

April 23, 1940.

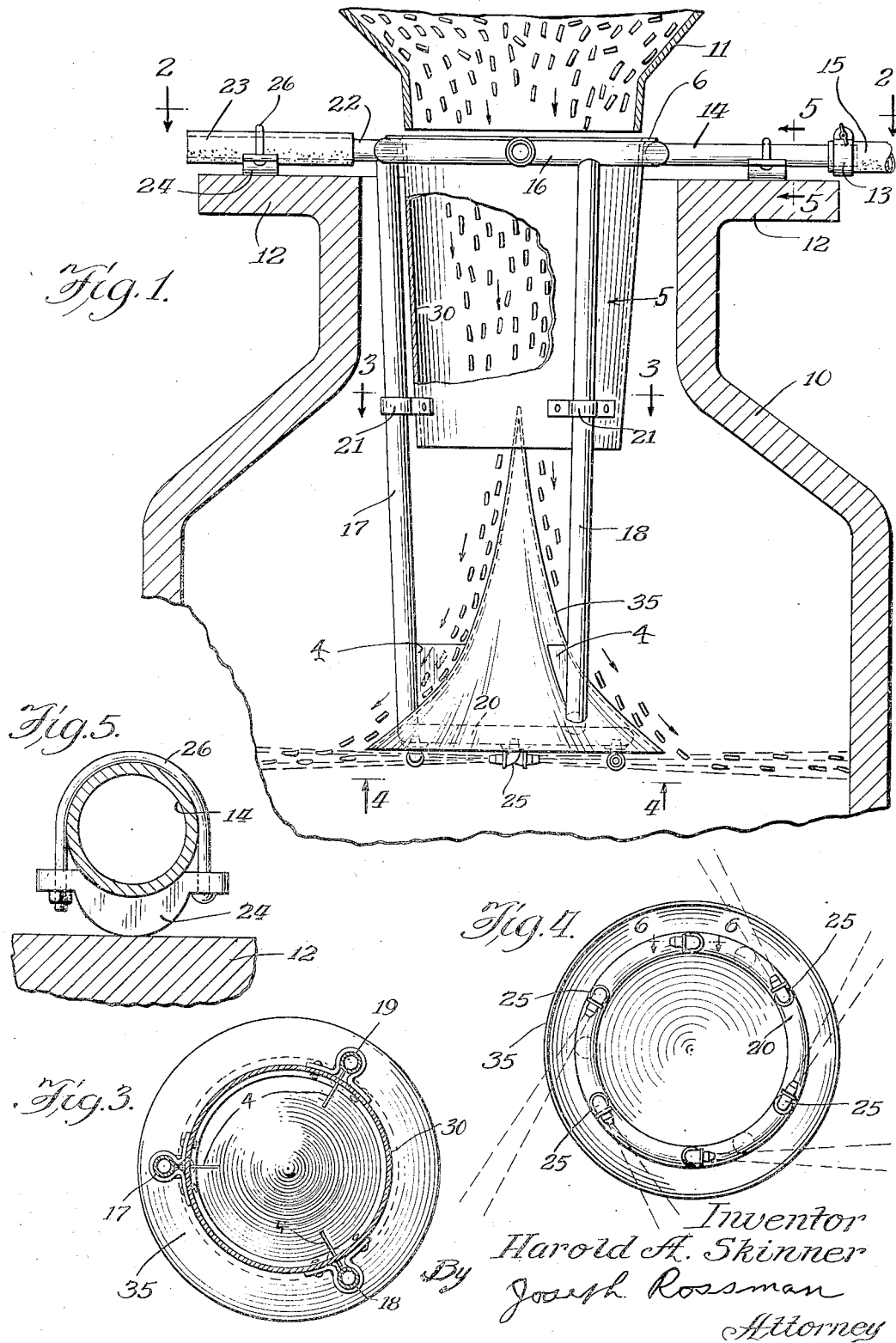
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METHOD OF AND APPARATUS FOR PACKING WOOD CHIPS OR THE LIKE

