

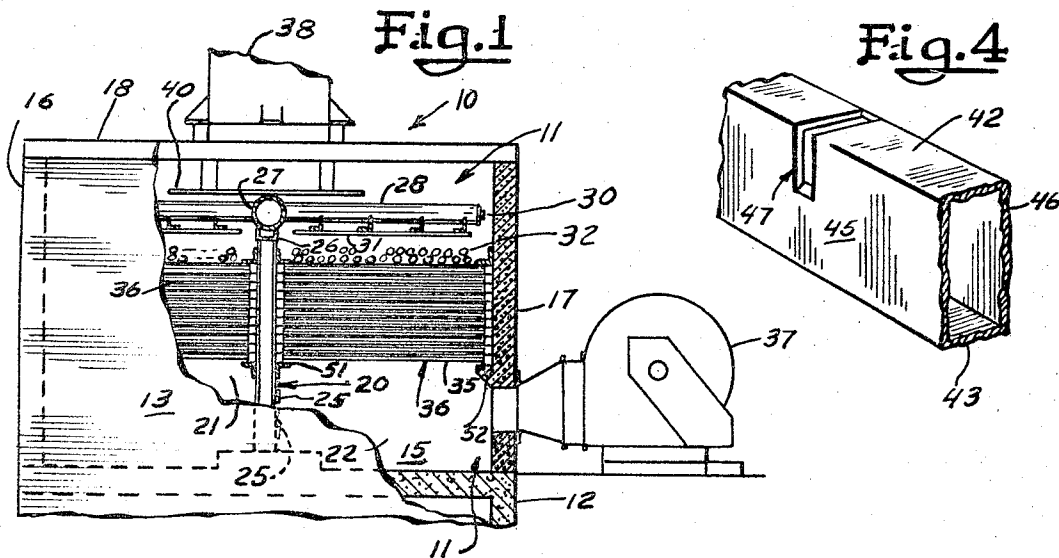
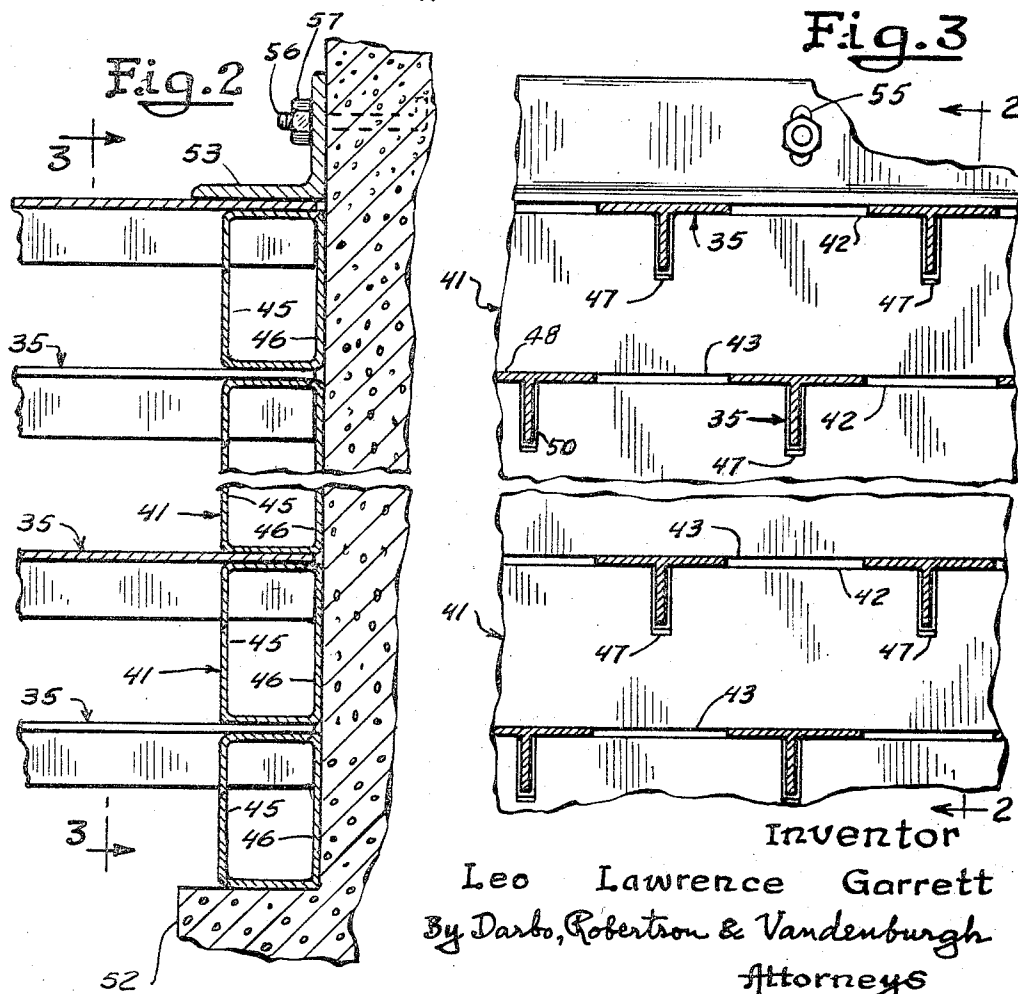
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TRICKLING BAR ASSEMBLY FOR BLOW-OUT TOWERS

