

[54] REVERSIBLE REFINER FEEDER
[75] Inventor: Chester Donald Fisher, Muncy, Pa.
[73] Assignee: Sprout, Waldron & Company, Inc.,
Muncy, Pa.
[22] Filed: Oct. 11, 1972
[21] Appl. No.: 296,564
[52] U.S. Cl. 241/247, 198/213
[51] Int. Cl. B02c 23/02
[58] Field of Search 241/245, 246, 247, 261.2,
241/DIG. 5, 135; 198/216, 213

[56] References Cited
UNITED STATES PATENTS
1,017,213 2/1912 Hottmann 241/240 X
1,955,010 4/1934 Mealey 241/135 X
3,132,680 5/1964 Schill et al. 241/247

3,441,227 4/1969 Fisher 241/247
3,497,229 2/1970 Sietmann et al. 198/216 X
Primary Examiner—Granville Y. Custer, Jr.
Assistant Examiner—Howard N. Goldberg
Attorney, Agent, or Firm—Howson and Howson

[57] ABSTRACT
A feeder for disc-type refiners comprising a plurality of spaced triangular conveying lugs disposed on the refiner drive shaft between the stock inlet and the rotor. The triangular lugs are disposed so that angularly oriented faces thereof will direct the stock toward the rotor regardless of the direction of drive shaft rotation. The spaced arrangement of the lugs permits the escape of steam from the refining region back along the drive shaft to a steam outlet located axially outwardly of the stock inlet.

14 Claims, 2 Drawing Figures

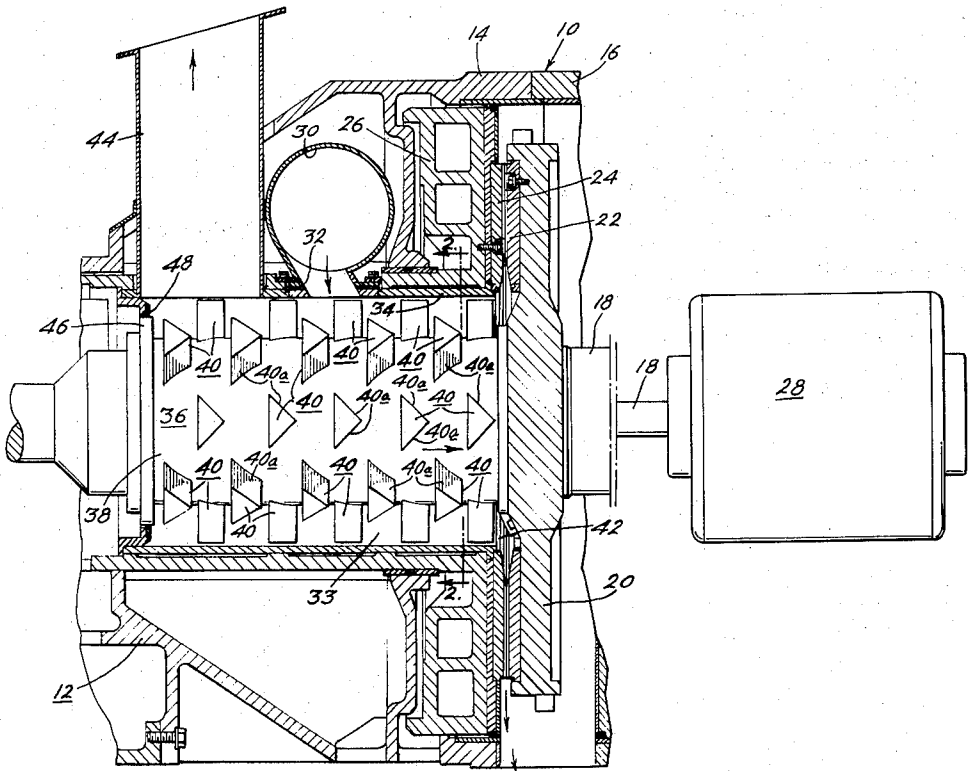


FIG. 1.

