Sept. 30, 1930. C. P. EISENHAUER 1,776,786

PUMP

Filed April 11, 1929 3 Sheets-Sheet 1

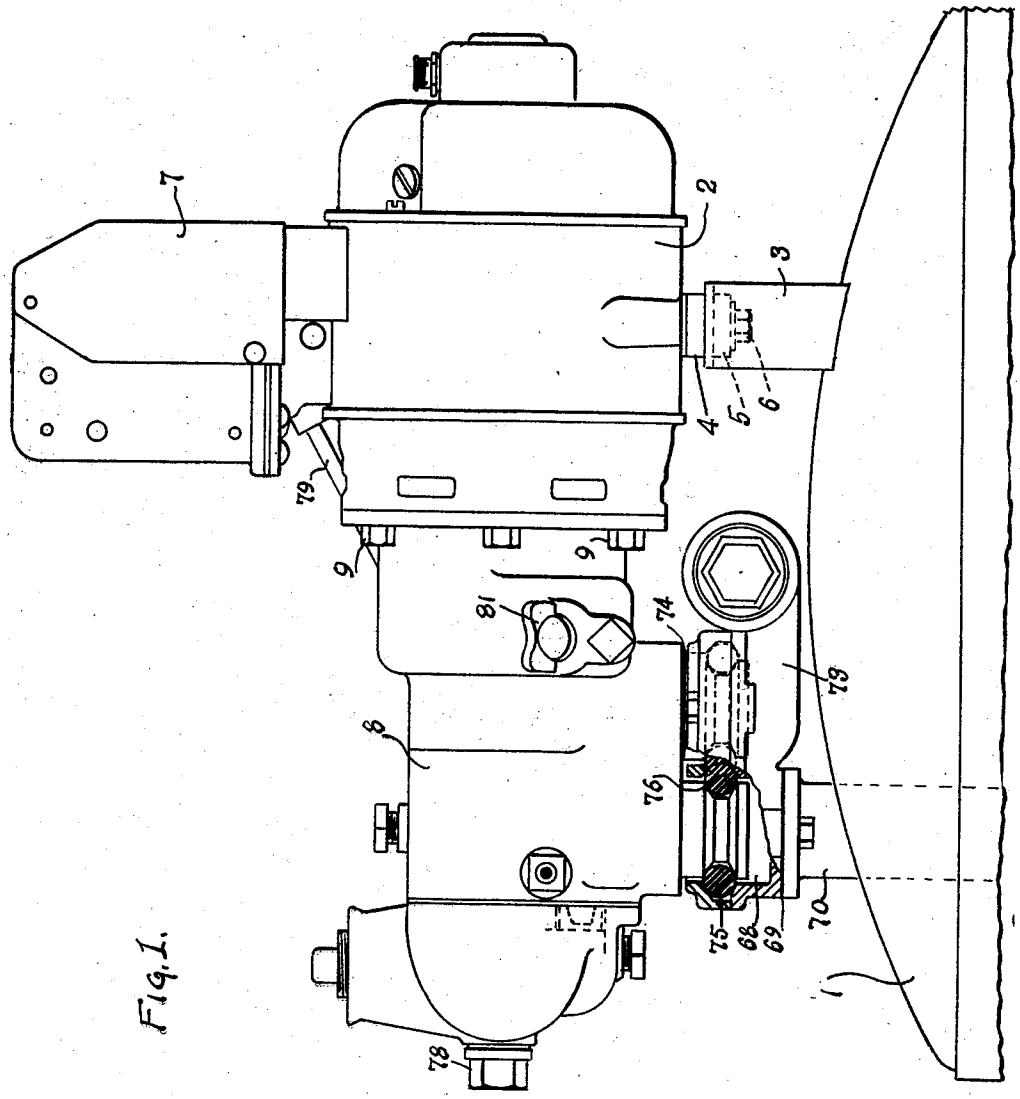


Fig. 1.

