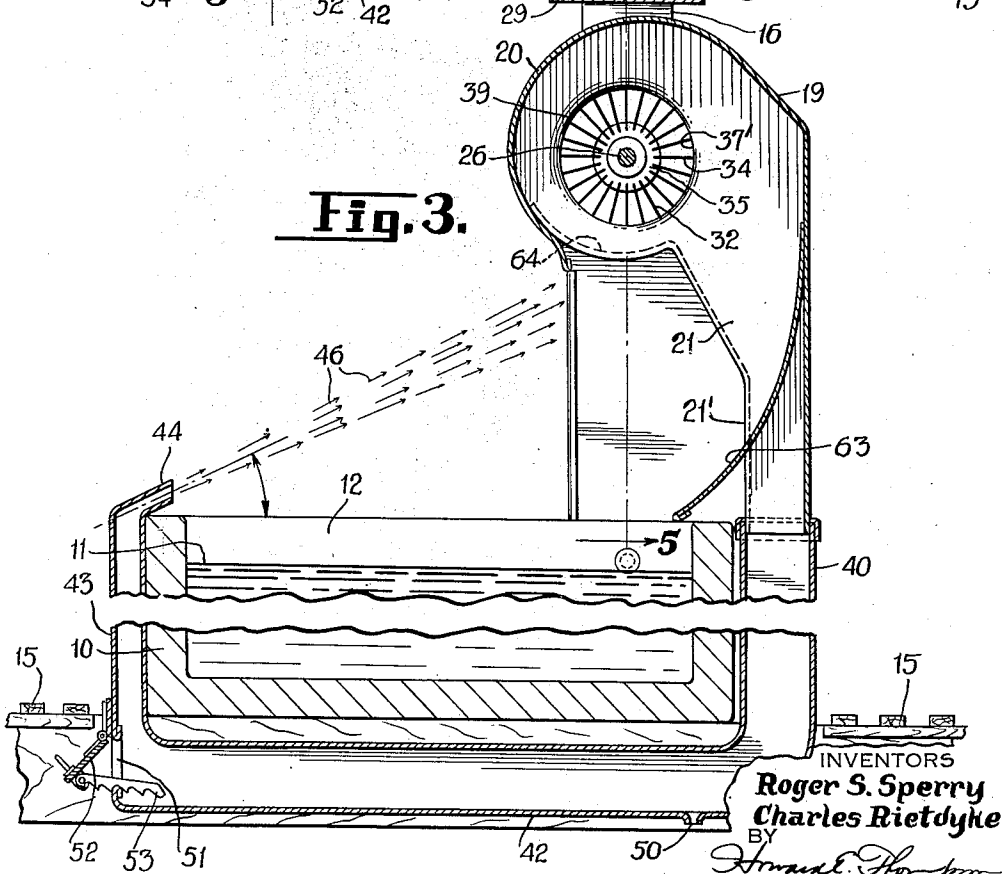
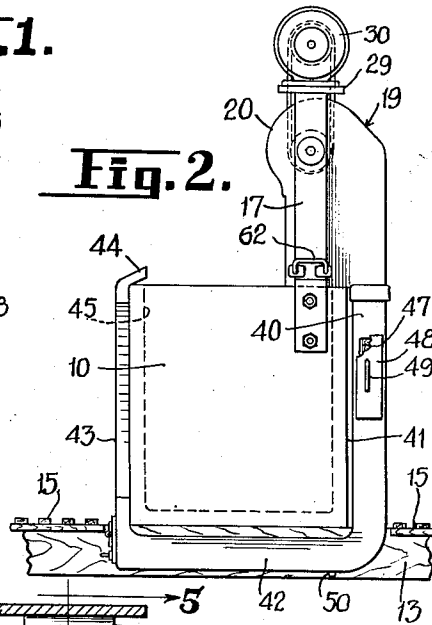
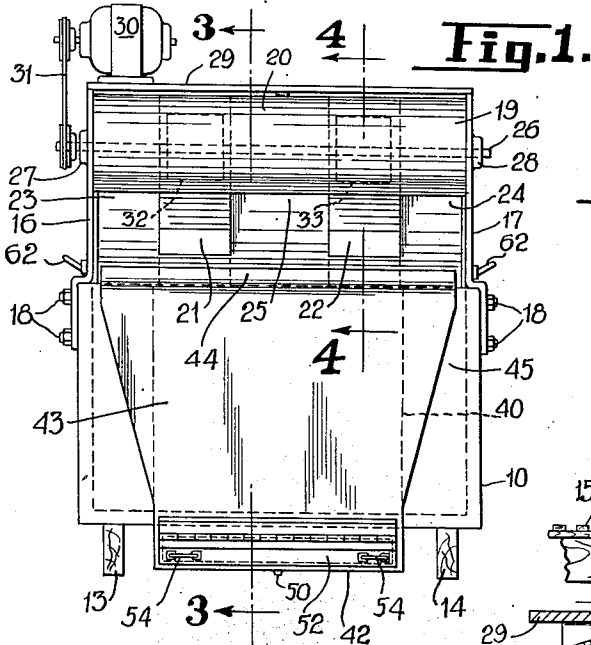
R. S. SPERRY ET AL