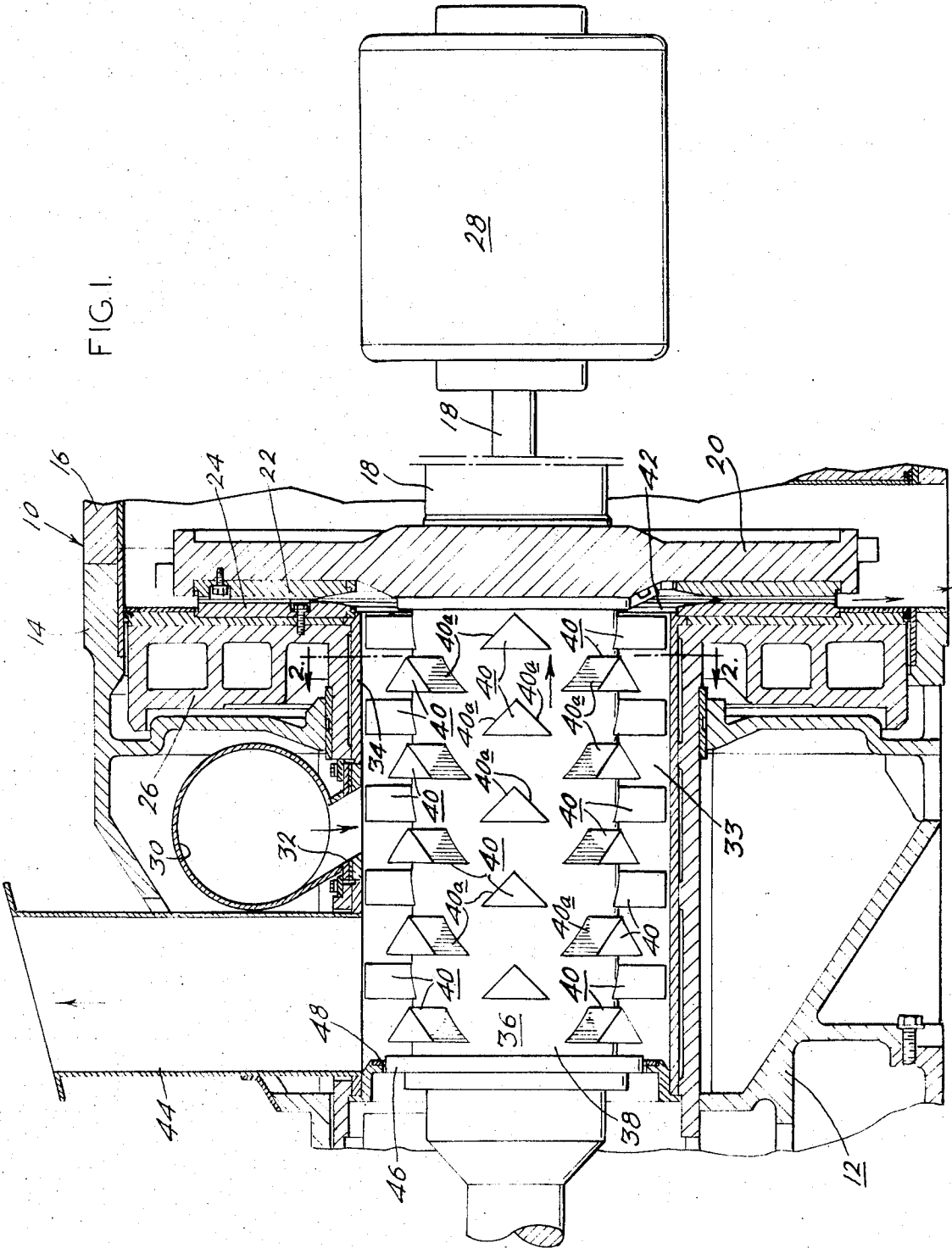
