Jan. 27, 1953 W. J. HOENECKE 2,626,571

ROTARY POSITIVE DISPLACEMENT PUMP

Filed Feb. 7, 1948

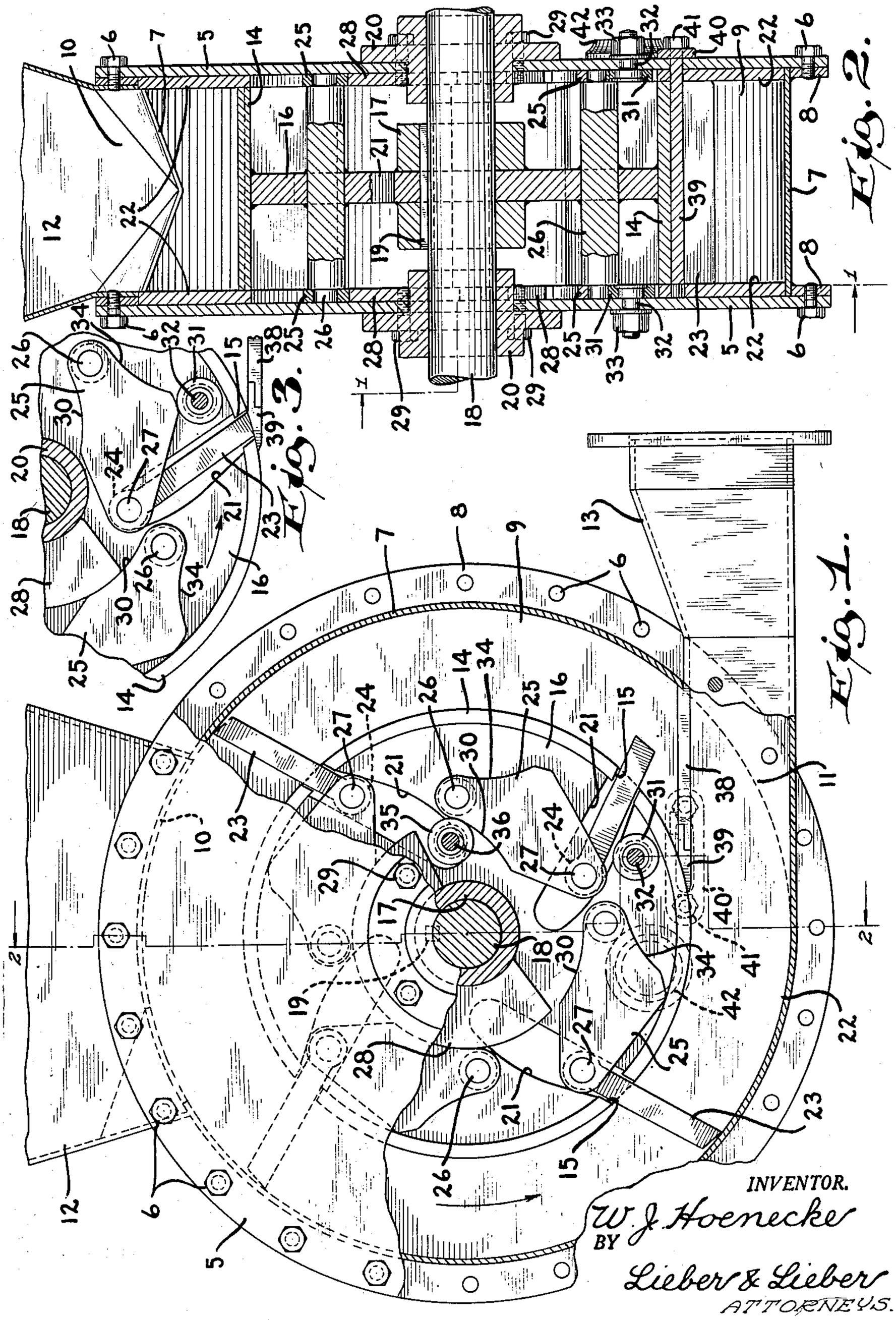

Fig. 1.

Fig. 2.

Fig. 3.

INVENTOR.
W. J. Hoenecke
BY
Lieber & Lieber
ATTORNEYS.

