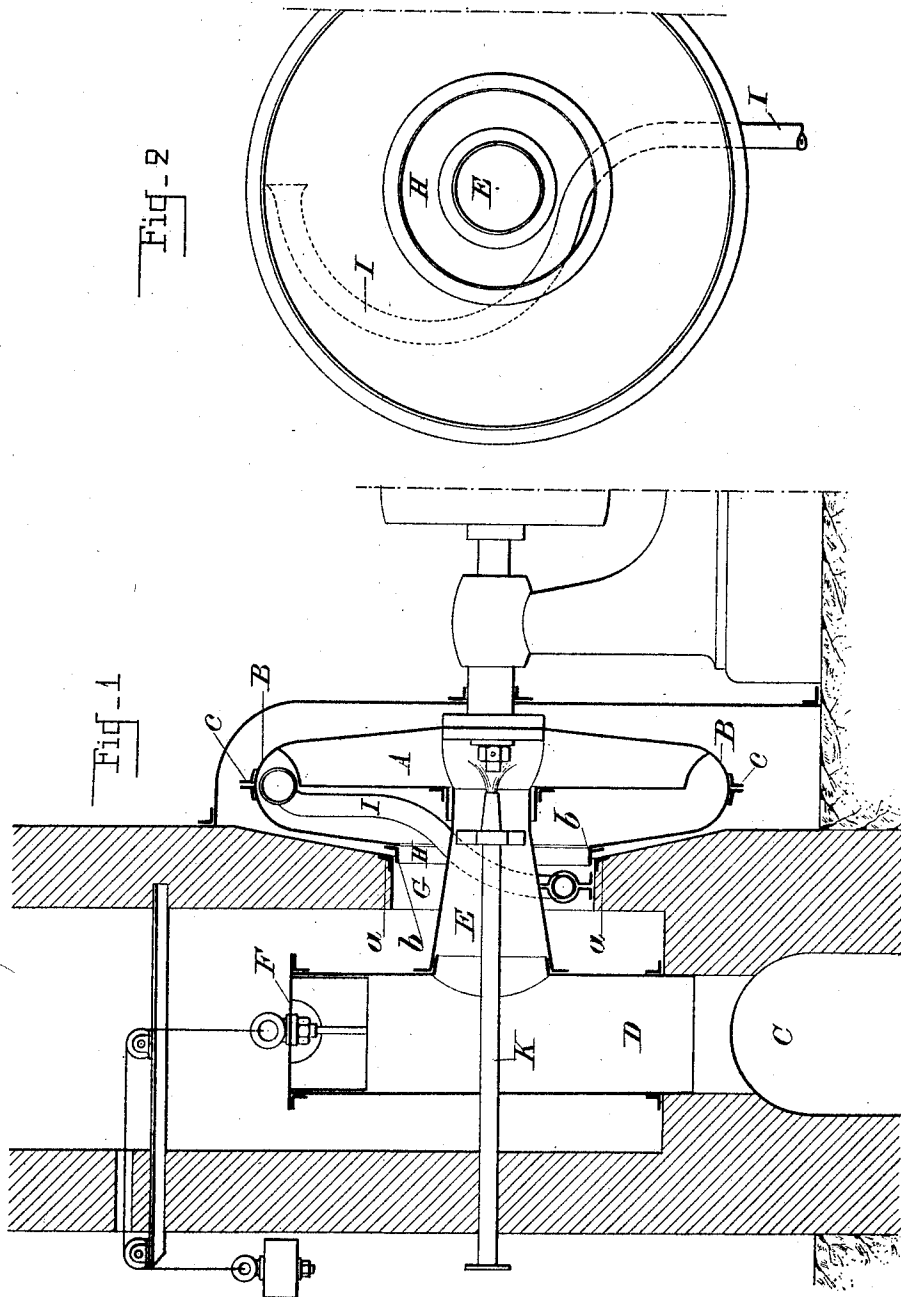


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GAS PURIFIER.
APPLICATION FILED FEB. 28, 1920.

