R. H. NESMITH.

ROTARY PUMP.

APPLICATION FILED SEPT. 18, 1912.

1,096,186.

Patented May 12, 1914.

2 SHEETS—SHEET 1.

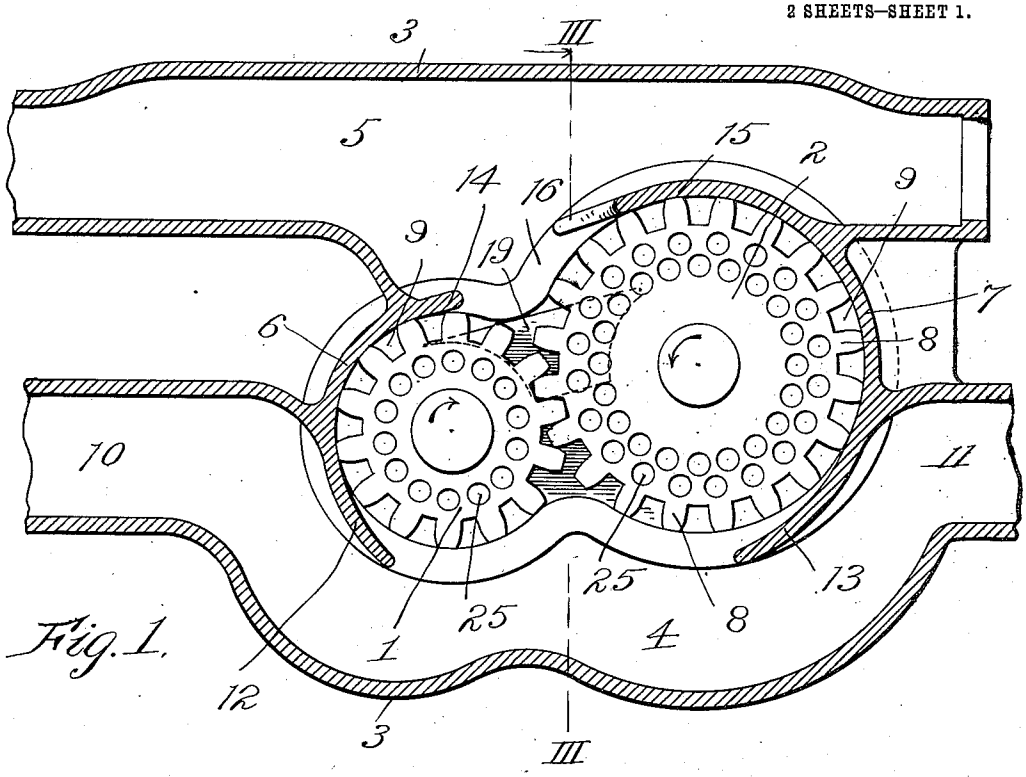


Fig. 1.

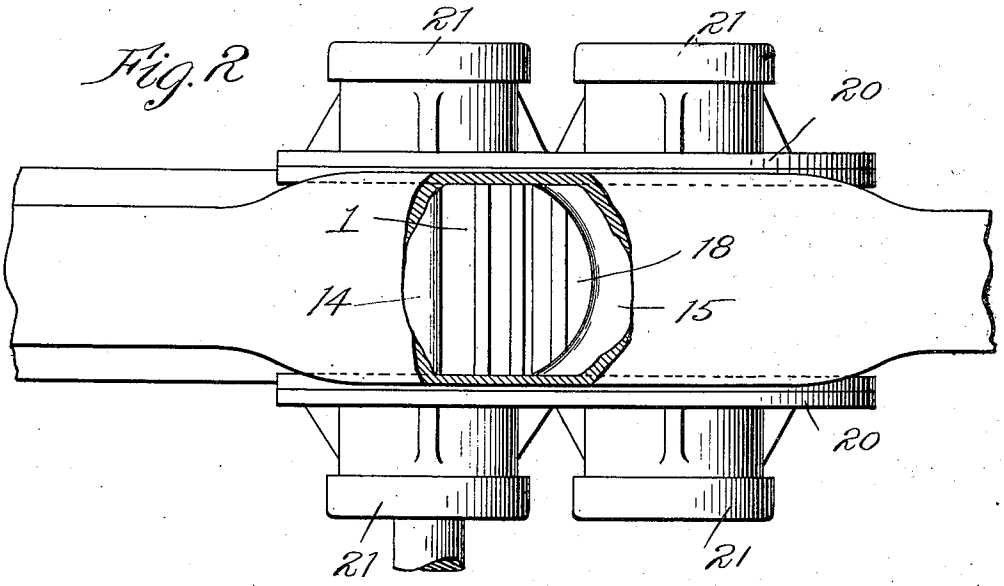


Fig. 2

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Fig. 3.