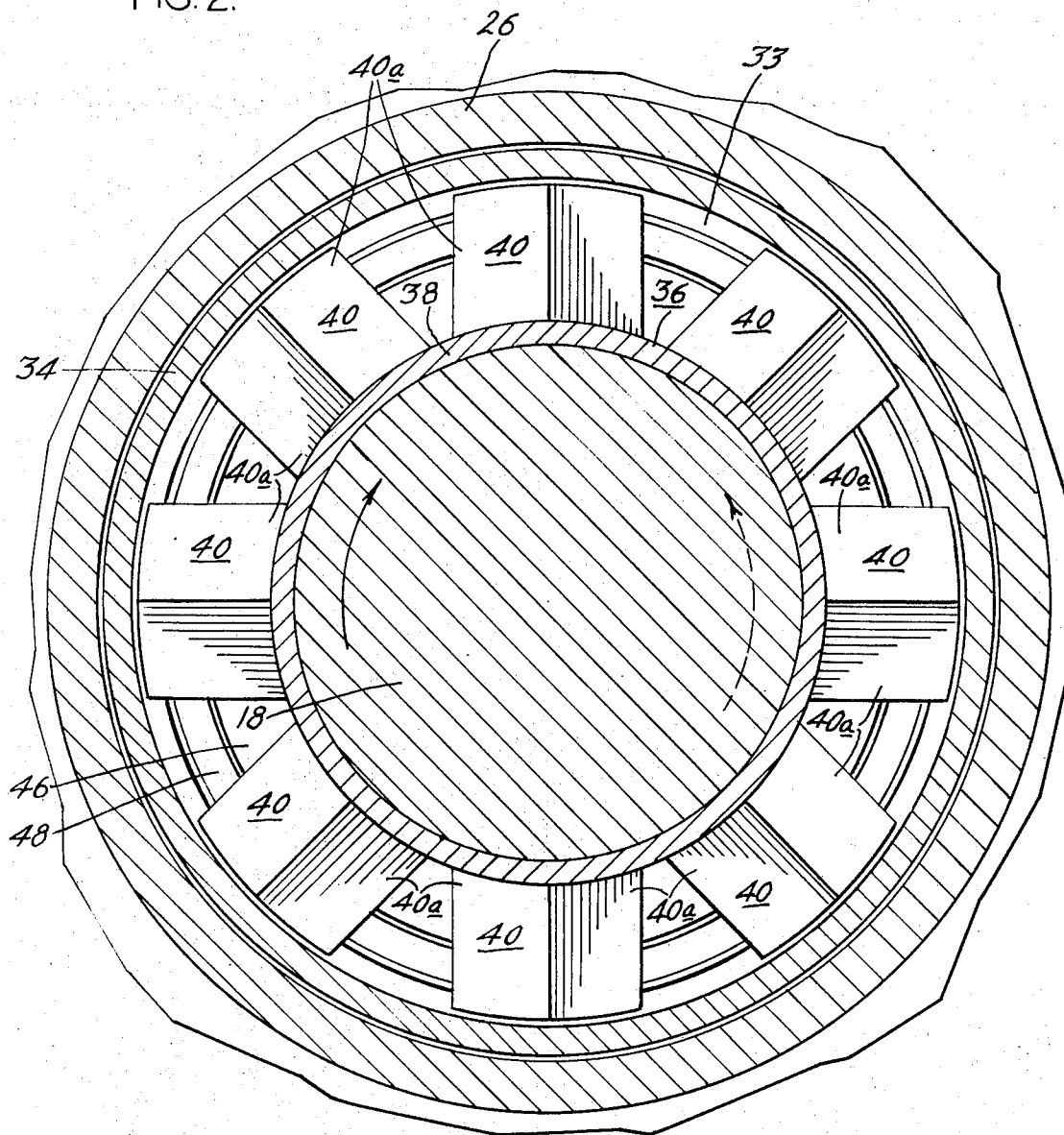


