No. 866,706. PATENTED SEPT. 24, 1907.

J. ZELLWEGER.

GAS WASHER.

APPLICATION FILED SEPT. 13, 1906.

Fig.1.

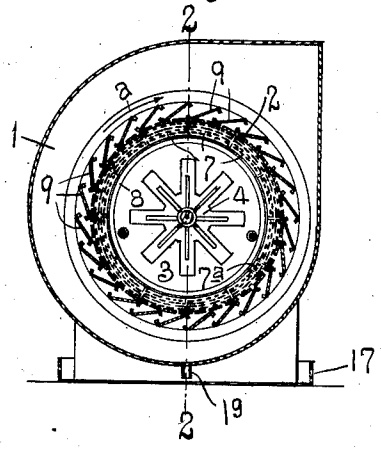


Fig.2.

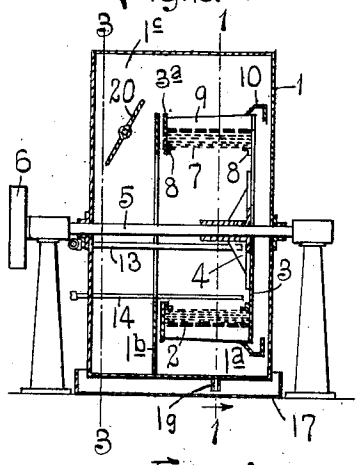


Fig.3.

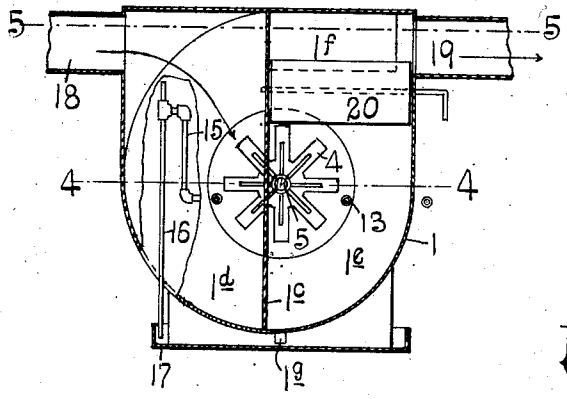


Fig.4.

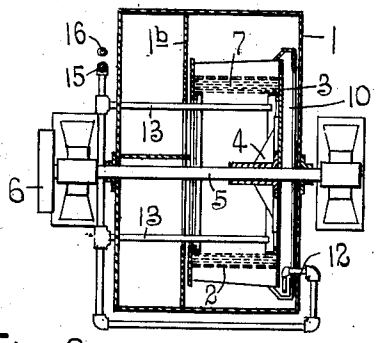


Fig.5.

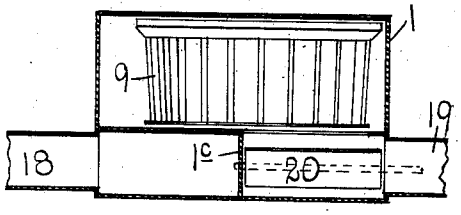


Fig.6.

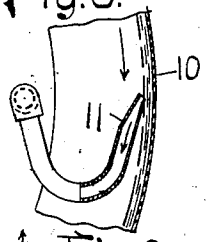


Fig.7.

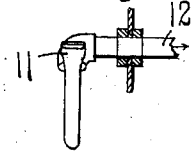
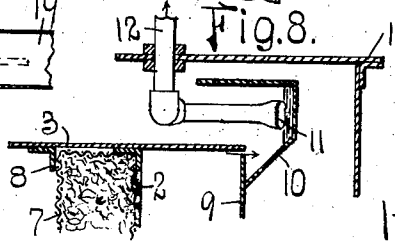


Fig.8.



Witnesses
A. J. McCauley.
Geo. K. Ladson.

Inventor:
John Zellweger
by Bakewell & Cornwall Atty's

UNITED STATES PATENT OFFICE.

JOHN ZELLWEGER, OF ST. LOUIS, MISSOURI.

GAS-WASHER.

No. 866,706. Specification of Letters Patent. Patented Sept. 24, 1907.

Application filed September 13, 1906. Serial No. 334,513.

