H. F. BICKEL.

DUST SEPARATOR.

APPLICATION FILED NOV. 23, 1911.

1,124,199.

Patented Jan. 5, 1915.

Fig. 1.

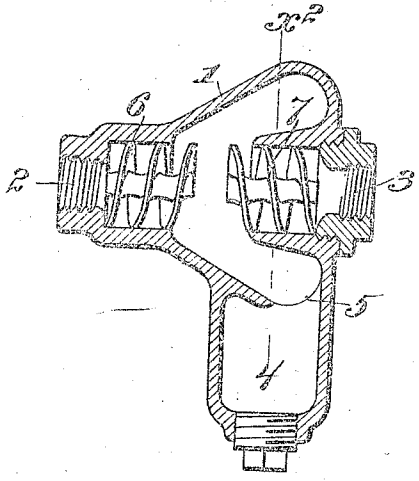


Fig. 2.

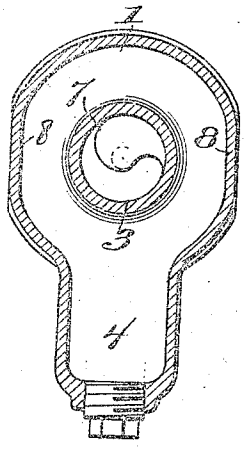
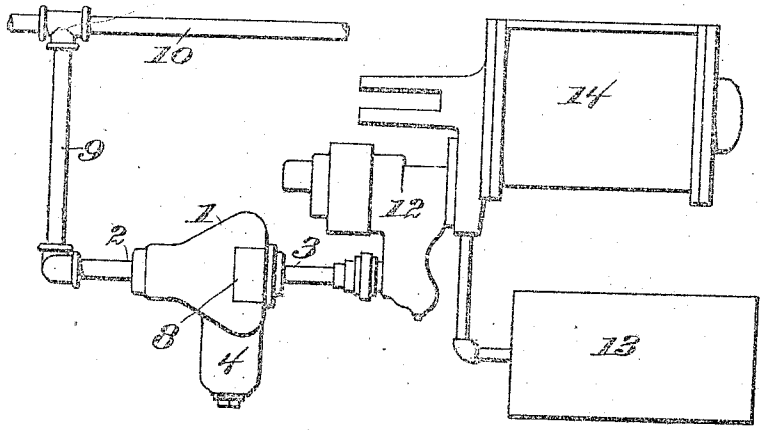


Fig. 3.



Witnesses:

Jas. J. Malone.

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UNITED STATES PATENT OFFICE.

HENRY F. BICKEL, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO NEW YORK AIR BRAKE COMPANY, A CORPORATION OF NEW JERSEY.

DUST-SEPARATOR.

1,124,199. Specification of Letters Patent. Patented Jan. 5, 1915.

Application filed November 23, 1911. Serial No. 661,960.

To all whom it may concern:

Be it known that I, HENRY F. BICKEL, a citizen of the United States, residing in Plainfield, county of Union, State of New Jersey, have invented an Improvement in Dust-Separators, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to a dust collector and is embodied in a device for separating foreign substances, such as particles of dust, from flowing air, in order to purify the air so far as is possible.

The dust collector embodying the invention consists of a chamber introduced in the duct through which the air flows, the said chamber being larger than the duct and provided with a receptacle located below the chamber so that the impurities which have been separated from the air will fall into said receptacle. The separation of the impurities from the air is brought about through centrifugal force and the force of gravity, the centrifugal force being utilized to carry the heavier particles into contact with the wall of the chamber, so that they are retarded by contact therewith and lose their velocity; while the force of gravity is depended upon to cause the particles to fall when they reach the lowest point in the chamber and are partially freed from the direct action of the flowing air. In order to utilize these forces to the best advantage, the separating chamber, as it may be called, is provided with inlet and outlet passages so that the air in entering the chamber leaves the inlet pipe in a lateral direction, while the air in leaving the chamber enters the outlet pipe, also laterally, but in the opposite direction, thereby breaking up and reversing the air current as the air expands in the chamber. Furthermore, the chamber is shown so shaped as to increase in sectional area from the end where the air enters, and as being provided at the opposite end with a deflecting wall which extends inward in the opposite direction, curving toward, and terminating at the mouth of an outlet passage, which projects into the chamber. This outlet passage is formed in an inwardly projecting tube, so that the chamber itself extends some distance beyond the mouth of the outlet, whereby the current of air entering the chamber and reaching the deflecting wall thereof must be reversed in direction of flow before it reaches the mouth of the outlet. The collecting receptacle at the bottom of the chamber is reached through an opening which is beyond the outlet relatively to the direction of flow of the air, at a point where the velocity of the air current has greatly diminished. In the construction shown, the separating chamber is in the general form of a cone having its inlet at the apex of the cone and the mouth of its outlet at the inner end of a tubular portion projecting into the cone from the base thereof.

