

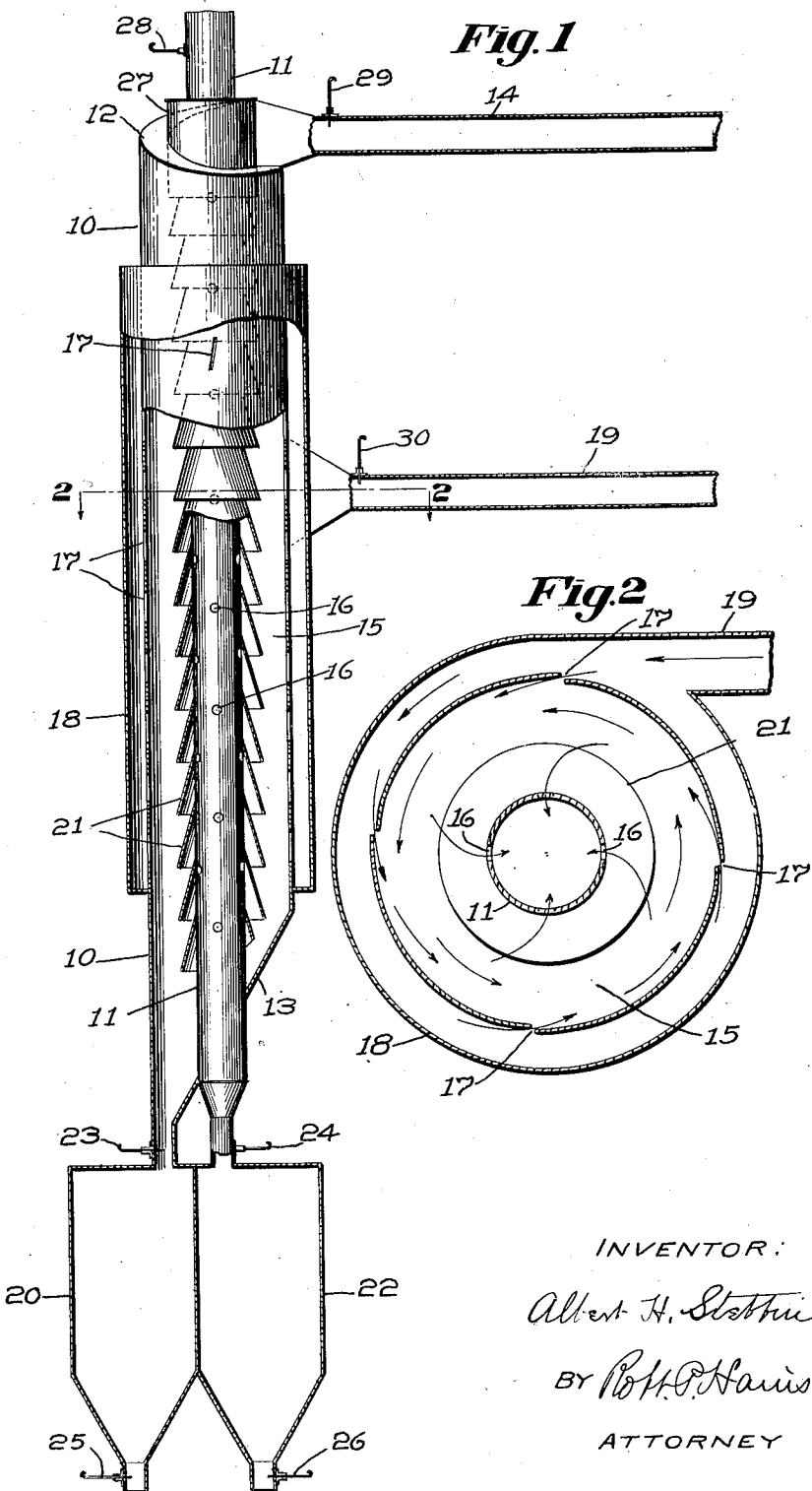
Sept. 30 , 1924.

