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2,415,935

ASH COLLECTOR

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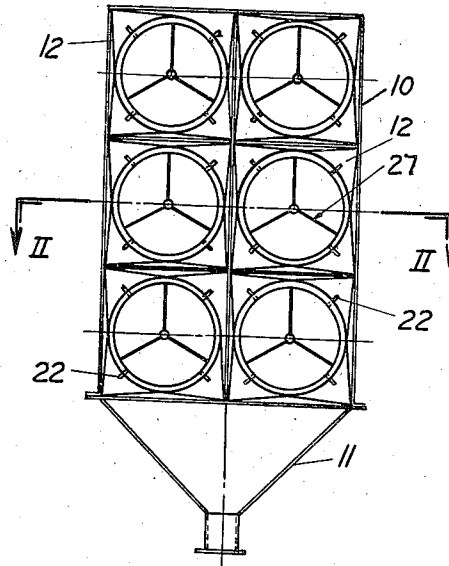


Fig.-1

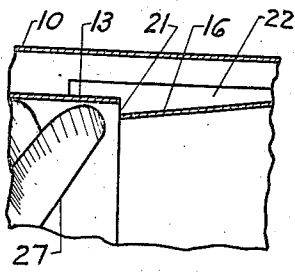


Fig.-3

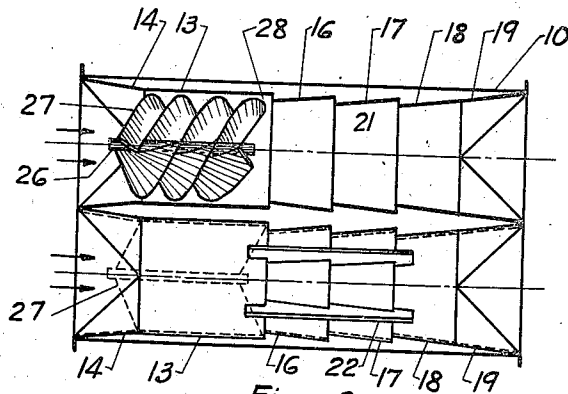


Fig.-2

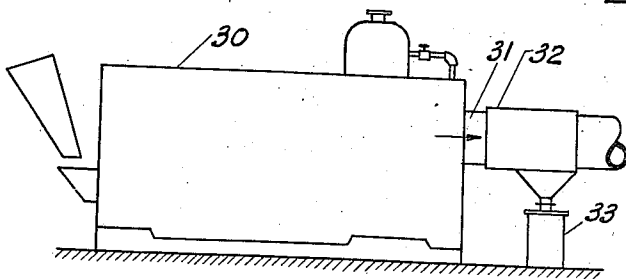


Fig.-4

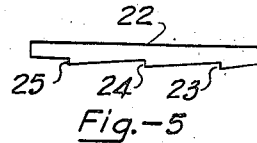


Fig.-5

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2,415,935

ASH COLLECTOR

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5 Claims. (Cl. 183—80)

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This invention relates to an ash collector of the type associated with the chimney or flue from a solid fuel fired furnace and has for an object the provision of apparatus of the character designated which shall be simple and economical of design, highly efficient in operation, and which shall operate with a minimum of draft loss.

A still further object of my invention is to provide a fly ash collector adapted to be installed in the breeching section of a furnace flue which shall occupy a minimum of space, and embody a plurality of separating units enclosed within a single casing through which the gases from the furnace pass, and which shall be adapted to separate the solid material from the gases of combustion with a maximum of efficiency and a minimum draft loss.

In my prior Patent No. 2,348,785, dated May 16, 1944, and assigned to Fly Ash Arrestor Corporation, I have shown, described and claimed an ash collector comprising a plurality of horizontally disposed relatively small tubes mounted in a single casing and in each of the tubes is located a helicoid which imparts a spiral path to the gases and causes the solid particles to travel around the walls of the tubes. Slots are provided in the tubes through which the solid particles pass to fall to the bottom of the casing and be discharged. In the apparatus disclosed in my patent aforesaid, I employ a regularly formed right helicoid; that is, one in which the flight stands perpendicular to the axis of the pipe upon which the flight is mounted. Also, in that apparatus the flights preferably each made a complete turn about the pipe upon which they were mounted, or extended through an arc of 360°. While the apparatus disclosed in my patent aforesaid has proved eminently satisfactory in operation, I have since discovered that the draft loss necessarily brought about by a collector of this type can be materially reduced without any sacrifice of efficiency and even with an increase in efficiency, by employing the apparatus herein disclosed.

