

Jan. 8, 1952

J. L. ERISMAN
ROTARY DRIER OR COOLER

2,581,756

Filed June 19, 1947

5 Sheets-Sheet 1

Fig. 1.

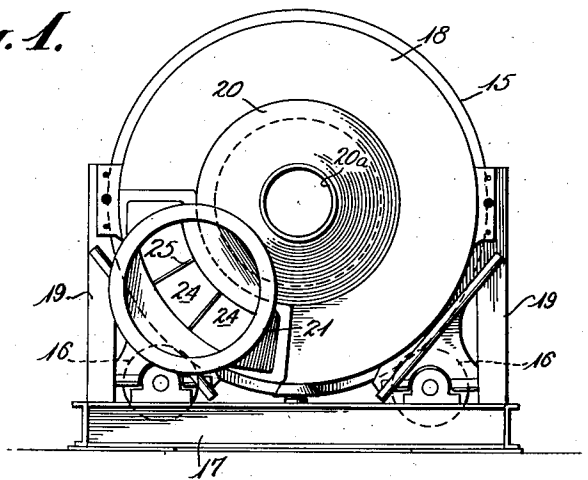
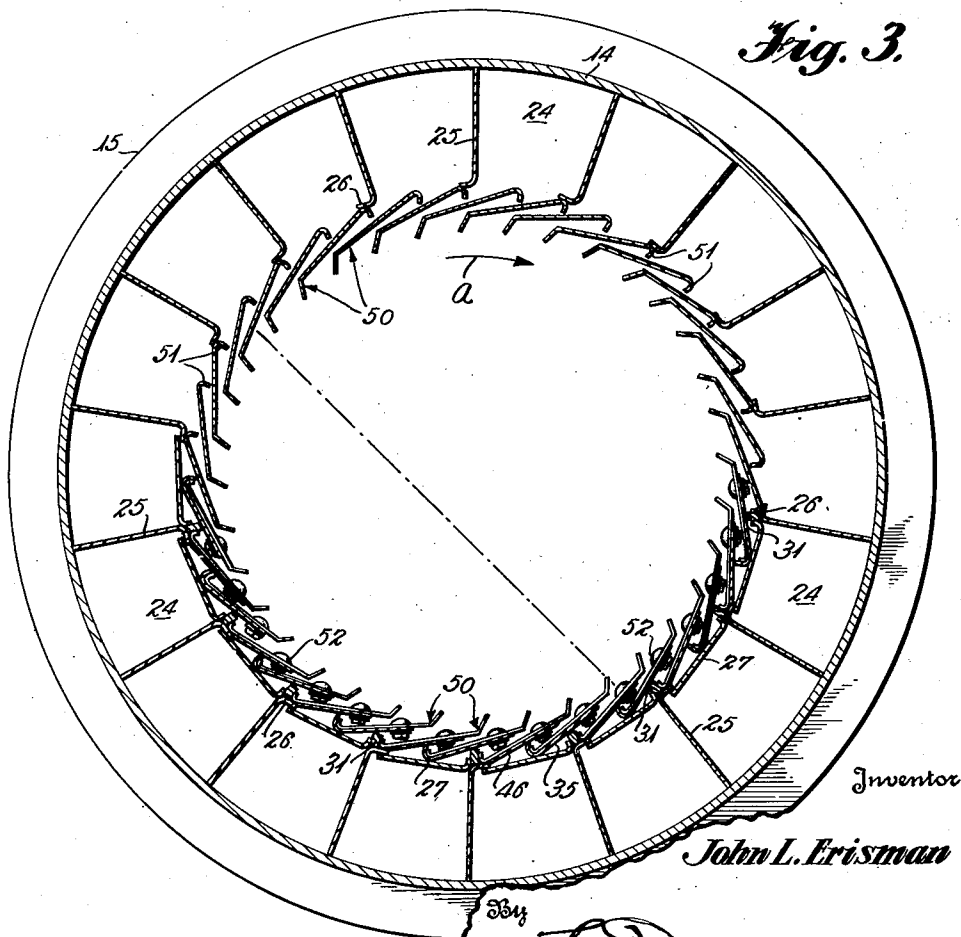


Fig. 3.