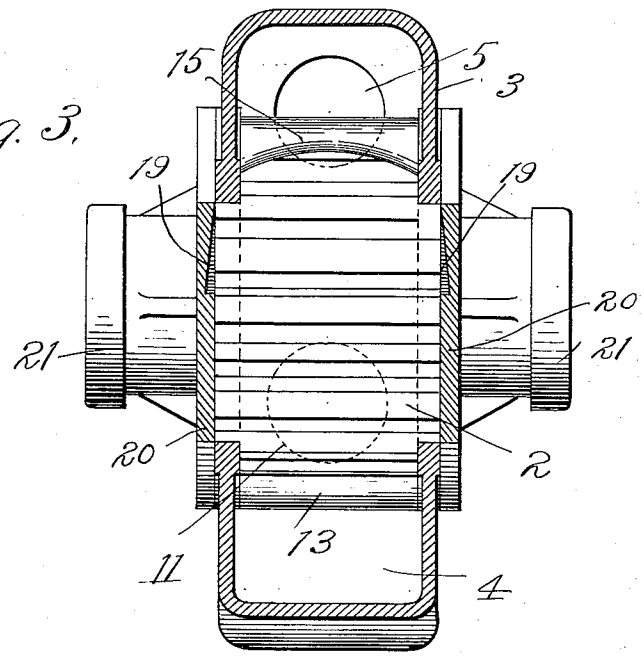
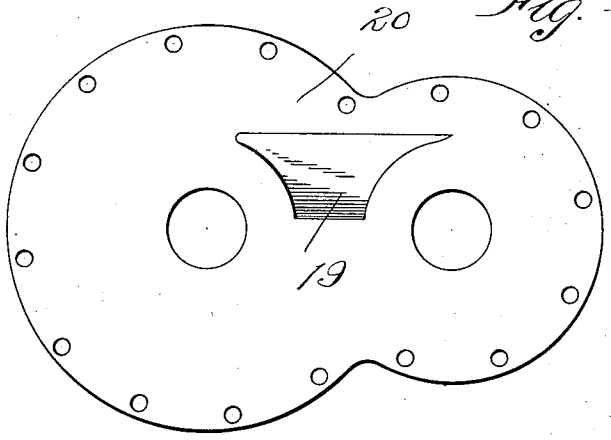


Fig. 4.



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UNITED STATES PATENT OFFICE.

RALPH H. NESMITH, OF ELMIRA, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AMERICAN-LA FRANCE FIRE ENGINE COMPANY, INC., A CORPORATION OF NEW YORK.

ROTARY PUMP.

1,096,186. Specification of Letters Patent. Patented May 12, 1914.

Application filed September 18, 1912. Serial No. 721,024.

To all whom it may concern:

Be it known that I, RALPH H. NESMITH, a citizen of the United States, residing at Elmira, in the county of Chemung, and in the State of New York, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

This invention relates to rotary pumps and more especially to that class of rotary pumps in which a pair of intermeshing gears are operated in a housing with an inlet chamber on one side of the line of centers of said gears and a discharge chamber on the other side of said line of centers.

The primary object of this invention is to provide an improved construction, combination and arrangement of parts according to which a device of this character can be simply and durably made and rendered efficient in operation.

Toward the attainment of this object, my invention contemplates the provision of suitable partitions or fixed vanes for shielding the rotary gear elements from the direct pressure of the in-rushing fluid in a direction retarding the movement of said gears.

A further object is to dispose these vanes and partitions in such a manner as will direct the in-rushing fluid against said gears in a direction to reinforce their movement.

Another object is to provide an improved by-pass for releasing the fluid which becomes pocketed between the intermshing teeth of the gears on the delivery side of the pump and which by-pass will deliver such fluid into the main current which leaves the pump.

Other collateral objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawings exemplifying the invention and in which—

Figure 1 is a vertical section of a pump constructed in accordance with the principles of the present invention, parts being shown in elevation. Fig. 2 is a top plan view of the same, parts being broken away and parts shown in section. Fig. 3 is a section on the line III—III, Fig. 1, looking in the direction of the arrows. Fig. 4 is an inside face view of one of the covers detached.

Referring more particularly to the drawings and to the embodiment shown therein, the rotary pumping elements comprise a smaller gear 1 and a larger gear 2, suitably mounted within a housing 3, which housing is provided with the inlet chamber 4 and the delivery chamber 5. A partition wall 6 is provided in the housing 3 to conform with the periphery of the gear 1 for a portion of its circumference, while a like partition 7 is similarly disposed about gear 2, said partitions being adapted to form with the gear teeth 8 and each of said gears, a plurality of fluid holding cells 9.

