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C. G. HAWLEY

1,746,253

SEPARATOR

Filed June 29, 1926

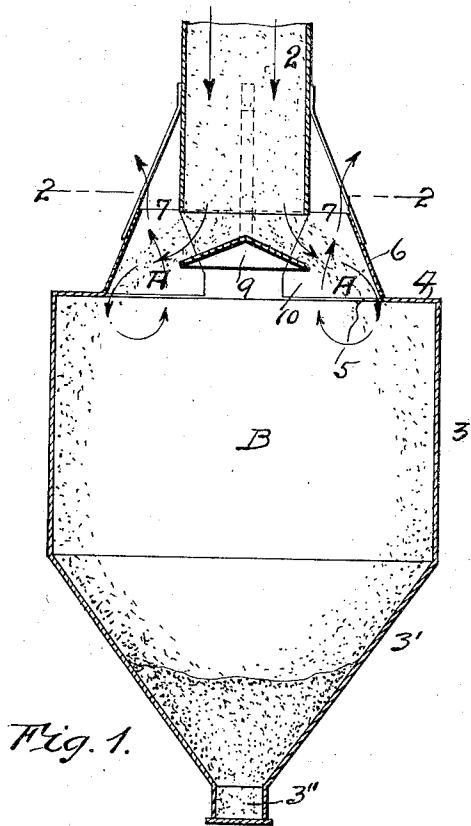


Fig. 1.

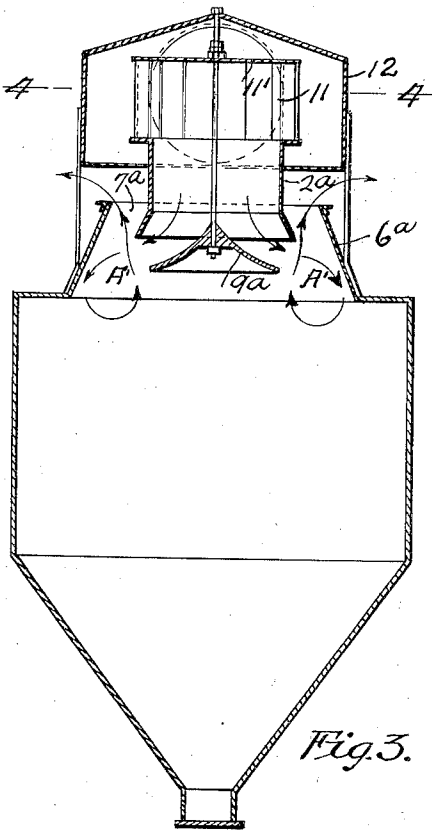


Fig. 3.

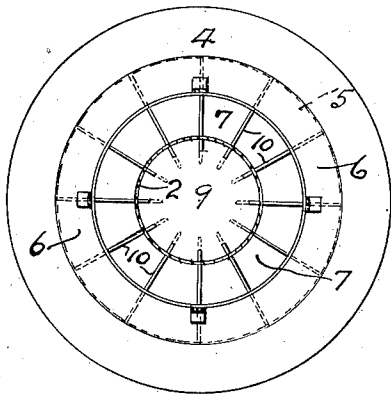


Fig. 2.

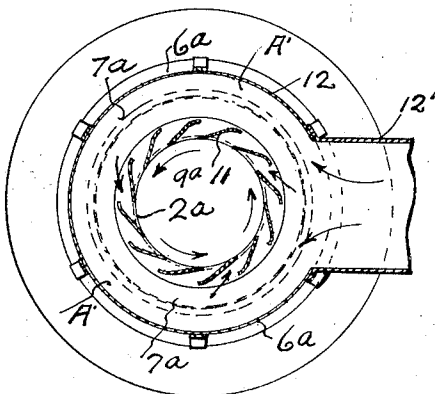


Fig. 4.

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The invention relates to improvements in the art of separating various substances from flowing fluids. Such flowing fluids are known as "carriers" and the term carrier is to be understood as meaning any fluid that is directed or kept in motion between given points whether liquid, gaseous or vaporous and whether hot or cold, or a mixture of such fluids; and, the terms "foreign-substances" and "entrained substances" as used herein are to be understood as meaning any and all carrier conveyed substances, whether solid or fluid, or both, and whether of less or greater weight than the carrier.

The invention comprises an improved apparatus for utilizing the forces of kinetic energy, centrifugal motion and gravity to separate or remove entrained substances from carrier fluids.