Patented July 12, 1921.

2 SHEETS—SHEET 1.

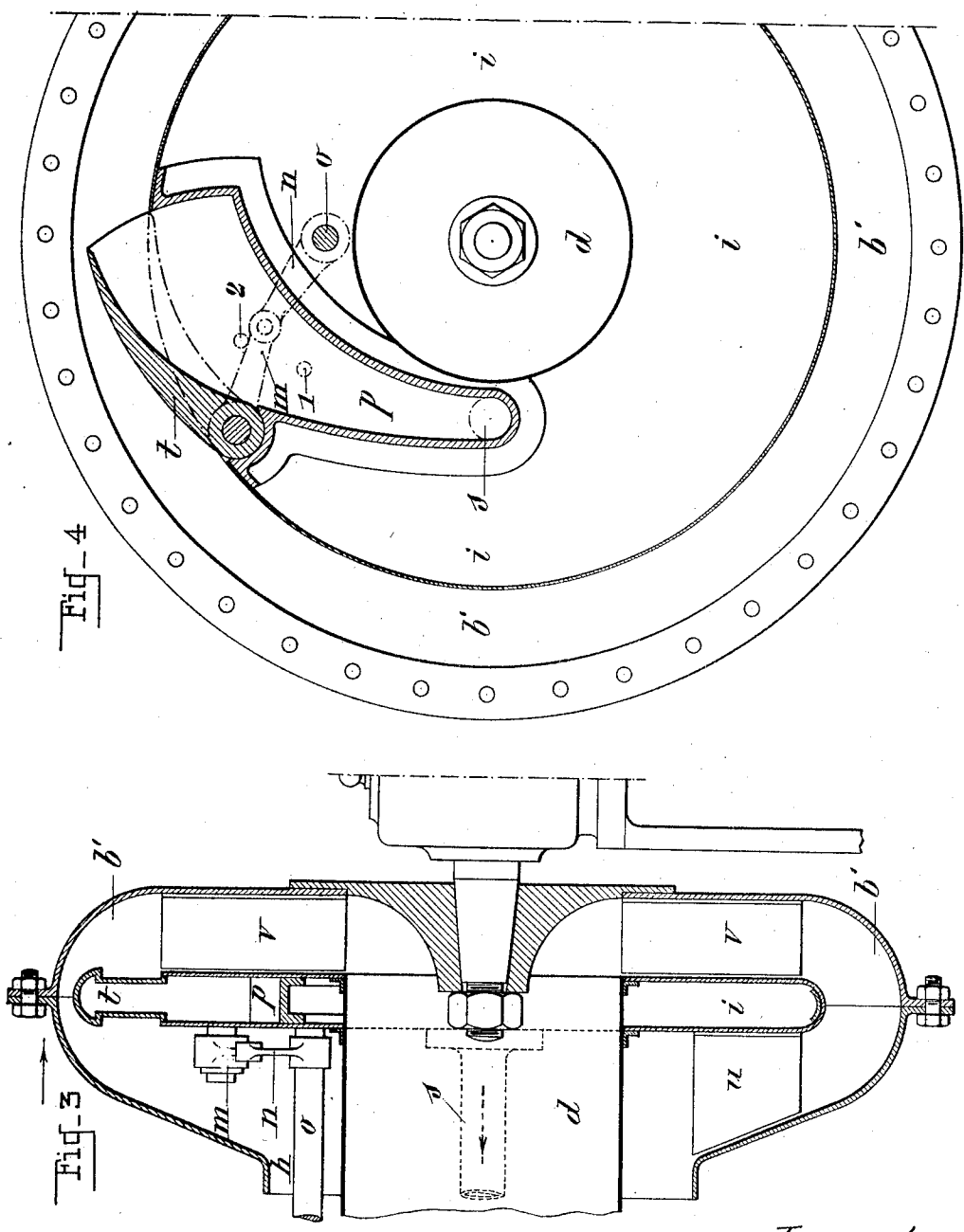


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UNITED STATES PATENT OFFICE.