Patented Jan. 27, 1953 2,626,571

UNITED STATES PATENT OFFICE

2,626,571

ROTARY POSITIVE DISPLACEMENT PUMP

Walter J. Hoenecke, Milwaukee, Wis., assignor of one-half to Clyde E. Van Duser, Milwaukee, Wis.

Application February 7, 1948, Serial No. 6,925

7 Claims. (Cl. 103—135)

1

The present invention relates generally to improvements in the art of transporting fluent materials; and relates more particularly to improvements in the construction and operation of positive displacement pumps of the type disclosed generally in my issued Patent No. 2,415,592, dated February 11, 1947, some of the features of the present pump being covered broadly by said prior patent.

A primary object of my present invention is to provide an improved rotary positive displacement pump which is extremely simple, durable and compact in construction, and which is moreover highly efficient in actual use.

A more specific object of my invention is to provide an improved rotary pump of the positive displacement type which is adapted to handle relatively dense materials such as diverse food products, tannery and other waste materials, paper pulp, and concrete.

Another specific object of this invention is to provide improved instrumentalities for continuously pumping and transporting high density stock in a highly efficient manner and at minimum cost.

Another specific object of the invention is to provide an improved rotary positive displacement pump which is composed of relatively few simple parts which are readily accessible for cleaning, replacement or repair, and which may be quickly and easily assembled and dismantled by a person of ordinary skill.

An additional specific object of the present invention is to provide an improved rotary positive displacement pump wherein a circular rotor member, revolvable within a circular chamber coaxially thereof, is provided with an annular series of spaced piston blades, each of which is alternately moved, by means of a cam, through peripheral slots in the rotor toward and away from the bounding surface of the circular chamber upon rotation of the rotor.

These and other objects and advantages of the present invention will be apparent from the following detailed description.

A clear conception of the several features constituting the present improvement, and of the mode of constructing and of utilizing rotary positive displacement pumps embodying the invention, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the several views.

Fig. 1 is a side view of a rotary positive displacement pump constructed in accordance with my invention, parts being broken away along the irregular line 1—1 of Fig. 2 to reveal normally concealed structure;

2

Fig. 2 is a transverse vertical section through the improved pump taken along the irregular line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary section showing a portion of the rotor with one of the blades in fully retracted position.

While the invention has been shown and described herein as being embodied in a rotary positive displacement pump having four blades and provided with an upper inlet part and a lower discharge conduit, it is not my desire or intent to thereby unnecessarily limit the scope or utility thereof.

Referring to the drawing, the improved pump shown therein as embodying my invention comprises, in general, an outer casing or housing formed by a pair of spaced-apart flat circular side plates 5 peripherally secured, by means of bolts 6 or the like, to a pair of annular radiating flanges 8 formed on a cylindrical plate 7 forming the outer bounding surface of the material displacement chamber 9, the cylindrical plate 7 being provided with an upper opening 10 forming the pump inlet and an opening 11 spaced from the inlet 10 and forming the pump outlet; a supply hopper 12 communicating with the chamber 9 through the inlet port 10; a discharge conduit 13 communicating with the chamber 9 through the outlet port 11; a circular rotor member or drum 14 confined between the side plates 5 and coaxially of the cylindrical plate 7 and having a series of spaced peripheral slots 15 therein, the rotor drum 14 thereby forming the inner bounding surface of the material displacement chamber 9 and being provided with a central web 16 having a hub 17 keyed in any suitable manner as at 19 to a shaft 18 journalled for rotation in bearings 20 carried by the side plates 5, the web 16 also being provided with a series of outwardly open spaced slots 21 corresponding in number and communicating with the slots 15 of the drum 14; a pair of spacer rings or side liners 22 each secured to one of the side plates 5 in any suitable manner to form the side bounding surfaces of the material displacement chamber 9; a pair of cam-shaped links 25 for each of the blades 23, the links 25 being pivotally mounted in pairs in an annular series by means of pins 26 or the like rigidly secured as by welding to the web 16 and each pair of links 25 being disposed within the confines of the drum-shaped