The gears 1 and 2 are rotatable in the directions shown by the arrows in Fig. 1. Upon opposite sides of the gears 1 and 2, the housing 3 is provided with intake openings or passages 10 and 11, such intakes being commonly disposed in this manner in fire engines embodying pumps of this character, so as to adapt the fire engine to be connected up with a water plug from either side. One of the drawbacks to this arrangement has heretofore been that water delivered through the intakes 10 and 11 under any considerable pressure, has been projected against the pumping gears 1 and 2 in a direction to retard their movement. In some instances the pressure of the inflowing water has been sufficient to render the pump inoperative by stalling said gears. In order to obviate these difficulties, the partitions 6 and 7 are, according to the present invention, provided with the fixed vanes or extensions 12 and 13 respectively, which serve to deflect the inflowing water away from those portions of the gears 1 and 2, which are moving in a direction contrary to the flow of the inflowing water. Furthermore, said extensions 12 and 13 are suitably arranged to confine the current from either inlet, to a channel which delivers the inrushing water to one or the other of said gears 1 and 2 at the periphery thereof and in the direction in which it is moving, thus imparting the momentum of the pressure driven water to the gears in the most effective manner. For this purpose, partitions or vanes 12 and 13 have their extremities deflected outwardly away from the gears 1 and 2 in such a way as to form raceways which contract in the direction of rotation of said gears. To enhance this effect, the wall of housing 3 is provided with a rounded protuberance 3′ intermediately of the inlets 10 and 11 which causes the inflowing water

from either inlet 10 or 11 to be projected against the teeth of the opposite gear in a direction tangential to the path of movement of said teeth. Further difficulties have been encountered in pumps of this character by reason of eddy currents created in the delivery chamber 5, the operation of the pump being seriously interfered with on this account. To overcome these difficulties, the partition 6 is provided with a smaller extension or vane 14 which is deflected upwardly from the gear 1 and a similar larger partition or vane 15 which overhangs the larger gear 2. A discharge port 16 is formed between the adjacent extremities of the upper extensions 14 and 15, the extension 15 being cut away at 18, as shown best in Fig. 2 to equalize the distribution of fluid discharged at either side of the chamber 5. One of the difficulties that has heretofore been encountered in pumps of this character is a greatly reduced capacity by reason of a considerable portion of the discharge fluid becoming pocketed between intermeshing teeth of the gears 1 and 2, the result being that considerable quantities of water has been returned to the suction chamber 4 instead of being discharged upwardly into the outer chamber 5. To overcome this difficulty the present invention contemplates the provision of a vent or by-pass 19 in either or both of the covers 20 of the housing 3. By an inspection of Figs. 1 and 3 it will be seen that the water thus pocketed will be displaced laterally into the by-passes 19 and upwardly into the chamber 5. In order to facilitate as far as possible the action of the by-passes 19, said by-passes are made deepest adjacent the line of centers of gears 1 and 2 and made shallower toward the discharge port 16 being flared upwardly to permit the return of the entrapped fluid to the outgoing currents with a minimum degree of back pressure. The gears 1 and 2 are preferably journaled in bearings 21 which are carried by the covers 20 on the housing 3.

It is obvious that only a very small clearance should be allowed between the faces of the gears and the adjoining heads of the casing, in order to prevent water from slipping back from the discharge into the suction side of the pump. In order to prevent undue friction between the gear wheel faces and the casing walls when the gears are closely fitted (allowing about 0.002″ play on each side), I provide means by which the gears are maintained laterally centered with the proper clearance on each side as above stated. These means constitute slight pockets or recesses 25, 25 Fig. 1 provided in each face of each gear, as close to their periphery and in as many rows as possible. These recesses, when running over or past by-pass 19, are filled with fluid of the same pressure, which prevails on the discharge side of the pump. Their tendency to discharge the fluid during the remainder of their travel, where the fluid pressure in the adjoining cells 9 is low, maintains on each side of the gears a film of fluid between their faces and the casing heads which most effectively prevents the gears from touching the casing heads, and thus prevents undue wear at these points of the pump. It is of course obvious that these recesses or pockets may have any suitable shape. I prefer to make them round as shown, as the cheapest way of manufacturing. Also the pockets 25 arranged in one or more rings as shown in Fig. 1 act as an effective means for preventing the water to slip past the gear wheel faces from the discharge to the suction side.

The operation of the several parts of my improved pump engine has been sufficiently indicated in the description embodied in the foregoing specification.

What I claim is:—

1. In a rotary pump, a pair of rotary elements provided with coöperating peripheries, a housing for said rotary elements, said housing being provided with inlet passages extending toward each other around portions of the peripheries of said rotary elements respectively, the wall of said housing intermediate to said inlet passages, being suitably formed to direct the inflowing water under pressure from each of said passages to the opposite rotary element in a direction corresponding to the direction of movement of that portion of the rotary element which is struck by the inrushing water.