To all whom it may concern:

Be it known that I, JOHN ZELLWEGER, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Gas-Washers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical cross sectional view of my improved gas washer, on the line 1—1 of Fig. 2; Fig. 2 is a longitudinal sectional view on the line 2—2 of Fig. 1; Fig. 3 is a vertical cross sectional view on the line 3—3 of Fig. 2; Fig. 4 is a horizontal sectional view on the line 4—4 of Fig. 3; Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 3; Fig. 6 is a detail view of the skimmer; Fig. 7 is a similar view; and Fig. 8 is a sectional view showing the skimmer in position.

This invention relates to a new and useful improvement in gas washers, the object being to simplify the construction of devices of this character and also to construct a machine in which the same gas can be washed repeatedly. By such repeated washing, gas may be cleaned not only of dust but also of condensable tar vapors, free carbon and gases absorbable by water.

My improved gas washer is designed especially for the purification of producer gas and blast furnace and other gases.

In the drawings, 1 indicates a casing in which is mounted a filter ring designed to be rotated at a relatively high rate of speed so as to force the gas, together with its cleansing liquids, outwardly by centrifugal force. This filter ring, as shown in Fig. 2, consists of a perforated cylinder 2 supported by a disk plate 3, said disk plate being mounted upon a spider 4 arranged on the shaft 5. Shaft 5 extends outside the casing and is mounted in suitable bearings and carries a pulley 6, which latter is belted to some suitable source of power.

The filtering material for washing combustible gases may be twisted metal bands, layers of corrugated wire netting or expanded metal, which for protection against corrosion may be copper plated or enameled. This filtering material is preferably arranged in separate compartments or boxes made up of wire mesh and arranged inside the filter ring as shown in Fig. 1. These boxes 7, are held in position by flanged rings 8.

In order to insert and remove the boxes without dismantling the filter ring, I provide a smaller box 7^a, see Fig. 1, which constitutes a key to hold the larger boxes 7 in position. Any appropriate means may be provided for removably securing the key 7^a in place. This key box is the last to be inserted to complete the ring of filtering material, and the first to be removed in the event that it is desired to take out any one of the boxes 7 for the purposes of repair or renewal of filtering material. The boxes 7 resting against the perforated cylinder 2 being supported in position by the flanged ring 8, preferably have no other fastening means.

The disk plate 3 which constitutes a solid head of the filter ring, has a companion plate 3^a forming an opposite end ring for the perforated cylinder 2. The opening in this ring 3^a permits gas and water to be introduced into the interior of the filter ring. Around the perforated cylinder 2 are vanes or wings 9 which have lips or flanges extending around their inner and outer edges respectively, the flange along the inner edge being out-turned and that on the outer edge being in-turned, the latter forming a gutter for the collection of liquid which is projected outwardly by centrifugal force through the filter ring. These wings or vanes overlap each other, as shown in Fig. 1, and are disposed in the direction of rotation of the filter ring as indicated by the arrow *a*. The outer guttered portions of these vanes 9 are slightly inclined, as shown in Figs. 2, 4 and 5, so that liquid caught by the vanes will run to one end thereof, that is, toward the disk plate 3. Between the disk plate 3 and the outer end of the vanes 9, are provided openings as shown in Fig. 8, and through which the liquid may pass, and, flying outwardly under centrifugal force, be caught in a circular reservoir formed by the flanged ring 10 mounted upon and carried by the disk plate 3 of the filter ring.

11 indicates a skimming nozzle extending into the reservoir 10 and terminating near the outer wall thereof, said skimming nozzle being connected to a pipe 12 extending outside the casing where it connects to branches 13 projecting into the open end of the filter ring where said branches are perforated. By this means, as the filter ring is rotated the water collected in the reservoir 10 will pass by momentum into the skimmer through the pipe 12 to the branches 13 and will again be introduced upon the inner surface of the filtering material. Fresh water is introduced upon the inner surface of the filtering material through a pipe 14. In order to take care of surplus liquid, pipe 12 is provided with an upwardly extending branch 15 which connects with an overflow pipe 16 extending down into a pan or other receptacle 17. In this manner should the skimmer 11 supply more liquid through branches 13 than can escape through the openings in the ends thereof and onto the filtering material, the liquid will rise in pipe 15 and overflow into pan 17. From the pan 17 the liquid may be conducted off through a suitable pipe to the sewer or other place of discharge for the utilization of the substances cleaned out of the gas.