1,509,915

A. H. STEBBINS  
CONCENTRATOR

Filed Nov. 9, 1922

2 Sheets-Sheet 1



INVENTOR:

Albert H. Stebbins,

BY R. H. Harris,

ATTORNEY

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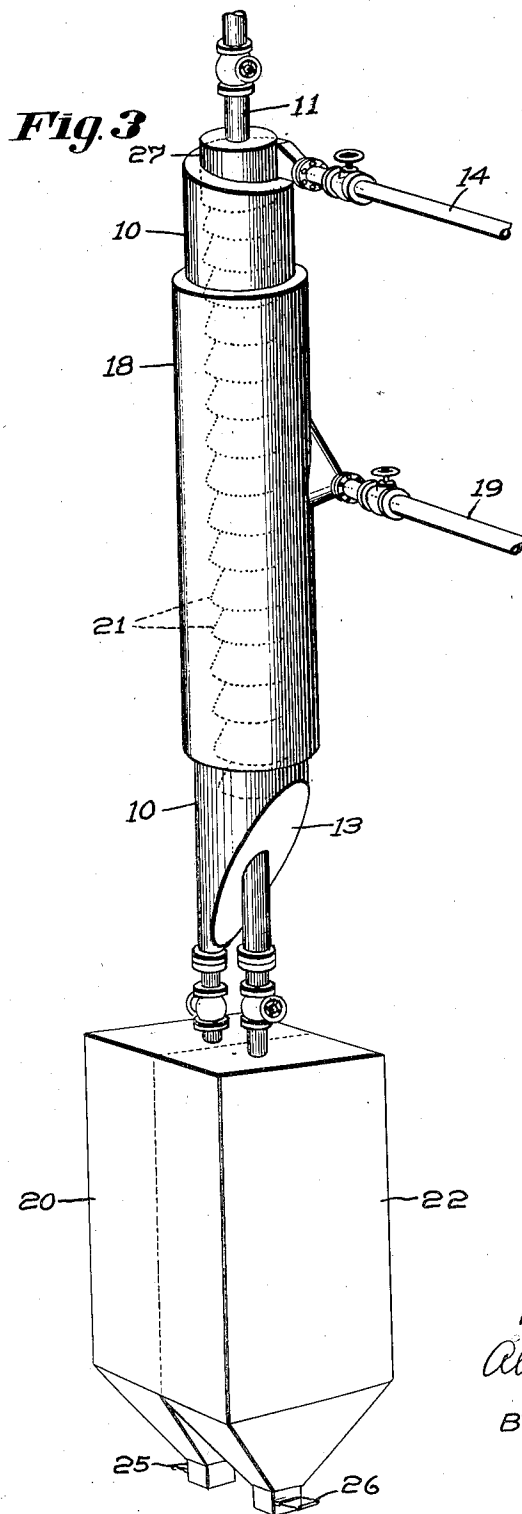
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2 Sheets-Sheet 2



INVENTOR  
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## UNITED STATES PATENT OFFICE.

ALBERT H. STEBBINS, OF LOS ANGELES, CALIFORNIA.

## CONCENTRATOR.

Application filed November 9, 1922. Serial No. 599,926.

*To all whom it may concern:*

Be it known that I, ALBERT H. STEBBINS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented an Improvement in Concentrators, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to concentrators, and more particularly to that type of concentrators in which separation of materials is effected by delivering a fluid bearing the materials to be separated into a chamber, and imparting a whirling movement to the fluid so that the heavier particles therein will be thrown outwardly by centrifugal force away from the lighter particles.

Various fluids either gaseous or liquid may be used as the material bearing medium, but in most cases it will be desirable to use either air or water, depending upon the specific gravity, size and other properties of the materials to be treated.

In concentrators of this type it is important that the material bearing fluid be kept in active motion until the desired separation of the materials is effected, for if the motion of the fluid is reduced the light and heavy materials will settle together.

One important feature of the present invention, therefore, resides in means by which a whirl promoting force may be exerted upon the material bearing fluid at various points lengthwise of the separating chamber.

In the present construction, the arrangement is such that the heavier particles are thrown outwardly by centrifugal force against the wall of the separating chamber, and the fluid bearing the lighter materials moves inwardly and enters apertures in the wall of a tube mounted centrally within the separating chamber.

It is important that the movement of the material bearing fluid be arrested adjacent the apertures of the central tube, and another feature of the invention resides in means for arresting the movement of the fluid adjacent these apertures.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings

which illustrate one good practical form thereof.

In the drawings:

Fig. 1 is a vertical sectional view through a concentrator constructed in accordance with the present invention.

