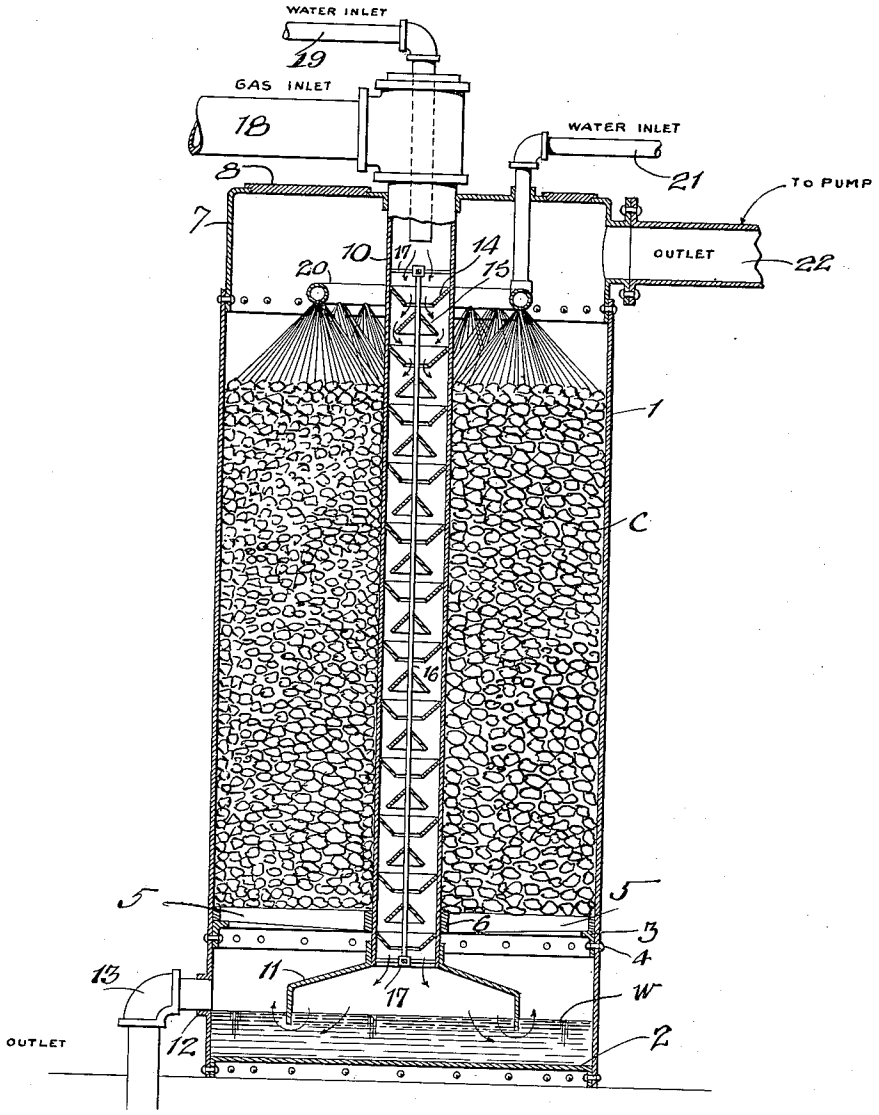
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GAS SCRUBBER

Filed July 16, 1920



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UNITED STATES PATENT OFFICE.

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GAS SCRUBBER.

Application filed July 16, 1920. Serial No. 396,665.

To all whom it may concern:

Be it known that I, HORACE G. JOHNSTON, a citizen of the United States, residing at Corsicana, in the county of Navarro and State of Texas, have invented certain new and useful Improvements in Gas Scrubbers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains, to make and use the same.

This invention relates to gas scrubbers particularly designated to remove the condensible vapors and solid particles from hot gases withdrawn from a gas producer.

It is an object of my invention to efficiently cool and clean the hot gases by causing the current of gas withdrawn from the producer to turn upon itself so that the return current may completely surround the current flowing in the opposite direction, while subjecting both currents to a cooling and washing action whereby there may be an efficient interchange of heat between the two currents and a compactness of the apparatus for washing or scrubbing the gas.

A further object is to pass the gas through a water seal in such a manner as to prevent excessive agitation of the water constituting the seal.

Other more specific objects will appear in the detailed description and claims.

The drawing is a vertical section through an improved gas scrubber embodying my invention.

An upright cylindrical container is indicated at 1, said container having a bottom 2 riveted or otherwise secured thereto or formed therewith so as to provide a water tight joint. A short distance above the lower portion of the container and within the same is a support for a grating shown as an annular angle member 3 riveted or bolted to the container 1, as shown at 4. Resting upon the angle member 3 is a grating or perforated support 5 having a central annular opening at 6. The supporting member 5 may be in the form of radiating grate bars. The cylindrical member 1 has its top closed by a cap 7 riveted or otherwise secured thereto. The cap 7 may have suitable manholes or other openings 8 therein, as desired. Extending through the top 7 and through the opening 6 in the support 5, substantially central of the container 1, is a gas inlet conduit or pipe 10 having at its lower end, below the grating 5, a greatly enlarged section or bell 11, the lower edge of which extends below the level of a drain orifice 12 in communication with a drain pipe 13. Within the pipe 10 is a vertical series of baffles 14—15. These baffles may be of any approved type, but I prefer to use baffles of the form shown in the drawing, consisting of alternately arranged conoidal shells in relatively reversed positions, each baffle 14 having a central opening and having its circumferential edge secured to the inner side of the tube 10, while each baffle 15 is secured to a rod 16 passing through its apex, its circumferential edge being spaced from the wall of the tube 10. The rod 16 may be supported by spiders 17 at the upper and lower ends of the tube.

