July 4, 1933. G. RAYMOND 1,916,528

SPRAY EXTRACTOR.

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Fig. 1.

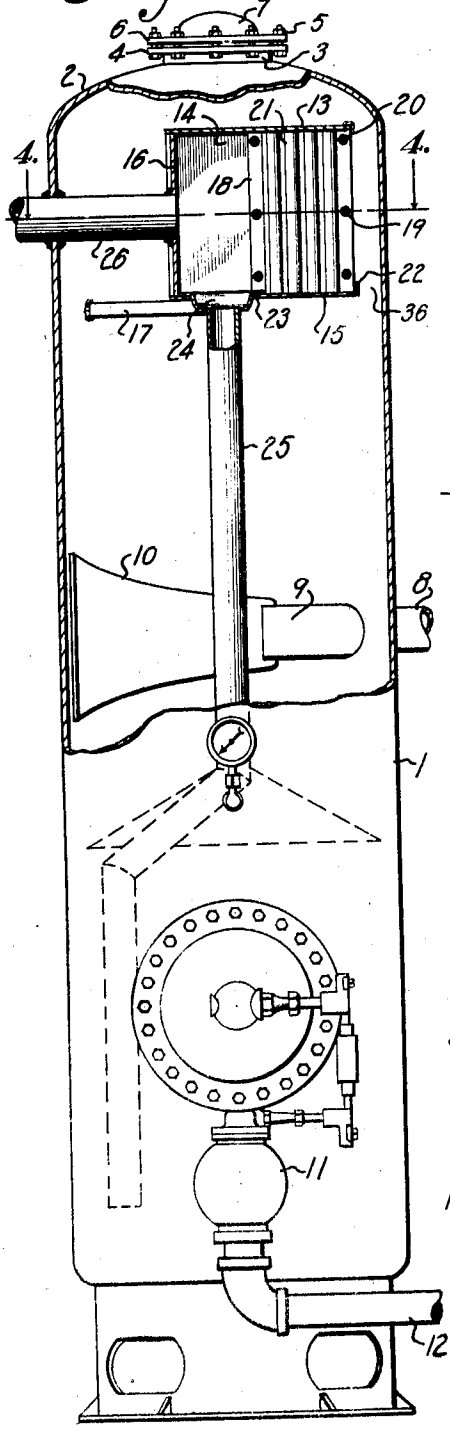


Fig. 2.

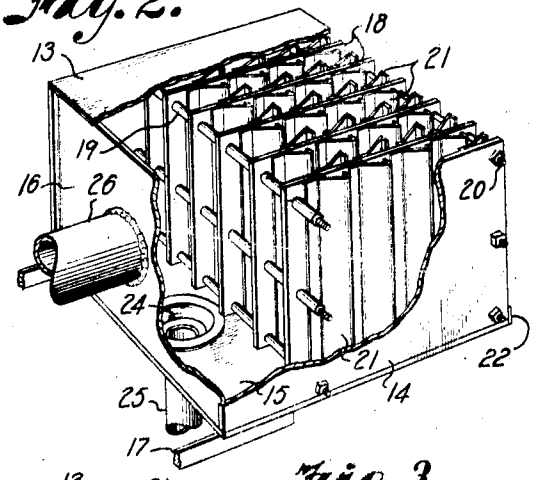


Fig. 3.

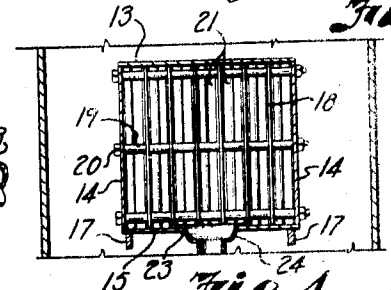


Fig. 4.

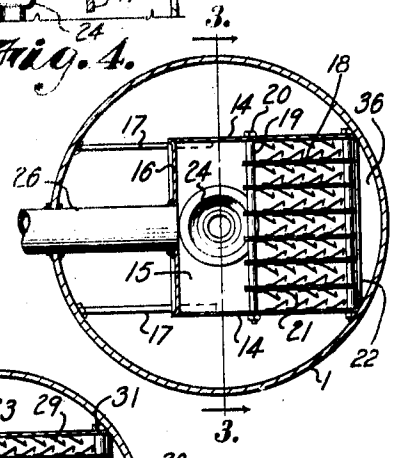
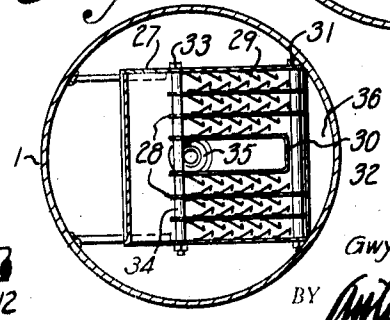


Fig. 5.



