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A. ELSENHANS.

APPARATUS FOR PURIFYING GAS.

APPLICATION FILED JAN. 10, 1906.

Fig. 1.

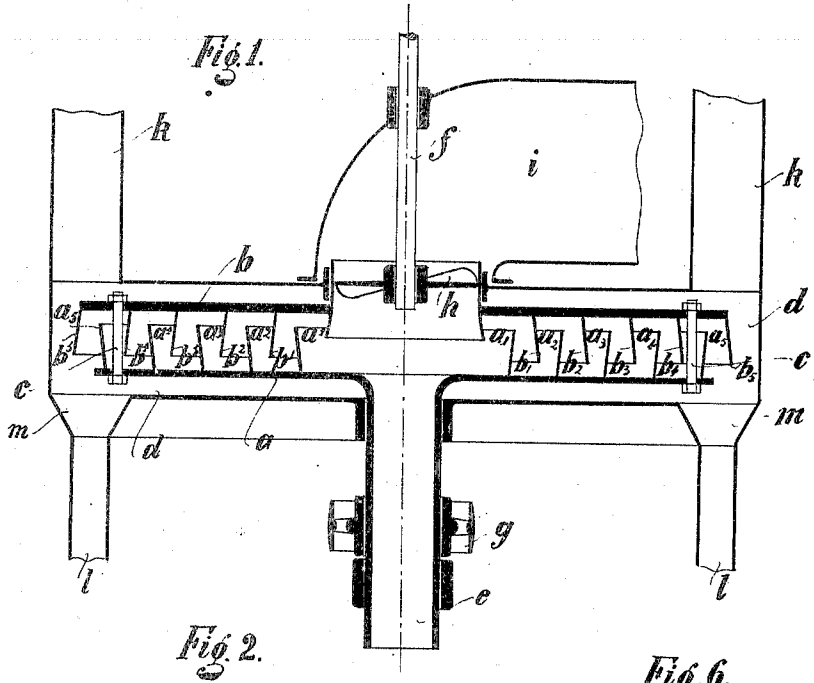


Fig. 2.

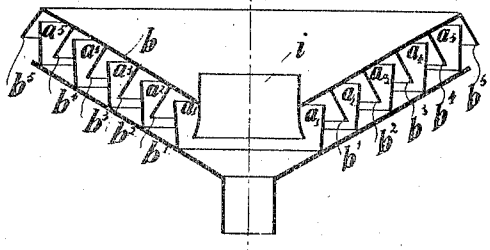


Fig. 6.

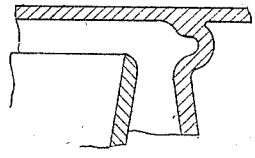


Fig. 3.

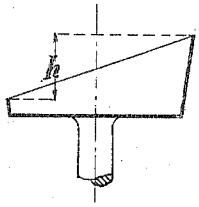


Fig. 4.

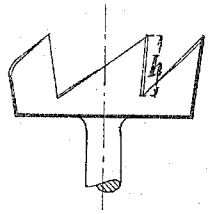
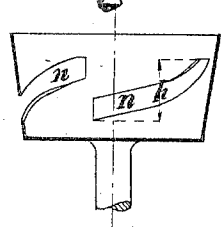


Fig. 5.



Witnesses

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APPARATUS FOR PURIFYING GAS.

No. 820,772. Specification of Letters Patent. Patented May 15, 1906.

Application filed January 10, 1906. Serial No. 295,449.

To all whom it may concern:

Be it known that I, ALBERT ELSENHANS, a citizen of the German Empire, residing at Rüttenscheid, near Essen, in the Province of Rhenish Prussia and Kingdom of Prussia, Germany, have invented certain new and useful Improvements in and Relating to Apparatus for Purifying Gases, of which the following is a specification.