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Designation of figures

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## TRICKLING BAR ASSEMBLY FOR BLOW-OUT TOWERS

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9 Claims

### ABSTRACT OF THE DISCLOSURE

A trickling bar assembly for blow-out towers in which a water supply is trickled through the assembly which is made up of stacked layers, each layer comprising a row of parallel nonwarping T-bars (which may be cut from conventional metal stock) supported at their ends by tubes which may be metal, rectangular in cross section. Each tube is notched downwardly through its top wall and a side wall lying under the T-bars to receive the leg of the T, the end of which bears approximately against the unnotched side wall of the tubular support. The notches of successive levels are staggered to stagger the bars, and the top flange of each T is wider than the spacing between the bars above to catch water dripping through.

This invention relates to trickling bar structures such as are used in blow-out towers in which a water supply is trickled down through horizontal slats with air blown between them to strip from the water such objectionable dissolved gases as  $H_2S$ ,  $CO_2$  and methane. The present disclosure of an improved assembly of the trickle bars is offered for public dissemination in the event that adequate patent protection can be given.

Blow-out towers for the stripping of objectionable gases from a water supply have been known heretofore, but they have been provided with wooden slats, and these slats have long been recognized to be objectionable in many ways. If the slats warped, they would cause a concentration of water flow at one or more points along their length rather than evenly therealong, and this renders the slats relatively useless for their intended purpose. In time, the deformation may become so extreme as to cause the slats to fall out of place. According to the present invention, the slats are made of metal, preferably aluminum, and the assembly is of such a construction as to provide an extremely satisfactory assembly, but which is nevertheless of reasonable cost as to both material costs and assembly time. Also, if servicing should be needed, disassembly is extremely simple and holds servicing time to a minimum.

In its preferred construction, the materials used for the slat assembly comprise standard and readily available T-bars and standard rectangular tubing, the only modification of either that is required (besides cutting to length) is that of cutting notches in the tubing, as by rotary saws. Matched pairs of horizontal lengths of tubing are horizontally spaced apart and lie along the tower walls, or divider supports, and serve as spaced supports for the T-bars which form the trickling slats. The notches in the tubing are to receive the legs of the T's, and by notching only the innermost wall of each tube, opposite extreme ends of each T-bar are longitudinally positioned between and adjacent to the outermost unnotched walls of the tubes, thereby holding the tubes in place against the tower walls or divider supports.

Additional objects and advantages will become apparent from the description on the drawings.

FIGURE 1 is an elevational view partly broken away to a vertical section of a typical blow-out tower incorporating the present invention;

FIGURE 2 is a fragmentary vertical sectional view through the form of trickling bar assembly chosen for illustration of the invention;

FIGURE 3 is a vertical sectional view approximately on a plane transverse to the plane of FIGURE 2 and taken generally along the line 3-3 thereof; and

FIGURE 4 is a fragmentary perspective view of one of the supporting tubes shown in the other figures, with the saw-kerf type of notch preferred for these tubes.

