

Dec. 9, 1930.

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1,784,664

SEPARATOR

Filed Nov. 7, 1928

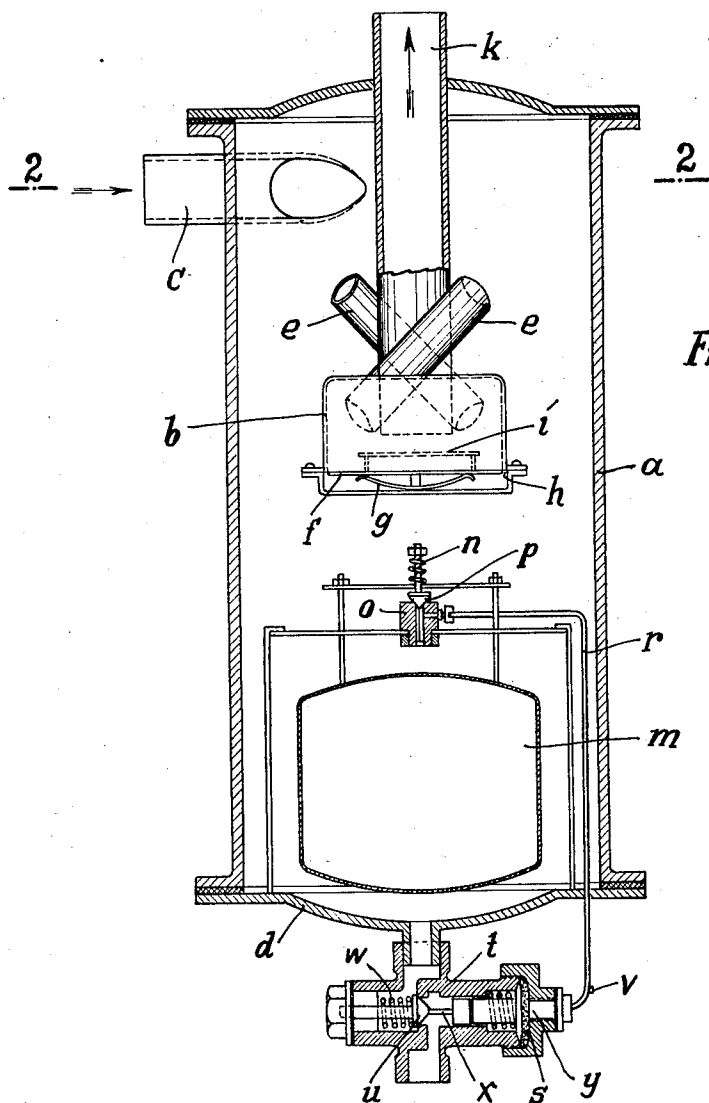


Fig. 1

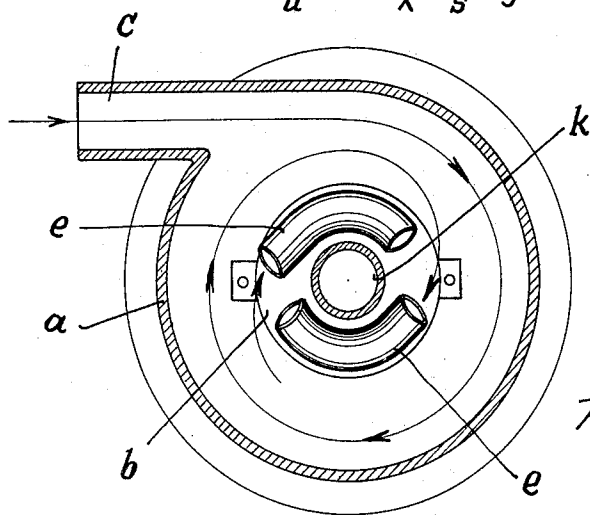


Fig. 2

Friedrich Eickholt  
by C. P. Goppel  
his Attorney.

## UNITED STATES PATENT OFFICE

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## SEPARATOR

Application filed November 7, 1928, Serial No. 317,775, and in Germany November 10, 1927.

