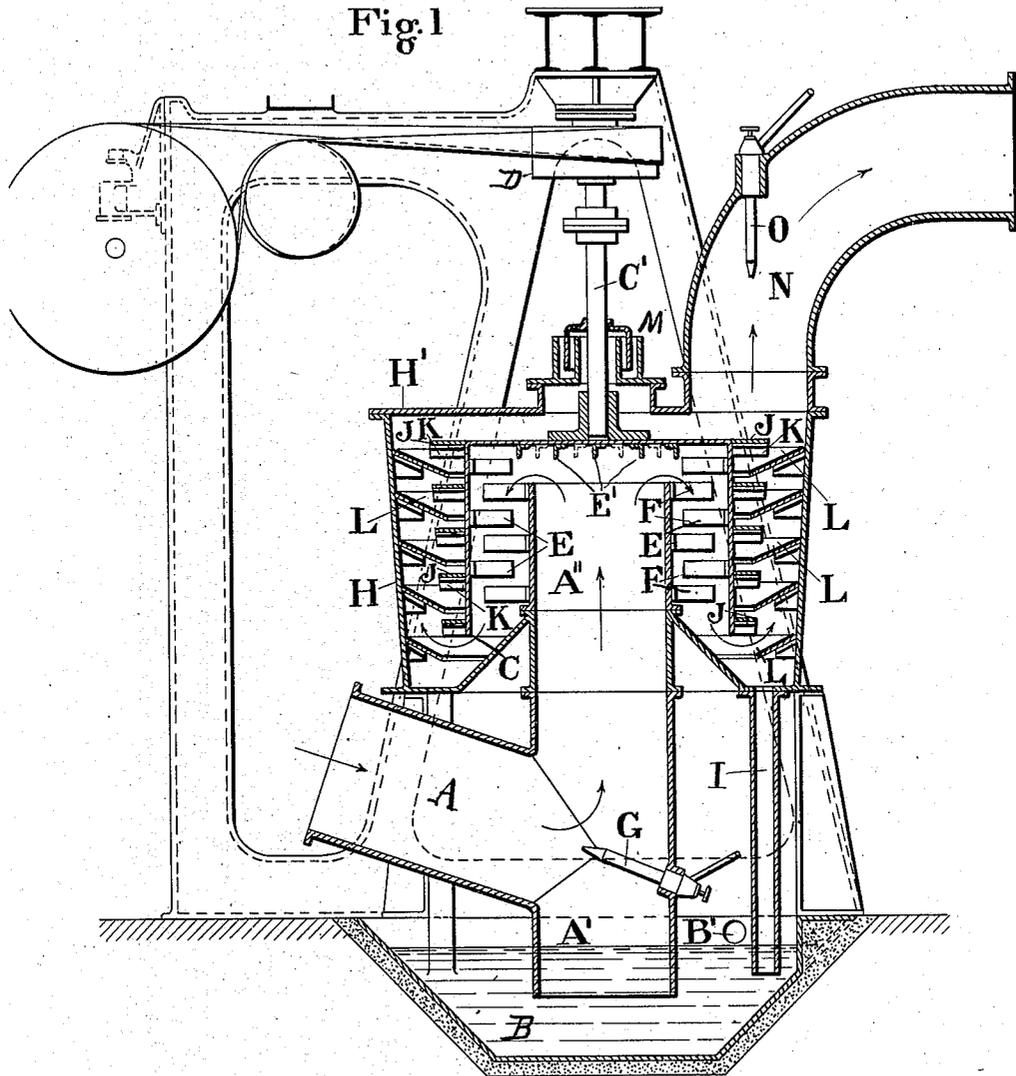


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 PROCESS OF CLEANING GASES.
 APPLICATION FILED APR. 15, 1908.

900,062.

Patented Sept. 29, 1908.