In accordance with my present invention, I provide a plurality of multiple flight helicoids, each mounted in a cylindrical casing and in which the flights lean with respect to the pipes upon which they are mounted, in the direction of gas flow. The angle of inclination of the flights may vary from 20° to 45° with respect to a vertical line, or a line vertical to the axis of the helicoid. I have found that this inclination of the helicoid flights aids in causing the solid particles to move outwardly of the helicoid. In-

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stead of providing the casings of the helicoids with slots, I provide a plurality of frusto-conical separating members through which the gases pass after leaving the helicoid, and in which the solid particles separate from the gases and fall downwardly into the bottom of the collector casing. Another important feature of my invention is the provision of a transition at the entrance end of each of the helicoid casings which changes it from a cylindrical casing to a rectangular one and all the rectangular helicoid casings are mounted in side by side relation at their entrance ends in the collector casing, so that there is a minimum of impedance to the flow of gases into the collector. Similar transitions are provided at the discharge ends of the frusto-conical separating elements, and the rectangular discharge ends thereof are mounted in the collector casing in a manner similar to that employed at the entrance ends of the helicoid casings. Each helicoid casing and its associated separating elements are supported intermediate their ends by a plurality of relatively narrow bars to which they are appropriately joined, preferably by welding.

Apparatus embodying features of my invention is illustrated in the accompanying drawing, forming a part of this application, in which

Fig. 1 is an elevational view of the collector looking towards the entrance end;

Fig. 2 is a sectional view taken along the lines II—II of Fig. 1;

Fig. 3 is a detail sectional view showing the relation between the separating elements and the helicoid;

Fig. 4 is a diagrammatic elevational view showing my improved ash collector installed in association with a boiler furnace; and

Fig. 5 is a detail view of one of the intermediate supports.

Referring now to the drawing for a better understanding of my invention, I show a rectangular collector casing 10 having a hopper bottom 11, in which casing are mounted a plurality of collector units 12. Each of the collector units comprises, at its entrance end, a helicoid casing 13 which is cylindrical in cross section the major portion of its length but which is provided with a transition 14 at the inlet end which transforms it into a rectangular form where it is secured to the casing 10. As will be seen in Fig. 1, the several collector units are mounted in the collector casing in side by side relation, thereby minimizing the resistance to gas flow entering the collector casing.

Mounted within the collector casing 10 in alignment with each of the helicoid casings 13 are a plurality of frusto-conical separating units 16, 17, and 18. The separating unit 18, at its discharge end, is provided with a transition 19, changing it from a cylindrical cross section to a rectangular cross section where it is connected to the casing 10 at its discharge end. The rectangular transitions 19 are connected in side by side relation at the discharge end of the collector casing 10, as may be seen in Fig. 2 of the drawing. Each of the separator units is smaller in diameter at its entrance end than it is at its discharge end, and thereby leaving a separating space around each of the units between the discharge end thereof and the receiving end of its next adjacent unit. Also, it will be seen from Fig. 3 of the drawing, that the unit 16 is smaller in diameter at its receiving, or entrance end, than is the discharge end of the helicoid casing 13, leaving a discharge space 21 around the entrance end of the separator unit 16 and between it and the discharge end of the helicoid casing 13. The helicoid casing 13 and the separator units 16, 17 and 18 are supported intermediate the ends of the collector casing 10 by means of a plurality of bars 22, the bars each being notched at 23, 24 and 25 to fit snugly against the sides of the helicoid casing and the separating units, thereby holding them in their proper relative positions. The bars 22 are secured to the casing and the separating units by welding or other suitable means.

Mounted in each of the helicoid casings 13 on the pipe 26, is a multiple flight helicoid 27. Each of the flights 28 of the helicoid leans, or is oblique, to the axis of the pipe 26 upon which the helicoid is mounted. By this arrangement, the solid particles borne by the gases entering the helicoid casing flow around through the passageways between the helicoids over the inclined, curved surfaces thereof and in their flow over said surfaces there are created regions of low density on said surfaces and around the walls of the helicoid casing toward which the solid particles migrate. I have found, with this design, that it is not essential for the flights 28 to make a complete turn around the pipe 26 in order to effect the separation of the solid particles from the gases, and that the draft loss is considerably reduced by stopping the flights short of a complete turn. I have found that where the flights are turned about the pipe 26 through an arc of 270° I obtain the maximum of efficiency of separation with a minimum of draft loss. Furthermore, my improved ash collector does not require gas velocities of the order of those necessary with centrifugal collectors.

In Fig. 4 of the drawing I show a boiler furnace 30 from which the gases of combustion pass through a flue 31. At 32 I show one of my improved ash collectors into which the gases of combustion are discharged from the flue 31. Ashes collected by the collector 32 are discharged into a suitable receptacle such as shown at 33.

