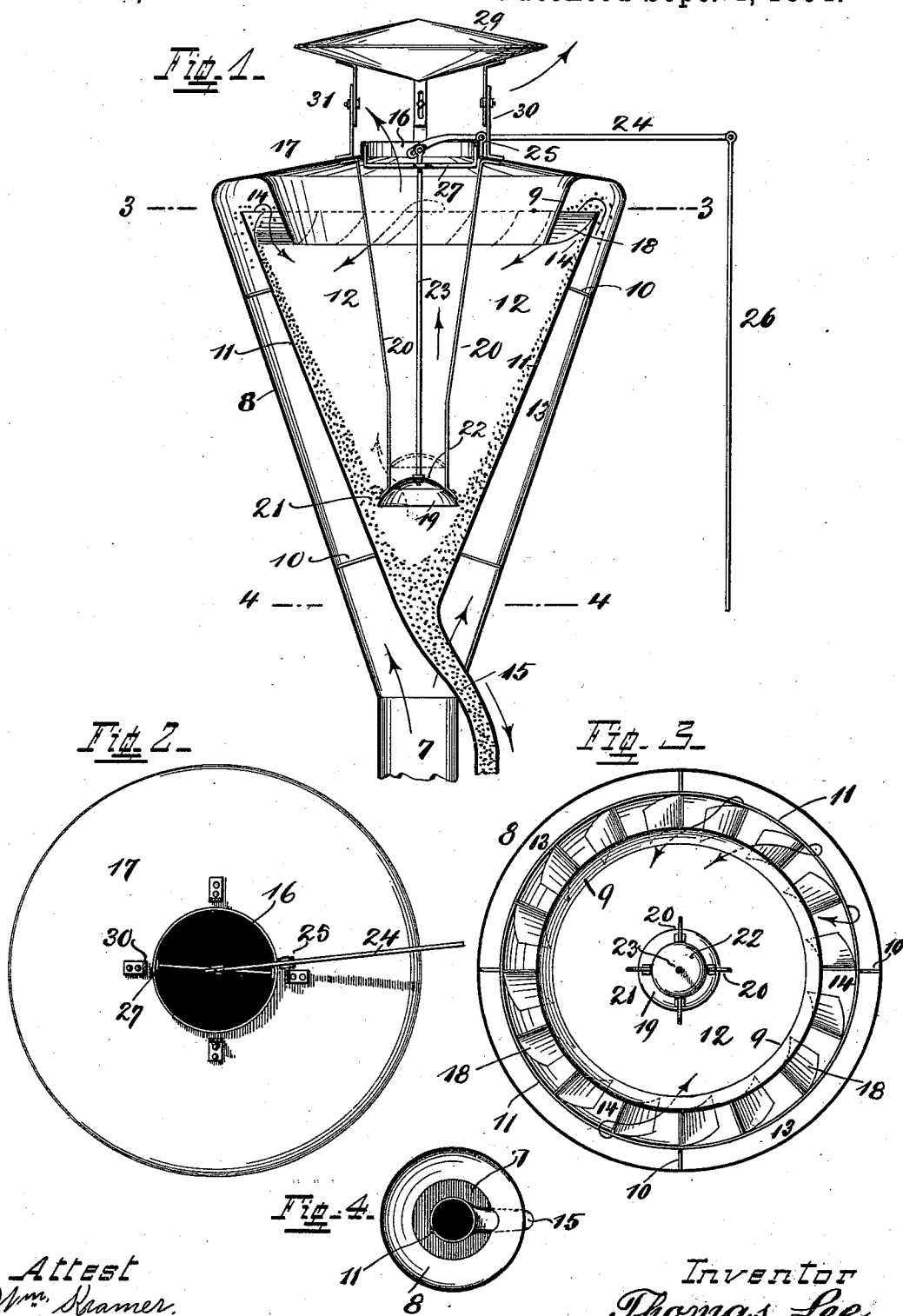


(No Model.)

T. LEE.
DUST SEPARATOR OR SPARK ARRESTER.

No. 525,389.

Patented Sept. 4, 1894.



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UNITED STATES PATENT OFFICE.

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DUST-SEPARATOR OR SPARK-ARRESTER.

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To all whom it may concern:

Be it known that I, THOMAS LEE, a citizen of the United States, and a resident of Home City, Hamilton county, State of Ohio, have invented a certain new and useful Dust-Separator or Spark-Arrester; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, attention being called to the accompanying drawings, with the reference-numerals marked thereon, which form a part of this specification.