CHARLES BOURDON, OF PARIS, FRANCE.

GAS-PURIFIER.

1,384,380.

Specification of Letters Patent.

Patented July 12, 1921.

Application filed February 28, 1920. Serial No. 362,094.

To all whom it may concern:

Be it known that I, CHARLES BOURDON, of Paris, France, residing at Paris, 1 Boulevard Beauséjour, have invented new and useful Improvements in Gas-Purifiers, of which the following is a specification.

The present invention has for its object a purifying apparatus applicable to any gas containing solid matter in suspension and particularly gaseous products resulting from combustion or from various industries, for the purpose of extracting the solid materials which contaminate the gases, when purified gases are needed or which have by themselves a marketable value. This extraction has, moreover, great advantages from a hygienic point of view when the gases are discharged into the atmosphere.

The apparatus constituting the object of this invention is essentially characterized by a fan device adapted to draw off the gases to be purified and to discharge them after being purified, but constructed in such a manner as to segregate by the action of centrifugal force the solid particles carried into an appropriate receptacle associated with the fan, and to conduct them to the outside by an appropriate conduit.

The drawing attached to the description, shows by way of example, one form of apparatus constructed in accordance with the present invention.

Figure 1 is a view in longitudinal sectional elevation.

Fig. 2 is a view of part of the fan showing the mode of arranging the conduit serving to discharge at the outside of the apparatus the solid products extracted from the treated gases.

Figs. 3 and 4 represent vertical sections, taken at right angles to each other, of a modified form of the apparatus.

The same letters of reference denote respectively the same parts in Figs. 1 and 2 and Figs. 3 and 4.

On referring to Figs. 1 and 2, it will be seen that the principal part of the apparatus which forms the object of the present invention is constituted by a rotary fan or turbine A of which the central part is analogous to that of a centrifugal force fan of ordinary type, but whose periphery is closed by a convex rim B obtained by connecting extensions of the walls of the turbine. The gas on entering the turbine is hurled toward the periphery and gives up under the

influence of centrifugal force all the particles which it holds in suspension, projecting these particles into the interior of the rim B where they accumulate and from which they are extracted by a conduit I provided for the purpose.

In the drawing, it is supposed that the gas to be purified arrives by the duct C and passes therefrom into a sheet metal flue D, which has on its side a tubular outlet E, which fits into the inlet in the fan. The duct D may have at its upper part a valve F associated with a system of counterweights which permit it to be raised. If, in the case illustrated, all the parts are disposed at the foot of a chimney opening into the atmosphere or adjoining the conduits where the gas is distributed to the apparatus in which it is to be utilized, the direct evacuation can be effected by raising the valve; if on the contrary this latter is lowered on to the top of the sheet metal flue D, it is kept tightly against its seating by the suction of the fan which draws in the gas arriving by flue D, said fan operating under the action of centrifugal force to extract from the gas the particles which it contains in suspension, after which the gas flows into and through the chimney which discharges it into the atmosphere or leads it to apparatus wherein it is utilized. For this purpose the fan is connected to a circular opening arranged at the bottom of the chimney and provided with a circular angle ring which constitutes together with a similarly shaped ring b, fixed to the wall of the turbine or with any other device, a lapped joint between the turning part and the fixed part, which joint can be rendered gas-tight by means of any appropriate packing.

The ring b reinforcing the wall of the turbine and tending to prevent its deformation by centrifugal force, allows of a large outlet opening H being provided without inconvenience, by which the purified gas can be made to circulate and be evacuated into the atmosphere or conducted to apparatus wherein it is utilized. Angle ring c can be used if necessary to reinforce the rim B at its extremity, and serves to keep together the parts constituting it.

It may be remarked here that this opening H presents to the gas issuing from the fan an outlet of very large section, with the result that the discharge can be produced at very low speed and under conditions very

favorable to the avoidance of the carrying along of dust.