2,544,769

FUME AND VAPOR CONTROL FOR CLEANSING TANKS

Filed Dec. 29, 1945

2 Sheets-Sheet 1



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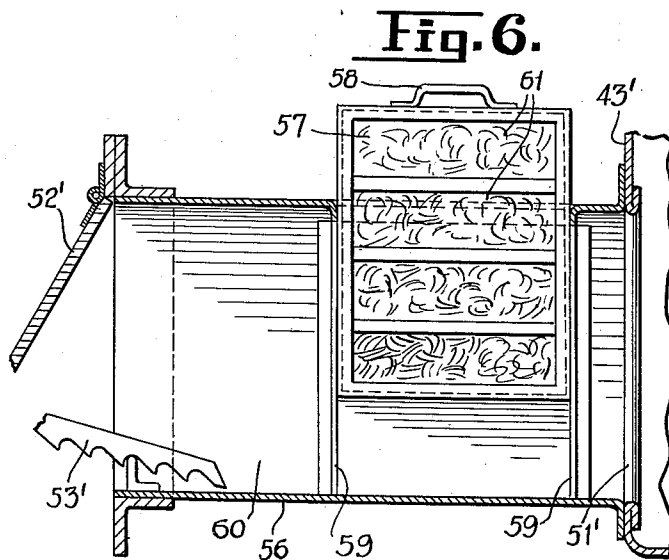
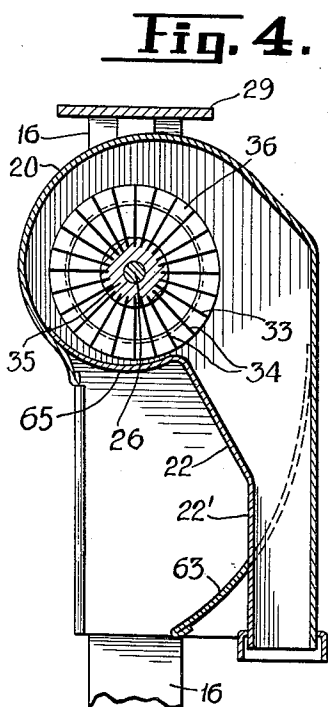
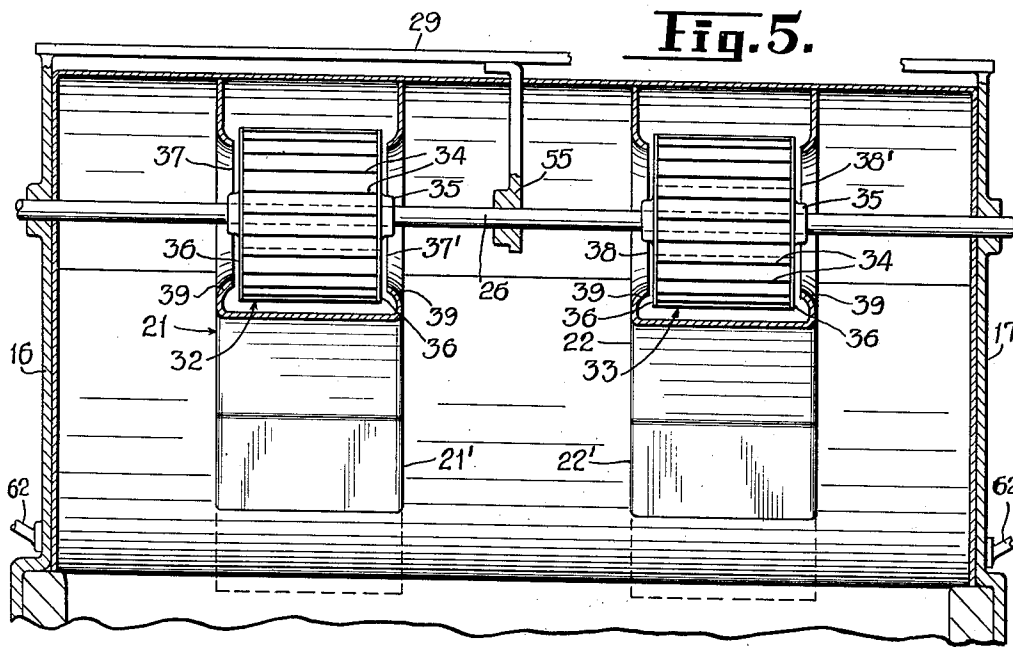
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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