This invention relates to a device which is adapted without any special changes in either case, to be used as a dust-separator or as a spark-arrester. In its first adaptation it is to be used to carry the waste, shavings, dust, &c., produced in manufacturing establishments, to a dust- or shaving-chamber or to a boiler-furnace when waste is used as fuel. As a carrying medium for this purpose the suction of air-currents, generated by fans or blowers, is used to advance the waste to its final destination. The office of a dust-separator in such connection is to separate the carrying air-current from its charge before the latter has reached its final destination which may be as mentioned, a shaving or dust-chamber or a boiler-furnace. The separation becomes necessary because if all or part of the air would enter either one of the places mentioned, it would, by reason of the agitation it produces, prevent the settling of the dust in the dust-chamber, or in case of a furnace, it interferes with the fire therein. The further progress of the air is therefore arrested in and by the dust-separator, from whence it is diverted in one direction, while waste and shavings proceed by gravitation in another. In its second adaptation, that is as a spark-arrester, it may be used on top of the smoke-stack of a locomotive, or any other similar smoke-stack, where their limited height permits fire and red-hot sparks or cinders to pass out with the smoke. Its office in this latter case is to arrest and precipitate the cinders within, by separating them from their carrying-medium which is the smoke, and whereby they are prevented from passing out with the latter. Thus in either adaptation the office of my device is to separate

air, gases, or vapor from the solid particles of whatever substance, carried by the former and this separation is accomplished substantially in a twofold way, first by introducing the carrying medium with its charge into an expansion-chamber considerably larger than the conduit leading it thereto, whereby the air or smoke becomes diffused, and secondly having the introduction performed in a manner that the further progress of the inflowing current is changed to proceed in a different direction. The diffusion by expansion, in connection with the changed direction, retards the current and weakens it as a carrying medium for solid particles, so that it becomes unable to sustain the latter any longer and permits them to drop and proceed by gravitation while the unburdened air, or gases proceed by themselves in another direction.

The object of my invention is to provide such a device where the separation is accomplished in the two ways mentioned, and it consists of a new, improved and simplified construction whereby such is accomplished and whereby this device may be used in either capacity, without any specific preparatory constructive changes for such.

In the following specification and particularly pointed out in the claims, is found a full description of my invention, its operation, parts and construction, the latter being also illustrated in the accompanying drawings, in which—

Figure 1, is a vertical, central section of my dust-separator and spark-arrester. Fig. 2, is a top view of the same taken above the air-outlet. Figs. 3 and 4, are horizontal sections on lines 3—3 and 4—4, respectively of Fig. 1. 7 is the end of an air-conduit pipe, or the upper end of a smoke-stack. It flares out and forms the inlet-pipe to a cone 8, the upper end of which is turned in and downwardly as shown at 9. Sustained within this first cone by suitable braces or stays 10, is another smaller cone 11, which forms the expansion-chamber 12, of the separator, while its wall, in conjunction with cone 8, forms an annular passage 13, through which the air rises until it reaches the upper edge of the expansion chamber, into which it is guided by the inturned end 9 of cone 8. This turn is made on

a substantially semi-circular curve whereby back-pressure as well as impact of the solid matter with the top and rebound and return therefrom back into passage 13 is prevented.

5 Passage 13 becomes gradually narrower toward its upper mouth which prevents its area, by reason of the increasing diameter of the cone, to become so large as to prematurely diffuse the air and cause it to drop its charge

10 too soon. Such diffusion takes place however as soon as it has turned over the upper edge of cone 11, and passed into the expansion-chamber 12 through the short passage 14, formed by the upper part of the inner cone

15 and by the inturned, downwardly projecting end 9 of the outer cone. The expansion and reduction of velocity which take place now, weaken the current of air or smoke at once and in a manner unfit them to be further a carrying-medium for solid particles supported thus far. The latter therefore separate and drop down into the lower part of the expansion-chamber from whence by gravitation, they proceed through an outlet

25 pipe 15, to their final destination. This outlet pipe pierces the outer cone 8 and passes through its wall. The relieved air or gases pass upwardly through an outlet 16 in the center of top 17, which covers the expansion

30 chamber. To prevent disturbing agitation and opposing action of the inflowing air-currents, especially of those entering diametrically opposite each other, I cause them to assume a direction which is the same for all and whereby any conflict is avoided. This is done by deflectors 18, placed within passage 14 and whereby the air while leaving such passage, assumes a lateral and downward direction, producing substantially one large current,

40 within which all the individual jets, passing out below deflectors 18 join, and which current proceeds downwardly within chamber 12 in a spiral direction. By reason of the rapidly evolved expansion however, its speed and force are quickly reduced, so that no disturbance or choking takes place in the narrow part of the expansion chamber. In addition to the special effect of the deflectors, the change of direction which they produce retards and weakens the current, which in addition to the weakening it suffers by expansion, hastens the desired final separation of the two elements.

The action of the deflectors on the direction

55 of the current as above described has the effect of driving all solid particles floating with the air-current, against the walls of the expansion-chamber, on which they gradually slide down until they reach their exit-pipe.

