

Aug. 24 , 1926.

1,597,411

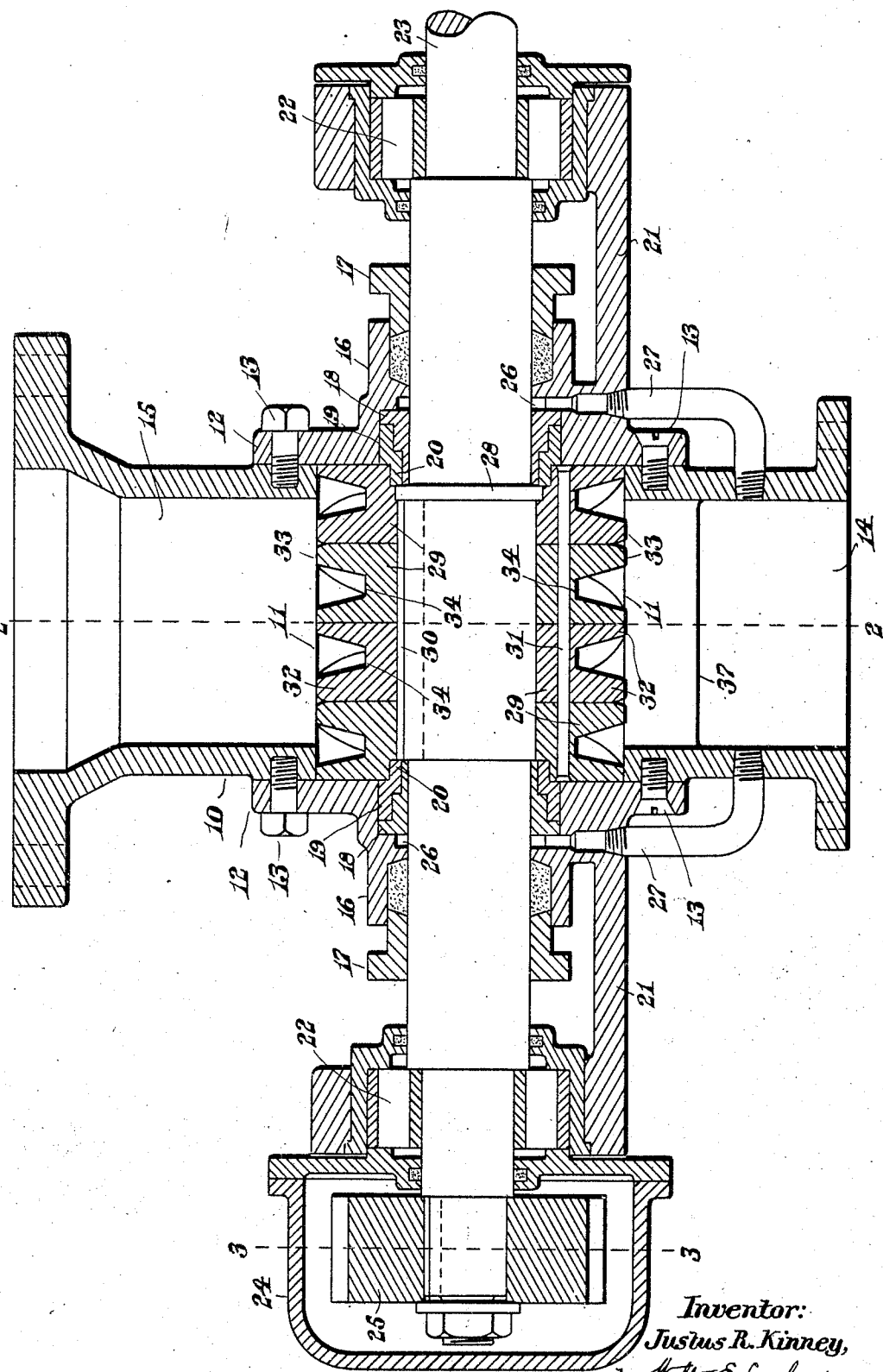
J. R. KINNEY

ROTARY PUMP

Filed Dec. 1. 1924

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Fig. 1



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Fig. 2.