Referring to Fig. 2 it will be seen that the casing 1 is divided by partition walls into several compartments in one of which, 1^a is located the filter ring. This compartment 1^a is formed by a division wall 1^b, which division wall has an opening corresponding in size to the opening in the open end of the filter ring. 1^c in-

dicates a partition wall arranged substantially parallel to the shaft 5 and at right angles to the wall 1^b. In this manner compartments 1^d and 1^e are formed, both of which communicate with the interior of the filter ring through the opening in the partition wall 1^b.

18 indicates a supply conduit for the gas communicating with the compartment 1^d, or said conduit may lead directly to the eye of the filter ring, in which event the compartment 1^d would be useless. 19 indicates a discharge pipe which leads from the compartment 1^e. An opening 1^f establishes communication between the space in the compartment 1^a outside the filter ring with the compartment 1^e. A damper 20 is arranged to regulate communication between the opening 1^f in the partition wall 1^b and the opening in said partition wall which registers with the eye of the filter ring.

In operation assuming that the gas to be washed is generated in suitable quantities and enters the apparatus through the pipe 18, it will leave said apparatus by pipe 19 to the point of consumption. As the filter ring is rotated at a high rate of speed it draws in the gas to be washed from the compartment 1^d and discharges it into the chamber around the filter ring whence it passes through the opening 1^f into the compartment 1^a and back into the filter ring, if the damper 20 is open to permit such action. If, however, the damper 20 is closed, the gas will pass into the conduit 19 under considerable pressure. The pressure of gas in conduit 19 depends upon the position of the damper 20. When damper 20 is open the gas will be repeatedly passed through the filter ring and thus will be repeatedly washed. When the damper is partly open, some of the gas discharged by the filter wheel reënters said wheel and the remainder passes out of the casing through pipe 19. It will be observed that by adjusting the damper 20, the bulk of the gas can be washed as often as desired. If it is not necessary to wash the gas a number of times the damper 20 can be closed and the washed gas, after passing through the filter ring once, will enter the conduit 19.

By disposing the vanes in the direction of travel of the filter ring particles of the cleansing liquid passing through the filtering material and the perforations in the filter cylinder will be caught and forced to run along the gutters at the outer edges of the vanes into the cylinder reservoir 10. The vanes overlapping each other will prevent any liquid passing into the chamber around the filter ring. In the event, however, that liquid escapes beyond the vanes, and in order to carry off any liquid deposited in the chamber when the filter ring ceases rotating, the casing 1 is provided with a discharge opening 1^g in its bottom which discharges the liquid accumulated in the casing into the pan 17.

While I have shown the construction of my improved apparatus where the same is to be used for washing combustible gas, it is necessary to make the parts of metal which will not be affected by the particular gas being treated, or the parts could be plated or coated with enamel so that the gas would not act upon the metal.

While I have mentioned combustible gas as the principal gas to be treated, it is obvious that my improved apparatus could be used in cooling and purifying air.

I have found by experiment that air passed through the apparatus shown in the drawings will have its temperature considerably reduced, in addition to having the foreign particles removed therefrom. In one engine room where I have an apparatus installed for cooling and purifying air, where air entering with a temperature of 105 degrees—115 degrees F. became heated to 115 degrees—125 degrees F., the machine cooled the entering air to 80 degrees—85 degrees F. and maintained in the engine room a temperature of 90 degrees—95 degrees F. according to the humidity of the air used.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In an apparatus of the character described, the combination with a rotating filter ring, a circular reservoir connected to said filter ring, means for collecting liquid projected from the filter ring and delivering said liquid into said reservoir, a skimmer projecting into the reservoir for removing liquid therefrom, and a pipe connected to said skimmer for returning the liquid back to the interior periphery of the filter ring; substantially as described.

2. In an apparatus of the character described, the combination with a rotating filter ring, guttered vanes attached thereto for collecting liquid projected from said filter ring, a circular reservoir connected to said filter ring and into which said guttered vanes discharge said liquid, and means for removing the liquid from said circular reservoir; substantially as described.