In illustrating the invention, I have shown the dust separator as applied to an air brake system in which the separator is utilized to purify, so far as is possible, the compressed air which flows from the train pipe through the triple valve to the auxiliary reservoir, but I do not limit myself to such use, as the invention may obviously be used for other purposes.

Figure 1 is a vertical longitudinal section of a dust separator embodying the invention; Fig. 2 is a vertical section, on the line x^2 of Fig. 1; and Fig. 3 is a diagram showing the location of the separator when it is applied to an air brake system.

Referring to Fig. 1, the separator embodying the invention consists of the main chamber 1 provided at opposite ends with inlet and outlet passages 2 and 3, the chamber being generally conical in shape and provided with an extended portion 4 which constitutes a collecting chamber for the particles separated from the air, the said collecting chamber being in communication with the chamber 1 through the orifice 5. The chamber 1 is shown as provided with a lateral wall tapered from the inlet passage which enters the smallest part of the chamber, the said wall being substantially conical in shape so that air entering the chamber flows into an inclosure which progressively increases in sectional area. At the opposite end of the chamber, the wall is curved inward toward the center where there is an inward tubular extension forming the outlet passage 3, the outer wall of said tubular extension being tapered toward the end thereof. The orifice 5 which leads to the collecting chamber 4 is below the said tubular extension. Both the inlet and the outlet passages are provided with means for

changing the direction in which the air flows, being shown as provided with helical deflecting members 6 and 7 each consisting of a spiral wing surrounding a core, and fitting in the passage, so that the air entering and leaving the chamber will be turned from its direction of flow through the main pipe, and, in the construction shown, made to follow a spiral path. These deflectors are oppositely inclined, so that the air leaves the chamber in a direction opposite to that in which it enters. Each deflector extends a short distance into the chamber beyond the passage in which it is contained, as shown.

The operation of the device is generally as follows: The current of air entering through the passage 2, under velocity, is caused by the deflector 6 to flow in a spiral direction, thereby meeting the wall of the chamber 1 as it enters, and tending to maintain its spiral direction through centrifugal force opposed by the deflecting action of the wall. Owing to the taper of the wall, however, the length of each spiral is increased and the velocity of flow is decreased, so that the particles of foreign substances having greater inertia than that of the air, tend to be thrown against the wall of the chamber where they are retarded by frictional contact therewith and lose velocity fastener than velocity is lost by the current of air itself. Upon reaching the opposite wall of the chamber, the current of air is more abruptly deflected and is finally reversed in direction, so that the velocity is still further diminished, the foreign particles being, at this time, nearly freed from all influence except that of the force of gravity. Those particles, therefore, which have not already fallen into the receptacle 4, while traveling past the orifice 5, will tend to fall from the air throughout all parts of the chamber over the said orifice, thus being separated from the air and collected in the receptacle 4. The current of air as it leaves the chamber is influenced by the deflector 7 which is curved in the opposite direction from that of the deflector 6, so that the current of air passing out is reversed in direction.

In order to assist in the preliminary separation of the particles which takes place before the direction of flow of the air is completely reversed, the wall of the chamber 1 is flattened at opposite sides along the part where the air current is deflected inward, the flattened portions, shown at 8, Fig. 2, catching and retarding some of the foreign particles which have not previously been projected far enough to reach the wall of the chamber. These flattened portions of the wall are over the orifice 5, so that the particles disengaged thereby can fall into the orifice through a path which is nearly vertical.

As an illustration of one practical use for the device embodying the invention, I have shown it in connection with an air brake system, as illustrated in Fig. 3. In this case, the separator is connected in a branch 9 of a train pipe 10 which leads to the triple valve 12, through which the auxiliary reservoir 13 and the brake cylinder 14 is controlled.

What I claim is:

1. In a dust separator, a main chamber provided with a tubular inlet passage and with a wall diverging in all directions from the inner end of said passage; a deflecting surface opposite to the said passage; a tubular outlet passage projecting inward from said deflecting surface; a collecting receptacle extending laterally from said main chamber and having an inlet from said chamber near the outlet end thereof, and located beyond the entrance to said tubular outlet passage; and spiral deflectors located in the inlet and outlet passages projecting into the chamber beyond the ends of said passages; the spiral deflectors having their ducts extending respectively in opposite directions.

2. A dust separator comprising a horizontal chamber approximately conical in shape, and having its conical wall curved to meet the vertical wall which constitutes the base of the cone, the curved portion being flattened at opposite sides and being provided with a lateral opening located between the flattened portions; a receptacle extending laterally from said chamber to receive foreign substances through said opening; a tubular outward projection at the apex of the cone constituting the inlet to the chamber; a tubular inward projection at the base of the cone constituting the outlet passage from the chamber, the said inward projection overlying and extending beyond the opening to the receptacle for foreign substances; and helical deflectors located in the tubular outward projection and the tubular inward projection, aforesaid.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY F. BICKEL.

Witnesses:
B. J. MINNIER.
JNO. F. MALONEY.