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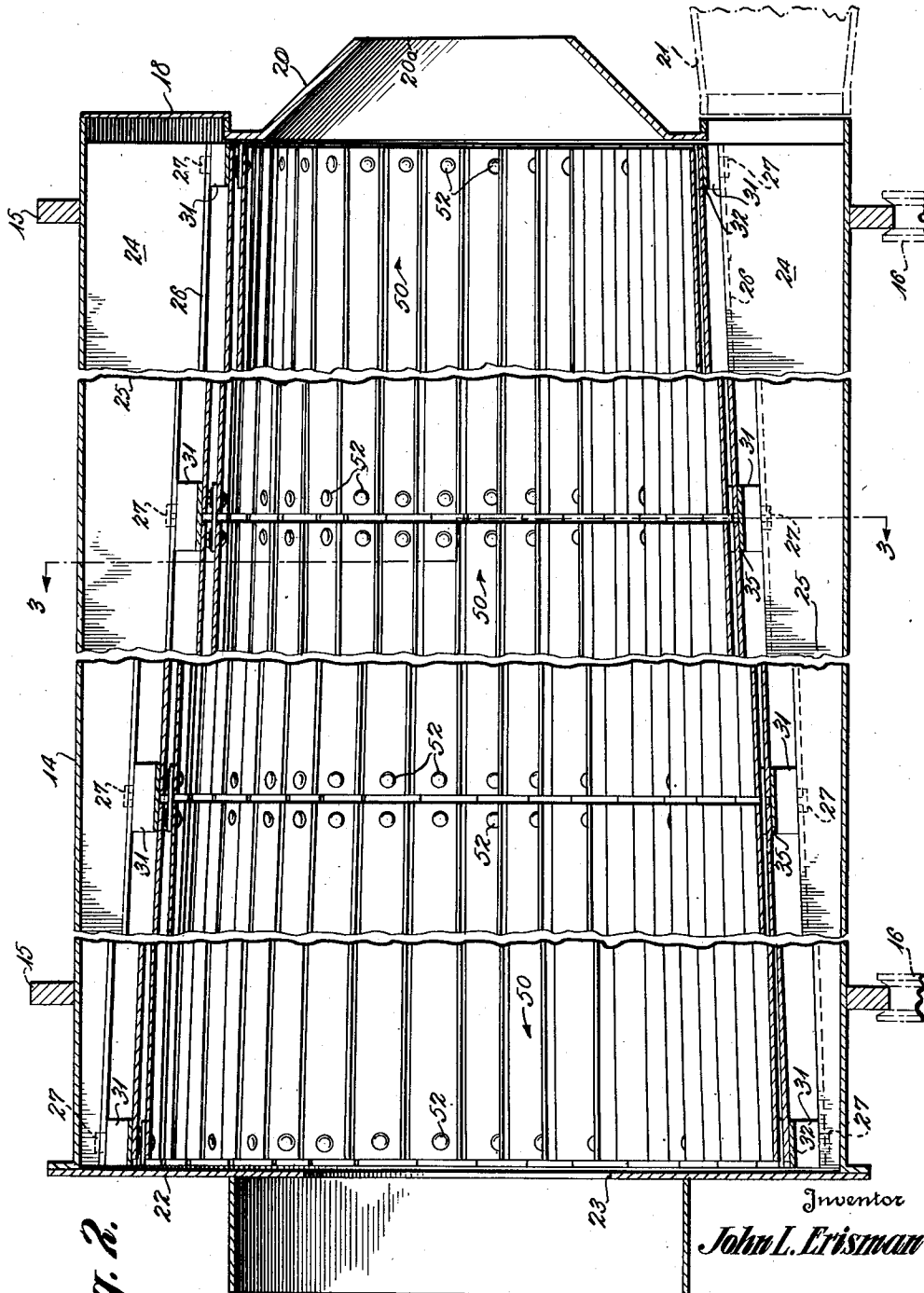
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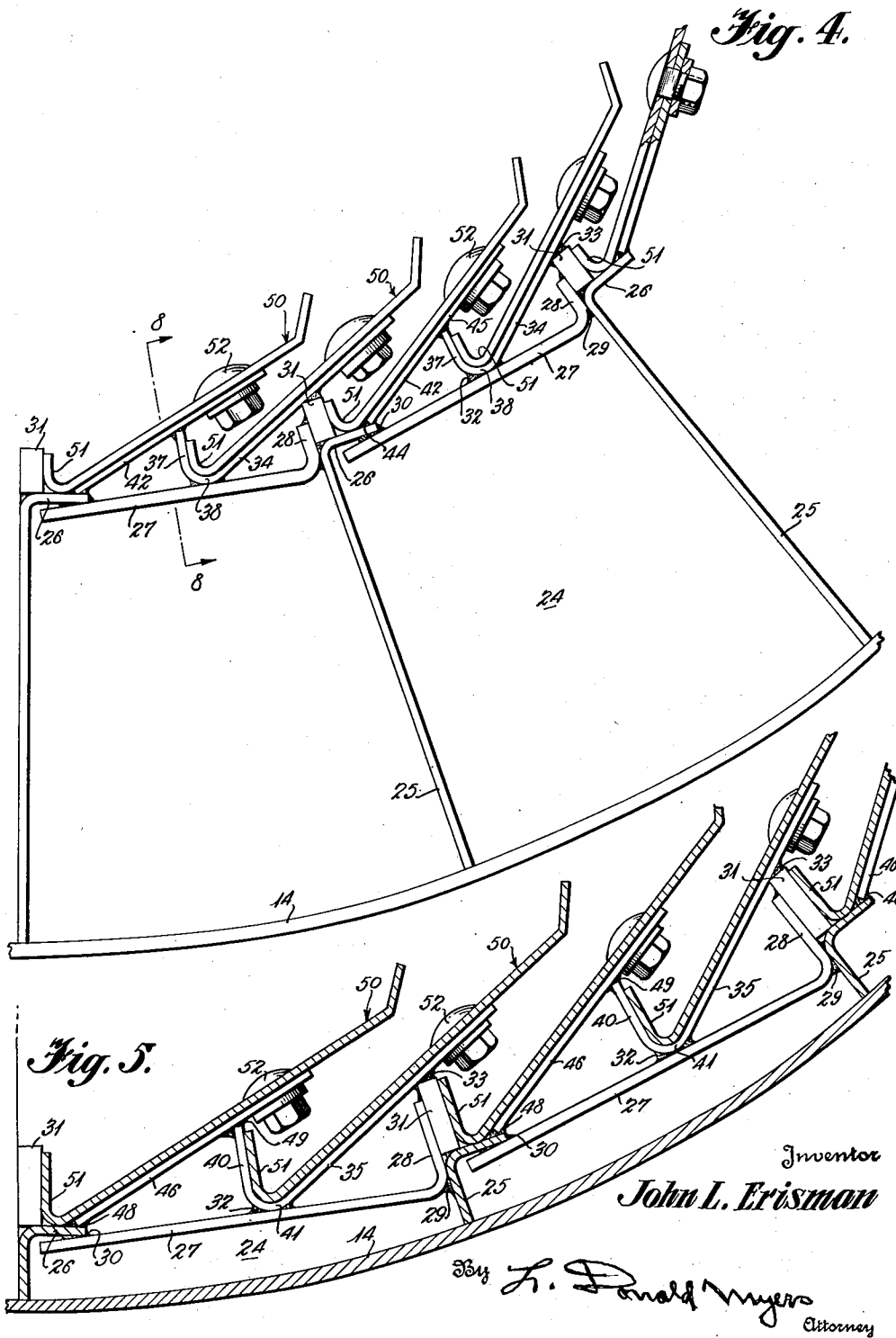