3. In an apparatus of the character described, the combination with a rotating filter ring, a reservoir carried by said filter ring, a skimmer coöperating with said reservoir, and a pipe with which said skimmer connects, said pipe conducting the liquid delivered into said skimmer back upon the inner periphery of the filter ring; substantially as described.

4. In an apparatus of the character described, the combination with a rotating cylinder provided with perforations, of a sectional ring-shaped filter bed arranged against the inner face of said perforated cylinder, said sectional filter bed being composed of separately removable perforated boxes containing filtering material, and means for securing said boxes in position; substantially as described.

5. In an apparatus of the character described, the combination with a rotatable perforated cylinder, of a sectional filter bed disposed around the inner surface thereof, one of said sections being a key section for holding the other sections in place; substantially as described.

6. In an apparatus of the character described, the combination with a rotatable cylinder formed from perforated material, of a ring-shaped filtering member arranged inside of said cylinder and composed of a plurality of perforated boxes containing filtering material, and means for holding said boxes in position; substantially as described.

7. In an apparatus of the character described, the combination with a rotatable perforated cylinder, of boxes made up of wire mesh and containing filtering material, said boxes being arranged around the inner periphery of said cylinder and one of said boxes constituting a key fof holding the remaining boxes in place, and a flanged ring cooperating with said boxes; substantially as described.

8. In an apparatus of the character described, the combination with a rotatable filter ring through which liquid and gas pass, means for collecting the liquid and delivering the same into a circular reservoir carried by said filter ring, a skimmer for removing the liquid from said reservoir and delivering the same into a pipe, said pipe extending back into the filter ring for discharging said liquid upon the inner surface thereof, and an overflow pipe connected with said first mentioned pipe; substantially as described.

9. In an apparatus of the character described, the combination with a filter ring, a circular reservoir carried thereby for receiving liquid, a skimmer arranged in said reservoir and connected to a pipe, said pipe conducting the liquid collected by said skimmer back into the filter ring, an overflow pipe coöperating with said first mentioned pipe, and a pipe for supplying fresh liquid to the inner surface of the filter ring; substantially as described.

10. In an apparatus of the character described, the combination with a casing, a rotating filter ring in said cas-

ing, a conduit for supplying gas to be washed to the eye of the filter ring, a passage leading from the space outside the filter ring back to the eye of the ring, a discharge conduit leading from said passage, and means in said passage for regulating the passage of gas therethrough; substantially as described.

11. In an apparatus of the character described, the combination with a casing, a filter ring arranged in said casing, a conduit for supplying gas to be washed to the eye of said filter ring, said casing forming a connection between the space around the filter ring and the eye of said filter ring, a damper in said connection, and a discharge pipe leading from the casing; substantially as described.

12. In an apparatus of the character described, the combination with a casing, a wall in said casing, said wall having openings, a filter ring in said casing whose eye registers with one of the openings in said wall, a conduit for supplying gas to be washed to the eye of the filter ring, which gas passes outwardly after being washed and is discharged into a space around the filter ring and passes through an opening in said wall back to the eye of the filter ring, a damper between said last named opening and the eye of the filter ring, and a discharge pipe leading from the casing; substantially as described.

13. In an apparatus of the character described, the combination with a casing divided into three compartments, in one of which is arranged a rotating filter ring whose eye communicates with the other two compartments, a supply conduit communicating with one of said other compartments, a discharge conduit leading from the other of said compartments, and a communication between the compartment containing the filter ring and outside of said filter ring and the compartment from which leads the discharge conduit; substantially as described.

14. In an apparatus of the character described, the combination with a casing divided into three compartments, in one of which is arranged a rotating filter ring whose eye communicates with said other two compartments, a supply conduit leading into one of said other compartments, a discharge conduit leading from the other of said compartments, said last mentioned compartment communicating with the compartment containing the filter ring at a point outside of said filter ring, and a damper arranged between said point of communication and the opening leading to the eye of the filter ring; substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this eleventh day of September 1906.

JOHN ZELLWEGER.

Witnesses:
F. R. CORNWALL,
GEORGE BAKEWELL.