rotor member 14 and adjacent the inner sides of the plates 5 with the swinging ends thereof pivotally secured to the enlarged end 24 of one of the blades 23 as by means of a pivot pin 27 piercing the enlarged end 24 of each blade; a pair of approximately semi-circular cam riding or guide plates 28 each rigidly secured to the inner side of one of the plates 5 by means of bolts 29 or the like so that the edges 30 of the cams 25 are adapted to ride and be guided along the peripheral edge thereof; a pair of coaxial blade retracting rollers 31 journalled for rotation on pins 32 or the like secured to the side plates 5 as by nuts 33, the rollers 31 being disposed in the path of travel of the cams 25 outwardly beyond the guide plates 28 near one end thereof for coaction with the edges 34 of the cams 25; a pair of coaxial blade projecting rollers 35 journalled for rotation on pins 36 or the like secured to the side plates 5 by nuts or other suitable means, not shown, the rollers 35 being disposed in the path of travel of the cams 25 inwardly of the outer edge of the guide plates 28 near the other end thereof for coaction with the cam edges 30; and a wall or scraper 38 projecting into the material displacement chamber 9 toward the periphery of the rotor drum 14 near the outlet port 11, the wall 38 being of substantially the same width as the chamber 9.

The various parts of the improved pump may be readily fabricated for the most part with suitable sheet material and may obviously be readily assembled. The wall 38 spans the displacement chamber 9 and may be a permanent wall and a removable nose plate 39 may be provided which may be readily replaced as wear occurs. As is apparent from the drawing, the nose plate 39 likewise spans the displacement chamber 9 at the free end of the wall 38 and extends toward the periphery of the rotor drum 14 and this nose piece may be secured in place by means of bolts 41 or the like and retaining plate 40. To permit drainage from the interior of the rotor drum, a drainage outlet or spout 42 may also be provided in one of the side plates 5, and any fluent materials which may seep into the rotor drum 14 from the displacement chamber 9 may be drained in an obvious manner. The slots 15 in the periphery of the drum 14 are adapted to snugly receive the blades 23 but there must be enough freedom to permit the blades 23 to freely slide through the slots 15, and the slots 21 in the web 16 are of such length that the plates 23 may be fully retracted within the peripheral confines of the drum 14 as clearly shown in Fig. 3. Since the improved pump is adapted to handle diverse materials including sludge and fibrous matter, it is preferable to provide the blades 23 with a relatively sharp cutting edge at the outer ends thereof and these blades therefore act to sever the fibrous material entering the inlet port 10 through the hopper 12. The nose 39 of the wall 38 at the discharge may likewise be provided with a relatively sharp scraping end, as shown, adapted to cooperate with the periphery of the rotor 14. The hopper 12 may be secured to the pump at the inlet port by means of the bolts 6 which also retain the side walls 5 in position and the bearings 20 may assume any suitable form and may be secured to the side plates 20 by means of the bolts 29 which also retain the cam riding or guide plates 28 in position. Obviously, welding may also be utilized in fabricating and assembling the various parts.

In operation, the shaft 18 is driven by a suitable source of power such as a motor so that the shaft and rotor 14 rotate in the direction of the arrow in Figs. 1 and 3. Material is dumped into the hopper 12 and is moved through the chamber 9 by the blades 23 which are projected across the chamber at the inlet side of the pump by the cam links 25 which are guided by the plates 28, the edges 30 of the cams riding on the peripheral edges of the plates 28. As the rotor revolves and the plates 23 approach the discharge port 11, the cam actuating rollers 31 co-act with the edges 34 of the cam links 25 to cause pivoting of the links 25 inwardly about the pivot pins 26 thereby drawing the blades 23 into the slots 21 of the web 16, the blades 23 being entirely retracted by the cam links 25 as these blades pass the wall 38 and the scraper nose 39 thereof as clearly shown in Fig. 3. When the blades 23 are past the wall 38 and as they are being advanced toward the inlet, the cam actuating rollers 35 become effective through co-action with the edges 30 of the cams 25 to cause pivotal outward movement of the cam links 25 thereby projecting the blades 23 into and across the material displacement chamber 9 so that these blades 23 again become effective to move the material through the displacement chamber 9 as they pass the inlet port 10. This action is, of course, continuous with the blades 23 being successively actuated by the cams automatically upon rotation of the shaft 18 and rotor member 14 and the material being forced by the blades 23 through the annular displacement chamber 9 is, of course, continually forced through the discharge port 11 and conduit 13. Any material leaking past the peripheral wall of the rotor drum 14 may of course be discharged through the outlet 42. As the blades 23 are alternately swung across and out of the material displacement chamber 9, the enlarged end portions 24 of the blades ride along the bounding edges of the slots 21 and it will be observed as the material is advanced in the displacement chamber 9, the portions 24 of the blades 23 are urged against the forward or straight edges of the slots 21 whereas when the blades are retracted into the slots 21, the enlarged portions 24 ride along the curved rear edges of the slots.