Fig. 2 is an enlarged sectional view taken on the line 2-2 of Fig. 1; and

Fig. 3 is a side elevation of a slightly different concentrator construction.

In the embodiment of the invention shown in the drawings, a container 10 is provided in the form of a drum which is maintained in a standing position by any suitable means (not shown), and within the container or drum 10 is mounted a tube 11 extending longitudinally thereof and which preferably protrudes beyond each end of the drum 10. The upper end of the drum is closed by a head 12 and the lower end of the drum is closed by an inclined end wall 13.

The material laden fluid may be directed into the drum 10 at the upper end thereof by a pipe 14, and this pipe preferably discharges tangentially into the drum 10 to impart a whirling motion to the fluid as it enters the drum, and the head 12 preferably has a downwardly extending spiral construction as shown to impart a downward motion to the fluid that causes it to whirl spirally downward within the annular space 15 between the drum and tube. The inner tube 11 has apertures 16 formed through the wall thereof at spaced points about the tube and lengthwise thereof, and these apertures permit fluid to pass into the tube from the annular chamber 15.

It is desirable that the material bearing fluid delivered to the drum 10 be maintained in a whirling condition so that the heavier particles carried by the fluid will be thrown outwardly by centrifugal force while the lighter particles will remain suspended within the fluid, and to this end, in the present case, provision is made for delivering jets of fluid through apertures 17 within the wall of the drum 10 and against the fluid within the chamber 15.

In the construction shown this is accomplished by providing a jacket 18 about the drum 10, and fluid which is free from the materials to be treated is delivered under pressure into the chamber formed by the jacket. From this chamber the fluid passes inwardly into the chamber 15 through the

apertures 17, and these apertures preferably are constructed as shown in Fig. 2 so that the fluid forced inwardly through these apertures enters the chamber 15 in substantially a tangential direction to impart a whirling movement to the fluid within the chamber 15 as indicated by the arrows. Fluid may be delivered into the jacket 18 by a pipe 19 which preferably leads tangentially into the jacket, as shown, to impart a whirling movement to the fluid therein.

As a result of the construction described a whirling force is exerted upon the material bearing fluid at various points lengthwise of the drum 10 to maintain this fluid in a whirling condition, and the heavier materials that are thrown outwardly by centrifugal force strike against the wall of the drum 10 and slide downwardly into the lower end of the drum, which preferably empties into a closed bin 20. The fluid which is forced through the apertures 17 should be delivered to the jacket 18 at a higher pressure than the pressure at which the material bearing fluid is delivered to the container, in order to force the fluid inwardly through the apertures against the pressure of the fluid within the container, and since different pipes 14 and 19 are provided for delivering fluid to the upper part of the container and jacket respectively the relative pressures may be varied as desired.

The fluid from which the heavier particles have been removed by centrifugal force will be crowded inwardly toward the tube 11 to enter the apertures 16, and it is desirable to provide means for arresting the whirling movement of the fluid adjacent these apertures. In the present case, cone-shaped aprons 21 are provided which embrace the tube 11 and extend downwardly over the apertures 16 to form protected chambers about these apertures.

The lower end of the tube 13 preferably is connected to a closed bin 22 and the materials that settle within the tube 11 pass downward into this bin. The bins 20 and 22 are closed to prevent the fluid from escaping through the lower ends of the drum and tube respectively, and when it is desired to empty the bins 20 and 22 the upper valves 23 and 24 may be closed while the lower valves 25 and 26 are opened.

A short cylinder 27 may be placed about the tube 11 at the upper end of the drum 10 to increase the diameter of this tube at the point where the pipe 14 delivers fluid into the space between the drum 10 and cylinder 27 with a whirling movement.

The lighter materials which are not separated out by the whirling motion of the fluid, and which do not settle within the tube 11 will pass off with the fluid through the upper end of this tube, and if desired a fan or pump may be connected to the upper

end of this tube to promote the flow of the fluid upwardly therethrough, and this flow may be controlled by the valve 28. The amount of fluid delivered by the pipes 14 and 19 may be controlled by the valves 29 and 30 respectively.

In some cases it may be desirable to form the apertures 17 at a slight inclination as shown in Fig. 1 so that they will direct their jets of fluid downwardly in the general direction in which the fluid within the chamber 15 whirls downward.