Although the following disclosure offered for public dissemination is detailed to ensure adequacy and aid understanding, this is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how others may later disguise it by variations in form or additions or further improvements. The claims at the end hereof are intended as the chief aid toward this purpose; as it is these that meet the requirement of pointing out the parts, improvements or combinations in which the inventive concepts are found.

Referring now to the drawings in more detail, the trickling bar assembly forms an integral part of a blow-out tower such as that shown generally in FIGURE 1, the general configuration of which is old. The outer structure of the tower 10 itself forms an enclosure 11 of generally rectangular shape defined by a lower supporting base 12, four upright side supports or walls including parallel front and rear walls 13 and 15 extending upwardly from base 12 as well as parallel left and right walls 16 and 17 extending upwardly from base 12 and joining front and rear walls 13 and 15, and a horizontal top wall or roof 18 joining the vertical walls at their uppermost portions. Tower 10 also includes an internal and vertically extending divider support 20 which divides the enclosure 11 generally into a left chamber 21 and a right chamber 22, as viewed in FIGURE 1. The lower portions of divider support 20 are generally open to permit the free flow of air between chambers 22 and 21, but may have air diffusers or baffles 25 attached thereto for purposes to be described later. Upper portions 26 of the divider support 20 support an elongate water supply pipe 27 extending horizontally through front wall 13 and extending rearwardly to a capped end (not shown) in the proximity of wall 15. Extending laterally outwardly from each side of supply pipe 27 are a plurality of longitudinally spaced distributor pipes 28, each having a cap 30 at its outermost end and a plurality of longitudinally spaced holes in its lowermost surface. Distributor pipes 28 receive water to be treated brought into the tower by means of supply pipe 27 and distribute this water downwardly through said holes in a relatively even pattern between the four side walls. Attached to, and hanging directly below each of the distributor pipes 28 is a splash plate 31 which sprays out each stream in all directions.

The water splashing off splash plates 31 drops downwardly, under the influence of gravity, onto a spreader bed such as several layers of chunks or balls 32 of DOW FN-90 Polyethylene Maspac. After working through these layers, the water flows downwardly through a plurality of horizontal trickling bars 35. Trickling bars 35 are arranged in a plurality of vertically spaced and horizontally aligned rows, each row including a plurality of trickling bars spaced at regular intervals throughout the space between front and rear side walls 13 and 15. As can be seen in FIGURE 1, each of the chambers 21 and 22 is provided with its own trickling bar assembly 36.

As the water moves downwardly through the trickling bar assembly, it is exposed to a current of fresh air forced upwardly through the assembly. This current of fresh air is supplied by means of a conventionally powered blower 37 which forces air through the lower portion of the side wall 17 and into the lower portions of chambers 21 and 22. Equal distribution of pressure in each of these chambers, or of upward flow from them, is accomplished by means of baffles 25 already mentioned above. The fresh air moves upwardly through the trickling bars, absorbing undesirable gases from the water, and then passes out of the enclosure 11 through a stack 38 extending through the upper wall 18 of the tower 10. Proper flow of the air near its point of exit is maintained by means of a baffle 40 attached to lower portions of the stack 38.

As has been pointed out earlier, the subject of this invention is concerned with the specific structure of the trickling bar assembly 36. Herein this structure includes a plurality of elongate support members 41 in the form of hollow rectangular tubes stacked in horizontally spaced apart and parallel pairs. Preferably, these support members 41 are made of water-resistive material, such as aluminum, so as to be free from the adverse effects of warping and corrosion. The support members are conveniently cut to length from standard runs of commercially available tubing so as to minimize their cost and construction time.