From the foregoing detailed description, it will be apparent that my present invention provides an improved device for transporting high density fluent materials. The improved rotary positive displacement pump has proven highly satisfactory and efficient in actual use and is adapted to pump materials of extremely high density. Obviously, the pump may be assembled and dismantled quickly and easily with the use of ordinary tools and the liners 22, scraping nose 39, cam guide plate 28 and any other parts subjected to considerable wear and abuse may be readily replaced. The pumps built in accordance with my improvement are not only simple and compact in construction, but they are extremely durable and adapted to withstand considerable abuse. Among the materials which may be satisfactorily handled by my improved pump are food products of various types, tannery waste, sewerage, sludge, paper pulp and even concrete and these high density stocks may be continually pumped for relatively long distances. The various parts are all readily accessible for cleaning as well as for replacement or repair and suitable corrosion resisting materials may be used wherever necessary. The blades 23 are positively actuated by

the cam links 25 which are motivated by the rollers 31, 35 and the guide plate 28 and since these blades 23 are fully retracted into the rotor 14 as they are moved past the wall 38 at the discharge end of the pump, the scraper nose 39 of the wall may be extended directly against the periphery of the rotor 14.

While the invention has been shown and described herein as being specifically embodied in a rotary positive displacement pump having an upper inlet and lower discharge port, the improved features may obviously be readily adapted to rotary pumps wherein these ports are otherwise located and the guide plates 28, cam actuating rollers 31, 35 and cam links 25 may be modified to suit working requirements.

It should be understood that it is not my desire or intention to limit this invention to the exact details of construction or to the precise mode of use wherein shown and described for various modifications within the scope of the appended claims may occur to persons skilled in the art to which this invention pertains.

I claim:

1. In a rotary positive displacement pump, a housing provided with spaced peripheral inlet and outlet ports, a circular rotor member revolvable within said housing coaxially thereof and having a series of peripheral slots therein, said rotor and said housing cooperating to provide an annular displacement chamber, a piston blade slidable through each of said slots toward and away from the circular bounding surface of said chamber, a wall projecting into said chamber near the outlet port, a cam for each of said blades, means coacting directly with one surface of each of said cams independently of its blade for withdrawing the successive blades from within said chamber during advancement thereof past said wall, and means coacting directly with another surface of each of said cams independently of its blade for projecting the successive blades outwardly across said chamber after the blades have passed said wall.

2. In a rotary positive displacement pump, a housing provided with spaced peripheral inlet and outlet ports, a circular rotor member revolvable within said housing coaxially thereof and having a series of peripheral slots therein, said rotor and said housing cooperating to provide an annular displacement chamber, a piston blade slidable through each of said slots toward and away from the circular bounding surface of said chamber, a wall projecting into said chamber near the outlet port, a cam for each of said blades, a roller disposed in the path of travel of said cams near said outlet port and adapted to coact directly with a surface of each of said cams independently of its blade to withdraw the successive blades from within said chamber during advancement thereof past said wall, and means for projecting the successive blades outwardly across said chamber after they have passed said wall.

3. In a rotary positive displacement pump, a housing provided with spaced peripheral inlet and outlet ports, a circular rotor member revolvable within said housing coaxially thereof and having a series of peripheral slots therein, said rotor and said housing cooperating to provide an annular displacement chamber, a piston blade slidable through each of said slots toward and away from the circular bounding surface of said chamber, a wall projecting into said chamber near the outlet port, a cam for each of said blades, a roller disposed in the path of travel of said

cams near said outlet port and adapted to coact directly with a surface of each of said cams independently of its blade to withdraw the successive blades from within said chamber during advancement thereof past said wall, and a second roller disposed in the path of travel of said cams in advance of said inlet port and adapted to coact directly with another surface of each of said cams independently of its blade to project the successive blades outwardly across said chamber after the blades have passed said wall.