2,544,769

## FUME AND VAPOR CONTROL FOR CLEANSING TANKS

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Application December 29, 1945, Serial No. 638,290

11 Claims. (Cl. 98—36)

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This invention relates to tanks for use in cleansing, processing or treating parts or materials of various kinds and classes, particularly wherein fumes or vapors rise from the tanks in the use thereof. More particularly, the invention deals with a tank construction having means for controlling the fumes and vapors so as to maintain the same against exhaust discharge from the upper surface of the tank, and to exhaust the fumes and vapors in order to prevent objectionable and harmful fumes and vapors from coming in contact with operators working in conjunction with the tanks. Still more particularly, the invention comprises an apparatus including means for filtering air circulated thereby to substantially filter and purify re-circulated air in removing foreign or objectionable elements therefrom. The novel features of the invention will be best understood from the following description when taken together with the accompanying drawing in which certain embodiments of the invention are disclosed, and in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a front view of a tank unit made according to the invention.

Fig. 2 is a side view of the structure shown in Fig. 1, with part of the construction broken away and in section.

Fig. 3 is a section on the line 3—3 of Fig. 1, on an enlarged scale, and with parts of the structure broken away.

Fig. 4 is a partial section on the line 4—4 of Fig. 1, on an enlarged scale.

Fig. 5 is a partial section on the line 5—5 of Fig. 3; and

Fig. 6 is an enlarged sectional detailed view of a modified form of exhaust.

In tanks or apparatus of the kind under consideration, attempts have been made to control or guard against the escape of fumes and vapors arising from treatment or processing tanks of the kind under consideration, particularly when such tanks employ chemicals giving off objectionable or obnoxious odors or injurious fumes or vapors, but for the most part, apparatus of this kind have not proved to be practical or successful in accomplishing the desired result. This has been largely due to the fact that the direction of air currents or the blasts of air passed over the tank have not efficiently exhausted the fumes or vapors rising from the tank.

With our present construction, we have shown means for discharging a blast of air at an angle

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of approximately twenty to thirty degrees to the horizontal over the top of the tank, so as to form above the tank a relatively large chamber in which the fumes and vapors are substantially housed and drawn by the blast of air into the exhaust means employed. Further in creating in the blower or exhaust hood, a suction drawing the fumes and vapors into the hood and discharging them through the exhaust duct or passage down the back and across the bottom of the tank, and then in providing the jet or nozzle-like discharge at the upper end of the front of the tank. In some installations of this type and kind, it is also desirable to filter the exhaust air of the unit in order to maintain a more efficient operation thereof and to prevent re-circulation of contaminated air, which would be objectionable to the operators, particularly from the standpoint of any slight escape which may occur in vapors or fumes rising from the angular air blast over the top of the tank.