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Fig. 6.

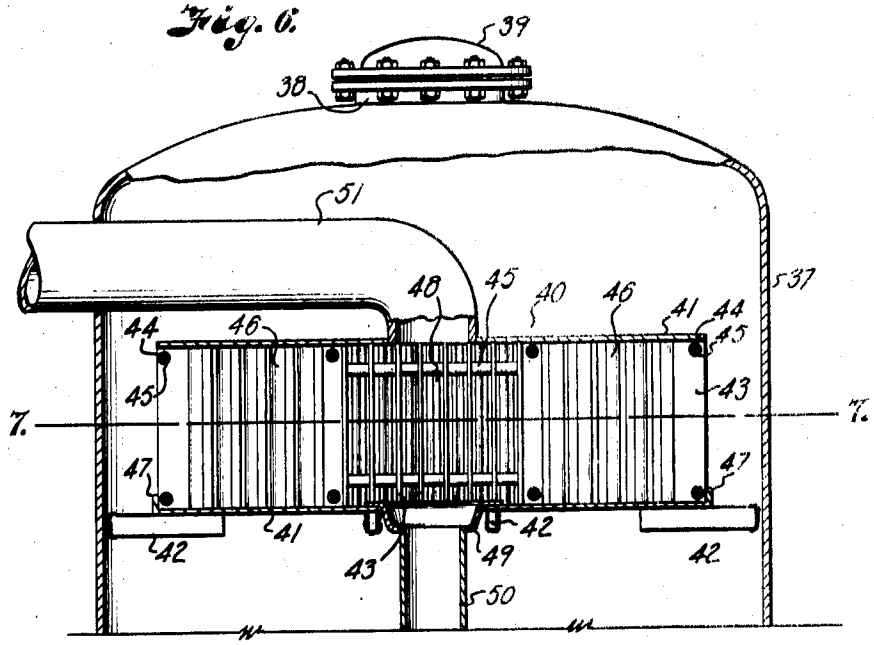
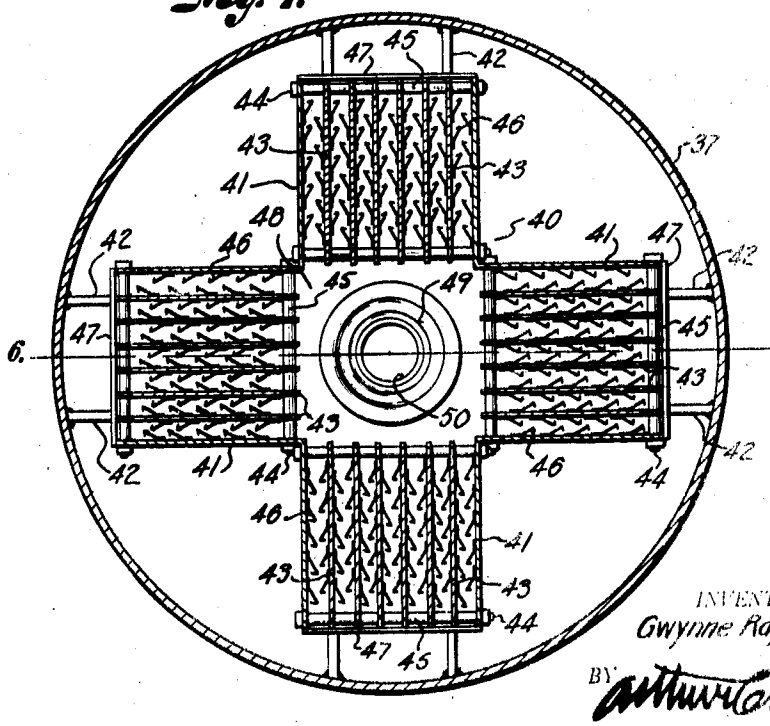


Fig. 7.



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Patented July 4, 1933 1,916,528

UNITED STATES PATENT OFFICE

GWYNNE RAYMOND, OF KANSAS CITY, MISSOURI

SPRAY EXTRACTOR

Application filed August 31, 1931. Serial No. 560,375.

My invention relates in general to devices for separating gas from liquids and more particularly to spray extractors for removing liquid and solid particles from a stream of gas, the principal objects of the invention being to increase the swirling or eddy movement of the gas stream, to provide a relatively quiet zone in an extractor wherein the liquid and solid particles may readily separate from the gas, and to remove such liquid and solids from the extractor without repassing the same through gas.

In accomplishing these and other objects of my invention, I have provided improved details of structure, the preferred form of which is shown in the accompanying drawings, wherein:

Fig. 1 is an elevation of a separator tank with parts broken away and in section, showing my spray extractor in position therein.