2 SHEETS—SHEET 1.



Witnesses:
 E. Nau Landt
 Norman Moore

Alfred Ernst Inventor
 By his Attorneys
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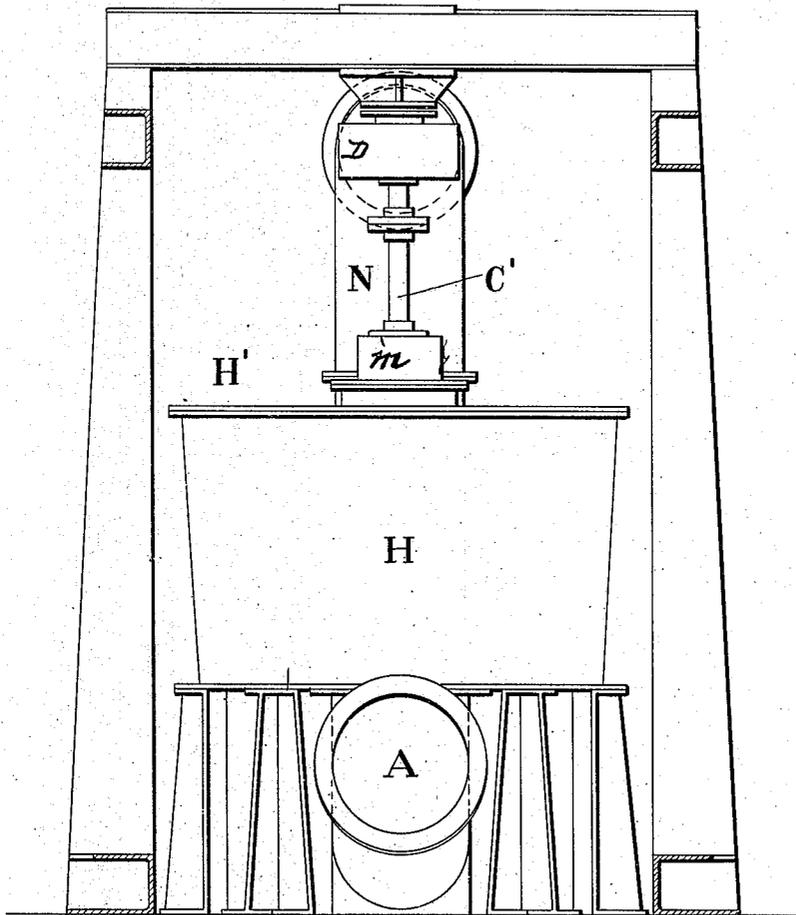


Fig. 2

Witnesses:
E. Vai. Landt
Norman Morris

Alfred Ernst Inventor
By his Attorneys
Benney & Ogden

UNITED STATES PATENT OFFICE.

ALFRED ERNST, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE COAL AND COKE BY-PRODUCTS COMPANY, A CORPORATION OF WEST VIRGINIA.

PROCESS OF CLEANING GASES.

No. 900,062.

Specification of Letters Patent.

Patented Sept. 29, 1908.

Original application filed February 14, 1908, Serial No. 415,847. Divided and this application filed April 15, 1908. Serial No. 427,163.

To all whom it may concern:

Be it known that I, ALFRED ERNST, a citizen of the United States, and a resident of Pittsburg, in the State of Pennsylvania, have invented certain new and useful Improvements in Processes of Cleaning Gases, of which the following is a specification.

The invention relates to a process for cleaning and purifying the gases by extracting by-products and impurities from the gas.

The object of the invention is to produce a simple and effective gas cleaning process.

The invention may be used with many kinds of gas, and I have selected for illustration of the process a machine designed for washing and purifying the gases liberated in by-product coke ovens, and for extracting the by-products, such as ammonia and tar.

This application is a division of my co-pending application Serial No. 415,847, filed February 14, 1908.

In the accompanying drawings: Figure 1 is a vertical sectional view; and Fig. 2 is a side elevation of the same, partly in section, seen from the left side of Fig. 1.

At A is the gas inlet, through which the coke oven gas is introduced into the machine after being partly cooled in the gas collecting mains on top of the ovens and the conducting pipes leading to this machine. The inlet A slants downward and has two continuations, one downward at A' and water-sealed in the water space B, and the other one, A'', extending upwards. The water space B collects the ammonia water and the other products that are extracted in the machine. An overflow B' is provided at a suitable height. The gas entering the inlet A is met by a strong fine spray from the nozzle G. This spray, if of water, meeting the hot gas, will cause a very considerable evaporation of water and will also absorb a very considerable proportion of the ammonia and some of the other impurities present. The gas, with the evaporated water and finely divided spray, passes up the pipe A'' and issues therefrom into the inverted rotary cup C driven by shaft C' and pulley D, which is suitably driven at high speed. The inverted cup C extends down a considerable distance around

the pipe A'', so that the gas has to flow downwards around the pipe A'' before passing beneath the lower edge of the cup C. The inner wall of the cup C is provided with a series of inwardly projecting beaters or blades E which move with it, and the outer surface of the pipe A'' is provided with similar beaters or blades F between which the blades E pass with high velocity and in close proximity, as shown.

Owing to the combined action of the beaters and centrifugal force, the gas is subjected to a very thorough mixing and beating action; and the dust and finely divided spray or liquids of any sort are thrown outwards against the inner surface of the cup C, down which they may pass to its lower edge and be thrown off, finally passing down through the pipe I into the water seal B. The lower surface of the upper end of the cup C is also provided with beaters or blades E', as shown, to aid in the action. The outer surface of the cup C is provided with a series of concentric annular shelves J which preferably are progressively longer from the lowest to the highest and which are provided at frequent intervals with depending blades or vanes K. The outer casing H incloses the space around the cup C and extends from the tube A downwards and outwards and then upwards, flaring slightly instead of being parallel with the wall of the cup C. At the top H' of the casing it is provided with a water-seal M for the shaft C' and the gas outlet N. In the upper portion of the apparatus, and preferably in the gas outlet N, is located a second spray nozzle O which delivers a spray into the gas above the rotary cup C. This spray falls partly on the top of the cup C, partly on the shelf J, and partly onto the uppermost stationary shelf L. There are a series of these shelves secured on the inner wall of the casing H and preferably slanting inwards and downwards, as shown, and extending nearly to the wall of the cup C between the shelves J and vanes K. The water falling on the rapidly rotating cup C and uppermost shelf J is thrown off by the centrifugal action directly