Filed July 15, 1938

2 Sheets-Sheet 1



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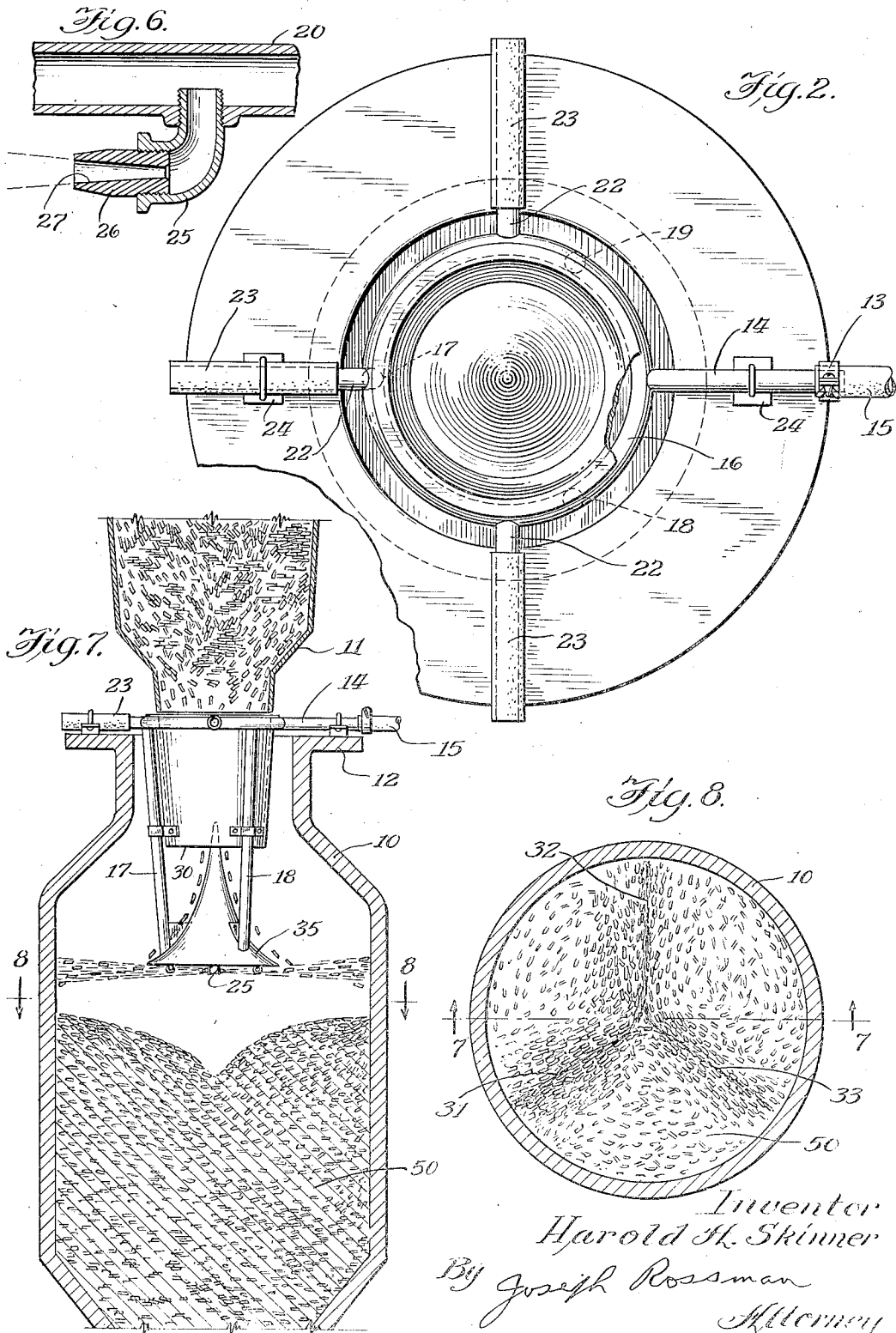
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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR PACK-
ING WOOD CHIPS OR THE LIKEHarold A. Skinner, Wausau, Wis., assignor to
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14 Claims. (Cl. 214-17)

This invention relates to improvements in method and apparatus for packing fibrous material in chemical pulp digesters.