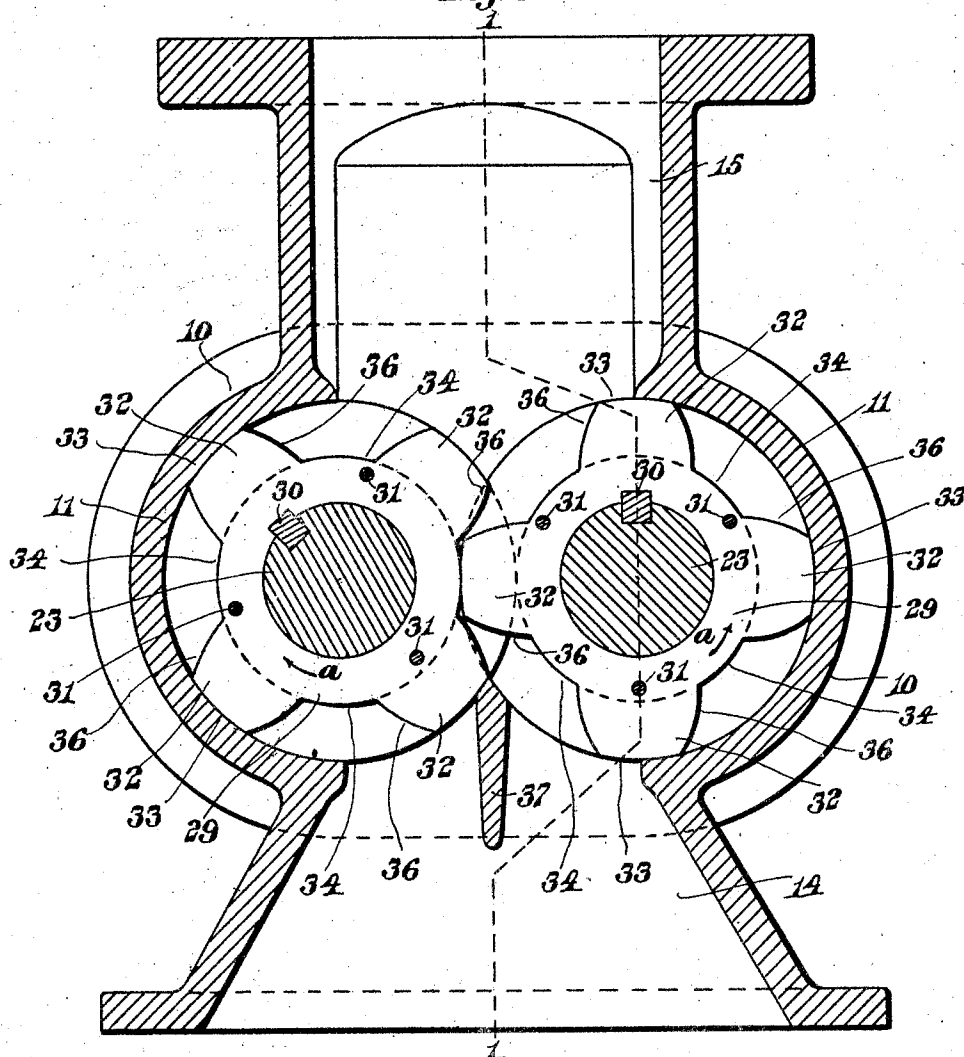
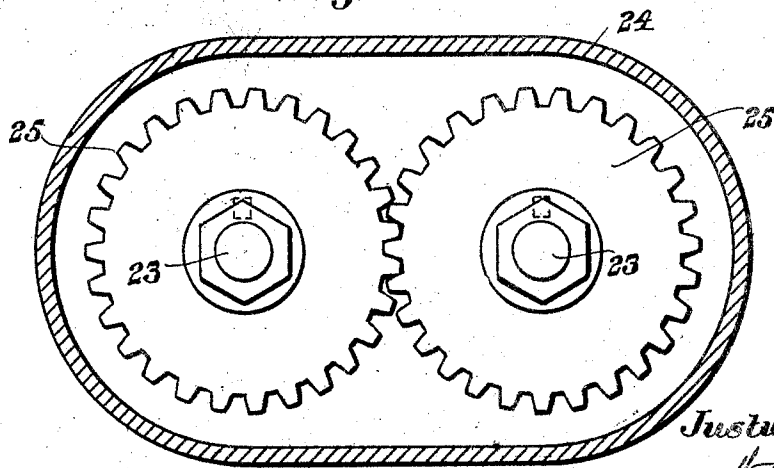


