CLAIMS

We claim:

1. A scrubber apparatus for removing contaminants from a gas stream, comprising:

a) a tank having a ceiling, a floor, a gas inlet, a gas outlet, a scrubbing fluid inlet at an upper end, and a scrubbing fluid outlet in the floor;

b) a submerged head extending horizontally between the four walls of the tank above the scrubbing fluid outlet and below the gas outlet, wherein the submerged head comprises a plate having a plurality of narrow slots extending throughout, four solid joined vertical walls inset from the walls of the tank and extending below the plate to form an open ended box under the plate, and a row of scrubbing fluid openings along each edge of the plate between the walls of the tank and the vertical walls of the submerged head;

c) a first baffle extending horizontally between the four walls of the tank and disposed above the submerged head and below the gas outlet; and

d) one or more spray means for spraying scrubbing fluid from an upper end of the tank.

2. The scrubber apparatus of claim 1, further comprising:

a) a first flooded head extending horizontally between the four walls of the tank above the first baffle and below the gas outlet, wherein the flooded head comprises a plate having a plurality of narrow slots extending throughout;

b) a second baffle extending horizontally between the four walls of the tank and disposed above the first flooded head and below the gas outlet.

3. The scrubber apparatus of claim 2, further comprising:

a) a second flooded head extending horizontally between the four walls of the tank above the second baffle and below the gas outlet;

b) a third baffle extending horizontally between the four walls of the tank and disposed above the second flooded head and below the gas outlet.

4. The scrubber apparatus of claim 1, 2, or 3, wherein the gas inlet is located at the top end of the tank and a gas inlet duct conducts the gas to a position below the submerged head.

5. The scrubber apparatus of claim 1, 2, or 3, wherein the gas inlet is located at the side of the tank and a gas inlet duct conducts the gas to a position below the submerged head.

6. The scrubber apparatus of claim 1, 2, or 3, wherein the gas inlet is located below the submerged head of the tank.

7. The scrubber apparatus of claims 1, 2 or 3, further comprising an access door in one or more walls of the tank.

8. The scrubber apparatus of claims 1, 2 or 3, further comprising a mist eliminator having four vertical walls forming a hollow vertical column contiguous with the tank, wherein the mist eliminator comprises an absorbent mesh extending between the four walls of the mist eliminator.

9. The scrubber apparatus of claims 1, 2 or 3, further comprising an access door in one or more walls of the tank.

10. The scrubber apparatus of claim 1, 2, or 3, wherein the flooded head further comprises an overflow pipe disposed through the plate of the flooded head.

11. The scrubber apparatus of claims 1, 2 or 3, wherein the spray means comprises one or more spray nozzles positioned near the ceiling of the tank.

12. The scrubber apparatus of claims 1, 2 or 3, wherein the slots of the submerged head are cut at an angle of between 20 and 40 degrees from vertical
and the flooded head

13. The scrubber apparatus of claims 2 or 3, wherein the slots of the flooded head are cut at an angle of between 20 and 40 degrees from vertical.

14. The scrubber apparatus of claims 1, 2 or 3, wherein the spray means comprises one or more spray nozzles positioned near the ceiling of the tank.

15. The scrubber apparatus of claims 1, 2 or 3, wherein the size of the slots in the submerged head are selected to prevent passage therethrough of scrubbing fluid in the presence of gas below the submerged head unless the level of scrubbing fluid exceeds a selected height above the submerged head.

16. The scrubber apparatus of claims 1, 2 or 3, wherein the size of the slots in the flooded head are selected to prevent passage therethrough of scrubbing fluid in the presence of gas below the flooded head unless the level of scrubbing fluid exceeds a selected height above the flooded head.

17. The use of the apparatus of any one of claims 1 to 16 to remove contaminants from a gas stream.

18. A method of removing contaminants from a gas stream, the method comprising:

a) introducing a scrubbing fluid into the apparatus of any one of claims 1 to 16 to a desired fluid level;

b) cooling a contaminated process gas using a prior art gas conditioner;

c) introducing the cooled contaminated gas into the apparatus of any one of claims 1 to 14 at a position below the submerged head;

d) allowing the gas to pass upwardly through the submerged and flooded heads and one or more baffles to transfer contaminants from the gas into the scrubbing fluid;

e) spraying the exiting gas to remove additional contaminants and slow the gas flow velocity;

f) allowing the exiting gas to exit the scrubbing apparatus;

g) draining scrubbing fluid from the bottom of the tank to maintain a desired scrubbing fluid level; and

h) cleaning drained scrubbing fluid for reuse in the scrubbing apparatus.

19. A plant assembly for processing contaminated gas streams, comprising one or more of the scrubbing apparatus of any one of claims 1 to 16.

20. The use of the apparatus of any one of claims 1 to 16 to remove from a gas stream one or more contaminants selected from the group of contaminants comprising nitrous oxide, nitric oxide, carbon dioxide, and sulphur dioxide.

CLAIMS

1. A scrubber apparatus for removing contaminants from a gas stream, comprising:

a) a tank having a ceiling, a floor, a gas inlet, a gas outlet, a scrubbing fluid inlet at an upper end, and a scrubbing fluid outlet in the floor;

b) a submerged head extending horizontally between the four walls of the tank above the scrubbing fluid outlet and below the gas outlet, wherein the submerged head comprises a plate having a plurality of narrow slots extending throughout, four solid joined vertical walls inset from the walls of the tank and extending below the plate to form an open ended box under the plate, and a row of scrubbing fluid openings along each edge of the plate between the walls of the tank and the vertical walls of the submerged head;

c) a first baffle extending horizontally between the four walls of the tank and disposed above the submerged head and below the gas outlet; and

d) one or more spray means for spraying scrubbing fluid from an upper end of the tank.

2. The scrubber apparatus of claim 1, further comprising:

a) a first flooded head extending horizontally between the four walls of the tank above the first baffle and below the gas outlet, wherein the flooded head comprises a plate having a plurality of narrow slots extending throughout;

b) a second baffle extending horizontally between the four walls of the tank and disposed above the first flooded head and below the gas outlet.

3. The scrubber apparatus of claim 2, further comprising:

a) a second flooded head extending horizontally between the four walls of the tank above the second baffle and below the gas outlet;

b) a third baffle extending horizontally between the four walls of the tank and disposed above the second flooded head and below the gas outlet.

4. The scrubber apparatus of claim 1, 2, or 3, wherein the gas inlet is located at the top end of the tank and a gas inlet duct conducts the gas to a position below the submerged head.

5. A plant assembly for processing contaminated gas streams, comprising one or more of the scrubbing apparatus of any one of claims 1 to 4.