In the drawing, 10 represents the tank of a unit in which a suitable cleansing or processing fluid 11 is arranged, and at 12 is shown the upper open end of the tank. The tank is mounted on spaced supports 13 and 14 in the form of beams arranged over a floor or other surface, and on the beams is usually arranged an openwork flooring, as for example at 15, note Fig. 2, and also partly shown in Fig. 3.

Arranged at the upper rear portion of the tank, and supported in suitable side brackets 16 and 17, secured to the tank, as seen at 18, note Fig. 1, is a hood 19. The hood has an upper substantially cylindrical portion 20 divided by two blower compartments 21 and 22 which divide or partition the hood into three exhaust passages, namely two side passages 23 and 24, and a center passage 25. Extending through the cylindrical hood 20 is a shaft 26 having suitable bearings in the brackets 16 and 17, as at 27 and 28. Supported on the top of the brackets is a table or platform 29 upon which is supported an electric motor 30 and from this motor is a belt or chain drive 31 to the shaft 26, as clearly appearing in Fig. 1 of the drawing.

Mounted on the shaft 26, within the compartments 21 and 22, are fans 32 and 33, preferably of the squirrel-cage type, that is to say, the fans comprise a plurality of circumferentially spaced blades 34 extending radially from a hub portion 35 and preferably joined at their side peripheral edges in rings 36. As each fan is of the same construction, the brief description of one will apply to both.

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The compartment 21 has openings 37—37' in side walls thereof, concentric to the fan 32 and of diameters substantially common to the inside diameters of the rings 36 on the fan 32. The compartment 22 has similar openings 38—38' registering with the fan 33. All of the openings 37—37' and 38—38' are bounded by inwardly flared walls, as seen at 39, to direct the air drawn into the openings 23, 24 and 25 into the fans, and then to discharge the same downwardly through the discharge ends 21' and 22' of the compartments 21 and 22, which open into the upper end of a rear flue or duct 40. The duct 40 extends downwardly over the back 41 of the tank 10, and then extends forwardly as a bottom duct or flue 42 across the bottom of the tank. The flue 42 communicates at its forward end in an upwardly extending and laterally flared duct 43. The duct 43 terminating at its upper end in an inwardly and upwardly directed elongated discharge nozzle 44, which extends substantially the full length of the front wall 45 of the tank, as will appear from a consideration of Fig. 1 of the drawing.

It will be apparent from the foregoing that in the operation of the fans 32 and 33, air will be drawn from the top of the tank and discharged downwardly through the duct 40 across the bottom duct 42, then passed upwardly through the duct 43 and discharged under pressure from the nozzle discharge 44 to form a blast column of air substantially as indicated by the arrows 46, note Fig. 3, which blast of air is directed to the lower front portion of the cylindrical part 20 of the hood so as to freely pass into the intake passages 23, 24 and 25, and be assisted in this operation by the suction created by the fans 32 and 33, which will tend to draw the air into the compartments 21 and 22, and then to recirculate the air through the ducts, as above described.

In Fig. 2 of the drawing, a suitable filter 47 is shown arranged in the duct 40 and removable through one side of the duct through the medium of a nozzle plate 48 having a handle as at 49. The filter will extend entirely across the duct 40 to filter the air in its passage through the duct. The lower wall of the duct 42 has a drain passage 50 for the discharge of condensation which may collect in said lower duct.

It is also preferred that an exhaust passage 51 be provided where the duct 42 joins the duct 43, the exhaust 51 being preferably arranged in the outer wall of the duct 43, at the lower end thereof. This exhaust is controlled by a hinge cover 52, carrying a gravity actuated catch 53 for supporting the cover 52 in different positions of adjustment so that the degree of opening of the exhaust can be controlled to maintain the required balance in circulation or recirculation of air. It will be understood that the blast of air as at 46, will pick up and carry with it air from the room or compartment in which the unit is arranged, resulting in a build-up of air, which will require an exhaust, as at 51 to avoid building-up of excessive pressure. The cover 52 will have suitable handle members 54 facilitating movement thereof into open and closed positions.

It will be noted upon consideration of Fig. 5 of the drawing, that the top platform 29 of the brackets 16 and 17 includes a center depending bearing member 55 for the shaft 26 to support said shaft intermediate the two fans.