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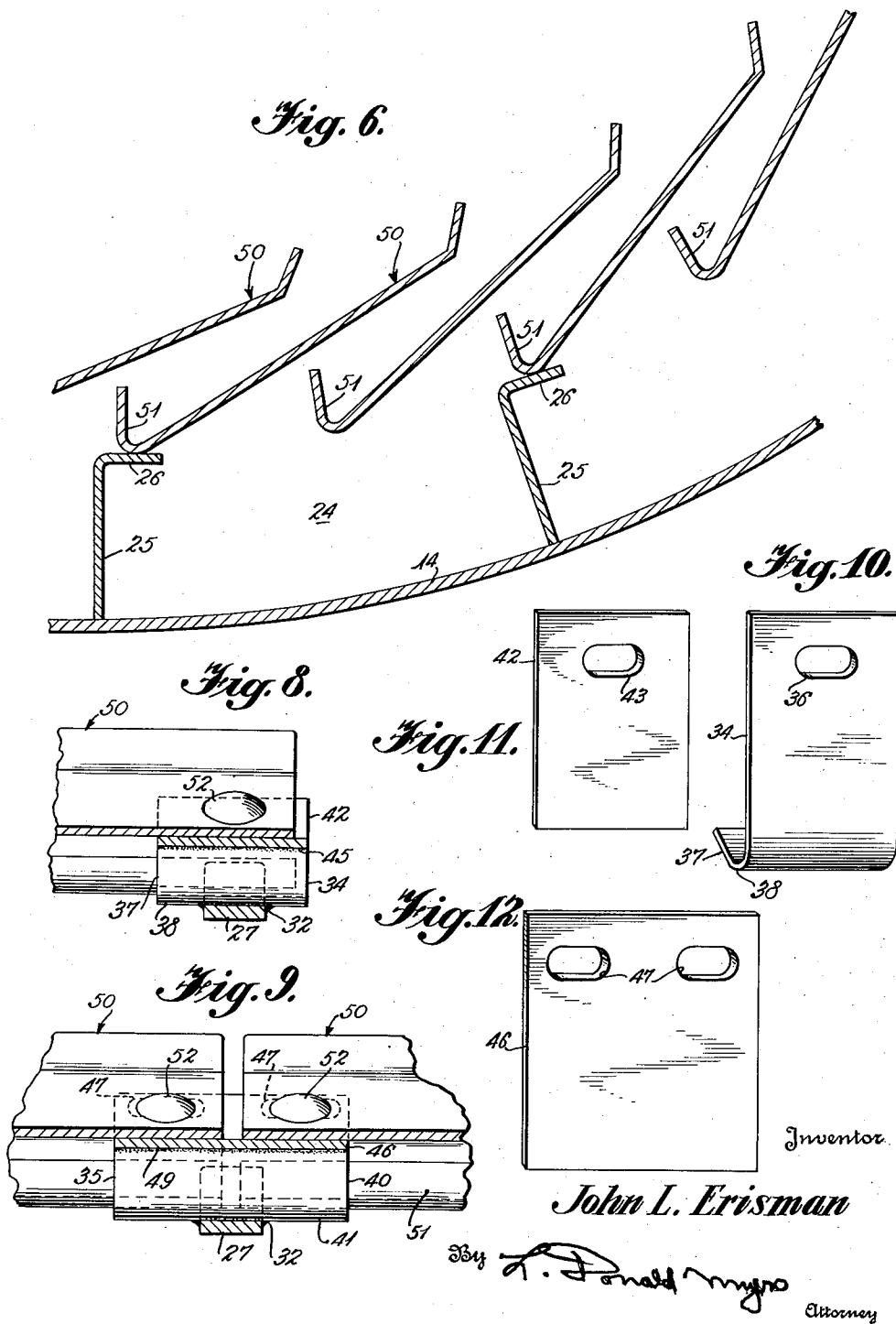
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UNITED STATES PATENT OFFICE