Fig. 3.

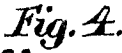


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ROTARY PUMP

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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ROTARY PUMP.

Application filed December 1, 1924. Serial No. 753,087.

This invention relates to rotary pumps and has for its object the production of a device of this character in which the rotation of two coacting bladed members will create a suction in the inlet passage and draw a liquid from a source of supply and discharge said liquid through the outlet passage.

This object is attained by the mechanism shown in the accompanying drawings.

For the purpose of illustrating the invention, one preferred form thereof is illustrated in the drawings, this form having been found to give satisfactory and reliable results although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and the invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described except as required by the scope of the appended claims.

Of the drawings,

Fig. 1 represents a longitudinal vertical section of a pump embodying the principles of the present invention, on line 1, 1, on Fig. 2.

Fig. 2 represents a transverse section of the same, on line 2, 2, on Fig. 1.

Fig. 3 represents a section through the gear casing on line 3, 3, on Fig. 1.

Fig. 4 represents a plan of the revoluble bladed members, drawn to an enlarged scale, and

Fig. 5 represents a perspective of one of said bladed members.

Similar characters indicate like parts throughout the several figures of the drawings.

In the drawings 10 is a casing having two semi-cylindrical chambers 11 formed therein, said chambers communicating as shown in Fig. 2 of the drawings.

The ends of the casing are closed by means of the end plates 12 secured thereto by bolts or screws 13.

The casing 10 is provided with an inlet passage 14 through which liquid may be drawn into the chambers 11 and subsequently discharged therefrom through an outlet passage 15, preferably aligned with said inlet passage 14.

The end plates 12 have outwardly extending hubs 16 in the outer ends of which are stuffing boxes 17 of usual construction.

These end plates 12 have recesses in their

inner faces in which are disposed the annular members 18, 19, the outer member 18 having reduced portions extending into and fitting a recess in the outer face of the inner member 19.

This inner member 19 is provided with an annular flange 20 extending inwardly beyond the inner face of the end plate 12.

Each end plate 12 is also provided with an outward extension 21 on the outer end of which is mounted bearings 22 for the revoluble shafts 23 extending through the chambers 11 and centrally disposed therein.

One extension 21 has secured to the end thereof a gear casing 24 which encloses the gears 25 which are mounted on the shafts 23 and mesh so that said shafts 23 will rotate together in opposite direction when rotary movement from any suitable source is imparted to either shaft 23.

Between the stuffing boxes 17 and the annular members 19 are annular passages 26 surrounding the shafts 23, these passages 26 having pipes 27 extending therefrom to the inlet passage 14.

Should any liquid being pumped leak from the chambers 11 past the annular members 18, 19, it will enter these recesses 26 and the suction in the inlet passage 14 will cause said liquid to be drawn into said passage.

The passage of any liquid outwardly from these recesses and around the shafts 23 will be effectually taken care of by means of the stuffing boxes 17.

It will be noted that the shaft bearings 22 are entirely separated from the stuffing boxes 17 at the outer ends of the hubs 16 so that it would be impossible for any of the material being pumped to enter the bearings 22 and interfere with the proper working thereof.