The present invention relates to an apparatus for purifying gases, and particularly for separating therefrom solid substances contained therein—such as dust, soot, and particles of coal, cinder, and ashes—and also for producing an artificial draft in furnaces, for extinguishing sparks, for condensing vapors, for cooling air, for removing smoke, and so on, by bringing the gases by means of centrifugal action into as intimate contact as possible with a washing fluid. Working processes and apparatus of this nature are of course well known. In these the gases are in most cases brought into reciprocal action with the fluid spread out in thin layers by means of centrifugal action by either leading them along these layers of liquid and by keeping them under pressure in contact therewith or by drawing them or forcing them through the layers of liquid. These older processes and apparatus, however, all work according to the counter-current principle—that is, the gases and the washing liquid move in opposite directions.

Other likewise well-known devices operate on the ventilator principle, several suction-fans working one after or behind another o into one another and operating either in the same direction or rotation or in alternately opposite senses. In some cases they draw the liquid and gas in at the inner circumference and propel them at the outer circumference to the nearest larger surrounding fan, whereby the blades or cell-wings are straight (radial) or are at different angles to the radius. In the case of these devices in order that they can work at all, the water also must be sprayed, because otherwise the fan would not be able to draw it in. Consequently the water is sprayed into the form of mist or vapor, so that the one medium is completely merged in the other.

In the case of still other contrivances inclosed by a casing provided with a central feed-opening several drums are mounted on a common horizontal shaft, of which drums each following drum is greater than the preceding one. Each of these drums consists of two disks situated at a certain distance from one another. The one of these disks is turned toward the feed-opening, and each is provided with an opening. The other is massive. Both disks are connected with one another by means of narrow rods (wings) like the beaters of the well-known disintegrators and beating-machines. Buckets are arranged at the circumference, which raise to a height the water flowing in through a laterally-opening tube and pour it between the rods, (wings,) while the gases enter centrally through the above-mentioned opening in the one disk. By means of the rotary motion the gases are intended to be thrown violently outward and at the same time to be mixed with the water poured between them by the buckets. Whereas the gas must follow the course between the two disks and right round them in order to reach the second drum, the water collects again at the bottom of the casing and flows to the next greater division, where the above-described process is repeated.

In contrast with these older working processes and apparatus the gas and washing fluid together are, according to the present invention, introduced into the central space of a so-called "multiple" centrifugal apparatus with several centrifugal rings or the like circulating in the same or in opposite directions, and the gas and washing fluid are centrifuged together in this device in such a way that they, moving through the device substantially in the same direction, flow along each centrifugal ring in a thin layer, then are centrifuged from said ring against the next centrifugal ring, whereby the water traverses the gas-current andthen flows along this second ring, and so on.

By means of the joint rebound of both mediums and the peculiar course of the same such an intimate mixture and interpenetration of both mediums, and consequently such an effective moistening of the solid particles contained in the gas, is brought about that the same are separated out in the liquid with certainty.

In the accompanying drawings a device rendering possible the working of the new process is diagrammatically represented by way of example.

In said drawings, Figure 1 is a transverse section through the device. Fig. 2 shows a modified form of the centrifuge in transverse section. Figs. 3 to 5 show three different forms of the centrifuge, and Fig. 6 shows in detail a special shape of the device from which the rebound occurs.

In the case of the construction shown in Fig. 1 the centrifuge is formed by the two disks *a* and *b*, which are arranged at a suitable distance one above the other and which are held together by means of bolts *c*. On the surfaces turned toward one another the disks *a* and *b* carry rings a' a^2 a^3 and b' b^2 b^3, respectively, in such a way that the rings of the one disk engage between those of the other disk. Said rings are concentrically arranged and each is in the form of a frustum of a cone. These rings are also so formed that they increase in width toward their free edges.

The centrifugal device so formed is set up in a suitably-shaped casing *d* and is revolubly mounted, with its shaft portions *e f*, in the walls of the casing or other suitable bearings. The belt-pulley *g*, shown by way of example, serves for enabling the centrifugal device to be rotated. The washing fluid is introduced centrally into the centrifuge through the lower hollow shaft portion *e*, whereas the gas to be purified is drawn in by the fan *h* out of the pipe *i* and is likewise centrally introduced. The pipes *k k* serve for leading away the gas, while the washing fluid flows away through the pipes *l l*, which are connected with a channel *m*, provided in the bottom of the casing.