2,581,756

ROTARY DRIER OR COOLER

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Application June 19, 1947, Serial No. 755,664

9 Claims. (Cl. 34—135)

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This invention relates to rotary dryers or coolers and deals more particularly with improvements in the type of dryer or cooler disclosed and claimed in my co-pending application, Serial No. 644,754, filed February 1, 1946, now Patent No. 2,483,630, issued October 4, 1949.

The type of dryer or cooler covered by my above identified application consists of a rotatable, horizontally arranged cell or cylinder through the central treatment chamber of which the bed of flowable solids being treated is gradually advanced and gently agitated as a result of rotation of the cell or cylinder. The central treatment chamber is formed by a circular series of longitudinally extending, overlapping, tangential louvres arranged radially inwardly of and supported by an annular series of longitudinally extending, substantially radial louvres which are secured at their outer longitudinal edge portions to the interior surface of the cell or cylinder.

The series of radial louvres collectively form a circular series of longitudinal treatment fluid passages which are opened throughout their inner sides and are employed for distributing treatment fluid lengthwise of the bed of material. The series of tangential louvres are provided in such numbers and are so positioned with respect to the open sides of the aforesaid treatment fluid passages as to form a plurality of longitudinally arranged, tangentially directed treatment fluid discharge paths for each one of said passages.

It is the primary object of this invention to materially improve dryers or coolers of the above mentioned type by modifying the construction of the two series of louvres so as to provide a more rigid and durable structure, and one which may be more easily serviced or repaired.

A further important object of the invention is the provision of an improved louvre assembly for dryers or coolers of the above mentioned type which will make possible the standardization of most of the individual parts or elements so that they can be assembled in the proper numbers or arrangements to produce louvre assemblies for dryers or coolers having cells or cylinders of different lengths and/or diameters, with the result that a considerably smaller number of different sized parts or elements can be manufactured for producing a complete range of dryer or cooler sizes, and so that a substantially smaller number of parts or elements need be kept in stock for supplying repair and replacement parts to customers.

A still further important object of the invention is to materially improve dryers or coolers of

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the above mentioned type by modifying the construction of the two series of louvres so as to materially reduce the number of parts required for a complete louvre assembly; simplify the method of assembling and supporting the tangential louvres on the radial louvres; permit the series of tangential louvres to be sectionalized lengthwise of the cell or cylinder, and permit each sectional part of each tangential louvre to be separately assembled or disassembled, whereby the cost of manufacturing this type of dryer or cooler and of repairing or replacing damaged louvres will be substantially reduced.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same:

Figure 1 is an elevational view of the feed end of a rotary dryer or cooler embodying this invention,

Figure 2 is a longitudinal sectional view of the dryer or cooler illustrated in Fig. 1,

Figure 3 is a transverse sectional view taken on lines 3—3 of Fig. 2,

Figure 4 is an enlarged, fragmentary, and elevational view taken at the feed end of the dryer or cooler with the stationary distributor head or ring removed,

Figure 5 is an enlarged, fragmentary, transverse sectional view taken through the cell or cylinder and the louvre assembly adjacent the discharge end of the dryer or cooler,

Figure 6 is a similar view to Fig. 5 but taken at another location with reference to the length of the dryer or cooler,

Figure 7 is an enlarged, fragmentary, elevational view of the louvre assembly when seen from within the central treatment chamber and with one of the tangential louvres omitted to better illustrate its supporting means,

Figure 8 is a fragmentary detail view taken on the section line 8—8 of Fig. 4,

Figure 9 is a similar view to Fig. 8 but illustrates the manner in which the adjacent ends of two tangential louvre parts are interconnected and supported,

Figure 10 is a perspective view of a flanged plate that is employed for supporting a tangential louvre at one of the ends of the cell or cylinder,

Figure 11 is a detail perspective view of a flat plate that is employed for supporting a tangential

tial louvre at one end of the cell or cylinder, and Figure 12 is a detail perspective view of a flat plate for supporting adjacent ends of tangential louvre parts and for interconnecting said ends.