This is essential for the material being pumped is not always of a lubricating character but of a character which would injure any bearings into which it might be permitted to enter.

Each shaft 23 is provided with a peripheral flange 28 bearing against the inner ends of the members 18, 19, the purpose of the flange being to prevent any end movement of said shafts.

This flange 28 fits into a recess in the outer face of one of the cylindrical members 29 mounted upon the shafts 23 and splined thereto by the key 30.

The members 29 are designed to operate in pairs and as many pairs may be mounted upon the shafts 23 as may be desired.

These members 29 have openings there-
5 through in which are inserted rods 31, the ends of which are upset, thereby locking together all of the members on each shaft.

When thus locked together the ends bear against the inner faces of the end plates 12
10 and the annular flanges 20 fit accurately into the recesses in the outer faces of the end members 29.

Each member 29 is a worm-like section having extending from the periphery of the
15 body portion a plurality of blades 32 having inclined sides with their cylindrical faces fitting the cylindrical walls of the chambers 11.

The blades 32 are angularly disposed upon
20 the members 29, the angle thereof to the axis of rotation of each member being approximately 68°.

The blades 32 are separated and form
25 grooves so that the blades on the members mounted upon one shaft will accurately fit the grooves formed in the members of the other shaft.

The axes of the shafts 23 are located a
30 distance apart equal to the diameter of the body portion of a member 29, plus the depth of a blade 32 so that when the shafts 23 are rotated the outer cylindrical faces 33 of the blades will bear against and be in rolling
35 contact with the bottom faces 34 of the grooves while the inclined walls of said blades will contact accurately with the inclined walls of the particular blades of the members on the other shaft with which they may be coacting.

As previously stated the members on each
40 shaft work in pairs, one member of each pair having right hand blades while the other has left hand blades.

When the two members of each pair are
45 positioned relatively to each other, the adjacent ends of the blades 32 will meet at a very acute angle forming a V-shaped portion 35, with a sharp edge 36 curved down-
50 wardly to the periphery of the body portion of the member 29 as shown in Fig. 4.

When the pump is in operation the shafts
are rotated in the direction of the arrows *a* on Fig. 2 of the drawings. At the lower
55 intersection of the walls of said chambers 11, the casing 10 is provided with a partition 37 extending downwardly into the inlet passage 14, the purpose of this partition being to divide the inflowing material and
60 cause equal portions thereof to pass through each chamber 11.

When the pump is in operation and the
bladed members are rotating in the direc-
65 tion of the arrows *a* on Fig. 2, the sharp edges 36 of the V-shaped portions 35 will plow through the material into the grooves

to be carried thereby in the inlet passage 14 and force said material through the cham-
bers 11 from which it will be discharged through the outlet passage 15.

The blades 32 are so disposed upon the
70 members 29 that the rear ends of the blades on one section 29 join the rear ends of the blades upon a contiguous section and form V-shaped pockets, the apexes of which are
75 indicated at 38.

As the members 29 rotate these V-shaped
pockets will be successively filled with ma-
terial and as there is no means for the ma-
terial to escape, all of said material will be
80 carried by the blades 32 into the discharge outlet 15.

Should there be no material in the inlet
when the pump is started the pockets will
be filled with air and a suction created which
will draw the material into and fill the inlet
85 passage, and this suction will be maintained during the operation of the pump.

As the members rotate and the pockets ap-
proach the outlet 15 the blades 32 of one
90 member 29 in their downward movement will enter the grooves in the coacting member and will completely fill the same in the plane of the axes of the shafts 23, so that
95 no material can pass downwardly between the members 29 into the inlet passage 14.

As the sharp edge 36 of each V-shaped
portion 35 of one member enters the pocket
of the opposed member it will gradually
force from said pocket all the material car-
ried therein, this material being forced up-
100 wardly into the outlet passage 15.

