Jan. 17, 1933. O. A. LINDEMANN 1,894,696

VAPOR CONDENSER

Filed Nov. 11, 1930

Fig. 1.

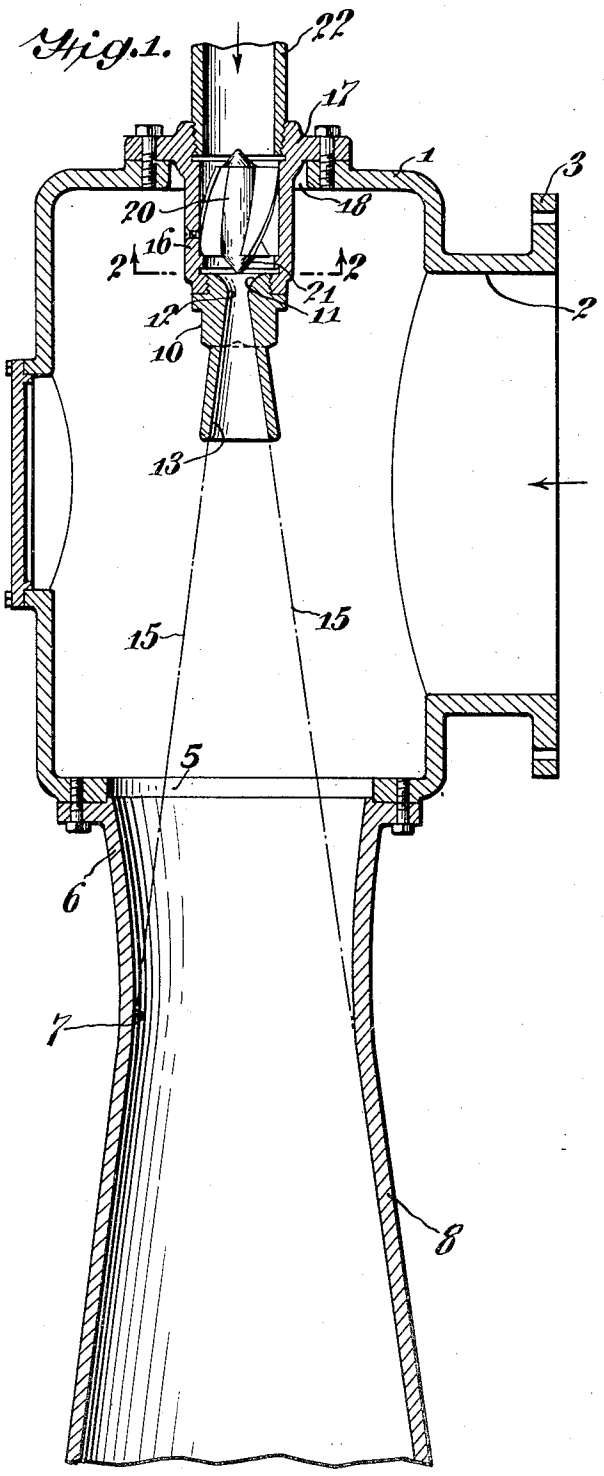


Fig. 2.

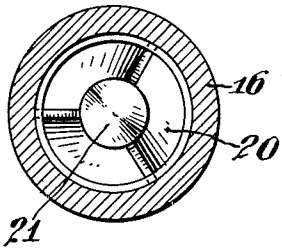
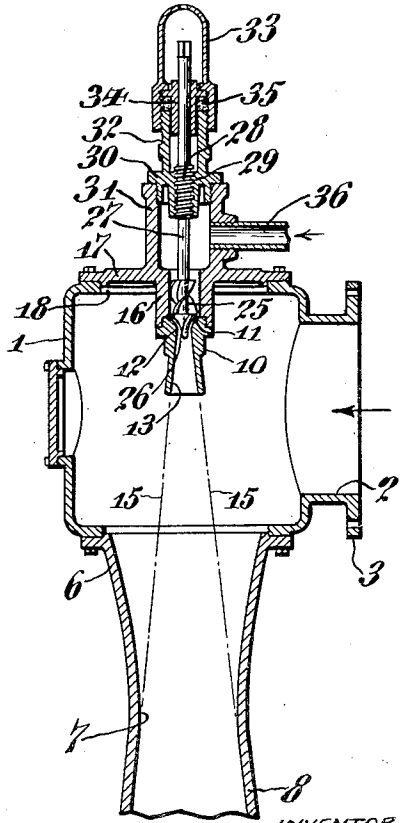


Fig. 3.