Fig. 2 is an enlarged perspective view of the extractor with parts of the casing broken away and in section, showing its interior construction.

Fig. 3 is a vertical section of the extractor and tank taken on the line 3—3, of Fig. 4.

Fig. 4 is a horizontal section of the spray separator and tank taken on the line 4—4, of Fig. 1.

Fig. 5 is a similar section of a modified form of spray extractor used in small capacity units.

Fig. 6 is a fragmental view with parts in section of a modified form of spray extractor as used in large separators and taken on the line 6—6 of Fig. 7.

Fig. 7 is a horizontal section of the same taken on the line 7—7 of Fig. 6.

Referring to the drawings in detail:

1 represents a tank or separator casing having a top 2 which is provided with an opening surrounded by a collar 3 around the upper edge of which is an outwardly extending flange 4. Secured to the flange by means of bolts 5 is a ring 6 by which a safety device 7 preferably in the shape of a domed frangible diaphragm is secured in position on the flange. This diaphragm is preferably made of sheet metal and of such thickness that it will fracture at a predetermined gas pressure and release the gas content of the tank, thus acting as a safety valve and preventing the tank from exploding.

A supply pipe 8 extends tangentially through the side of the tank at a distance above its bottom and has its discharge end 9 directed tangentially within the tank. A wear plate 10 is affixed to the inside of the tank wall in such a position that it will receive the initial impact of the gas charged liquid issuing from the pipe 8 and prevents wear of the tank wall at that point. The wear plate may be removable so that it can be readily replaced when necessary.

The usual float controlled liquid outlet valve 11 and outlet pipe 12 are shown in their proper position but will not be described in detail as they form no important part of the present invention.

The spray extractor comprises a rectangular casing having a top 13, end walls 14, a bottom 15 and one side wall 16, the remaining side of the casing is open. The casing is located within and adjacent the top of the tank and may have the vertical edges of the end walls at the open side secured to the tank wall, bars 17 are secured to the casing preferably on its bottom 15 and project outwardly. The outer ends of these bars are secured to the tank wall and thus the extractor casing is so supported in the tank as to be completely surrounded by gas and it will be noted that I have provided ample gas passageway between the vertical walls of the extractor casing and the tank wall so that in event the safety device 7 is fractured or operated by abnormal gas pressure in the tank, no retarding of the sudden escape of the gas will occur. If desired, any form of safety valve may be substituted for the diaphragm without departing from the spirit of my invention.

Located within the extractor casing are a plurality of vertical plates 18. These plates are parallel to the end walls 14 and are laterally spaced therefrom and from each other by means of sleeves 19. Bolts 20 pass through the end walls 14, plates 18 and sleeves 19 and thus complete the assembly of the plates within the casing.

Vertically extending baffles 21 are secured along one edge to opposite sides of the plates 18 and also to the inner faces of the end walls. The unattached portions of the baffles 21 are bent outwardly from the plates and walls and are so arranged as to provide sinuous passageways for gas entering the extractor, in which the rate of travel of the gas stream is reduced.

The outwardly bent portions of the baffles 21 are directed toward the open side of the casing, thereby forming pockets which temporarily trap a portion of the gas stream passing between the plates 18 and baffles 21 where it eddies about before escaping therefrom.

It will be seen from the foregoing that not only is the separation of liquid and solids, which have been carried upward by the gas as it is released from the spray of gas charged liquid formed when gas is released from the mixed liquid and gas which enters the separator through the tangential inlet 9, facilitated by the passing of the gas stream in a sinuous passage while passing through the extractor and by the eddies created by the baffles, but such separation is also enhanced by the large surface area contacted with by the gas during such passage. The front ends of the baffles are preferably hooked in order to further increase the eddying of gas and the particles carried thereby in the pockets.

The liquids and solids thus extracted from the gas flow downwardly over the surfaces of the baffles 21, plates 18 and inside faces of the side walls 14 and gather on the bottom 15. The liquids and solids thus gathered are prevented from passing out of the open side of the casing by an upwardly extending flange 22 which may be formed integral with the bottom 15.

The bottom 15 is provided with an opening 23 with which a sump 24 communicates. To this sump is attached the upper end of a liquid discharge conduit 25, the lower end of which terminates adjacent the bottom of the tank 1 so that this end of the conduit will always be sealed by the liquid in the tank and prevent wet gas from entering said conduit and passing directly into the gas chamber of the extractor.

A gas discharge 26 which communicates with the interior of the gas chamber extends beyond the exterior of the tank.

It will be noted, especially from Figs. 2, 4, and 5, that the plates carrying the baffles do not extend completely to the side wall 16 but are spaced therefrom to form a gas collecting chamber which receives all of the separate streams into which the gas has been divided while passing between the plates prior to conducting to the reservoir.