One of the objects of the invention is to provide means for distributing chips or the like in a digester during the packing operation so as to permit circulation of the cooking liquor through the mass of chips. Such packing permits me to improve the cooking efficiency, as it enables me to increase the output per cook and also the output per day, reduce chemicals and steam consumption, as well as improve the quality of the pulp and the yield of pulp per unit of raw material cooked.

Another object of the invention is to reduce the packing time and cost. By the method, more chips can be distributed and packed in a given digester space in considerably less time than with the methods heretofore used. Furthermore, as my chip packing device is portable, it is possible to use one chip packing apparatus for a large number of digesters without requiring any auxiliary conveying equipment.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a vertical sectional view, partly in elevation, of one form of my apparatus shown placed on the neck of a digester,

Figure 2 is a fragmental view taken on lines 2-2 of Figure 1,

Figure 3 is a sectional view taken on lines 3-3 of Figure 1,

Figure 4 is a view taken on lines 4-4 of Figure 1,

Figure 5 is a sectional view taken on lines 5-5 of Figure 1,

Figure 6 is a sectional view taken on lines 6-6 of Figure 4,

Figure 7 is a vertical sectional view, partly in elevation, of the apparatus in use on a digester, and

Figure 8 is a sectional view taken on lines 8-8 of Figure 7.

Referring to the drawings, 10 designates a chemical pulp digester and 5 designates the improved packer. The packer being light in weight can be manually placed in position on the mouth 12 of the digester. The packer comprises a conduit or hopper 30 having a collar portion 6 which

is supported on a hollow pipe ring 16 serving as a manifold for vertical pipes 17, 18 and 19 connected thereto.

An inlet pipe 14 is connected to the ring 16 which is connected by a coupling 13 to a suitable supply 15 of steam or other fluid pressure. Three spaced supporting arms 22 are attached to the ring 16 which, together with inlet pipe 14, serve to form a symmetrical support for the packer on the mouth 12 of the digester. A sleeve 23 of any suitable heat insulating material is provided on the arms 22 for manually grasping the packer. Curved bearing blocks 24 are fastened by bolts 26 to two aligned supporting arms as shown in Figures 1 and 2 which serve to support the arms in spaced relation to the mouth of the digester and also permit the packer to rock slightly on the curved bearing surface 24 as shown in Figure 5 when the packer is in use.

Vertical pipes 17, 18 and 19 are rigidly attached to the conduit or hopper 30 by means of brackets 21 shown in Figure 1. The lower ends of vertical pipes 17, 18 and 19 extend through the hollow substantially cone-shaped distributor 35 and are connected to a ring-shaped pipe 20. Nozzles 25 are provided on the ring 20 at substantially equally spaced intervals arranged in substantially tangent relation to the ring 20 as shown in Figure 4 with the orifices of the nozzles directed so as to permit jets of fluid under pressure to escape in streams substantially tangent to the ring 20 as shown in Figure 4.

The nozzles 25 are preferably of the Venturi construction shown in Figure 6. The nozzles have an outwardly flaring bore so as to produce the Venturi effect when steam or other fluid under pressure is forced through the nozzles thereby increasing the pressure of the fluid jet as it leaves the nozzles.

Plates 4 are provided on the distributor which together with the lower portions of pipes 17, 18, and 19 serve to subdivide the stream of chips into a plurality of spaced streams.

In using the packer, it is manually placed on the mouth of the digester as shown in Figure 7 and connected to a steam line 15. Steam pressure of about 135 lbs. per sq. in. is turned on which will pass to the manifold 16, down the vertical pipes 17, 18 and 19 to the ring 20 and escape in jets from the spaced nozzles 25. The wood chips are then fed from the storage supply 11 and fall in a stream through the conduit 30 upon the surface of the distributor 35. The stream of chips on the distributor is subdivided into three spaced streams by the spaced plates 4

and lower portions of pipes 17, 18 and 19 before reaching the lower edge of the distributor 35. The subdivided stream of chips continues to slide by gravity past the lower edge of the distributor where the chips are impinged by the jets of steam or other fluid pressure and distributed within the digester. As the chips are fed, a slight rocking motion will be imparted to the packer so that it will rock on the curved bearings 24 thereby serving to facilitate the continuous flow of the chips.