The method of operation of this device according to the above-described process is as follows:

The gas as well as the washing fluid are both introduced into the central space surrounded by the ring a' and are here submitted to violent centrifugal action. They consequently mount up along the ring-wall a' and are then centrifuged away over the upper edge of the same against the ring b'. After the gas and the fluid have become intimately mixed at the place of rebound, whereby the impurities moistened hereby pass into the liquid, and after the water has simultaneously penetrated the gas-current the liquid and gas pass along the ring b' and are thrown off over the edge of b' onto a^2, thence onto b^2, then onto a^3, and so on until they are whirled against the outer ring, the above-described mixing and purifying phenomena being repeated at each place of rebound. From the outermost ring the water and gas are centrifuged against the wall of the casing *b*, whereupon the purified gas is delivered to the pipes *k*, while the washing fluid, together with the deposited solid particles carried with it, collects in the channel *m* in the bottom of the casing and flows away through the pipes *l*—for example, into a collecting or clarifying vessel, from which it may be supplied anew to the centrifuge.

As is evident from the above, the gas and washing liquid are always centrifuged in the same direction jointly against a resisting surface, and at this surface each time such an intimate mixing and whirling together of both mediums takes place that the purpose striven after is attained. This action can, moreover, be enhanced by specially shaping the centrifugal ring serving as the rebound-wall or reflecting-wall.

According to the form shown in Fig. 5 the reflecting-wall is, for example, for this purpose provided with a groove, into which the gas and liquid together are thrown. The more frequently that the centrifuging or subjection to centrifugal action is repeated—that is, the greater the number of rings—the more perfectly of course will the gas be washed. If the object is only to extinguish sparks, it might be sufficient for the gas and fluid to be mixed only once.

Instead of connecting both centrifugal parts *a* and *b* with one another and driving them together they might each be driven separately, which would render it possible for both parts to be rotated with different velocities or even in different directions. It is, however, of importance that always both parts be driven in order that the gas and liquid may under all circumstances be centrifuged from one onto the other rings a' a^2 or b' b^2.

The parts *a b* of the centrifuge instead of consisting of two plain disks may also be formed conical, as is shown in Fig. 2 of the drawings. No alteration of the method of operating results from this modification.

If the free edge of the rings a' a^2 a^3 or b' b^2 b^3 over which the gas and liquid are centrifuged are not formed straight, as is shown in Fig. 1, but are cut off obliquely, Fig. 3, or formed tooth-shaped or indented, Fig. 4, or, finally, if the rings are provided with oblique slots *n*, Fig. 5, instead of a narrow place of rebound being formed a larger striking or distributing surface is formed corresponding to the height *h* of the teeth or slots, as indicated in the figures. Hereby the manner in which the device works is still further materially perfected. Such a centrifugal drum besides being able to be used with advantage for the purposes mentioned above can also be profitably used for many other purposes.

Having now explained the nature of my invention, I declare that what I claim, and desire to secure by Letters Patent, is—

1. In gas-purifying mechanism, a pair of opposed disk-like devices and mechanism for rotating the same, a casing surrounding the said parts, means for introducing gas to the space between them, and means for introducing a washing fluid to the same space, the

said disk-like parts being provided with series of concentric annular walls arranged so that the walls of each disk-like part enter the annular spaces between the walls of the other, and these walls in their rotation act centrifugally on the gas and liquid to thoroughly mix them and finally throw them outward against the said casing substantially as set forth.

2. In gas-purifying mechanism, a pair of opposed disk-like devices provided with means for admitting gas and purifying fluid to the space between them and concentric series of annular walls, in combination with an inclosing casing and means for rotating the said devices, the annular walls of one device entering the annular spaces between the corresponding walls of the other, and the annular walls of both devices being cut away obliquely substantially as and for the purpose set forth.

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

ALBERT ELSENHANS.

Witnesses:
OTTO KÖNIG,
J. A. RITTERSHAUS.