In Fig. 5 I have shown a modified form of my invention when applied to units of relatively small capacity. In such a structure the extractor casing must of necessity be made smaller in order to provide adequate space between it and the tank wall for the passage of gas to the escape opening in the event of abnormal pressure and to this end I have constructed a casing 27 similar to the casing previously described. Within this casing and at the open side thereof are mounted plates 28 carrying baffles 29. A number of these plates are located adjacent each end wall of the casing and a U-shaped housing 30 is positioned between the innermost of the plates 28 with the open side of the housing directed towards the closed side of the casing. The plates are secured in position within the casing at their front edges by bolts 31 and spacer sleeves 32 and at their inner edges by bolts 33 and spacers 34. The bolts 33 also secure the housing 30 in position. A sump 35 is secured in the bottom of the casing 27 to which a discharge conduit similar to the conduit 25 is secured.

It will be noted from Fig. 5 that the inner faces of the casing end walls and the outer faces of the housing side walls are also provided with baffles 29, and also that the plates 28 and side walls of the housing 30 terminate closer to the end wall of the separator casing than the plates shown in Fig. 4.

This construction compensates for the loss of contact surface area due to the smaller dimensions of the separator casing and the housing 30 will provide sufficient space on the discharge side of the spray extractor to accommodate the discharge connections, especially the fluid discharge.

The sump in this construction is located between the side walls of the housing 30. The casing 27 is also provided with a conduit, not shown, for conducting the gas from the gas chamber as has been previously described.

It will also be noted from Figs. 4 and 5 that when either of the casings is secured within the tank, a gas passageway 36 is formed between the open side of the casing and tank wall, which gas can readily enter along the top and bottom of the casing.

In Figs. 6 and 7 I have shown a modified form of spray extractor which is used when separators of more than ordinary capacity are required and in which the tank 37 is of the same construction as the tank 1 previously described, but of course of larger dimensions and is provided with an emergency gas outlet 38 which is normally closed by means of a safety device 39.

Located within the casing 37 and adjacent its top is a spray extractor 40 composed of a battery of spray extracting units 41 arranged radially about a central outlet and is held centrally of the tank 37 by means of supports 42 which are secured to the tank wall.

Each of the units contains a plurality of vertical, parallel, spaced plates 43 which are

secured in position by means of bolts 44 and spacers 45 as has been previously described. Baffles 46 are secured to opposite faces of the plates 43 and inner faces of the side walls of each unit so as to form sinuous horizontal passageways for the gas. The construction and arrangement of these baffles is the same as that previously described.

An upturned flange 47 extends across the lower portion of the inlet end of each unit for preventing liquid and solids extracted from the gas from passing back into the tank through the gas.

A gas chamber 48 is formed at the center of the assembled battery of units and has a sump 49 in its bottom which carries a conduit 50 through which extracted liquid and solids are delivered directly into the liquid in the lower portion of the tank 37.

A gas conduit 51 conducts the gas which has collected in the chamber 48 to a point beyond the tank.

It will be noted from Fig. 7 that by my arrangement of the battery of separator units the gas can readily pass upward to the emergency outlet so that in the event the safety device 39 is operated by abnormal gas pressure in the tank, no retarding of the sudden escape of the gas will occur.

What I claim and desire to secure by Letters Patent is:

1. In a spray extractor, a rectangular casing having one open side, a U-shaped housing located within said casing and having its open end directed toward and spaced from the closed side of said casing, a plurality of vertical laterally spaced plates located within said casing and parallel to said housing, said plates being spaced from the closed side of said housing, a plurality of vertical baffles carried by opposite faces of said plates and adjacent faces of the vertical walls of the casing and the housing, said baffles arranged to form forwardly open pockets, and sinuous gas passageways between said plates and walls, a gas chamber formed in said casing to the rear of said plates and in said housing, means for conducting liquid from said casing, and means for conducting gas from said chamber.

2. In a spray extractor including a tank, pressure relief means connected with the top of the tank, a rectangular casing in the tank having an open side, a plurality of vertical laterally spaced plates located within said casing and spaced from the side of the casing opposite said open side to form a gas outlet chamber in the casing, a gas outlet conduit communicating with said chamber, baffles carried by opposite faces of said plates and adjacent faces of the side walls of the casing, and arranged to form sinuous gas passageways between said plates for retarding flow of gas from the tank to said outlet conduit to effect gravity separation of fluid carried with the gas, and means supporting the casing in spaced relation with the walls of the tank to provide passageways therebetween whereby gas delivered to the tank acts directly upon said relief means to effect relief of excessive pressure in the tank independently of the retarded flow through said sinuous passageways when the relief means functions.

In testimony whereof I affix my signature.

GWYNNE RAYMOND.