Each of the members 41 includes an upper horizontal wall defining an upper surface 42, a lower horizontal wall defining a lower surface 43, and a pair of vertical and spaced apart side walls 45 and 46 which join the upper and lower walls. Longitudinally spaced along the entire length of each member 41 are a plurality of transversely oriented notches or slots 47 spaced apart a distance slightly less than twice the width of a trickling bar. These notches are each cut through the upper wall and the upper part of side wall 45 of each support member 41 by some convenient means such as a rotary saw. Although the configuration of each notch as well as the spacing between any two adjacent notches is the same for all of the support members, their placement on the support members follows two distinct patterns, as will be seen upon a viewing of FIGURE 3. Each of the members 41 is of a length generally equal to the perpendicular distance between front and rear tower walls 13 and 15, and the spacing between each horizontal pair of support members in a trickling bar assembly is defined by the distance between the divider support and one of the left and right side walls 16 and 17 against which the support members are laterally supported. Side walls 45 of each horizontal pair of support members face one another in this position, and the notches 47 therein act as guides for a plurality of trickling bars supported thereon and extending therebetween, to be described next.

Each of the trickling bars 35 consist of an elongate member of generally T-shaped cross section having a top or table portion 48 which is flat, wide and relatively thin, and lower depending leg portions 50. The length of the T-bars 35 is slightly less than the perpendicular distance between the outermost unnotched side walls 46 of each horizontally spaced pair of support members 41. T-bars 35 are also made of a suitable corrosion and warp-resistant material, preferably aluminum. The T-shaped cross section is a commercially available structural shape which only requires the single operation of cutting it to length to finish it and render it suitable for assembly.

It will be noted that each of the slots 47 in the support members 41 is slightly wider than the thickness of the depending leg portions 50 of the T-bars 35 so that the leg portions at each longitudinal end of a T-bar may be slipped easily into each of a pair of corresponding slots 47 on a horizontal pair of support members to prevent lateral movement of the T-bar relative thereto. Slots 47 are slightly deeper vertically than the vertical depth of the depending leg 50 so that upper or table portions 48 of the T-bars rest on the upper surface 42 of the support member, thereby holding the table portions level.

In assembling the trickling bar assembly, and referring only to right chamber 22 of FIGURE 1 to avoid a duplication of description, a first and lowermost pair of support members 41 are placed on level supports provided therefor as at 51 and 52, support 51 being an angle iron attached to the right side of divider support 20 at the same level as support 52, previously formed on the left side of side wall 17. A first row, or layer, of T-bars 35 are then horizontally bridged across these support members by slipping them into the notches provided therefor in the support members. Inasmuch as the length of each support member 41 is very nearly equal to the distance between front and rear walls 13 and 15, the support members are restrained from any longitudinal movement, and inasmuch as the T-bars are very nearly of a length equal to the distance between divider support 20 and one of the side walls, support members 41 are constrained from lateral movement inasmuch as the notch 47 does not extend through the vertical outer wall 46 of the support members.

A second horizontal pair of support members is then rested on the uppermost longitudinal end portions of the first row of T-bars 35. This second horizontal pair supports a second horizontal row of T-bars, however, the slots 47 are each longitudinally aligned midway between the slots in the lowermost support member. The positioning of the notches 47 in the next higher or third support member is identical to, and vertically aligned with, those of the lowermost or first support member, and the positioning of the notches in the fourth support member is the same as, and aligned with those of the second, and so on. Any desirable number of rows of T-bars can be stacked in the same fashion as described heretofore, and the uppermost row is desirably fixed in a position by means of a clamp or angle bar as at 53, this serving to lock the entire assembly. Angle bar 53 is provided with a plurality of elongated slots 55 which are placed over studs 56 secured in the side wall 17 and divider support 20, and (after being pressed firmly down on T-bars 35) is clamped in place as by nut 57.

The entire assembly can be disassembled in short order merely by removing angle bars 53 and progressively slipping the T-bars out of their respective support members and removing same, and then the support members. In its assembled position, the assembly is extremely rigid and is almost entirely free from the adverse effects of the water.