In the drawings, wherein for the purpose of illustration is shown the preferred embodiment of this invention, and first particularly referring to Figs. 1 and 2, the reference numeral 14 designates the outer cell or cylinder of a horizontally arranged, rotatable dryer or cooler. This cell or cylinder is provided with a suitable number of peripheral supporting rings or tracks 15 that ride on the rollers 16 suitably journaled on the supporting frame or base 17.

At the feed end of the dryer or cooler cell or cylinder, see Figs. 1 and 2, a stationary distributor head or ring 18 is positioned and supported by the frame members 19, see Fig. 1. The feed end, also, is provided with a plate 20 having a central feed opening 20a through which the material to be treated is delivered to the central treatment chamber of the dryer or cooler. The distributor head or ring 18 is formed with a treatment fluid inlet manifold 21 through which the hot or cold treatment fluid is delivered to one selected portion or zone of the interior of the cell or cylinder 14 at a point adjacent its inner circumference.

Fig. 2 shows the discharge end of the dryer or cooler cell or cylinder 14 as having attached thereto a discharge end plate 22 that is formed with a discharge opening 23 through which the treated material spills and through which the used hot or cold treatment fluid is exhausted after it has passed through the bed of material being treated in the central chamber of the dryer or cooler.

The patent to Charles A. Schneider, No. 2,253,058, issued August 19, 1941, discloses in considerably greater detail the construction of the stationary distributor head or ring 18. Consequently, reference may be made to this patent for a better disclosure of this element.

The dryer or cooler cell or cylinder 14 has formed therein an annular series of longitudinal treatment fluid passages that are located adjacent its inner circumference. These passages 24 are best illustrated in Figs. 2 to 6, inclusive, as being formed by the longitudinally extending, substantially radially arranged louvre plates 25 that are secured along their outer longitudinal edges to the inner surface of the cell or cylinder 14 in any suitable manner, such as by continuous or tack welding, or by being suitably flanged and bolted or riveted to the cell or cylinder. By inspecting Figs. 2, 4, 5 and 6, it will be seen that these radial louvres 25 are gradually reduced in depth lengthwise of the cell or cylinder 14 with the result that the space defined collectively by the inner, free longitudinal edge portions of these louvres gradually increases in diameter from the feed end to the discharge end of the cell or cylinder.

Figs. 3 to 6, inclusive, best illustrate the fact that the inner free edge portions of the radial louvres 25 are provided with right angularly arranged flanges 26 that are on the trailing sides of the radial louvres with reference to the direction of rotation of the cell or cylinder, as indicated by the arrow line A of Fig. 3. These longitudinal edge flanges 26, of course, help to stiffen and prevent buckling of the radial louvres 25 when they are subjected to treatment fluid at elevated temperatures. These flanged longitudinal edges 26 also play an important part, as will be pointed out

in detail as the description proceeds, in supporting tangential louvres on the radial louvres.

At any desired number of equally spaced locations throughout the length of the cell or cylinder 14, the inner, free, longitudinal edge portions of the radial louvres 25 are tied together and braced by the bars 27. Fig. 2 discloses these tying bars to be provided at four longitudinally spaced locations. Two of these locations occur at the opposite end portions of the radial louvres 25. The remaining two locations for tying bars 27 are equally spaced between the end locations. Figs. 3 to 5, inclusive, best illustrate the fact that the tying bars 27 are located between the inner longitudinal edge portions of adjacent radial louvres 25. Each tying bar is provided with a substantially right angularly bent or flanged end portion 28. The flanged or bent end 28 of each tying bar is welded, as at 29, to the longitudinal edge portion of one of its two associated radial louvres so as to extend radially inwardly of the flange 26 of said louvre. The remaining end portion of each tying bar 27 is welded as at 30 to the outer face of the flange 26 of the second one of the two radial louvres 25 with which the tying bar is associated. It will be understood, therefore, that at each one of the several locations for the tying bars 27, a circular series of such bars is provided and the series is concentrically arranged with reference to the cell or cylinder 14. Therefore, at each location for a circular series of tying bars 27, a continuous ring is formed by the cooperation of the tying bars 27 with the circumferentially aligned portions of the radial louvre flanges 26.

By inspecting the several figures, and particularly Figs. 2 to 5, inclusive, and 7, it will be seen that each radially inwardly directed end portion 28 of each tying bar 27 has welded to it, and to the cooperating radial louvre flange 26, a filler bar 31. As seen in Fig. 7, these filler bars 31 are equal in length to about four times the width of a tying bar 27.