In Fig. 6 of the drawing is shown a modification, and in this figure, 43' represents the lower part of the front wall of the duct 43, such as shown in Fig. 3 of the drawing, having an open-

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ing 51' therein, similar to the opening 51. With this construction, an exhaust tube 56 forms an extension for the opening 51'. The outer open end of the tube 56 is controlled by a hinge cover 52' similar to the cover 52, and having a latch 53' similar to the latch 53. The elongated tube 56 is made sufficiently long to provide a support for a filter unit 57 insertable into the tube from the top thereof through a medium of a handle 58 on said unit. The unit is suitably guided by cleats, as at 59, arranged in side walls of the tube to maintain the same in predetermined position within the tube passage 60. The filter unit 57 will be of an open frame construction in which filter pads or sections such as 61 are arranged for filtering the air exhausted through the exhaust passage 60. This filter pad may be used independently or in conjunction with the filter 47, and provides a further means for filtering the air, which would be discharged into the room at the lower forward end portion of the unit and below the openwork flooring, as for example at 15, in Figs. 2 and 3.

By making both of the filters 47 and 57 readily detachable, they can be removed for replacement and cleaning from time to time. The filters employed will preferably be of a type and kind not to materially interfere with air flow of the apparatus and will be constructed to suit the type and kinds of fluids employed in the tank, or the fumes or vapors rising therefrom.

It will also appear from a consideration of Figs. 1 and 2 of the drawing that the upper hood portion of the unit can readily be removed by simply detaching the bolts 18 and handle members 62, which are provided at opposite sides of the hood portion of the unit to facilitate handling of the same.

Considering Fig. 3 of the drawing, it will appear that the hood 19 includes a supplemental curved back wall 63 which has cut-outs therein for receiving the compartments 21 and 22, including the tubular conduit portions 21' and 22' thereof. This wall operates to direct the air into the upper portion of the hood.

Considering now Figs. 3 and 4 of the drawing, it will further appear that the upper end of the compartments of the front wall portions thereof have curved walls 64 and 65 respectively, which seat on and substantially conform with the hood 20, completing the lower portion of said hood. Noting Fig. 4 particularly, it will appear that the wall portions, as for example at 65, are arranged in a closer proximity to the periphery of the fan than the remaining wall portions of the hood 20 which gradually increases in diameter to the upper portion of the fan, forming a relatively larger discharge at the rear portion of the compartments which open into the downwardly directed tubular discharges 21' and 22' opening into the duct 40.

It will be apparent from a consideration of Figs. 1 and 2 of the drawing, that the air circulated through the ducts is materially restricted in the duct 43, which is narrower, but slightly wider than the duct 42, and terminates in a restricted discharge in the nozzle 44 in producing the required blast pressure discharge over the top of the tank.

Having fully described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In treatment tanks of the character described, a fume and vapor control apparatus, said apparatus comprising a tank, a hood mount-

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ed on and extending over the full length of and in vertical spaced relation to the rear end portion of said tank, said hood having side walls, spaced blower compartments within the hood and spaced from said side walls, said hood having passages between said compartments and the compartments and said side walls, said passages being exposed to the upper open end of the tank forwardly of the back thereof, said compartments having conduits directed downwardly at the rear portion of the hood and the back of the tank, a duct communicating with said conduits and extending downwardly along the back, across the bottom and upwardly at the front of the tank, the upper front end of said duct having a contracted discharge nozzle extending over the full length of the upper front edge of the tank and in an upwardly inclined direction, said nozzle being adapted to direct air discharged therefrom in an upwardly and rearwardly inclined path over the top of the tank and to the passages of said hood, said compartments having openings communicating with the passages of said hood, a fan within said compartments and means for driving the fan for drawing air into the hood passages and forcibly discharging the same therefrom into said duct and out through said discharge nozzle.