What I claim is:

1. In an installation incorporating a trickling bar assembly to assist in the removal of undesirable gases dissolved in a liquid, an improved trickling bar assembly, comprising: support means; a plurality of horizontal pairs of elongate and substantially parallel support members arranged in vertically spaced apart horizontal planes, said plurality including a lowermost pair supported by said support means, and each support member having an upper supporting surface and a lower supporting surface, said upper surface of each support member having a series of parallel notches cut transversely therethrough; and a plurality of elongate and substantially horizontal trickling bars forming a vertically spaced apart series of horizontal rows, each of the bars of each row being substantially parallel and having upper portions aligned in a horizontal plane between one pair of support members, said trickling bars being cut from lengths of commercially available metal having a standard cross section including a wide and thin upper portion and a narrow and deep depending portion, each of the trickling bars of each row extending generally perpendicular to the pair of support members immediately supporting it and having its top portion resting thereon with its downwardly extending portion extending into said notch thereby preventing lateral movement thereof wherein the notches in said support members are cut only part way through horizontally in alignment with the trickling bars to provide an abutment limiting movement of the support members longitudinal of said trickling bars.

2. In an installation for the removal of undesirable gases from water, wherein said installation incorporates a forced fresh air supply blown upwardly against the downward flow of water, said installation including two parallel pairs of vertically extending structures, each pair being perpendicular to the other, an improved trickling bar assembly, comprising: a plurality of elongate and parallel trickling bars extending horizontally and longitudinally between one of said pairs, said trickling bars being arranged into a plurality of horizontal rows extending between said other pair, each of said rows being spaced vertically relative to one another, each of said trickling bars having a generally T-shaped cross section of a width slightly greater than the spacing between adjacent T-bars in a given row, the T-bars in each row lying under the space between the T-bars in the row next above, and a plurality of elongate and horizontal support members lying adjacent said one pair at each longitudinal end of said T-bars and aligned generally perpendicularly thereto for supporting said T-bars in their respective positions, each of said support members being formed of rectangular tubing and having a plurality of slots cut perpendicularly part way therein along their upper portions at equal intervals therealong for receiving the lower portions of said T-bars and maintaining the horizontal spacing thereof in their respective rows, each of said support members supporting one of said rows of T-bars, and each above the lowermost member resting on the longitudinal end portions of an immediately subjacent row of T-bars to thereby form a rigid and easily assembled structure.

3. In an installation for the removal of undesirable gases from water, wherein said installation incorporates a forced fresh air supply blown upwardly against the downward flow of water, said installation including two parallel pairs of vertically extending structures, each pair being perpendicular to the other, an improved trickling bar assembly, comprising: a plurality of elongate and parallel trickling bars extending horizontally and longitudinally between one of said pairs, said trickling bars being arranged into a plurality of horizontal rows extending between said other pair, each of said rows being spaced vertically relative to one another, each of said trickling bars having a generally T-shaped cross section of a width slightly greater than the spacing between adjacent T-bars in a given row, the T-bars in each row lying under the space between the T-bars in the row next above, and a plurality of elongate and horizontal support members lying adjacent said one pair at each longitudinal end of said T-bars and aligned generally perpendicularly thereto for supporting said T-bars in their respective positions, each of said support members being formed of rectangular tubing and having a plurality of slots cut perpendicularly part way therein along their upper portions at equal intervals therealong for receiving the lower portions of said T-bars and maintaining the horizontal spacing thereof in their respective rows, each of said support members supporting one of said rows of T-bars, and each above the lowermost member resting on the longitudinal end portions of an immediately subjacent row of T-bars to thereby form a rigid and easily assembled structure; and clamping means attached to one of said pairs to vertically lock the assembly in its assembled configuration.

4. A trickling bar structure including a pair of spaced apart parallel elongate base supports, structural members forming vertically extending channels over said base supports facing one another, and an assembly of loosely laid interstacked trickling bars and support members confined by said structural members; said bars being substantially identical bars of T-shape in cross section cut to length from a common corrosion resistant metal stock; said support members being tubes of corrosion resistant metal extending under ends of the T-bars notched from their upper corners furthest under the T-bars and to receive the ends of the vertical legs of the T-bars to a depth allowing the

top portions of the T-bars to rest on the tops of the tubes, said T-bars bearing endwise against said support members to hold them in place.