My invention relates to improvements in apparatus for separating dust, water, oil, and the like from air, gas or vapor, and more particularly in apparatus of the type in which a plurality of separating receptacles are disposed in series. The object of the improvements is to provide an apparatus of this type in which the resistance opposed to the current of air or gas is comparatively small, so that the loss of pressure within the apparatus is reduced to a minimum. With this object in view my invention consists in providing an outer separating receptacle having a tangential supply of the air, gas or vapor, and a separating receptacle disposed within the said outer receptacle and having helically shaped intake pipes and an axial discharge pipe for the gas, the said intake pipes of the inner receptacle being preferably disposed so as to be directed with their intake ends in opposition to the current of air or gas delivered into the outer receptacle. Preferably, the total cross-sectional area of the intake pipes of the inner receptacle and the cross-sectional area of the axial discharge pipe are equal to or larger than the cross-sectional area of the intake pipe of the outer receptacle. For separating the foreign matter separated from the air or gas, the inner receptacle is provided with a bottom in the form of a valve and adapted to yield against the pressure of a spring for opening the receptacle and permitting the escape of the said foreign matter into the outer receptacle.

My invention also relates to means for controlling the discharge of the foreign matter separated from the air or gas from the outer receptacle, and the object of the improvements is to provide an apparatus in which the valve controlling the escape of the said foreign matter can not be obstructed by the said foreign matter. With this object in view my invention consists in connecting the said valve with a power operated member adapted to be acted upon by the pressure within the receptacle for opening the valve.

Other objects of the improvements will be explained in connection with the description of the apparatus.

For the purpose of explaining the invention

an example embodying the same has been shown in the accompanying drawing in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawing,

Fig. 1, is a sectional elevation, and

Fig. 2, is a sectional plan view taken on the line 2—2 of Fig. 1.

In the example shown in the drawing the apparatus for purifying air, gas or vapor consists of an outer receptacle *a* and an inner receptacle *b* disposed concentrically within the outer receptacle. The air or gas is admitted to the outer receptacle through an intake pipe *c* disposed tangentially of the said receptacle, so that the air or gas taken into the receptacle *a* has a circular movement, and the foreign matter is separated from the air by centrifugal action and collected on the bottom *d*. The inner receptacle *b* is provided with helically wound intake pipes *e*. The inner receptacle *b* is mounted on a concentric outlet pipe *k* extending through the top of the receptacle *a* and ending in the receptacle *b* substantially at the middle thereof. The air to be purified is admitted to the receptacle *b* through helical intake pipes *e* having their intake ends substantially at the middle between the axis of the outer receptacle and the wall thereof, the said intake ends being directed against the current of air circulating within the receptacle *a*. The receptacle *b* is provided with a yielding bottom *f* bearing on an annular shoulder of the receptacle *b*, a spring *g* being provided for normally holding the said bottom on the said shoulder. Thus the bottom *f* provides a valve for the receptacle *b*. Through the helical intake pipes *e* the air is delivered into the receptacle *b* downwardly and in circular direction, and by the pressure of the said air the bottom is slightly pressed downwardly and away from its seat thus providing a small annular gap *h*. The foreign matter is thrown by the circulating air against the wall of the receptacle *b*, and it flows downwardly for being delivered through the gap provided by the bottom *f*, and into the receptacle *a*. Preferably, a plate *i* is disposed within the receptacle *b* above the bottom thereof, the object of the

said plate being to prevent the separated foreign matter from being whirled around by the current of air. The purified air is discharged from the inner receptacle *b* through the axial pipe *k*.

The foreign matter separated from the air within the receptacles *a* and *b* is gathered on the bottom *d* of the receptacle *a*, and it is adapted to be delivered at suitable intervals of time through a valve *t* connected with the bottom of the receptacle *a*. The valve cone *u* is normally pressed on its seat by a spring *w*, and its operation is controlled by a plunger or diaphragm *s* acting on the valve cone through the intermediary of a stem *z*. The diaphragm *s* is located within a chamber *y* of the valve casing *t*, and the said chamber is connected by a pipe *r* with a valve block *o* having an axial bore controlled by a valve *p*. The said valve cone *p* is adapted to be operated by means of a float *m* provided at the bottom of the receptacle *a*. The operation of the controlling valve is as follows:

As the foreign matter separated from the air rises within the receptacle *a* the float *m* rises thus compressing a spring *n* acting on the valve *p*. As the float rises its upward pressure is increased, until finally the pressure is sufficient to lift the cone *p* from its seat, whereupon the valve is thrown upwardly by the spring *n*. It appears therefore that the valve is suddenly opened while the float gradually rises within the receptacle. After opening the valve *p*, the pressure of the air within the receptacle *a* is transmitted through the pipe *r* to the chamber *y*, so that the diaphragm or plunger *s* is forced to the left, and the valve *u* is unseated for permitting the discharge of the foreign matter from the receptacle *a*. Now the float *m* sinks within the receptacle *a*, so that the valve cone *p* is again pressed on its seat by the spring *n*. The pressure within the pipe *r* and the chamber *y* is relieved through a vent *v* provided in the pipe *r*. Therefore, the valve cone *u* is again placed on its seat after closing the valve *o*, *p*. The operation of the valve *u* takes only a few seconds, so that the loss of pressure through the vent *v* is immaterial.