FIG. 2.



REVERSIBLE REFINER FEEDER

The present invention relates generally to disc-type attrition mills and relates more particularly to a stock feeder for high speed disc refiners.

Disc-type refiners are commonly employed in the paper pulp industry for the refining of wood chips. A substantial amount of steam is generated in the refining of high consistency stock and must be vented to prevent the interruption of the stock feed. In my U.S. Pat. No. 3,441,227, I have disclosed a ribbon screw refiner feeder which directs the stock into the throat of a disc-type refiner around the periphery of the conveyor housing while permitting the steam to escape through the interior of the ribbon conveyor. Since a ribbon screw conveyor is not reversible, the patented feeder can suitably be used only with an independent drive if the refiner rotor rotation is to be reversed. It is conventional practice to periodically reverse the rotation of the refiner to equalize the wear of the refiner plate elements, and thus the above patented feeder is primarily used with single disc refiners wherein the rotor is mounted outboard of the shaft bearings and the ribbon screw is independently mounted and driven.

In the present invention, a refiner feeder arrangement is provided which is mounted directly on the refiner drive shaft and which will uniformly feed the stock from a stock inlet toward the refiner rotor regardless of the direction of drive shaft rotation. The invention comprises a plurality of spaced triangular conveying lugs disposed on the refiner drive shaft within a conveying chamber between the stock inlet and the rotor. The lugs are so disposed on the drive shaft that angularly oriented faces thereof will direct the stock toward the rotor with rotation of the shaft in either direction. Steam generated in the refining region can escape back along the drive shaft to a steam outlet located axially outwardly of the stock inlet since centrifugal force will hold the flow of stock around the periphery of the conveyor housing.

It is accordingly a primary object of the present invention to provide a novel stock infeed conveyor for a disc type refiner.

It is a further object of the invention to provide a conveyor as described which is mounted directly on the refiner drive shaft.

Another object of the invention is to provide a conveyor as described which will convey stock toward the refiner rotor regardless of the direction of drive shaft rotation.

A still further object of the invention is to provide a conveyor as described which provides a venting of steam generated in the refining region during the processing of high consistency stock.

Another object of the invention is to provide a stock conveyor as described of a relatively simple construction.

Additional objects and advantages of the invention will be more readily apparent from the following detailed description of an embodiment thereof when taken together with the accompanying drawings in which:

FIG. 1 is a partial side elevational view of a disc type refiner embodying the conveyor of the present invention, the refiner being cut away and partly in section to more clearly illustrate the components thereof; and

FIG. 2 is an enlarged sectional view taken along line 2—2 of FIG. 1 showing the arrangement of the conveying lugs around the refiner drive shaft.

Referring to the drawings, FIG. 1 illustrates a high speed disc type refiner generally designated 10 having a frame 12 supporting separable refiner casing sections 14 and 16. A refiner drive shaft 18 is rotatably supported by bearing means at spaced locations on the frame 12. A rotor 20 centrally mounted on the drive shaft 18 carries on each radial face thereof a set of refining plates 22. A similar set of refining plates 24 juxtaposed from the plates 22 are secured to a nonrotating but axially adjustable head 26 which is hydraulically positioned within the casing in a conventional manner. Since the refiner structure, aside from the stock feed conveyor, is essentially conventional, only one side of the refiner is illustrated in FIG. 1, namely that side to the left hand of the rotor 20. It should be understood that a substantially identical refiner construction is present on the right hand side of the rotor as viewed in FIG. 1, the rotor carrying a second set of plates on the right hand side thereof to cooperate with a second set of non-rotating axially adjustable plates in a manner well known in the art. The drive shaft 18 is driven by a motor 28 located outboard of the casing sections on a portion of the refiner frame 12. The motor is illustrated schematically in FIG. 1 since the installation thereof is conventional.

The stock, which might for example comprise wood chips, is introduced into the refiner through an inlet conduit 30 from which it passes through passage 32 into a conveying chamber 33 defined by cylindrical conveyor housing 34 spaced coaxially around the refiner shaft 18. A conveyor assembly generally designated 36 mounted on the drive shaft 18 includes a conveyor sleeve 38 on which are mounted a plurality of triangularsectioned conveyor lugs 40, each of which extends radially from the sleeve 38. The conveying lugs 40 extend radially almost to the surface of the conveyor housing 34 so as to sweep through substantially the entire conveying region 33 upon rotation of the drive shaft.

The conveying lugs 40 are oriented on the sleeve 38 in such a manner that an angularly directed face 40a thereof is moved against the stock to advance the stock toward the rotor regardless of the direction of rotation of the drive shaft. In the embodiment illustrated, each lug in section comprises an isosceles triangle with the apex angle of the equilateral legs comprising a right triangle. This apex angle is directed toward the rotor so that one of the equilateral faces of the lug will serve to engage the stock at a 45° angle and advance the stock toward the refiner throat 42 during rotation of the shaft. In the illustrated embodiment, the lugs are arranged in spaced disposition in axial rows, alternate rows being axially displaced to present a staggered disposition of the circumferentially adjacent lugs.