2. A fume and vapor control apparatus for tanks of the class described, said apparatus comprising a tank, a hood of a length substantially equal to the length of the back wall of said tank, means for mounting the hood in spaced relation to and above the tank at and forwardly of said back wall, a shaft extending longitudinally through the hood, a pair of fans on said shaft spaced with respect to each other and to the ends of said hood, blower compartments in said hood and around said fans, said blower compartments dividing said hood into longitudinally spaced air admission passages, said compartments having openings placing said air admission passages in communication with the interior of said compartments, means for rotating said shaft to drive said fans to draw air into the blower compartments, said compartments having downwardly directed tubular conduits rearwardly of said back wall, a duct communicating with said conduits and extending downwardly over said back wall of the tank, across the bottom wall thereof and upwardly over the front wall, and the upper front end of said duct having an inwardly directed upwardly inclined discharge nozzle extending the full length of the tank for directing air upwardly and rearwardly over the top of the tank to the admission passages of said hood.

3. A fume and vapor control apparatus for tanks of the class described, said apparatus comprising a tank, a hood of a length substantially equal to the length of the back wall of said tank, means for mounting the hood in spaced relation to and above the tank at and forwardly of said back wall, a shaft extending longitudinally through the hood, a pair of fans on said shaft spaced with respect to each other and to the ends of said hood, blower compartments in said hood and around said fans, said blower compartments dividing said hood into longitudinally spaced air admission passages, said compartments having openings placing said air admission passages in communication with the interior of said compartments, means for rotating said shaft to drive said fans to draw air into the blower compartments, said compartments having downwardly

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directed tubular conduits rearwardly of said back wall, a duct communicating with said conduits and extending downwardly over said back wall of the tank, across the bottom wall thereof and upwardly over the front wall, the upper front end of said duct having an inwardly directed upwardly inclined discharge nozzle extending the full length of the tank for directing air upwardly and rearwardly over the top of the tank to the admission passages of said hood, and adjustable means in said duct controlling discharge of part of the air circulated therethrough.

4. A fume and vapor control apparatus for tanks of the class described, said apparatus comprising a tank, a hood of a length substantially equal to the length of the back wall of said tank, means for mounting the hood in spaced relation to and above the tank at and forwardly of said back wall, a shaft extending longitudinally through the hood, a pair of fans on said shaft spaced with respect to each other and to the ends of said hood, blower compartments in said hood and around said fans, said blower compartments dividing said hood into longitudinally spaced air admission passages, said compartments having openings placing said air admission passages in communication with the interior of said compartments, means for rotating said shaft to drive said fans to draw air into the blower compartments, said compartments having downwardly directed tubular conduits rearwardly of said back wall, a duct communicating with said conduits and extending downwardly over said back wall of the tank, across the bottom wall thereof and upwardly over the front wall, the upper front end of said duct having an inwardly directed upwardly inclined discharge nozzle extending the full length of the tank for directing air upwardly and rearwardly over the top of the tank to the admission passages of said hood, means for filtering air passed through said duct, and said last named means comprising a filter element detachably supported in the duct at the back of the tank.

5. A fume and vapor control apparatus for tanks of the class described, said apparatus comprising a tank, a hood of a length substantially equal to the length of the back wall of said tank, means for mounting the hood in spaced relation to and above the tank at and forwardly of said back wall, a shaft extending longitudinally through the hood, a pair of fans on said shaft spaced with respect to each other and to the ends of said hood, blower compartments in said hood and around said fans, said blower compartments dividing said hood into longitudinally spaced air admission passages, said compartments having openings placing said air admission passages in communication with the interior of said compartments, means for rotating said shaft to drive said fans to draw air into the blower compartments, said compartments having downwardly directed tubular conduits rearwardly of said back wall, a duct communicating with said conduits and extending downwardly over said back wall of the tank, across the bottom wall thereof and upwardly over the front wall, the upper front end of said duct having an inwardly directed upwardly inclined discharge nozzle extending the full length of the tank for directing air upwardly and rearwardly over the top of the tank to the admission passages of said hood, adjustable means in said duct controlling discharge of part of the air circulated therethrough, means adjacent said adjustable means for filtering the air

discharged from said duct, and means in the back part of said duct for filtering air passed through said duct.