Connected with the upper end of the pipe 10 is a gas inlet pipe 18 through which hot gases from a producer may be drawn into the pipe 10. Projected centrally into the upper portion of the pipe 10 is a water pipe 19. Encircling the pipe 10 in the upper part of the chamber is an annular pipe 20 positioned midway between the outer surface of the pipe 10 and the inner surface of the container 1. Perforations are formed in the pipe 20 whereby water entering the pipe 21, which is tapped into the pipe 20, may be forcibly sprayed downward and over the area between the pipe 10 and the inner walls of the container 1. An outlet pipe 22 is connected at or near the top of the container 1, said outlet being in communication with a pump or other means for drawing the gas into and out of the scrubbing apparatus.

In use, the annular chamber formed by the container 1 and the pipe 10 will be filled with coke or other suitable scrubbing material *c* resting upon the grating 5. An air pump or equivalent means, will, in operation, draw gas through the pipe 18, through the pipe 10, and water seal, up through the scrubbing material surrounding said pipe 10 to the top of the container 1, whence it will finally issue through the outlet 22. A continuous flow of water passing through pipe 19 into the central tube 10 will mingle with the gas passing downward through said pipe, over the baffles, so that the gas will be cooled by contact with the water;

vapors of tar, oil, or other condensible matter will be condensed and carried with the water into the bottom of the container. Water flowing through the water inlet 21 will be sprayed over the top of the coke or other scrubbing material within the container 1 and the scrubbing material will be thoroughly wetted.

The water passing down through the pipe 10 and through the coke or other scrubbing material will collect in the bottom of the chamber and its level will be maintained as at *w* at a height determined by the height of the water outlet 12 above the bottom 2. Thus the lower end of the enlarged mouth-member 11 projects below the surface of the water and forms a water seal so that all gas issuing through the pipe 10 must pass through the water before it turns upward into the scrubbing material. The tar or oil will therefore be removed in the water seal and will float off through the orifice 12, preferably to a collection chamber, whereafter the tar and oil may be removed from the water and saved, if desired. The water seal will also remove dust and other material so that the gas issuing from the water seal will be in a relatively clean condition. The gas then passing up through the scrubbing material *c* will be caused to spread out and take tortuous paths in contact with the wet, cool surfaces of the scrubbing material so that by the time it reaches the upper portion of the container 1 it is adequately clean. The cooling water percolating down through the scrubbing material assists in cooling the tube 10, there being an interchange of heat between the water passing down through the said tube and that passing down through the scrubbing material and also an interchange between the oppositely flowing currents of gas. By this arrangement an efficient cleansing and cooling of the gases is obtained in a compact space.

By reason of the considerable expansion permitted by the enlargement 11 at the lower end of the pipe 10, the gas may be removed from the said tube through the water seal with such a reduction of speed as not to cause undue agitation of the water, with the consequent difficulty of keeping it at an even level and will be more widely distributed through the water seal in smaller bubbles than when the discharge end of the pipe 10 is not expanded.

Having described my invention in a manner to enable those skilled in the art to make and use the same, what I claim is:

1. In a gas scrubber, a container adapted to inclose scrubbing material and having a gas outlet at one end, a gas inlet pipe entering said container at the outlet end continuing thereinto and opening adjacent at the opposite end, baffling means in the pipe, and means for discharging water onto said baffling means and into the container around said pipe.

2. In a gas scrubber, a container adapted to inclose scrubbing material and having a gas outlet at one end, a gas inlet pipe centrally arranged with respect to said container and arranged to discharge into the container at the end opposite that provided with said gas outlet, baffling means within the pipe, means for admitting water to said pipe so that it will flow over the baffles, and an annular spraying device within the container, surrounding the pipe and arranged midway between said pipe and the walls of the container.

3. A gas scrubber comprising a container having a gas outlet in its upper end, a gas inlet pipe extending downward from the upper end of said container and opening into said container near the bottom thereof, said pipe being arranged centrally of the container, a grating for supporting scrubbing material near the bottom of said container above the opening in said gas inlet pipe, baffles in the pipe, means for admitting water to the pipe, and means for spraying water evenly over scrubbing material resting upon the grating.

4. The combination of a container adapted to hold sealing water in its lower end, a gas outlet at its upper end, means for maintaining the sealing water at a constant level, a gas inlet pipe entering the container, extending downward therein and having its lower end disposed so as to dip into the water of the water seal, means for supporting scrubbing material in the container above the water seal, baffling means in the gas inlet pipe within the container, and means for distributing water over the baffling means and over the scrubbing material.

5. A gas scrubber comprising a container, a gas washing and condensing conduit having an enlarged imperforate bell open at its lower end, a drain pipe so disposed as to maintain a constant-level water seal in said container into which said bell dips, a gas outlet from said container and means for admitting water through and about said conduit.

6. In a gas scrubber, a container having in its lower portion a drain pipe so disposed as to maintain a constant-level water seal, a gas inlet conduit entering the upper end of the container and extending downward therein, said conduit having an enlarged imperforate bell open at its lower end below the surface of the water seal, a gas outlet at the upper end of the container and means for admitting water through and about said conduit.

7. In a gas scrubber adapted to remove oil, tar and other liquids from gas produced from coal or the like, a container, a drain

pipe so disposed as to maintain a constant level water seal in said container, a gas washing and condensing conduit entering said container and extending downward therein, said conduit having an enlarger lower discharge end below the water level adapted to permit the issuing gas to pass upward in relatively small bubbles well distributed throughout the water, a gas outlet, means for showering scrubbing water within the container around the inlet conduit and means for admitting water direct to said conduit.

In testimony whereof I affix my signature.

HORACE G. JOHNSTON.