

No. 652,773.

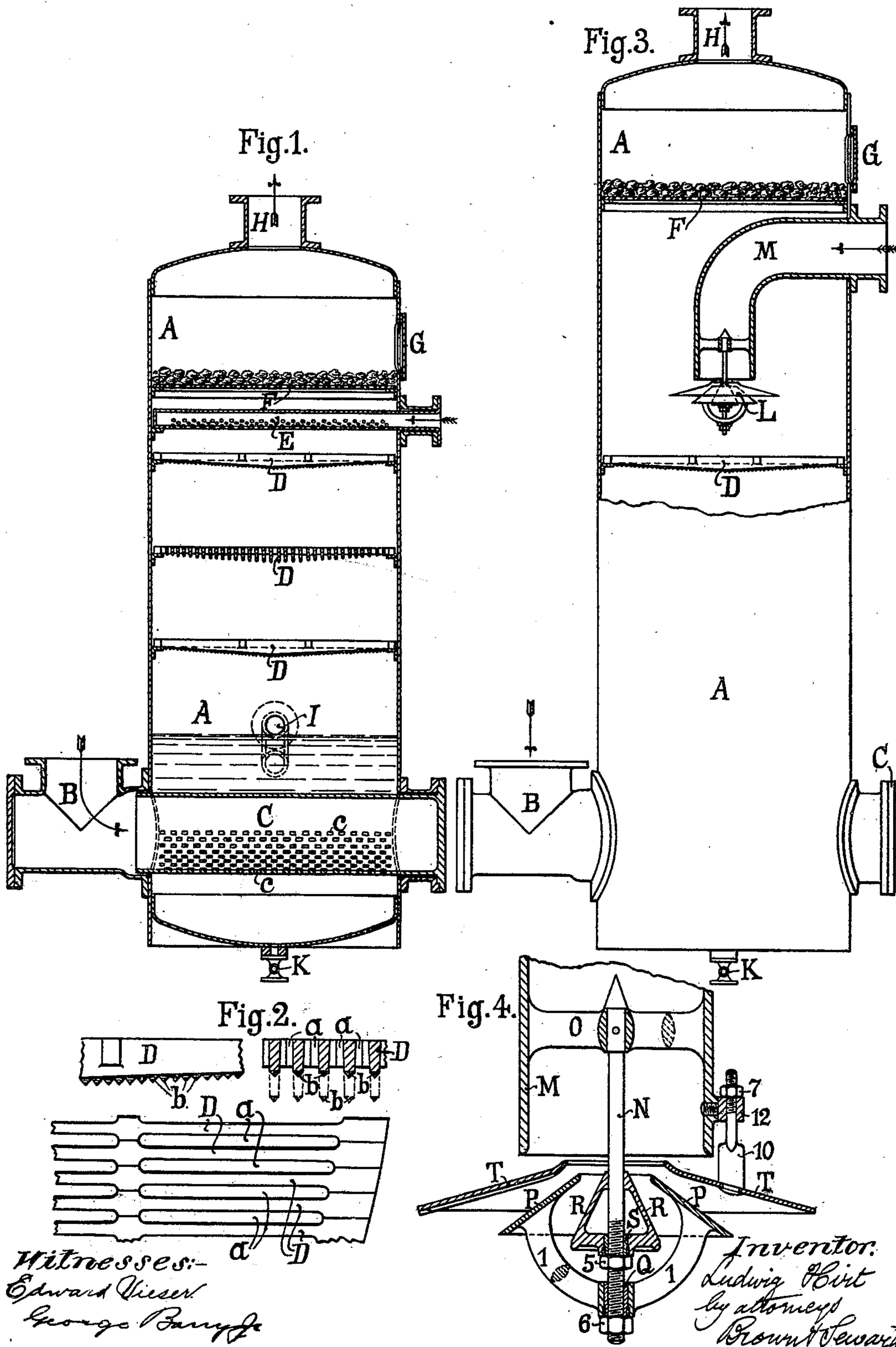
Patented July 3, 1900.

L. HIRT.

APPARATUS FOR CLEANSING AND COOLING GAS.

(Application filed Aug. 28, 1899.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

LUDWIG HIRT, OF GREVENBROICH, GERMANY.

## APPARATUS FOR CLEANSING AND COOLING GAS.

SPECIFICATION forming part of Letters Patent No. 652,773, dated July 3, 1900.