6. The herein described means for controlling fumes and vapors rising from a treatment tank of the class described, said means comprising a tank, an air circulating apparatus for said tank, said apparatus having an elongated discharge nozzle above and extending longitudinally of the front wall of the tank to be controlled, said discharge nozzle being directed rearwardly and upwardly over the top of the tank, a hood arranged over and above the full length of the rear portion of the tank, means comprising a blower within the hood and a duct communicating with the hood and extending around the back, bottom and front walls of the tank for providing a forced circulation of air through the apparatus for discharge from said nozzle in an upwardly inclined rearward direction over and above the top of the tank, and said hood having means at the rear portion of the tank for collecting the air including fumes and vapors rising from the tank for circulation by said forced circulation means through the apparatus.

7. The herein described means for controlling fumes and vapors rising from a treatment tank of the class described, said means comprising a tank, an air circulating apparatus for said tank, said apparatus having an elongated discharge nozzle above and extending longitudinally of the front wall of the tank to be controlled, said discharge nozzle being directed rearwardly and upwardly over the top of the tank, a hood arranged over and above the full length of the rear portion of the tank, means comprising a blower within the hood and a duct communicating with the hood and extending around the back, bottom and front walls of the tank for providing a forced circulation of air through the apparatus for discharge from said nozzle in an upwardly inclined rearward direction over and above the top of the tank, said hood having means at the rear portion of the tank for collecting the air including fumes and vapors rising from the tank for circulation by said forced circulation means through the apparatus, and the bottom portion of the duct having a controlled air outlet.

8. The herein described means for controlling fumes and vapors rising from a treatment tank of the class described, said means comprising a tank, an air circulating apparatus for said tank, said apparatus having an elongated discharge nozzle above and extending longitudinally of the front wall of the tank to be controlled, said discharge nozzle being directed rearwardly and upwardly over the top of the tank, a hood arranged over and above the full length of the rear portion of the tank, means comprising a blower within the hood and a duct communicating with the hood and extending around the back, bottom and front walls of the tank for providing a forced circulation of air through the apparatus for discharge from said nozzle in an upwardly inclined rearward direction over and above the top of the tank, said hood having means at the rear portion of the tank for collecting the air including fumes and vapors rising from the tank for circulation by said forced circulation means through the apparatus, the bottom portion of the duct having a controlled air outlet, and means for filtering air circulated through the duct.

9. The herein described means for controlling

fumes and vapors rising from a treatment tank of the class described, said means comprising a tank, an air circulating apparatus for said tank, said apparatus having an elongated discharge nozzle above and extending longitudinally of the front wall of the tank to be controlled, said discharge nozzle being directed rearwardly and upwardly over the top of the tank, a hood arranged over and above the full length of the rear portion of the tank, means comprising a blower within the hood and a duct communicating with the hood and extending around the back, bottom and front walls of the tank for providing a forced circulation of air through the apparatus for discharge from said nozzle in an upwardly inclined rearward direction over and above the top of the tank, said hood having means at the rear portion of the tank for collecting the air including fumes and vapors rising from the tank for circulation by said forced circulation means through the apparatus, the bottom portion of the duct having a controlled air outlet, means for filtering air circulated through the duct, and means for filtering air passed through said outlet.

10. The combination with a treatment tank of the character described, of means for housing and controlling fumes and vapors rising from the tank, said means comprising a hood arranged over and above the full length of the rear portion of the tank, an upwardly inclined discharge nozzle arranged over the full length of the front portion of the tank, means including a duct for placing said hood in communication with said nozzle, and means within the hood providing a forced circulation of air through the duct to said nozzle for discharge in an upwardly and rearwardly inclined column over and above the tank into said hood.

11. The combination with a treatment tank of the character described, of means for housing and controlling fumes and vapors rising from the tank, said means comprising a hood arranged over and above the full length of the rear portion of the tank, an upwardly inclined discharge nozzle arranged over the full length of the front portion of the tank, means including a duct for placing said hood in communication with said nozzle, means within the hood providing a forced circulation of air through the duct to said nozzle for discharge in an upwardly and rearwardly inclined column over and above the tank into said hood, means for purifying the air circulated through said duct, and adjustable means in said duct controlling exhaust of part of said circulated air at a point spaced with respect to said nozzle.

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