Each tying bar 27 and the filler bar 31 that is attached to the end flange 28 of the tying bar have welded thereto, as at 32 and 33, see Figs. 4 and 5, a tangential supporting plate 34 or 35. Figs. 4, 8 and 10 disclose the louvre supporting plates 34 while Figs. 5 and 9 disclose the louvre supporting plates 35. In other words, the louvre supporting plates 34 are of single width and are associated with the tying bars 27 that are located at the opposite ends of the cell or cylinder 14 while the tangential louvre supporting plates 35 are of double width and are associated with the tying bars 27 that are positioned at the two remaining or intermediate locations.

Each one of the single width, louvre supporting plates 34 is provided with a transversely elongated aperture 36 adjacent one end while the remaining end portion is bent to provide a flange 37 and a curved portion 38. The double width louvre supporting plates 35 are provided with two transversely elongated apertures 39 adjacent one end, see particularly Fig. 7, while the remaining end portion is bent to provide a flange 40 and a curved portion 41. It will be seen by particularly inspecting Figs. 4, 5, 8 and 9 that the louvre supporting plates 34 and 35 form angular seats while the main body portions of said louvre supporting plates are tangentially arranged. The function performed by these plates 34 and 35 will be explained more in detail at a later point.

Figs. 4, 7, 8 and 11 disclose a single width, flat,

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tangential louvre supporting plate 42, one of which is provided for each one of the tying bars 27 located at the opposite ends of the cell or cylinder 14. These single width, flat, louvre supporting plates 42 are each provided with a single, transversely elongated aperture 43 adjacent one end portion. The remaining end portion is not bent like the end portion of each one of the louvre supporting plates 34. Each one of these plates 42 is welded, as at 44, to one of the flanges 26 of a radial louvre 25, and, as at 45, to the end edge of the flange 37 of the associated louvre supporting plate 34. By particularly inspecting Fig. 4, it will be seen that the main body of each one of the flat louvre supporting plates 42 cooperates with the associated radial louvre flange 26 and filler bar 31 to form an angular seat that will function the same as the angular seat that is formed by the main body portion of each one of the supporting plates 34, its end flange 37, and its curved portion 38.

Figs. 5, 7, 9 and 12 disclose double width, flat, tangential louvre supporting plates 46. These double width plates are provided adjacent one end portion with the two transversely elongated apertures 47. Each one of these double width supporting plates 46 is welded as at 48 to a radial louvre flanged inner edge 26, and at 49 to the extremity of a flange 40 of a louvre supporting plate 35. It will be seen, therefore, that the flat body portions of the plates 46 cooperate with their associated filler bars 31 and radial louvre flanges 26 to form angular seats that will function in the same way as the angular seats formed by the main bodies of the louvre supporting plates 35, their end flanges 40 and their intermediate curved portions 41.

From the above description of the louvre supporting plates 34, 35, 42 and 46, it will be seen that each location throughout the length of the cell or cylinder 14 that is provided with a circular series of tying bars 27, also, is provided with a circular series of angular seats which will function to support and properly position tangential louvres. It further will be noted that there are twice as many angular seats for tangential louvres as there are tying bars 27 and treatment fluid passages 24 that open radially inwardly of the cell or cylinder 14.

Figs. 2 to 9, inclusive, disclose longitudinally extending, radially overlapped, tangential louvres, each one of which is designated in its entirety by the reference numeral 50. Figs. 2 and 7 disclose the fact that each one of the tangential louvres 50 is formed of several parts that are longitudinally aligned so that all of the parts collectively form a single tangential louvre. These tangential louvres are constructed or shaped so as to provide inner edge flanges 51 that cooperate with or are positioned in the previously referred to angular seats that are formed by the inner end portions of the louvre supporting plates 34 and 35, and by the filler bars 31 and their associated radial louvre flanges 26. The main bodies of all of the louvre supporting plates 34, 35, 42 and 46 are flatly engaged by the main bodies of the tangential louvres 50. Bolt and nut assemblies 52 are employed for connecting the ends of the tangential louvre parts to the supporting plates 34, 35, 42 and 46. The bolts of these assemblies pass through the transversely elongated apertures 36, 39, 43 and 47 of the said supporting plates. These apertures are transversely elongated to allow for expansion and contraction of the parts of the tangential louvres.

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By inspecting Figs. 2 and 7, it will be seen that the double width supporting plates 35 and 46 function to interconnect adjacent ends of longitudinally aligned tangential louvre parts.