2. In a rotary pump, a rotor housing provided with inlet and discharge passages, and a rotor in said housing, said housing being provided with an intake for water adjacent a portion of said rotor which is moving in a direction contrary to the flow of water through said intake, and a partition interposed between the intake and said rotor, said partition being deflected away from said rotor to form a gradually contracted passageway for directing the water against said rotor only in the direction of movement of that portion of said rotor which is adjacent to said intake.

3. In a rotary pump, a pair of rotary elements provided with coöperating peripheries, a housing for said rotary elements, said housing being provided with inlet passages extending toward each other around portions of the peripheries of said rotary elements respectively and adapted by the conformation of said housing to direct the inflowing water under pressure from each of said passages to the opposite rotary element in a direction corresponding to the direction of movement of that portion of the rotary element which is struck by the inrushing water, a protuberance on the inner wall of said housing intermediate of said inlet pas-

sages, said protuberance being adapted to deflect the inrushing water toward the rotary element opposite to the inlet from which the inrushing water comes, and partitions extending around portions of the peripheries of said rotary elements and toward said protuberance on the inner wall of said housing.

4. In a rotary pump, a pair of rotary elements provided with coöperating peripheries, a housing for said rotary elements, said housing being provided with inlet passages extending toward each other around portions of the peripheries of said rotary elements respectively and adapted by the conformation of said housing to direct the inflowing water under pressure from each of said passages to the opposite rotary element in a direction corresponding to the direction of movement of that portion of the rotary element which is struck by the inrushing water, a protuberance on the inner wall of said housing intermediate of said inlet passages, said protuberance being adapted to deflect the inrushing water toward the rotary element opposite to the inlet from which the inrushing water comes, and partitions extending around portions of the peripheries of said rotary elements and toward said protuberance on the inner wall of said housing, said partitions being deflected away from the peripheries of said rotary elements to bring them into approximate conformation with the wall of said housing on the other side of said protuberance.

5. In a rotary pump, a pair of intermeshing toothed pumping elements and a housing conforming approximately with the peripheries of said pumping elements on the off sides thereof to form fluid transporting cells between adjacent teeth and having extensions overreaching said pumping elements and spaced from the outer walls of said housing to provide guide vanes for directing fluid under pressure against said elements in the direction of rotation only, said extensions being adapted to form portions of the walls of said inlet passages.

6. A gear pump comprising a pair of intermeshing gears and a housing forming inlet and discharge chambers on opposite sides of the line of centers of said gears, said housing being provided with curved walls conforming to said gears, extensions on said curved walls projecting inwardly toward each other to provide fluid controlling ports, and a by-pass extending from approximately the line of centers toward the port of discharge side of said pump.

7. A gear pump comprising a pair of intermeshing gears and a housing forming inlet and discharge chambers on opposite sides of the line of centers of said gears, said housing being provided with curved walls conforming to said gears, extensions on said curved walls projecting inwardly toward each other to provide fluid controlling ports, and a by-pass extending from approximately the line of centers toward the port on the discharge side of said pump, said extensions having their extremities deflected away from the peripheries of said gears.

8. A gear pump comprising a pair of intermeshing gears and a housing forming inlet and discharge chambers on opposite sides of the line of centers of said gears, said housing being provided with curved walls conforming to said gears, extensions on said curved walls projecting inwardly toward each other to provide fluid controlling ports, and a by-pass extending from approximately the line of centers toward the port on the discharge side of said pump, said by-pass being flared toward said discharge port.

9. A gear pump comprising intermeshing pumping elements, a housing therefor provided with intakes directed opposite to the direction of rotation of said pumping elements, said intakes being respectively adapted to deliver fluid to the pumping elements disposed oppositely thereto, and oppositely disposed partitions respectively shielding said rotary elements from the retarding pressure of fluid entering said intakes.

10. A gear pump comprising intermeshing pumping elements, a housing therefor provided with intakes directed opposite to the direction of rotation of said pumping elements, oppositely disposed partitions respectively shielding said rotary elements from the retarding pressure of fluid entering said intakes, and other partitions arranged on the delivery side of said pump for preventing the return of fluid to said pump.

11. A gear pump comprising intermeshing pumping elements, a housing therefor provided with intakes respectively directed opposite to the direction of rotation of said pumping elements, oppositely disposed partitions respectively shielding said rotary elements from the retarding pressure of fluid entering said intakes, and other partitions arranged on the delivery side of said pump for preventing the return of fluid to said pump, said other partitions having their extremities deflected away from said pumping elements to form a discharge port.

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Witnesses:
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