60 While it may be assumed that all or most of the air by reason of the expansion, leaves the solid particles before they have proceeded very far, I prefer to guard in a positive manner against the further progress of the air-current into the extreme small end of the separator where, unable to pass out freely, it would commence to whirl and interfere with

the discharge of the dust, waste or cinders. Such guard I provide in the shape of an internal partition 19, which is suspended by

70 rods 20 within the expansion-chamber 12, at such a height as to leave a space 21 between it and the inside of the latter, which space is so calculated as to admit the precipitated separated matter to pass freely. This matter is

75 expected in most cases to fill this space, whereby it becomes closed to the admission of air or smoke, which strike against partition 19 which arrests their advance and changes their direction. It may occur however that

80 the descending separated matter does not completely fill out this space 21 and whereby some of the air would find a chance to pass below. This would soon cause an accumulation of condensed air below, which would

85 exert a back-pressure and soon produce the disturbance mentioned before. To provide means for such air to pass out without returning the same way it passed in, whereby it would interfere with the descending solid

90 particles, I have partition 19, in two parts, one of which, the central one, 22, may be elevated from the other part, to provide an opening in such partition, which permits such air which has escaped below, to re-ascend freely

95 through such passage without interfering with the matter passing down through passage 21. Once above partition 19 it joins with the other air or smoke passing up and out through exit 16. This adjustable part 22, of

100 the partition 19, is secured to a rod 23, which connects to a lever 24, supported and pivoted at 25. This latter, where the device is elevated, may have a pull-rod 26 whereby part 22 may be operated. Its elevation is also ad-

105 justable and may be suited to the volume of air or smoke to be released. By reason of such adjustability, I am enabled also to hold back part of such downwardly escaped air and force it to pass on with the separated

110 solid matter through exit pipe 15. Such becomes desirable when the distance from the separator through exit-pipe 15, to the final destination is considerable and the sluggishly moving matter requires some agent to aid its

115 advance. The volume and strength of this diverted air-current may be graduated to meet exactly its purpose, by the position of part 22 of partition 19, which part becomes thereby a regulator for such current. The

120 latter may thereby be graduated so as to have only sufficient force to move the matter to its destination (dust-chamber, boiler-furnace) but not more, so that, when arrived at that point, it is practically exhausted and unable

125 to become a disturbing element thereat. In its adjustment, regulator 22 is guided by rods 20, while its supporting rod 23, is guided by a brace 27, through an opening in which it passes. 29 is a combined hood and deflector

130 above the exit-opening 16, which excludes rain and thereby, in case the device is used as a dust-separator, prevents the dust from caking inside. The height of this deflector

above the exit-opening may be regulated, for which purpose its supporting legs 30 are in two parts, one part being secured to the under side of the deflector, the other rising up from top 17. The parts of these legs are so set as to overlap each other and are held on each other by bolts 31 passing through both. One set of the parts is slotted which permits the other part to be raised and lowered thereon. When used as a spark-arrester this hood and deflector, as well as part 22 becomes superfluous and may be removed or in the case of the latter part, it may be lifted and fixedly secured in its raised position.

Having described my invention, I claim as new—

1. In a device for use as a dust-separator or spark-arrester, where the separation is accomplished by the expansion of the entering charge as well as by its retardation caused by changing the direction of its current, the combination of an expansion chamber 12, of inverted conical shape, an annular inlet to it formed by a cone 8 of larger diameter and higher than chamber 12, which latter is supported within cone 8 by stays and braces, the upper edge of cone 8 being turned over the upper edge of the expansion chamber and partly into the same, the turn being on a curve whereby back-pressure and rebound are avoided, spiral deflectors 18, between the down-turned edge of cone 8 and the upper part of the wall of the expansion chamber which change the direction of the entering current and retard the same to aid the ensuing separation and outlet openings for air and gases and for the separated matter.

2. In a device for use as a dust-separator or spark-arrester, where the separation is accomplished by the expansion of the entering charge as well as by its retardation caused by changing the direction of its current, the combination of two cones and a cone-frustum concentrically arranged within each other, the space between the two cones forming a passage 13 to the inner cone, which is lower than the outer one and constitutes the expansion-chamber 12, deflectors 18 between the inner cone and the cone-frustum, a top with an outlet opening for air and gases and

an outlet in the expansion-chamber for the separated matter.

3. In a device for use as a dust-separator or spark-arrester where the separation is accomplished by the expansion of the entering charge as well as by its retardation caused by changing the direction of its current, the combination of an inlet pipe 7, flaring outwardly to form a cone 8, another smaller cone 11, forming an expansion chamber 12, supported within cone 8, in a manner to form a passage 13 between the two cones, said passage being decreasing in width toward its upper end to prevent premature expansion of the rising charge and separation of the solid particles by reason of increasing area, a passage 14 formed by the in- and down-wardly turned end of cone 8 and the upper part of cone 11, and outlets for air and gases and separated matter.

4. In a device for use as a dust-separator or spark-arrester where the separation is accomplished by the expansion of the entering charge as well as by its retardation caused by changing the direction of its current, the combination of an inlet pipe 7, flaring outwardly to form a cone 8, another smaller cone 11, forming an expansion chamber 12, supported within cone 8, in a manner to form a passage 13 between the two cones, the upper edge of cone 8 being turned over and around the upper edge of the expansion chamber and partly into the same, the turn being made on a curve substantially semi-circular to prevent back-pressure and rebound, spiral-deflectors 18, between the down-turned edge of cone 8 and the upper part of the wall of the expansion chamber which change the direction of the entering current and retard the same to aid the ensuing separation an outlet opening in the expansion chamber for air and gases and an exit-pipe in the latter passing through the outer cone.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS LEE.

Witnesses:

C. SPENGLER,
WM. KRAMER.