4. In a rotary positive displacement pump, a housing provided with spaced peripheral inlet and outlet ports, a circular rotor member revolvable within said housing coaxially thereof and having a series of peripheral slots therein, said rotor and said housing cooperating to provide an annular displacement chamber, a rectilinear piston blade slidable through each of said slots tangentially of a circle surrounding the rotor axis toward and away from the circular outer bounding surface of said chamber, a wall projecting into said chamber near the outlet port, a cam for each of said blades pivotally suspended from said rotor, an approximately semicircular guide plate disposed in the path of travel of said cams and adapted to coact with an inner surface of each of said cams to maintain said blades in active material-advancing position between said inlet and outlet ports, and a roller carried by said housing and coacting with an outer surface of each cam to withdraw the successive blades from within said chamber during advancement thereof past said wall.

5. In a rotary positive displacement pump, a housing provided with spaced peripheral inlet and outlet ports, a circular rotor member revolvable within said housing coaxially thereof and having a series of peripheral slots therein, said rotor and said housing cooperating to provide an annular displacement chamber and said rotor having a central web provided with a corresponding number of slots communicating with the peripheral slots of said rotor member, a rectilinear piston blade disposed within each of the slots in said web and slidable through each of said peripheral rotor slots tangentially of a circle surrounding the rotor axis toward and away from the circular outer bounding surface of said chamber, a wall projecting into said chamber near the outlet port, a cam for each of said blades pivotally suspended from said rotor, means carried by said housing and coacting with an outer surface of each cam for withdrawing the successive blades from within said chamber during advancement thereof past said wall, and means for projecting the successive blades outwardly across said chamber after they have passed said wall.

6. In a rotary positive displacement pump, a housing provided with spaced peripheral inlet and outlet ports, a circular rotor revolvable within said housing coaxially thereof and having a series of peripheral slots therein, said rotor and said housing cooperating to provide an annular displacement chamber, a piston blade slidable through each of said slots toward and away from the circular bounding surface of said chamber, a wall projecting into said chamber near the outlet port, a cam carried by each of said blades, each of said cams having an inner arcuate surface, a guide plate having an outer arcuate peripheral surface disposed in the path of travel of said cams, a stationary roller also disposed in the path of travel of said cams and cooperable with the inner arcuate surfaces thereof to project the suc-

cessive blades outwardly toward the circular bounding surface of said chamber, said inner arcuate cam surfaces being thereafter cooperable with the arcuate peripheral surface of said plate to maintain said blades in extended position, and means for withdrawing the successive blades from said chamber during advancement thereof past said wall.

7. In a rotary positive displacement pump, a housing provided with spaced peripheral inlet and outlet ports, a circular rotor revolvable within said housing coaxially thereof and having a series of peripheral slots therein, said rotor and said housing cooperating to provide an annular displacement chamber, a piston blade slidable through each of said slots toward and away from the circular bounding surface of said chamber, a wall projecting into said chamber near the outlet port, a cam carried by each of said blades, each of said cams having an inner arcuate surface, a guide plate having an outer arcuate peripheral surface disposed in the path of travel of said cams, a stationary roller also disposed in the path of travel of said cams and cooperable with the inner arcuate surfaces thereof to project the successive blades outwardly toward the circular bounding surface of said chamber, said inner

arcuate cam surfaces being thereafter cooperable with the arcuate peripheral surface of said plate to maintain said blades in extended position, and another roller cooperable with an outer surface of each of said cams to withdraw the successive blades from within said chamber during advancement thereof past said wall.

WALTER J. HOENECKE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
432,216	Smith	July 15, 1890
605,460	Gilbert	June 7, 1898
662,547	Sandahl	Nov. 27, 1900
1,078,168	Ruhlmann	Nov. 11, 1913
2,157,141	Murray	May 9, 1939
2,207,182	Smith	July 9, 1940
2,382,259	Rohr	Aug. 14, 1945

FOREIGN PATENTS

Number	Country	Date
1,701	Great Britain	1882