When the sharp edges 36 of one set of
members 29 reaches the apexes 38 of the
pockets on the companion members all of
the material will have been gradually but
105 completely forced therefrom.

Owing to the various blades 32 being an-
gularly disposed, in opposite directions upon
the members 29, there is absolutely no end
thrust on the shafts 23, all end thrust being
110 neutralized.

Preferably the material entering the inlet
passage 14 is strained prior to admission
thereto, but as the strainer forms no part of
the present invention, it is deemed unneces-
115 sary to show or describe the same.

The walls of the inlet passage 14 parallel
to the shafts 23 are in the same plane with
the axes of said shafts so that a full supply
of material may be admitted to the pockets
of the members 29 just prior to the upward
movement of said pockets in the rotation of
these members 29 in the semi-cylindrical
chambers 11.

While the various sections of the members
29 are somewhat in the form of worms, they
are not worms and do not act in a similar
manner as the blades 32 are not constructed
so as to permit them to coact with a worm
120 gear.

On the contrary these blades 32 are formed with flat sides which cannot be constructed on any gear cutting or worm cutting machine but special machinery is required to form them.

The flat sides of the blades 32 of one member 29 have a rolling contact with the flat sides of the grooves of another member 29, the entire surfaces being in contact at all times so that there is absolutely no chance for leakage by the blades as the material in the grooves approaches the outlet 15.

Consequently all material entering the inlet 14 is discharged without loss through said outlet 15.

The combined area of the grooves of each member 29 is the same in every plane radial to the axis of said member.

In other words when material enters the grooves or pockets of the members 29 the same amount is always entering these depressions regardless of the position of said depressions and as the members 29 rotate the blades 32 will force ahead of them the same quantities of material from the inlet 14 to the outlet 15 without any compression of material and with no unfilled space in said depressions.

As a consequence of this construction the pump is perfectly noiseless when in operation and a continuous stream of material is discharged of unvarying amount at all times.

This makes a very simple device for pumping liquid which is most effective in operation.

Having thus described my invention, I claim—

1. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; a plurality of members within said chambers having oppositely disposed separated blades forming angular grooves, the peripheries of the blades of each member contacting with the interior wall of a chamber and having a rolling contact with the bottoms of the grooves in the other member; and means for rotating said members in opposite directions.

2. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; a plurality of members within each chamber having oppositely disposed angular blades with flat inclined sides and forming grooves to receive the blades of the members in the other chamber, the peripheries of said blades of the members in one chamber having a rolling contact with the bottoms of the grooves of the members in the other chamber; and means for rotating said members in opposite directions.

3. In a device of the class described, the

combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; a plurality of members in each chamber having peripheral blades oppositely disposed thereon at an angle of approximately sixty-eight degrees to the axis of rotation of said members, the blades of the members in one chamber forming grooves to receive and accurately fitting the blades of the members in the other chamber and with which blades the walls of said grooves are in rolling contact; and means for rotating said members in opposite directions.

4. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; a series of bladed sections in each chamber, the blades of alternate sections being oppositely disposed with wide peripheries contacting with the wall of said chamber and in rolling contact with the bottoms of the grooves in the sections disposed in the other chamber; and means for rotating the two series of sections in opposite directions.

5. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; cylindrical members in each chamber having a plurality of blades thereon at acute angles to each other and having wide peripheral surfaces in rolling contact with the cylindrical body portions of the members in the other chamber, the blades of one member accurately fitting the grooves formed by the blades of the other member; and means for rotating said members.

6. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; a plurality of members in each chamber provided with oppositely disposed separated blades extending to the inner wall of said chamber and forming grooves at a very acute angle to the ends of said members, the blades of the members in one chamber fitting accurately the grooves of the members in the other chamber with the peripheral surfaces of said blades in rolling contact with the bottoms of said grooves; and means for rotating said members.

7. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; members in each chamber having blades oppositely disposed thereon at an acute angle to each other and forming grooves to receive the blades of the members in the other chamber, the entire surfaces of said blades having a rolling contact with the walls of said grooves and the peripheries

of said blades being wide and in contact with the inner walls of said chamber; and means for rotating said members.

8. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein; members in each chamber having blades oppositely disposed thereon at an angle of approximately sixty eight degrees to the axis of rotation of said members, forming grooves to receive the blades of the members in the other chamber, the entire surfaces of said blades having a rolling contact with the walls of said grooves and the peripheries of said blades being wide and in contact with the inner walls of said chambers; and means for rotating said members.

9. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein; a plurality of members within said chamber in rolling contact and having peripheral pockets adapted to convey material from the inlet to the outlet, said members each being provided with means for forcing the material from said pockets as they approach the outlet; and means for rotating said members in opposite directions.

10. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein; a plurality of members within each chamber in rolling contact and having V-shaped pockets to receive material from said inlet and convey it to said outlet, and projecting blades between said pockets, the peripheries of which have a rolling contact with the bottoms of the pockets of the members in the other chamber; and means for rotating said members in opposite directions.

11. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein; a plurality of members in each chamber having peripheral blades oppositely disposed thereon at an angle of approximately sixty-eight degrees to the axis of rotation of said members, the blades of the members in one chamber forming V-shaped pockets to receive and accurately fitting the blades of the members in the other chamber, and means for rotating said members in opposite directions.

12. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein; a series of bladed sections in each chamber, the blades of alternate sections being oppositely disposed with wide peripheries contacting with the wall of said chambers and in rolling contact with the bottoms of the grooves in

the sections disposed in the other chamber; rods extending through the sections of each series; and means for rotating the two series of sections in opposite directions.

13. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein; cylindrical members in said chambers in rolling contact and having a plurality of peripheral pockets, each member having peripheral projections adapted to enter the pockets in the other member and force the material therefrom in a direction tangential to the peripheries of said members and toward the outlet; and means for rotating said members.

14. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein; cylindrical members in said chambers in rolling contact, the member in each chamber being in a plurality of sections and provided with oppositely disposed separated blades extending to the inner wall of said chamber, the blades of the members in one chamber fitting accurately the grooves of the members in the other chamber with the outer ends of the blades on one section joining those on a contiguous section at a very acute angle; and means for rotating said members.

15. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein; cylindrical members in said chambers in rolling contact, the member in each chamber being in a plurality of sections and provided with oppositely disposed separated blades extending to the inner wall of said chamber, the blades of the members in one chamber fitting accurately the grooves of the members in the other chamber with the outer ends of the blades on one section joining those on a contiguous section at a very acute angle, and forming a sharp curved edge extending from the hubs of said members to the cylindrical faces of said blades; and means for rotating said members.

16. In a device of the class described, the combination of a casing having oppositely disposed inlet and outlet passages communicating with semi-cylindrical chambers therein, said inlet passage having a width equal to the distance between the centers of said chambers; members in each chamber having blades disposed thereon at an acute angle to each other and forming grooves to receive the blades of the members in the other chamber, the entire surfaces of said blades having a rolling contact with the walls of said grooves and the peripheries of said blades being in contact with the inner walls of said chambers; a partition extending transversely of the inlet passage dividing the inflowing

material and causing it to enter both chambers; and means for rotating said members.

17. In a device of the class described, the combination of a casing having oppositely disposed passages communicating with semi-cylindrical chambers therein and cylindrical recesses in the inner faces of its end walls; members in each chamber having angularly disposed blades thereon, forming grooves to receive the blades of the members in the other chamber, the entire surfaces of said

blades having a rolling contact with the walls of said grooves and the peripheries of said blades being in contact with the inner walls of said chambers, said members having their opposite ends disposed in said recesses; and means for rotating said members.

Signed by me at 746 Old South Bldg., Boston, Mass., this 28th day of November, 1924.

JUSTUS R. KINNEY.