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UNITED STATES PATENT OFFICE

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VAPOR CONDENSER

Application filed November 11, 1930. Serial No. 494,862.

My invention relates to vapor condensers, especially those which are adapted for use in the condensing of obnoxious vapors.

In devices for condensing vapors, whether obnoxious or otherwise, the vapors are delivered into a chamber into which also is discharged a suitable condensing fluid, usually water, which is discharged from the said chamber through a Venturi tail pipe. In order that the condensers shall operate or function properly and efficiently, it is necessary that the flare of the spray of water or other liquid which may be employed shall be sufficient to fill the flared tail end of the Venturi pipe. An objection to condensers as heretofore constructed has been the difficulty encountered in causing the flare of the spray of water to correspond with the flare of the discharge end portion of the tail pipe—particularly has this been true in cases where the supply of water to the discharge nozzle of the structure was decreased for any purpose or other, as for the effecting of economy in the amount of water used.

The general object of my invention is to provide a vapor condenser, particularly one adapted for the condensing of obnoxious vapors, of simple but novel construction which is characterized by the fact that a relatively small amount of water employed will result in the production of a spray, the outer surface of which will be located in contiguous relation to the inner surface of the flared tail end portion of a Venturi tail pipe.

It also is an object of the invention to provide a vapor condenser having a nozzle provided with novel features of construction of a character to cause it to cooperate with the Venturi tail pipe of the structure to cause efficient operation at a minimum of expense.

A further object of the invention is to provide a vapor condenser including a nozzle of novel construction for cooperation with the Venturi tail pipe of such condenser in association with means for regulating the control and flow of water or other suitable liquid through the nozzle.

To the foregoing and other ends my invention comprehends the construction and relationship of parts as hereinafter described in detail, particularly pointed out in the appended claims and as illustrated in the drawing, wherein I have shown an embodiment of the invention. However, it should be understood that the invention is susceptible of embodiment in structural forms differing in detail from that shown and that changes in the details of construction may be made within the scope of the claims without departing from the invention or the principle thereof.

In the drawing:

Fig. 1 is a view in vertical section of a vapor condenser and the upper portion of a discharge tail pipe provided with my invention;

Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a vertical sectional view of a condenser of slightly modified construction provided with my invention.

Before proceeding with a description of the structure in detail, it may be well to point out that while devices embodying the invention are adapted for use for the condensation of vapors of any character, yet the device has been designed and is especially well adapted for use for the condensation of obnoxious vapors which result, for example, from the preparation of chemicals, fertilizers, paints, varnishes, food products, etc.

It is essential that these condensers be of a character such that they shall have high vapor handling capacity, small water consumption, small space requirements and low initial and operating costs. The broad and general object of the invention, therefore, is to provide a condenser having novel characteristics which will enable it to meet and fulfill these requirements.

In the drawing, I have shown at 1 a casing having an opening 2 in one side thereof. The outer end or edge of the said opening is provided with a lateral flange 3 to which may be connected a similar flange upon the adjoining end of a pipe, not shown, through which vapor is delivered from any source to the interior of the chamber 1.

Preferably, the vapor to be condensed at its moment of delivery is flowing in a direction practically at right angles to the vertical

axis of the casing 1 and the chamber provided thereby. However, it is not essential to the invention that the vapor at its moment of delivery shall be flowing in that particular direction.

The lower end of the casing 1 is provided with an outlet opening or port 5 to the edge of which is connected the upper end of a Venturi tail pipe having a short upwardly flared receiving portion 6, a neck or throat portion 7 and a downwardly flared tail discharge portion 8 which has connection at its lower end with an absorption chamber, not illustrated. From the latter, the non-condensable gases usually pass out to the atmosphere through a stack. For the purpose of condensing the vapors water is discharged in spray form through and from a nozzle 10. The passageway through this nozzle may be described as being of Venturi form, having an upwardly flared portion 11, a throat portion 12 and a discharging downwardly flared tail portion 13. The minimum length of the downwardly tapered flared tail portion 13 of the nozzle passageway should be, for the most efficient operation, not less than approximately six times that of the diameter of the opening at the throat 12 thereof. The said flared passageway may be of greater length but not of less length. The angle of taper of the tail portion 13 of the nozzle passageway should be identical with that of the discharge tail end portion 8 of the Venturi tail pipe. That this is so is indicated by the dash and dot lines 15 which are extended from diametrically opposed points at the lower end of the passageway 13 downwardly to the upper portion of the inner surface of the flared discharge tail portion 8 of the Venturi discharge pipe. The upper end of the nozzle 10 is mounted in the lower end of a hollow or tubular projection 16 which extends downwardly from the inner side of the cover or closing plate 17 which closes an opening 18 of greater or less extent provided in the upper side of the casing 1.