The conveying of the stock into the refiner throat can, especially with the refining of high consistency stock be interrupted by the back flow of steam generated during the refining process unless provision is made for venting the steam. In the present stock conveyor, to permit the escape of steam without interrupting the stock flow, a steam outlet conduit 44 is provided which communicates with the conveying chamber axially outwardly from the stock inlet passage 32. The steam generated in the refining region travels axi-

ally adjacent the shaft through the lugs to the steam outlet conduit. A flange member 46 on the drive shaft cooperates with a seal 48 on the refiner frame 12 to prevent the controlled escape of steam into the atmosphere.

During operation of the refiner, with the motor 28 turning the drive shaft and rotor at a relatively high rotational speed, the stock is introduced through the stock inlet 30 and passes through passage 32 into the conveyor chamber 33. The triangular lugs 40 and specifically the angularly disposed faces thereof engage the stock and serve to advance it toward the conveyor throat 42. The high speed of rotation of the lugs 40 produces a sufficient centrifugal force to throw the stock outwardly around the periphery of the conveyor housing 34, thereby allowing the steam generated in the refining section to pass freely adjacent the conveyor sleeve 38 into the steam outlet conduit 44. The spacing of the lugs 40 coupled with the centrifugal movement of the stock to the periphery of the conveyor chamber leaves a more than adequate space for the steam to escape without disrupting the stock flow. In the unlikely event that any stock should become entrained in the escaping steam, the lugs 40 are provided the entire length of the conveyor sleeve 38, namely back to the drive shaft flange 46. Any stock which should go astray is thus returned toward the refiner throat by the lugs in the steam outlet conduit region.

It will be apparent that the direction of rotation of the refiner drive shaft is immaterial, since the same conveying action will be provided by the triangular lugs regardless of the rotational direction of the shaft. The shape of the triangular lugs 40 may, of course, be varied to suit the particular application for which the refiner is designed. Thus, although a right angle triangular section is illustrated, other similar angles may also be suitably employed. Similarly, although a solid triangular shaped lug is illustrated, it may be possible to employ simply a V-shaped element, arranged so that the apex of the V is directed toward the refiner throat.

Manifestly, changes in details of construction can be effected by those skilled in the art without departing from the spirit and the scope of the invention.

I claim:

1. In a disc type refiner for high consistency stock comprising a frame, a refiner shaft rotatably supported on said frame, a rotor mounted on said shaft for rotation therewith, a non-rotating head mounted on said frame, and refining plates mounted in juxtaposed relation on said rotor and said nonrotating head to produce a refining action on stock introduced therebetween upon rotation of said drive shaft, the improvement comprising reversible conveyor means for introducing stock into the space between said refining plates, said conveying means comprising a substantially cylindrical conveying chamber surrounding said drive shaft adjacent said rotor in coaxial relation thereto, a plurality of conveying lugs fixed to said drive shaft and extending into said conveying chamber, said conveying lugs each having a pair of intersecting faces oppositely angularly inclined with respect to the drive shaft axis, the lug edge formed by said intersecting faces being directed toward said rotor, and conduit means for introducing stock into said conveying chamber, said lugs upon rotation of said drive shaft serving to advance stock introduced into said conveying chamber toward said rotor

for passage between said plates regardless of the direction of the shaft rotation.

2. The invention as claimed in claim 1 including a steam discharge conduit communicating with said conveying chamber, said steam discharge conduit being axially outwardly spaced with respect to said stock inlet conduit means from said rotor.

3. The invention as claimed in claim 1 wherein said conveying lugs are arranged in evenly spaced relation in axially aligned rows, the lugs of each row being axially staggered with respect to the lugs of the adjacent rows.

4. The invention as claimed in claim 1 wherein said conveying lugs extend substantially radially outwardly from said drive shaft.

5. The invention as claimed in claim 1 including a conveyor sleeve secured to said drive shaft, said conveying lugs being mounted on said conveyor sleeve.

6. The invention as claimed in claim 1 wherein said conveying lugs are triangular in section.

7. The invention as claimed in claim 6 wherein said conveying lugs in section each comprise an isosceles triangle with the apex of the equilateral edges thereof being directed toward said rotor.