Inventor
CHARLES P. EISENHAUER,
BY
Toulmin & Toulmin
Attorneys

Sept. 30, 1930. C. P. EISENHAUER 1,776,786

PUMP

Filed April 11, 1929 3 Sheets-Sheet 2

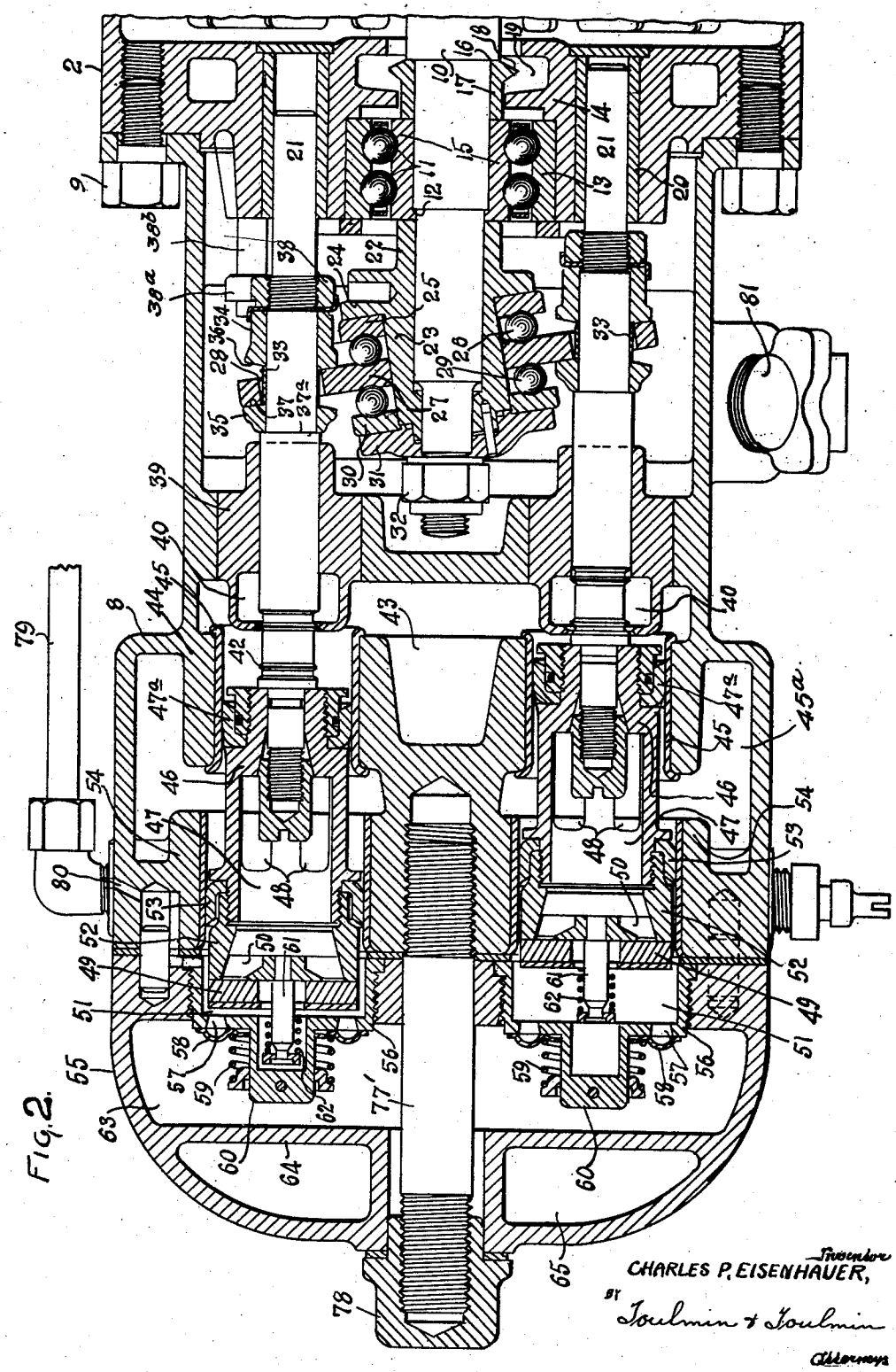


Fig. 2.

Inventor
CHARLES P. EISENHAUER,
By Toulmin & Toulmin
Attorneys.

Sept. 30, 1930. C. P. EISENHAUER 1,776,786

PUMP

Filed April 11, 1929 3 Sheets-Sheet 3

Fig. 3.