The opening H, moreover permits, for effecting the extraction of solid matter resulting from the purification, the introduction into the rim B of a pipe I directed oppositely to the direction of rotation of the fan, and whose extremity slightly widened out approaches as near as possible the wall of the rim. All matter collected in this part of the apparatus is drawn into this pipe during the operation of the fan and expelled toward the exterior.

This discharge will occur so much the more energetically as the fan system under the combined action of the circumferential speed of the turbine and centrifugal force gives a pressure double of that obtained with ordinary fans.

Moreover, if as frequently happens it becomes necessary to cool the gas at the same time that it is purified there is added to the apparatus a device for injecting water more or less abundantly, which can be done very easily at the center of the turbine by means of a pipe K. This water would be evacuated at the same time as the products from the purification by the pipe I.

It will thus be seen that purification can be effected at will either dry or wet. If the purified gas does not have to be cooled, advantage can be taken of throwing the discharge from pipe I into a receptacle adapted for retaining the sediment so that the water can be recovered and returned to the fan, and thus materially reduce the consumption. When the gas to be purified is warm the water will rapidly reach a temperature which causes a greater or less liberation of steam, which in certain cases can be made use of.

With the arrangement, as described, it is evident that in operating boilers with forced draft instead of under pressure, in which case great difficulties occur in charging the grates, it is possible to utilize the aspiration action of the present invention and effect at the same time a certain amount of purification of the smoke.

It is not certain that, even by giving to the fan a sufficiently high speed, there can be separated from the smoke products of dark color which are so to speak tar in a state of vapor disseminated in the combustion gases, but the solid particles, even if they are light, are separated by increasing to a suitable extent the speed of the fan.

It is particularly possible by this process to avoid the discharge of fine cinders which results especially at the moment of cleaning out the grates in installations where, in order to avoid very black smoke, light and dry combustible materials such as coke and anthracite coal are burned. These cinder discharges give rise continually in towns to

complaints by the inhabitants living near factories where steam generators are installed in which combustibles of this nature are used.

The modification represented in Figs. 3 and 4 comprises more particularly a device in which, on the one hand, the expulsion of the dust, instead of being effected in a continuous manner as is the case in Figs. 1 and 2, is brought about in an intermittent manner and at more or less frequent intervals at will, the device on the other hand facilitating the discharge of the purified gas.

Experience has shown, in fact, that it is not necessary to extract the dust in a continuous manner, because the dust is instantaneously expelled in such a great mass as soon as the layer which accumulates in the rim of the fan has a sufficient thickness that it only needs a few seconds to expel the dust which has been extracted from large masses of gas, even when very much loaded with dust.

In Figs. 3 and 4, *i* denotes a drum replacing the tube 1 in Figs. 1 and 2; this drum which is fixed, is mounted on the conduit *d* for the admission of gas to be purified, and it carries internally a pocket *p* having at its base an orifice *j* for egress of dust, the upper part being closed by a valve *t* whose form is such that when it is closed it coincides with the periphery of the drum, while when it is open it terminates close to the internal periphery of the rim *b'* of the fan. A mechanism comprising the two levers *m*, *n*, of which the one *m* is mounted on the axis of rotation of the valve *t* while the other *n* is keyed to a horizontal shaft *o* extending into the fan through the outlet opening *h* for the purified gas, permits of bringing the end of the valve as near as possible the internal wall of the rim *b'* when it is considered that the mass of dust is of sufficient thickness to be expelled.

The angular displacement of the levers *m* and *n* is limited by stops 1, 2.

From the preceding description it will be seen that the valve *t* fulfils the double function of capturing the dust and blocking the escape of the gas, during the periods of interruption in the expulsion of the dust. With this arrangement, there should be, in principle, an intermittent discharge, but it may be continuous in case of necessity. The operation of the valve will be effected at intervals, practice determining the frequency, according as the gas is more or less charged with dust, and it may be brought about by hand or mechanically by a device connected to be actuated by the movement of the turbine.