8. In a disc type refiner for high consistency stock comprising a frame, a refiner shaft rotatably supported on said frame, a rotor mounted on said shaft for rotation therewith, a non-rotating head mounted on said frame, means for rotating said shaft and rotor, and refining plates mounted in juxtaposed relation on said rotor and said non-rotating head to produce a refining action on stock introduced therebetween upon rotation of said drive shaft, the improvement comprising reversible conveyor means for introducing stock into the space between said refining plates, said conveying means comprising a conveyor housing defining a cylindrical conveying chamber surrounding said drive shaft adjacent said rotor in coaxial relation thereto, seal means axially spaced from said rotor extending between said shaft and said housing for sealing one end of said conveying chamber, said conveying chamber extending axially between said seal means and said rotor, a stock inlet conduit for introducing stock to be refined into said conveying chamber intermediate said rotor and said seal means, a steam discharge conduit communicating with said conveying chamber axially disposed between said seal means and said stock inlet conduit, a plurality of conveying lugs extending from said drive shaft within said conveying chamber, said conveying lugs each having a pair of intersecting faces angularly inclined with respect to the axis of said drive shaft, the lug edge formed by said intersecting faces being directed toward said rotor, said lugs upon rotation of said drive shaft serving to advance stock introduced into said conveying chamber through said stock inlet conduit toward said rotor for passage between said plates regardless of the direction of shaft rotation, the conveyed stock being centrifugally directed around the periphery of said conveying chamber to permit passage of steam from said refining plates between said lugs adjacent said shaft to said steam discharge conduit.

9. The invention as claimed in claim 8 wherein said conveying lugs are arranged in evenly spaced relation in axially aligned rows, the lugs of each row being axially staggered with respect to the lugs of the adjacent rows.

10. The invention as claimed in claim 8 wherein said conveying lugs extend substantially radially outwardly from said drive shaft.

11. The invention as claimed in claim 8 including a conveyor sleeve secured to said drive shaft, said conveying lugs being mounted on said conveyor sleeve.

12. The invention as claimed in claim 8 wherein said conveying lugs are triangular in section.

13. The invention as claimed in claim 12 wherein said conveying lugs in section each comprise an isosceles triangle with the apex of the equilateral edges thereof being directed toward said rotor.

14. In a disc type refiner for high consistency stock comprising a frame, a refiner shaft rotatably supported on said frame, a rotor mounted on said shaft for rotation therewith, a non-rotating head mounted on said frame, reversible means for driving said shaft in rotation, and refining plates mounted in juxtaposed relation on said rotor and said non-rotating head to produce a refining action on stock introduced therebetween upon rotation of said drive shaft, the improvement comprising reversible conveyor means for introducing stock into the space between said refining plates, said conveying means comprising a substantially cylindrical conveyor housing surrounding said drive shaft adjacent said rotor in coaxial relation thereto, seal means extending between said housing and said drive shaft axially spaced from said rotor, a conveyor sleeve secured

to said drive shaft and extending between said rotor and said seal means, said conveyor sleeve, coaxial cylindrical housing, seal means and rotor defining therebetween a conveying chamber, said conveying chamber opening at the rotor end thereof into the refiner throat through which the stock passes into the refining region between the juxtaposed plates, a stock inlet conduit for introducing stock into said conveying chamber, a steam discharge conduit communicating with said conveying chamber intermediate said stock inlet conduit and said seal means, and a plurality of conveying lugs extending radially from said conveyor sleeve, said conveying lugs in section each comprising an isosceles triangle with the apex of the equilateral edges thereof being directed toward said rotor, said conveying lugs being arranged in evenly spaced relation in axially aligned rows, the lugs of each row being axially staggered with respect to the lugs of the adjacent rows, said conveying lugs upon rotation in either direction of said shaft serving to advance stock introduced into said conveying chamber toward the refiner throat, the centrifugal force of the rotating lugs serving to advance the stock around the periphery of said conveying chamber permitting steam from the refining zone to pass along said conveyor sleeve between said lugs into said steam discharge conduit without interfering with the flow of stock into the refiner throat.

* * * * *

30

35

40

45

50

55

60

65