5. A trickling bar structure including a pair of spaced apart parallel elongate base supports, structural members forming vertically extending channels over said base supports facing one another, and an assembly of loosely laid interstacked trickling bars and support members confined by said structural members; said bars being substantially identical bars of T-shape in cross section cut to length from a common corrosion resistant metal stock; said support members being tubes of corrosion resistant metal extending under ends of the T-bars notched from their upper corners furthest under the T-bars and to receive the ends of the vertical legs of the T-bars to a depth allowing the top portions of the T-bars to rest on the tops of the tubes; said T-bars bearing endwise against said support members to hold them in place and said support members being uniform lengths cut from common stock and being confined lengthwise thereof by structural members at the ends thereof.

6. A trickling bar structure including a pair of spaced apart parallel elongate base supports, structural members forming vertically extending channels over said base supports facing one another, and an assembly of loosely laid interstacked trickling bars and support members in and confined by said structural members; said bars being substantially identical bars of T-shape in cross section cut to length from a common corrosion resistant metal stock; said support members being tubes of corrosion resistant metal extending under ends of the T-bars notched from their upper corners furthest under the T-bars and to receive the ends of the vertical legs of the T-bars to a depth allowing the top portions of the T-bars to rest on the tops of the tubes; and said support members being uniform lengths cut from common stock and being confined lengthwise thereof by structural members at the ends thereof, each support member having its bar-holding notches staggered midway between the bar-holding notches of the bar above it, and the bars being wide enough to span the space between bars.

7. A trickling bar structure including a pair of spaced apart parallel elongate base supports, structural members forming vertically extending channels over said base supports facing one another, and an assembly of loosely laid interstacked trickling bars and support members in and confined by said structural members; said bars being substantially identical bars of T-shape in cross section cut to length from a common corrosion resistant metal stock; said support members being tubes of corrosion resistant metal extending under ends of the T-bars notched from their upper corners furthest under the T-bars and to receive the ends of the vertical legs of the T-bars to a depth allowing the top portions of the T-bars to rest on the tops of the tubes; and said support members being uniform lengths cut from common stock and being confined lengthwise thereof by structural members at the ends thereof, and confined lengthwise of the bars by a snug fit between facing structural members and the length determined by abutment of the support members at the ends of their notches against the ends of the bars.

8. In an installation incorporating a trickling bar assembly to assist in the removal of undesirable gases dissolved in a liquid, an improved trickling bar assembly, comprising: support means; a plurality of horizontal pairs of elongate and substantially parallel support members arranged in vertically spaced apart horizontal planes, said plurality including a lowermost pair supported by said support means, and each support member having an upper supporting surface and a lower supporting surface, said upper surface of each support member having a series of parallel notches cut transversely therethrough; and a plurality of elongate and substantially horizontal trickling bars forming a vertically spaced apart series of horizontal rows, each of the bars of each row being substantially

parallel and having upper portions alinged in a horizontal plane between one pair of support members, said trickling bars having a standard cross section including a wide and thin upper portion and a narrow and deep depending portion, each of the trickling bars of each row extending generally perpendicular to the pair of support members immediately supporting it and having its top portion resting thereon with its downwardly extending portion extending into said notch thereby preventing lateral movement thereof wherein the notches in said support members are cut only part way through horizontally in alignment with the trickling bars to provide an abutment limiting movement of the support members longitudinal of said trickling bars.

9. In an installation incorporating a trickling bar assembly to assist in the removal of undesirable gases dissolved in a liquid, an improved trickling bar assembly, comprising: support means; a plurality of horizontal pairs of elongate and substantially parallel support members arranged in vertically spaced apart horizontal planes, said plurality including a lowermost pair supported by said support means, and each support member having an upper supporting surface and a lower supporting surface, said upper surface of each support member having a series of parallel notches cut transversely therethrough; and a plurality of elongate and substantially horizontal trickling bars forming a vertically spaced apart series of horizontal rows, each of the bars of each row being substantially parallel and having upper portions aligned in a horizontal plane between one pair of support members, said trickling bars including a wide and thin upper portion and a narrow

and deep depending portion, each of the trickling bars of each row extending generally perpendicular to the pair of support members immediately supporting it and having its top portion resting thereon with its downwardly extending portion extending into said notch thereby preventing lateral movement thereof wherein the notches in said support members are cut only part way through horizontally in alignment with the trickling bars to provide an abutment limiting movement of the support members longitudinal of said trickling bars.

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