It is important to afford the purified gas the greatest facility possible for egress, for this has naturally a great effect on the output of the turbine. By reason of the con-

siderable volumes of gas which have to be purified in metallurgical works, it is as well to push this output as nearly as possible to the limit at which there is the risk of drawing in dust into the purified gas. If, to avoid drawing in dust, a very large diameter is not given to the outlet *h*, there will be two causes for the reduction of the output, one being that which brings about the return of the gas from the periphery toward the center, a flowing back which creates a compression naturally opposed to the flow, while the other pertains to the centrifugal force which tends always to lead toward the periphery the mass of gas which is in the turbine on the outlet side thereof, so that it is only under the influence of a preponderance of this centrifugal action on the gas entry side that evacuation occurs.

Compression resulting from the flow of the gas toward the center is obviated by giving to the inner wall of the turbine a flared form, as shown in Fig. 3, which can be so accentuated that at any distance from the center the section remains constant.

On the other hand, the action of centrifugal force, on the outlet side is suppressed by means of fixed vanes *u* of appropriate form mounted on the wall of the drum *i*, whose length is such as to leave some space between their edges and the wall of the turbine. Likewise the replacing of the median wall, which exists in the first device, with the drum *i*, requires the mounting of vanes *v* overhanging the wall of the turbine at the gas entry side, also with some space between their edges and the wall of the drum.

Having now particularly described and ascertained the nature of the said invention and in what manner it is to be performed, I claim as my invention—

1. An apparatus for purifying gas containing solid particles in suspension, comprising a blast fan for such gas having a convex rim formed by the union of the walls of the fan and providing a peripheral receptacle to collect the solid particles separated by centrifugal force from the gas; a chimney for the gas discharged by the fan; a supply conduit for the gas to be purified disposed in said chimney; a pipe connecting the supply conduit and the fan inlet; a valve enabling the passage of the gas alternatively through the supply conduit directly into the chimney, or through said connecting pipe into the fan, said fan having an outlet opening communicating with the chimney; and a spiral discharge pipe for the separated solid particles arranged within the fan and curving in the opposite direction to the direction of rotation of the fan, said spiral pipe terminating at one end in a flared inlet mouth

which is located in close proximity to the wall of said rim to collect said particles from the rim.

2. An apparatus for purifying gas containing solid particles in suspension, comprising a hollow element having a convex rim wherein the solid particles separated by centrifugal force from the gas accumulate; means for rotating said element; a fixed drum mounted interiorly of said element; a pocket in the upper portion of the drum to receive the solid particles from said rim, said pocket having an opening in its lower portion for discharging said particles; a valve arranged in the upper portion of the drum for alternatively opening and closing the entrance to said pocket, said valve adapted to catch said particles and deflect them into said pocket when open; and means for operating said valve.

3. In a gas-purifying apparatus, the combination of a hollow rotary element; a fixed drum therewithin, said drum having an internal pocket provided with a discharge opening; means for controlling communication between the interior of the hollow element and said pocket; and a plurality of vanes mounted on the wall of said drum with their edges spaced from the wall of said hollow element to overcome the action of centrifugal force on the outlet side.

4. In a gas-purifying apparatus, the combination of a hollow rotary element; a fixed drum therewithin, said drum having an internal pocket provided with a discharge opening; means for controlling communication between the interior of the hollow element and said pocket; and a plurality of vanes overhanging the wall of said hollow element on the gas entry side with their edges spaced from the wall of said drum.

5. In a gas-purifying apparatus, the combination of a hollow rotary element; a fixed drum therewithin, said drum having an internal pocket provided with a discharge opening; means for controlling communication between the interior of the hollow element and said pocket; a plurality of vanes mounted on the wall of said drum with their edges spaced from the wall of said hollow element to overcome the action of centrifugal force on the outlet side; and a plurality of vanes overhanging the wall of said hollow element on the gas entry side with their edges spaced from the wall of said drum.

In testimony whereof I have signed my name in presence of two witnesses.

CHARLES BOURDON.

Witnesses:

JULES FAYETTE,
ANDRÉ BORDILLO.