From the foregoing description, the operation of my improved apparatus will be apparent. The gases of combustion bearing solid material such as fly ash enter into the helicoid casing 13 and flow through the helicoidal passageways which causes the solid particles to move to the outer perimeter of the path of flight as already described. I have found that the helicoidal motion imparted to the gases persists for some time and is pronounced throughout the passage of the gases through the separating units 16, 17 and

18. The solid material borne by the gases being at the outer perimeter of the path thereof, passes through the openings 21 between the discharge ends of the helicoid casing 13, in the entrance ends of the separating units 16, and also passes outwardly through the spaces between the discharge ends of the separating units 16 and 17 and the entrance ends of the separating units 17 and 18. The solid material thus passing out through the said spaces falls downwardly into the hopper bottom 11 of the collector casing, from whence it is discharged as has already been explained. The helicoid casings 13 and the separating units 16, 17 and 18 are made of relatively thin sheet metal, as are the transitions 14 and 19, and the transitions are connected to the casing 10 and to each other in side by side relation, whereby there is a minimum of impedance to gas flow entering the collector casing.

From the foregoing it will be apparent that I have devised an improved ash collector which is simple and economical of design, presents a minimum of impedance to flow of gases therethrough, and consequently operates with a minimum of draft loss, and one which affords the maximum of separation of solid materials from the gases of combustion.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In an ash collector of the character described, a collecting unit comprising a single helicoid casing of substantially constant diameter through which the gases of combustion pass, a helicoid mounted in the casing and comprised of a helical flight mounted on an axial shaft, and a frusto conical separating unit disposed in alignment with the helicoid casing, said unit and said helicoid casing having their adjacent ends lying substantially in the same transverse plane to define an annular space between the discharge end of said helicoid casing and the entrance end of the separating unit.

2. In an ash collector of the character described, a collecting unit comprising a single helicoid casing of substantially constant diameter through which the gases of combustion pass, a helicoid mounted in the casing and comprised of a helical flight mounted on an axial shaft, said flights leaning with respect to the shaft in the direction of gas flow therethrough, a frusto-conical separating unit mounted at the discharge end of the helicoid casing in alignment therewith and having its entrance end smaller in diameter than the helicoid casing and disposed adjacent the discharge end of the helicoid casing in substantially the same transverse plane, thereby defining an annular separating space between the discharge end of the helicoid casing and the entrance end of the separating unit.

3. In an ash collector of the character described, an outer casing, a plurality of collecting units mounted within the casing in parallel side by side relation each comprising a single horizontally disposed helicoid casing of substantially constant diameter through which the gases of combustion pass, a helicoid mounted in the casing and comprised of a helical vane mounted on an axial shaft, a frusto conical separating unit

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mounted at the discharge end of the helicoid casing in alignment therewith and having its entrance end smaller in diameter than the helicoid casing and disposed adjacent the discharge end of the helicoid casing in substantially the same transverse plane, thereby defining an annular separating space between the discharge end of the helicoid casing and the entrance end of the separating unit.

4. In an apparatus for collecting solids from the gases of combustion from a furnace, a collecting unit comprising a cylindrical casing through which the gases pass, a helicoid mounted in the casing comprised of helical flights mounted on a central axial shaft and having its flights leaning in the direction of gas flow therethrough, and a frusto conical separating element having a lesser diameter smaller than that of the cylindrical casing connected to the discharge end of the said casing in alignment therewith with the entrance end of the separating element and the discharge end of the casing lying in substantially the same transverse plane thereby defining an annular separating space.

5. In an apparatus for collecting solids from the gases of combustion from a furnace, a collecting unit comprising a cylindrical casing through which the gases pass, a multiple flight helicoid mounted in the casing comprised of helical flights mounted on a central shaft and having its flights leaning from 20° to 45° in the direction of gas flow to effect stratification of the solid matter in the gases, a series of frusto-conical separating

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members disposed in end to end relation with respect to each other with the first member of the series at the discharge end of the helicoid casing in alignment therewith, each of said separating members having its lesser diameter smaller than the discharge end of the helicoid casing and its greater diameter substantially that of the helicoid casing and each being disposed for the gases to flow therethrough from the lesser toward the greater diameter end thereof, the adjacent ends of the helicoid casing and its associated separating member and the adjacent ends of succeeding separating members lying in substantially the same transverse planes thereby defining a plurality of annular separating spaces, and a plurality of relatively narrow supporting members for holding the helicoid casing and separating members in alignment.

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