By providing power operated means for opening the valve *u* the valve is completely opened immediately after operating the valve *p*, so that even a very viscous emulsion is readily discharged, and by arranging the compressible spring *n* in the manner illustrated and described, the valve *p* is promptly opened under the upward movement of the float for the supply of motive fluid to pass from the receptacle *a* to the chamber *y*, and the valve is held open for a sufficient length of time, being closed only after the float is sunk to a certain point. Therefore in each operation a large amount of liquid is discharged.

#### I claim:

1. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake, an inner receptacle within the outer receptacle having an outlet and a downwardly displaceable valve bottom, an intake connection from the outer receptacle, with its discharge end disposed within the inner receptacle between said outlet and said valve bottom and pointed in a direction to supply fluid for causing the operation of said valve bottom.
2. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake near its top and an outlet with a valve at its bottom, an inner receptacle within the outer receptacle having an outlet and a downwardly displaceable valve bottom, an intake connection, from the outer receptacle, with its discharge end disposed within the inner receptacle and pointed in a direction to supply fluid for causing the operation of said valve bottom, and means including a float and connections controlling the operation of the valve in the bottom of the outer receptacle.
3. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake, an inner receptacle within said outer receptacle having an intake opening from the outer receptacle and an outlet, and a bottom valve for said inner receptacle adapted to be opened by the pressure of the fluid within the inner receptacle.
4. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake, an inner receptacle within said outer receptacle having an intake opening from the outer receptacle and an outlet, said inner receptacle having a bottom in the form of a valve having its seat on the circumferential wall of the receptacle, and yielding means tending to press said bottom on its seat.
5. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake, an inner receptacle within said outer receptacle having an intake opening from the outer receptacle and an outlet, a bottom valve for said inner receptacle adapted to be opened by the pressure of the fluid within the inner receptacle, and a plate within said inner receptacle above said valve.
6. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake for the fluid, an inner receptacle having an intake opening from said outer receptacle and an outlet, a bottom valve on said inner receptacle adapted to be opened by the pressure of the fluid within the inner receptacle, a power controlled discharge valve connected

with the bottom part of said outer receptacle, and a float within said outer receptacle controlling the supply of a power medium to said power controlled valve.

5 7. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake for the fluid, an inner receptacle having an intake  
10 opening from said outer receptacle and an outlet, a bottom valve on said inner receptacle adapted to be opened by the pressure of the fluid within the inner receptacle, a power controlled discharge valve connected  
15 with the bottom part of said outer receptacle, a valve controlling the supply of fluid from said outer receptacle to said power controlled valve, and a float within said  
20 outer receptacle controlling said valve for supplying fluid from said outer receptacle to said power controlled valve.

8. An apparatus for separating foreign matter from a fluid medium, comprising an outer receptacle having an intake for the fluid, an inner receptacle having an intake  
25 opening from said outer receptacle and an outlet, a bottom valve on said inner receptacle adapted to be opened by the pressure of the fluid within the inner receptacle, a discharge valve connected within the bottom  
30 part of said outer receptacle, a fluid operated member acting on said discharge valve for opening the same, a pipe for supplying pressure fluid from said outer receptacle to said fluid operated member, a valve controlling  
35 the supply of pressure fluid through said pipe, and a float within said outer receptacle controlling said valve for separating pressure fluid.

9. An apparatus for separating foreign  
40 matter from a fluid medium, comprising an outer receptacle having an intake for the fluid, an inner receptacle having an intake opening from said outer receptacle and an outlet, a bottom valve on said inner receptacle adapted to be opened by the pressure  
45 of the fluid within the inner receptacle, a power controlled discharged valve connected with the bottom part of said outer receptacle, a valve controlling the supply of fluid from said outer receptacle to said power controlled  
50 valve, a float within said outer receptacle controlling said valve for supplying fluid from said outer receptacle to said power controlled valve, and a spring interposed  
55 between said float and controlling valve adapted to store the power of the float and to open the valve.

In testimony whereof I hereunto affix my signature.

60 FRIEDRICH EICKHOLT.