against the inner wall of the casing. Thence flowing downwards and inwards along the stationary shelf L, it drips onto the next shelf J, from which it is again thrown off in a fine spray against the casing. Again it flows downwards and inwards over the second shelf L onto the third shelf K, and so on through the series. In this way the gas flowing upwards around the cup C, is subjected to a violent beating and whirling action from the vanes K and is compelled to take a sinuous course around the successive shelves J and L and is intimately subjected to the water on the surface of the stationary shelves and in passing each of the shelves J is subjected to the fine spray thrown therefrom directly across the space through which the gas is passing. It will be seen that the gas as it passes outwards from the lower end of the cup C, passes upwards in this devious course to the gas outlet N, while the cleansing liquid from the spray O passes downwards in the opposite direction to the gas and finally escapes from the lowermost shelf L through the water-sealed pipe I, carrying with it the absorbed or collected impurities. The gas therefore meets the water in a fresher condition at each succeeding shelf as it passes toward the gas outlet, while the water passing downwards becomes richer and richer in impurities from the gas. I make no claim broadly, however, to the passing of gas and liquid in opposite directions for this purpose.

The other details of the apparatus will be readily understood, as applied, to those skilled in the art, without further description.

It will be seen that the gas is first subjected to a spray by which it takes up vapor, and if highly heated is considerably cooled by the spray. As a second step the gas is subjected to beating and centrifugal action as it passes downwards to the lower edge of the cup C, and then passing upward between the shelves J and L it is subjected intimately to the wet surfaces. It is subjected to the centrifugal action and to the spraying action on the outer side of the cup C and to the flowing water on the shelf L, the water flowing downward and the gas upward. Lastly, it is subjected to the spray O. As the gas thus cleaned passes from the apparatus with an excess of moisture, I prefer to pass it through a second apparatus substantially like that described, with the exception of the water sprays. In this second apparatus any condensed vapor or free moisture will be thrown out by the action of the apparatus, carrying with it the absorbed ammonia, and whatever other impurities it contains will drain down into the water seal beneath the apparatus.

In place of the water spray at G I may in-

troduce steam or part steam and water, according to the condition and qualities of the gas to be washed, the choice, as will be understood, depending largely on the composition and temperature of the gases. I desire also to include as equivalents other liquids used in place of the water.

I claim the following:

1. The improvement in the art of cleaning gases, which consists in subjecting the impure gas to a spray or jet of water or steam and causing the gas to take up vapor, then subjecting the gas to a combined beating and centrifugal action, allowing the excess of liquid with contained impurities to drain off, and then passing the gas in an upward direction between water-bearing shelves and there subjecting it to a beating, spraying and whirling action and to successively purer quantities of water.

2. The improvement in the art of cleaning gases, which consists in subjecting the gas while in a heated state to finely divided water and causing evaporation and draining off and catching the excess of water with attendant impurities, subsequently passing the gas in an upward direction and subjecting it while passing upward to a whirling, beating, and centrifugal action and to intimate contact with water passing in a downward direction and itself subjected to being thrown by the centrifugal action in a fine spray across the gas currents.

3. The improvement in the art of cleaning gases, which consists in subjecting the gas while in a heated state to a spray of water or steam and causing the gas to take up vapor before being subjected to centrifugal and beating effect, then conveying the gas to beaters and subjecting it to combined beating and centrifugal action, subsequently passing the gas in an upward direction and there subjecting it while passing upwards to a beating action a plurality of times and to successively purer quantities of water each time, for substantially the purposes set forth.

4. The improvement in the art of cleaning gases, which consists in subjecting the gas while in a heated state to a spray of water or steam and causing the gas to take up vapor before being subjected to centrifugal and beating effect, then conveying the gas to beaters and subjecting to combined beating and centrifugal action, subsequently passing the gas in an upward direction and there subjecting it while passing upwards to a beating action a plurality of times and to successively purer quantities of water each time and subsequently subjecting the gas to a jet or spray of water after it leaves the immediate vicinity of the beaters, for substantially the purposes set forth.

5. The improvement in the art of cleaning

gases, comprising subjecting the gas to water and to beating and centrifugal action while passing the gas upwards and the water downwards in contact with the gas, whereby the gas is violently beaten while being subjected to successively purer quantities of water.

In testimony whereof I have signed this

specification in the presence of two subscribing witnesses, April 9th 1908.

ALFRED ERNST.

Witnesses:

S. B. FRITZ,
ALICE A. TRILL.