Fig. 2 best illustrates the fact that the tangential louvres can be considered as being sectionalized lengthwise of the cell or cylinder 14. That is to say, the disclosure of Fig. 2 illustrates that there are three annular sections of tangential louvre parts provided within the cell or cylinder 14. It will be appreciated, therefore, that tangential louvre assemblies can be provided for dryer or cooler cells or cylinders 14 of different lengths by providing different numbers of tangential louvre sections. That is to say, if all of the tangential louvre parts are six feet long, a twelve foot cell or cylinder 14 will be provided with two tangential louvre sections while three sections would be required for an eighteen foot cell or cylinder. It has been found to be more practical, however, to make the tangential louvre parts of four foot lengths so that three tangential louvre sections will provide an assembly for a twelve foot cell or cylinder 14 while four sections will provide a tangential louvre assembly for a sixteen foot cell or cylinder.

It further will be appreciated that by forming each one of the tangential louvres of several parts, and by fastening each part at its ends to supporting plates by means of bolt and nut assemblies, it is very easy to repair or replace the tangential louvres. That is to say, it is only necessary to remove the parts of the tangential louvres that are actually damaged and it is not necessary to remove or replace an entire tangential louvre if only one or two parts of the same are damaged.

Having thus described the invention, I claim:

1. A device of the type described, comprising a rotatably supported, horizontally arranged cylinder, an annular series of longitudinally extending, substantially radial louvres secured at their outer longitudinal edge portions to the cylinder in circumferentially spaced relation to form a circular series of radially inwardly opening longitudinal treatment fluid passages, a plurality of circumferentially extending bars positioned between and attached at their ends to the inner longitudinal edge portions of adjacent radial louvres for tying said louvre edge portions together, said tying bars being arranged to form several circular series which are spaced longitudinally of the cylinder, plate members attached partly to said tying bars and partly to the associated edge portions of the radial louvres to form a plurality of circumferentially arranged, angular seats at the location of each circular series of tying bars, a plurality of longitudinally extending, tangential louvres supported in said angular seats to collectively form a supporting surface for a bed of material to be treated and to form paths for discharging into the bed of material the treatment fluid that leaves the fluid passages through their radial openings, and means for detachably fastening said tangential louvres in place.

2. A device of the type described, comprising a rotatably supported, horizontally arranged cylinder, an annular series of longitudinally extending, substantially radial louvres secured at their outer longitudinal edge portions to the cylinder in circumferentially spaced relation to form a circular series of radially inwardly opening longitudinal treatment fluid passages, a plurality of circumferentially extending bars positioned be-

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tween and attached at their ends to the inner longitudinal edge portions of adjacent radial louvres for tying said louvre edge portions together, said tying bars being arranged to form several circular series which are spaced longitudinally of the cylinder, plate members attached partly to said tying bars and partly to the associated edge portions of the radial louvres to form a plurality of circumferentially arranged angular seats at the location of each circular series of tying bars, a plurality of longitudinally extending, tangential louvres with each one of said louvres being formed of several longitudinally aligned parts, said tangential louvres being supported in said angular seats with the ends of the aligned parts of the respective louvres registering with the members forming said seats to collectively form a supporting surface for a bed of material to be treated and to form paths for discharging into the bed of material the treatment fluid that leaves the fluid passages through their radial openings, and means for detachably fastening the ends of all of the louvre parts to the seat forming members with which they register.

3. A device of the type described, comprising a rotatably supported, horizontally arranged cylinder, an annular series of longitudinally extending, substantially radial louvres secured at their outer longitudinal edge portions to the cylinder in circumferentially spaced relation to form a circular series of radially inwardly opening longitudinal treatment fluid passages, a plurality of circumferentially extending bars positioned between and attached at their ends to the inner longitudinal edge portions of adjacent radial louvres for tying said louvre edge portions together, said tying bars being arranged to form several circular series which are spaced longitudinally of the cylinder, a plurality of plates attached partly to said tying bars and partly to the associated edge portions of the radial louvres to form a like number of tangentially extending supports at the location of each circular series of tying bars, a plurality of longitudinally extending, tangential louvres supported on said plates to collectively form a supporting surface for a bed of material to be treated and to form paths for discharging into the bed of material the treatment fluid that leaves the fluid passages through their radial openings, and means for fastening the tangential louvres to their supporting plates.

4. A device of the type described, comprising a rotatably supported, horizontally arranged cylinder, an annular series of longitudinally extending, substantially radial louvres secured at their outer longitudinal edge portions to the cylinder in circumferentially spaced relation to form a circular series of radially inwardly opening longitudinal treatment fluid passages, a plurality of circumferentially extending bars positioned between and attached at their ends to the inner longitudinal edge portions of adjacent radial louvres for tying said louvre edge portions together, said tying bars being arranged to form several circular series which are spaced longitudinally of the cylinder, a plurality of plates attached partly to said tying bars and partly to the associated edge portions of the radial louvres to form a like number of tangentially extending supports at the location of each circular series of tying bars, a plurality of longitudinally extending, tangential louvres with each one of said louvres being formed of several longitudinally aligned parts, said tangential louvres being sup-

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ported on said plates with the ends of the aligned parts of the respective louvres registering with said plates to collectively form a supporting surface for a bed of material to be treated and to form paths for discharging into the bed of material the treatment fluid that leaves the fluid passages through their radial openings, and means for detachably fastening the ends of all of the louvre parts to the plates with which they register.