Application filed August 23, 1899. Serial No. 728,153. (No model.)

*To all whom it may concern:*

Be it known that I, LUDWIG HIRT, a subject of the King of Prussia, Emperor of Germany, and a resident of Grevenbroich, Kingdom of Prussia, German Empire, have invented new and useful Improvements in Apparatus for Cleansing and Cooling Gases, especially Carbonic Acid in Sugar Manufacturing, of which the following is a specification.

10 The herewith-described invention has for its object an apparatus for the cleansing or "scrubbing" of gases—that is, the retaining and removing of mechanically-carried-over particles and the washing of the gases themselves. At the same time these latter may be cooled.

While the apparatus forming the subject-matter of my invention may be applied to a variety of uses, the apparatus is particularly well adapted for the cleaning, washing, and cooling of the carbonic-acid gas used in sugar manufacture.

Figure 1 shows the apparatus in central vertical lengthwise section. Fig. 2 shows details of the grates used in the apparatus on a larger scale than Fig. 1. Fig. 3 shows the apparatus partly in elevation and partly in section with a modified form of water-distributing appliance. Fig. 4 is an enlarged detail vertical sectional view of the modified form of water-distributing appliance.

30 The apparatus shown in Fig. 1 in longitudinal vertical section consists of the vessel or receptacle A, of suitable cross-section, that is supplied with the following-named fittings and appliances: For the admission of the gas an inlet B is provided on the lower side of the receptacle A, to which inlet is connected the pipe C, which extends into the receptacle A and which has in its lower half perforations *c* and is closed at the opposite end to that at which the gas enters. This pipe C can, as may be seen in Fig. 1, reach through the wall of the receptacle A and may be fastened thereto by a flange. This has the advantage of permitting the ready removal of the pipe for cleaning purposes.

In the interior of the receptacle A there lie, above the pipe C, grates D. In the drawings

three of these gratings are shown, but more of them may be used. These gratings D consist of single grate-bars or of grate-plates cast, like several grate-bars, together. In the further description I shall consider only grate-bars. The single grate-bars have lateral projections, by means of which when the bars are laid together side by side long openings or slits *a* are formed between the bars. The cross-section of each bar—that is, their lateral sides—tapers from above downward and terminates in the pyramid or conical "dropping-corners" *b* on the lower side of each bar. The height of these grate-bars can be proportionate to the mass of water and the volume of gas-currents that flow upon, over, or past them and may be different in different parts of the apparatus. The bars of the superposed gratings can also be so arranged that they are laid either in a suitable angle to each other (preferably those in one row ninety degrees to those in the next ones above and below) or under each opening or slot a bar shall come.

Above the grating a suitable water-sprayer is arranged. This can consist of a pipe E, that within the receptacle is perforated on its under half or side. In place of this pipe the distribution of the water can also be effected (as seen in Fig. 3, which is otherwise like Fig. 1) by spray-plates L, the arrangement of which is seen in Fig. 4.

The construction and operation of the distributing-plates or spray plates or cones for the cooling-water are as follows, in the accompanying illustration three such plates or cones being shown, although more or fewer may be used. These distributors are attached to the central vertical cooling-water pipe M, although they may be otherwise attached, if so desired. This central pipe has a bridge O, the arms of which are for the purpose of offering minimum resistance to the water lens-shaped in cross-section. For the same reason the middle of the bridge or spider that is made into a central eye is furnished with an upward-pointing conical tip. In this eye there is fastened the spindle N, that is threaded along its lower portion. On this spindle N



there are the adjustable distributing cones or funnels P and R. The middle funnel-shaped plate P has a supporting-bow I, of lens-shaped cross-section, that carries the sleeve Q, which latter has an interior thread. By means of this the plate P is screwed on the spindle N and can be vertically adjusted. The nut 6, which sits on the spindle N under the sleeve Q, serves as a lock-nut as well as to fasten the plate P. The inner distributing-plate R, which has the form of a truncated cone, has a screwed sleeve S, which can be adjusted on the threaded part of the spindle N. The nut 5 serves as a lock-nut and also to make this plate R fast on the spindle. The outer plate T is fastened by three screws 10 with flat heads, which screws are led through the eye 12 on the pipe M. By means of the nuts 7, which are on the screws 10 above the eye 12, this plate T can be vertically adjusted. Between or among the plates R P T, on the one hand, and between the plate T and the pipe M, on the other hand, are spaces, the width of each of which can be varied by adjustment of the distributing-cones. The water which flows through M is by means of the distribution-cones diverted sidewise. It goes through the spaces between the plates and the pipe and is thereby sprayed or spread in fine films or sheets of parabolic bell form upon the entire surface of the underlying parts of the condenser vessel A. Adjustment of the plates regulates the proper distribution of the cooling-water over this surface.