As shown in Figures 7 and 8 the spaced streams of chips will be packed into a plurality of segments, three distinct segments being illustrated within the digester, with the center of the mass of chips slightly depressed. As shown in Figure 8, although the three segments of the chips abut each other, the chips at the abutting portions 31, 32 and 33 of the segments are loosely packed so as to provide channels through which the cooking liquor can circulate.

My method of packing thus divides the contents of the digester into a plurality of longitudinally extending segments with loosely packed regions or channels between the segments, thereby permitting circulation of the cooking liquor between each segment. The cooking liquor is thus able to reach every part of the digester thereby assuring complete and satisfactory circulation. By use of my method of packing wood chips in digesters, I have been able to increase the usual yields by as much as 20% for each digester. This increased yield has also lowered the consumption of steam, sulphur and limestone necessary for digesting wood chips for paper making purposes.

It is to be understood that the invention is not restricted to the specific embodiment herein disclosed and that numerous changes and modifications may be made embodying the principles of my invention. When using the apparatus shown in Figure 1, three segments of chips will be formed within the digester because the stream of chips is separated by the plates 4 and the lower portions of the three vertical pipes 17, 18 and 19. If desired, four or more plates may be used which will separate the chips into a corresponding number of segments within the digester.

In the preferred embodiment herein disclosed the entire frame of the packer is made from pipes which are suitably connected to supply the fluid pressure. Any other means may, however, be used for supplying steam or other fluid to the nozzles. A direct connection may, for example, be made to ring 20. In such case the pipes 17, 18 and 19 may be dispensed with. Spaced plates, bars, or other suitable means will, however, be affixed adjacent the lower edge of the distributor so as to subdivide the stream of chips into a plurality of streams for the purpose previously explained.

It is to be understood that any suitable fluid may be used for projecting the chips from the distributor. It is advantageous to use steam as the chips are thereby given a preliminary heating which facilitates the penetration of the chips by the cooking liquor. The steam also serves to equalize the moisture content of the chips prior to being packed within the digester. A further advantage in using steam jets is that there is no substantial heat loss as the heat is absorbed by the chips.

If desired, compressed air or other gases may be supplied to the nozzles for projecting the chips. I may also use liquids instead of steam

or other gases for projecting the chips. For example, I have found it advantageous to project the chips with jets of the cooking liquor with which the chips are to be treated.

The invention is particularly adapted for packing wood chips in digesters for making paper pulp, but it is to be understood that the invention is also applicable for packing other subdivided materials.

I claim:

1. A method of packing subdivided material in a digester or the like, which comprises introducing a stream of subdivided material into the upper end of the digester, dividing the stream of the said material into a plurality of spaced streams, and projecting the said spaced streams within the digester so as to pack same into a plurality of packed segments extending vertically within the digester and with the abutting faces of said segments extending substantially radially of the cross-section of said digester to provide radial and vertical channels for circulating fluids through the sub-divided material within the digester.

2. A method of packing wood chips in a digester or the like, which comprises introducing a stream of subdivided material into the upper end of the digester, dividing the stream of the said material into a plurality of spaced streams, and projecting with steam jets the said material within the digester so as to pack the said material into a plurality of packed segments extending vertically within the digester and with the abutting faces of said segments extending substantially radially of the cross-section of said digester to provide radial and vertical channels for circulating fluids through the sub-divided material within the digester.

3. A method of packing wood chips or the like in a digester or the like, which comprises feeding a stream of chips into said digester, dividing the stream of chips into a plurality of spaced streams and projecting the chips in each stream towards the outer walls of the digester to pack within the digester to form longitudinally extending substantially equal segments of packed chips within the digester and with the abutting faces of said segments extending substantially radially of the cross-section of said digester to provide radial and vertical channels for circulating fluids through the chips within the digester.

4. A method of packing wood chips or the like in a digester or the like, which comprises feeding a stream of falling chips within the digester, organizing the chips into a substantially hollow conical formation, dividing the stream of chips into a plurality of spaced streams and projecting the chips within the digester so as to pack the chips into a plurality of packed segments within the digester and with the abutting faces of said segments extending substantially radially of the cross-section of said digester to provide radial and vertical channels for circulating fluids through the chips within the digester.