5. A device of the type described, comprising a rotatably supported, horizontally arranged cylinder, an annular series of longitudinally extending, substantially radial louvres secured at their outer longitudinal edge portions to the cylinder in circumferentially spaced relation to form a circular series of radially inwardly opening longitudinal treatment fluid passages, a plurality of circumferentially extending bars positioned between and attached at their ends to the inner longitudinal edge portions of adjacent radial louvres for tying said louvre edge portions together, said tying bars being arranged to form several circular series which are spaced longitudinally of the cylinder, plate members attached partly to said tying bars and partly to the associated edge portions of the radial louvres to form a plurality of circumferentially arranged angular seats at the location of each circular series of bars, a plurality of longitudinally extending, tangential louvres having their outer longitudinal edge portions angularly flanged to fit said angular seats to collectively form a supporting surface for a bed of material to be treated and to form paths for discharging into the bed of material the treatment fluid that leaves the fluid passages through their radial openings, and means for fastening said tangential louvres to the members forming said angular seats.

6. A device of the type described, comprising a rotatably supported, horizontally arranged cylinder, an annular series of longitudinally extending, substantially radial louvres secured at their outer longitudinal edge portions to the cylinder in circumferentially spaced relation to form a circular series of radially inwardly opening longitudinal treatment fluid passages, a plurality of circumferentially extending bars positioned between and attached at their ends to the inner longitudinal edge portions of adjacent radial louvres for tying said louvre edge portions together, said tying bars being arranged to form several circular series which are spaced longitudinally of the cylinder, plate members attached partly to said tying bars and partly to the associated edge portions of the radial louvres to form a plurality of circumferentially arranged angular seats at the location of each circular series of bars, a plurality of longitudinally extending, tangential louvres having their outer longitudinal edge portions angularly flanged to fit said angular seats to collectively form a supporting surface for a bed of material to be treated and to form paths for discharging into the bed of material the treatment fluid that leaves the fluid passages through their radial openings, each one of said tangential louvres being formed of several longitudinally aligned parts with the ends of the aligned parts registering with the members forming said seats, and means for detachably fastening the ends of all of the louvre parts to the seat forming members with which they register.

7. A device of the type described, comprising a rotatably supported, horizontally arranged cyl-

inder, means forming an annular series of longitudinally extending, radially inwardly opening treatment fluid passages at the inner circumference of the cylinder, a stationary inlet manifold at one end of the cylinder for delivering treatment fluid to the adjacent ends of a limited number of said fluid passages as the rotation of the cylinder causes said passage ends to successively register with said manifold, means for tying together the fluid passage forming means at locations that are longitudinally spaced and circumferentially arranged with respect to the cylinder, plate members attached partly to said tying means and partly to the fluid passage forming means to form a plurality of circumferentially arranged angular seats at each longitudinally spaced location of the tying means, a plurality of longitudinally extending, overlapping, tangential louvres arranged inwardly of said treatment fluid passage and supported in said angular seats to collectively form a supporting surface for a bed of material to be treated and to form paths for discharging treatment fluid from said passages into the bed of material, and means for detachably fastening said tangential louvres to said seats.

8. A device of the type described, comprising a rotatably supported, horizontally arranged cylinder, an annular series of longitudinally extending, substantially radial louvres secured at their outer longitudinal edge portions to the cylinder in circumferentially spaced relation to form a circular series of longitudinal treatment fluid passages, a stationary inlet manifold at one end of the cylinder for delivering treatment fluid to the adjacent ends of a limited number of said fluid passages as the rotation of the cylinder causes said passage ends to successively register with said manifold, a plurality of circumferentially extending bars positioned between and attached at their ends to the inner longitudinal edge portions of adjacent radial louvres for tying said louvre edge portions together, said tying

ing bars being arranged to form several circular series which are spaced longitudinally of the cylinder, a plurality of tangentially extending plates associated with each circular series of tying bars, means for attaching alternate ones of said plates to the tying bars and to the associated inner edge portions of the radial louvres, means for attaching the remaining ones of said plates to the associated inner edge portions of the radial louvres and to the said alternate ones of said plates, each one of said plates forming a support, a plurality of longitudinally extending, overlapping, tangential louvres arranged inwardly of said treatment fluid passages and engaging said supporting plates to collectively form a supporting surface for the bed of material to be treated and to form paths for discharging the treatment fluid from said passages into the bed of material, and means for detachably fastening said tangential louvres to said supporting plates.

9. A device of the type defined by claim 8, further characterized by each tangential louvre being formed of several longitudinally aligned parts with the ends of the parts registering with and detachably fastened to the tangentially extending plate supports.

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