Above the water-spreader there is, as seen in Figs. 1 and 3, a sieve F, which serves for the separation of any water from the gas as the latter passes from the apparatus, as will hereinafter more fully appear. For the better attainment of this end there can be laid on this sieve a filtering material or coke. The manhole G serves for the bringing in of this material and for general cleaning out of the apparatus. The nozzle H, attached to the cover of the vessel A, serves for the outlet of the cleaned gases. The water which collects in the vessel A goes through the water-overflow I, Fig. 1, when it reaches the right height. The pipe connected to the water-overflow is bent to form an ordinary water-trap, as indicated at  $\alpha$ , and which is constantly filled with water, so as to constitute a water seal for the prevention of the escape of gas or the entrance of air.

The blow-off cock K serves for the complete emptying of the apparatus.

The operation of the apparatus is as follows: The water which enters through the water sprayer or distributor is by this latter distributed in a rain or shower over the entire upper surface of the upper grating. This water trickles downward along the grating-surface and falls from the dropping surfaces or points finely divided upon the grating-surfaces below, which effect a still finer subdi-

vision. By reason of the great number of dropping surfaces or points there results between the grates and below the lowest one a fine mist-like rain, which offers an enormous water-surface to the gases which meet it. The water which falls collects in the lower part of the vessel until it reaches the overflow and what would reach a greater height than this leaves the apparatus. The gas which comes into the pipe C through the nozzle B is compelled to leave the pipe through the openings  $c$ , Fig. 1, in a finely-divided condition and to rise through the water column which exists in the vessel A. In this manner a large part of the coarser impurities will be removed. The gas goes now through the mist-like water-shower below and between the gratings and between these and the water-sprayer. At the same time it comes in contact with the surfaces of the gratings. In this manner the gas gives up its last impurities. Then it passes for separation from the possibly mechanically-entangled water through the sieve-plate F and the filter layer which lies thereupon and at last leaves the apparatus through the nozzle H. By means of this previously-described procedure the gas is however thoroughly cooled by the water, especially as it is so finely divided.

I claim—

1. In an apparatus for cleansing and cooling gases, the combination of a main vessel, gas inlet and openings therefor, a gas-distributing device extending throughout the diameter of the vessel and located in the lower portion thereof, a water-spraying device located in the upper portion of the vessel, a series of superposed gratings having the openings therein the openings in each grate being angularly disposed to the openings in an adjacent grate, said gratings being interposed between the water-spraying and gas-distributing devices and a filter layer located above the water-spraying device and in the path of the gas-outlet.

2. In an apparatus for cleansing and cooling gases, the combination of a gas-distributor located in the lower portion of the apparatus and comprising a pipe C open at its inlet end and perforated on its lower side, a filter layer F in the upper part of the apparatus, a gas-outlet pipe H above the filter, a water-spraying device consisting of an inlet-pipe E perforated on its under side, said water-spraying device being located under the filter layer, a plurality of superposed gratings D having the openings therein the openings in each grate being angularly disposed to the openings in an adjacent grate for fine division of the dripping water and an overflow-pipe I provided with a cooperating water seal, said overflow being located above the gas-distributor.

3. In an apparatus for cleansing and cooling gases, a filter layer, a water-inlet with

water - distributing device below said filter  
layer, a gas-inlet device and several super-  
posed horizontal gratings or slotted plates D,  
the crevices or slots of which latter are cross-  
5 wise to each other, with pyramidal dropping-  
points for the equal distribution of the water  
which trickles through the crevices or slots,  
throughout the interior of the apparatus.

In testimony that I claim the foregoing as  
my invention I have signed my name, in pres- 10  
ence of two witnesses, this 18th day of July,  
1899.

LUDWIG HIRT.

Witnesses:

CARL KNOOP,  
HERNANDO DE SOTO.