As stated, the concentrator of the present invention is well adapted to treat materials that are suspended in either a liquid or gas, and the construction shown in Fig. 1 is provided with sliding gates or valves that are satisfactory to control the flow of air, while in Fig. 3 valves are shown of a type that are commonly used to control the flow of liquids. In other respects the construction shown in Fig. 3 is substantially the same as that shown in Fig. 1.

What is claimed is:

1. A concentrator comprising, in combination, a container supported in a standing position, a tube mounted centrally within said container and having apertures therein along its length for the passage of fluid from the container into the tube, means for delivering a fluid bearing the materials to be treated into the upper portion of the container with a downward whirling movement about the tube to throw the heavier materials outward by centrifugal force away from the tube, and means for directing jets of a fluid inwardly through the walls of the container in substantially a tangential direction further to promote whirling movement of the material bearing fluid moving downwardly within the container.

2. A concentrator comprising, in combination, a container supported in a standing position, a tube mounted centrally within said container and having apertures therein along its length for the passage of fluid from the container into the tube, means for delivering a fluid bearing the materials to be treated into the upper portion of the container with a downward whirling movement about the tube to throw the heavier materials outward by centrifugal force away from the tube, means for directing jets of a fluid inwardly through the walls of the container in substantially a tangential direction further to promote whirling movement of the material bearing fluid moving downwardly within the container, and means for deflecting the whirling fluid away from said apertures.

3. A concentrator comprising, in combination, a container supported in a standing position, a tube mounted centrally within said container and having apertures therein along its length for the passage of fluid

from the container into the tube, means for delivering a fluid bearing the materials to be treated into the upper portion of the container with a downward whirling movement about the tube to throw the heavier materials outward by centrifugal force away from the tube, a jacket surrounding the container and having means for delivering a fluid into the space between the container and jacket with a whirling movement, and the container having apertures in its walls to direct the fluid within the jacket into the container in a direction further to promote whirling movement of the material bearing fluid within the container.

4. A concentrator comprising, in combination, a container supported in a standing position, a tube mounted centrally within said container and having apertures therein along its length for the passage of fluid from the container into the tube, means for delivering a fluid bearing the materials to be treated into the upper portion of the container with a downward whirling movement about the tube to throw the heavier materials outward by centrifugal force away from the tube, a jacket surrounding the container and having means for forcing a fluid into the space between the container and jacket, the container having apertures in its walls to direct fluid from the jacket into the container in substantially a tangential movement further to promote whirling movement of the material bearing fluid within the container, and aprons adjacent the apertures within the tube to deflect the whirling fluid from the apertures.

5. A concentrator comprising, in combination, a container supported in a standing position, a tube mounted centrally within the container and adapted to receive the fluid delivered to the container and to conduct the fluid therefrom, means for delivering fluid bearing the materials to be treated into the container with a downward whirling movement about the tube to throw the heavier materials outwardly by centrifugal force against the wall of the container, and means for directing jets of fluid tangentially

inwardly through the wall of the container at a pressure in excess of the pressure at which the material bearing fluid is delivered to the container further to promote whirling movement of the fluid moving downwardly within the container.

6. A concentrator comprising, in combination, a container supported in a standing position and having narrow elongated slots formed in its walls around the container and at distributed points lengthwise thereof, a tube mounted centrally within the container and having apertures therein along its length for the passage of fluid from the container into the tube, means for delivering a fluid bearing the materials to be treated into the upper portion of the container with a downward whirling movement about the tube to throw the heavier materials outwardly by centrifugal force away from the tube, and means for forcing a fluid through said narrow slots to produce jets directed substantially tangentially against the material bearing fluid within the container further to promote a whirling movement of the fluid moving downward therein.

7. A concentrator comprising, in combination, a tubular container having slots formed in its walls at points throughout a substantial portion of its length, a tube mounted centrally within the container and having apertures therein along its length for the passage of fluid from the container into the tube, means for delivering a fluid bearing the materials to be treated into the upper portion of the container with a downwardly whirling movement about the tube to throw the heavier materials outwardly by centrifugal force away from the tube, cone-shaped aprons extending downwardly over said apertures to deflect the whirling fluid from the apertures, and means for forcing fluid inwardly through said slots in substantially a tangential direction further to promote whirling movement of the material bearing fluid moving downwardly in the container

In testimony whereof, I have signed my name to this specification.

ALBERT H. STEBBINS.