The invention may be readily understood on reference to the accompanying drawings, in which Fig. 1 is a vertical section of a dust collector, both embodying and illustrating this invention; Fig. 2 is a plan view thereof on the line 2—2 of Fig. 1; Fig. 3 is a vertical section illustrating an operation of the invention wherein the incoming stream is set into rotation before it is subjected to the separating operation within the body of the separator; and Fig. 4 is a sectional view on the line 4—4 of Fig. 3.

Referring to Figs. 1 and 2, 2 represents the inlet pipe through which the burdened carrier enters the separator. This pipe and the body of the separator are coaxial upon a vertical axis. The body 3 of the separator is of considerable depth, usually terminating in a hopper 3' and a drain spout 3''. The body 3, may be rectangular or circular as here shown. The top 4 thereof contains a large opening 5, from which the collar 6 rises. This collar may be cylindrical, but preferably is conical as here shown. It rises to about the height of the lower end of the pipe 2 and, obviously, is concentric therewith. The upper end of the collar 6 is open to the atmosphere affording an annular outlet opening 7, surrounding the foot of the inlet pipe 2. Though the separator thus discharges to the atmosphere, as a general rule it may of course be

fitted with an elbow adapted for connection with a discharge pipe. Centrally below the pipe 2, and at a distance substantially equaling one-half the diameter thereof is a deflecting cone 9 and this deflecting cone may be supported by a plurality of radial plates or laminations 10, the latter serving to prevent any detrimental displacement of the dust particles as hereinafter explained. The space A, between the cone 9, and the collar 6, is known as the separating chamber, whereas the space B, within the body 3, is called the accumulation space of the separator. The operation of the apparatus shown in Figs. 1 and 2 is as follows:

The direction arrows in Fig. 1 represent the movement of the different parts of the carrier stream outward and downward into the separating space A and as indicated the fluid having discharged its burden of foreign substances and having been completely or largely deprived of its energy attains practically a static pressure condition in the central parts of the accumulation space B. From that position the unburdened carrier fluid may escape from the separator only by way of the space A and the annular passage 7; that is, the unburdened carrier is forced to find its way out through the incoming stream of burdened carrier fluid. Thus the final filtration of the fluid is ensured, the entering stream serving as the filtering medium therefor.

Flowing downward from the pipe 2 the burdened carrier encounters the conical deflector 9 and is thereby expanded into an umbrella-like stream which persists in its movement until interrupted by the collar 6. The centrifugal separation is initiated at that moment and is accentuated by the immediate effort of the carrier fluid to turn within itself and escape upwardly. The gravity separation proceeds normally at all times. The radial plates 10 successfully defeat inequalities in the stream from the pipe 2 and also defeat the tendency of the particles to deflect laterally within the space A as contrasted with the described general downward or longitudinally of the particles therein. It is to be noted that the effective cross-sectional

area of the separating space A is several times that of the pipe 2 and the opening 7, this being a prerequisite to the persisting downward movement of the burdened carrier within the collar 6.

The structure of Figs. 3 and 4 exhibits a tangential or whirl-producing tuyère 11 (having a closed top 11') as a means for promoting a whirling condition in the carrier fluid descending through the pipe 2^a. The carrier fluid enters the tuyère from the housing 12 and pipe connection 12', supported at a distance above the top of the separating collar 6^a. The lower end of the pipe 2^a may be flared outwardly as shown in Fig. 3 or may be straight. It closely approaches the suitably supported spreading cone or deflector 9^a. The action of the separator is as before described except to the extent that it is modified by the initial separation of the dust particles within the tuyère 11 and the spiral downward movement that the tuyère imparts thereto within the pipe 2^a. The initial separation accomplished by the centrifugal tuyère 11 obviously has the effect of preliminarily collecting or massing the dust particles against the inner side of the pipe 2, so that they are thrown outward at the lower end of the pipe, and are more certain to be projected against the collar 6^a and to be whirled downward by the carrier stream crossing the separating chamber A'.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. The herein described process of separation that consists in projecting a burdened carrier stream downward, at one point deflecting said stream laterally and thence downward and thence inward, throughout the circumference of the stream, collecting the separated foreign substances, and, releasing the unburdened carrier fluid outward through the first deflected portion of the burdened stream.

2. The separator herein described comprising a separator body having a discharge opening at the bottom for the foreign substances, in combination with an annular separating chamber erected on the top of said body and in open communication therewith, said chamber being open at the top and forming the outlet of the separator, a deflecting cone centrally positioned in said chamber, a burdened carrier inlet pipe descending vertically nearly to said cone and coaxial therewith, and a plurality of laminating plates radially positioned in said separating chamber, substantially as described.

In testimony whereof I have hereunto set my hand this 26th day of June, A. D. 1926.

CHARLES GILBERT HAWLEY.