In the construction as illustrated in Figs. 1 and 2 of the drawing, a relatively short spiral device 20 is mounted in the tubular portion 16, the lower end thereof terminating in a tapered cone-shaped portion 21 which is located in proximity to the upper end of the passageway through the nozzle 10. Water is supplied to the nozzle from a pipe 22 which is connected in an opening provided in the cover 17 in alignment with the opening through the projection 16 and with the passageway through the nozzle 10.

In the construction as illustrated in Fig. 3, I have provided a spiral 25 which is located within the projection 16. The said spiral is provided at its lower end with a tapered portion 26 which is adapted to project into the upper end of the passageway through the nozzle 10, for the purpose of regulating and controlling the quantity of water or other liquid which may be discharged through the said nozzle opening. The spiral 25 and the portion 26 are carried upon the lower end of a rod 27 which is provided with screw threads 28 intermediate its ends which are in engagement with a screw-threaded opening 29 through a plug 30 which is mounted in the upper end of a hollow or tubular projection 31 which extends upwardly from the cover 17 and is in alignment with the hollow or tubular projection 16 and the passageway through the nozzle 10. The rod or stem 27 extends upwardly beyond the screw-threaded portion 28 through a tubular extension 32 and terminates within a protecting cap 33 which is mounted upon the upper end of the tubular extension or projection 32. The upper end portion of the rod 27 extends through a sleeve 34 between which and a portion of the cap 33 a packing 35 is provided. The water or other liquid which is supplied to the nozzle 10 is first delivered from a pipe 36 into the chamber provided by the hollow or tubular projection 31, and from the latter to the nozzle 10 from which it is discharged into the condensing chamber.

By my invention I have provided means whereby a spray is produced, the taper of which corresponds to and constitutes a continuation of the taper of the flaring discharge tail portion of the Venturi tail pipe. This is accomplished by reason of the fact that the angle of the taper of the tail portion of the passageway of the nozzle 10 is identical with that of the discharge tail portion of the Venturi tail pipe.

In the operation of vapor condensers, it is a well known fact that in order to obtain efficient results it is necessary that the spray which enters the Venturi tail pipe shall have a spread sufficient to cause it to fill the flared tail discharge portion of the Venturi tail pipe. I have found that by my invention I am enabled to effect that result with a smaller quantity of water or other condensing liquid than heretofore, as far as I am aware, has been required; hence, I am enabled to obtain efficient results in the condensation or in the withdrawal of non-condensable gases from the condensing chamber at a reduced or smaller cost in operation.

As already suggested, devices embodying the invention are capable of general application and use as condensers but they are particularly well adapted for use in the condensing of obnoxious vapors. In addition to the elimination of vapors which may be condensed, such devices also operate to withdraw and convey away non-condensable gases so that they may be disposed of in any desired known manner. But, the said devices are particularly well adapted for use in the condensing of obnoxious vapors which frequently are given off in industrial processes as, for

example, from drying apparatus, boiling pots in varnish works, mixers in fertilizer plants where phosphate rock is treated with sulphuric acid, apparatus in which mixing, cooking or roasting of materials is effected and from which are released obnoxious vapors, meat cookers and roasters in packing houses, containers or apparatus in which chemical reactions take place in laboratories, etc.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

A vapor condenser comprising, in combination, a condensing chamber, a Venturi tail pipe leading from the bottom of said chamber, a nozzle located in the said chamber and projecting downwardly therein in alignment with the said Venturi tail pipe, the said nozzle having a Venturi passageway, the angle of taper of the tail discharge portion of the passageway through said nozzle being approximately the same as that of the angle of taper of the tail discharge portion of the said Venturi tail pipe, a tapered device projecting into the upper end of the said Venturi passageway, adjustable means for supporting said tapered device to adjust the latter into position as desired with relation to the upper end of the said Venturi passageway, and means for supplying liquid to the said passageway.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 8th day of November, A. D. 1930.

OTTO A. LINDEMANN.