5. A method of packing wood chips or the like within a digester or the like which comprises feeding a stream of falling chips into the upper end of a digester, organizing the stream into a plurality of spaced streams and forcibly projecting the falling chips toward the outer walls of the digester to form a series of packed segments within the digester and loosely packed chips at the abutting faces of the segments and with the abutting faces of said segments extending substantially radially of the cross-section of said

register to provide radial and vertical channels to circulate fluids through the sub-divided chips within the digester.

6. A chip packing apparatus for digesters comprising a conduit through which a stream of chips is introduced into a digester, a conically shaped distributing surface beneath the lower end of the conduit for distributing the chips, means on the distributing surface to subdivide the stream into a plurality of spaced streams and means adjacent the discharge edge of the distributing surface to forcibly project the chips within the digester to form a plurality of packed segments within the digester and with the abutting faces of said segments extending substantially radially of the cross-section of said digester to provide radial and vertical channels for circulating fluids through the chips within the digester.

7. A chip packing apparatus for digesters comprising a conduit through which a stream of chips is introduced into a digester, a conically shaped distributing surface beneath the lower end of the conduit for distributing the chips, means to subdivide the stream into a plurality of spaced streams and a plurality of nozzles adjacent the lower periphery of the conically shaped surface to forcibly project the chips within the digester to form a plurality of packed segments within the digester.

8. A chip packing apparatus for a digester comprising a distributor suspended at the mouth of a digester in the path of a stream of chips, means for subdividing the stream into spaced streams and spaced nozzles adjacent the lower edge of the distributor to supply fluid pressure for impinging and distributing the spaced streams of chips within the digester to form a plurality of packed segments within the digester.

9. Apparatus for packing chips in a digester comprising an annular manifold, a conduit, spaced vertical pipes connected to said manifold, the lower ends of said pipes being connected to a ring, a substantially conically shaped chip distributor positioned over said ring, spaced nozzles connected to said ring for emitting fluid jets adjacent the lower edge of said distributor to impinge the chips as they leave the distributor and distribute same within the digester.

10. Apparatus for packing chips in a digester comprising an annular manifold, a conduit, spaced vertical pipes connected to said manifold, the lower ends of said pipes being connected to a

ring, a substantially conically shaped chip distributor positioned over said ring, spaced Venturi nozzles connected to said ring for emitting fluid jets adjacent the lower edge of said distributor to impinge the chips as they leave the distributor and distribute same within the digester.

11. Apparatus for packing chips in a digester comprising a conduit through which a stream of chips is introduced into the digester, a distributor beneath said conduit, means for subdividing the stream of chips into a plurality of spaced streams, and tangentially arranged nozzles adjacent the lower edge of said distributor for directing jets of packing fluid against the chips as they leave the distributor.

12. Apparatus for packing chips in a digester comprising a conduit through which a stream of chips is introduced into the digester, a distributor beneath said conduit, means for subdividing the stream of chips into a plurality of spaced streams, and tangentially arranged Venturi nozzles adjacent the lower edge of said distributor for directing jets of fluid against the chips as they leave the distributor.

13. Apparatus for packing chips in a digester comprising an annular manifold, spaced arms connected to said manifold for supporting the packer upon the mouth of the digester, a conduit, spaced vertical pipes connected to said manifold, the lower ends of said pipes being connected to a ring, a substantially conically shaped chip distributor positioned over said ring, spaced nozzles connected to said ring for emitting fluid jets adjacent the lower edge of said distributor to impinge the chips as they leave the distributor and distribute same within the digester.

14. Apparatus for packing chips in a digester comprising an annular manifold, spaced arms connected to said manifold for supporting the packer upon the mouth of the digester, two opposed arms being provided with bearing blocks for permitting rocking of the packer, a conduit, spaced vertical pipes connected to said manifold, the lower ends of said pipes being connected to a ring, a substantially conically shaped chip distributor positioned over said ring, spaced nozzles connected to said ring for emitting steam jets adjacent the lower edge of said distributor to impinge the chips as they leave the distributor and distribute same within the digester.

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