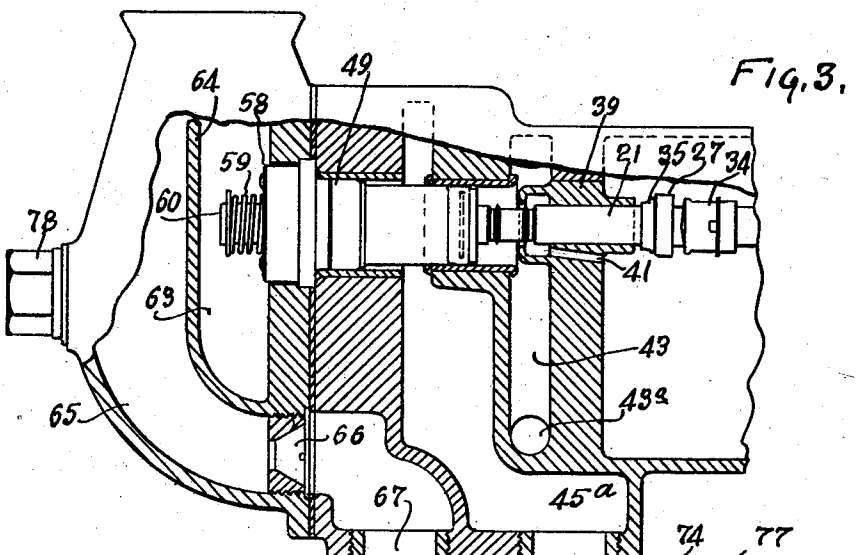
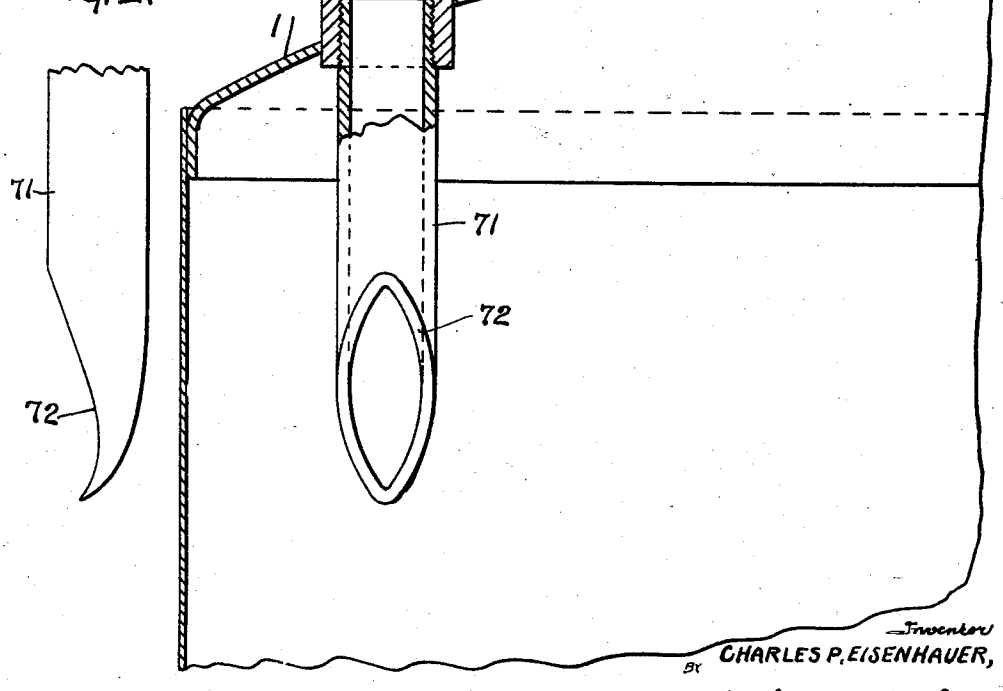


Fig. 4.



Inventor
CHARLES P. EISENHAUER,
By Toulmin & Toulmin
Attorneys

Patented Sept. 30, 1930 1,776,786

UNITED STATES PATENT OFFICE

CHARLES P. EISENHAUER, OF DAYTON, OHIO, ASSIGNOR TO THE DURO COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO

PUMP

Application filed April 11, 1929. Serial No. 354,257.

My invention relates to pumps.

It is the object of my invention to provide a pump which may be directly driven from a high-speed electric motor that will furnish a continuous stream of liquid, but in which any vibration due to the impulses of the pump will be broken up and dissipated thereby enabling a high-speed pump to be utilized without the disadvantage of noise due to vibrations.

Referring to the drawings, Figure 1 is a side elevation partially in section of the complete pump.

Figure 2 is a section of the line 2—2 of Fig. 1.

Figure 3 is a detailed view partially in section of the pump end of the pump.

Figure 4 is a side elevation of the distribution pipe.

Referring to the drawings in detail, 1 is a tank in which water from the pump is stored. The pump and motor are mounted upon this tank. 2 indicates the motor which is mounted upon the bracket 3 on the tank 1. This motor is insulated from the tank by the plugs 4 and 5 of rubber, through which pass the retaining bolts 6.

The motor is preferably a standard motor delivering 1750 revolutions per minute. On the top of this motor is mounted the pressure switch 7 which controls a starting and stopping of the motor and the operation of the pump.

The pump itself is designated 8, being connected by the bolts 9 to one end of the motor housing.

Motor drive

The armature shaft 10 is mounted in one end of the motor housing in the ball bearings 11. One-half of the cage of this ball bearing is mounted over the shoulder 12 of the armature shaft, while the other half of of the cage, designated 13, is mounted within the shoulder sleeve 14 of the motor housing.

Between the inside ball race 15 and the shoulder 16 on the armature shaft is mounted a sleeve 17 with a sharp V-shaped shoulder 18 that revolves within a pocket 19 so that any oil or water proceeding along the shaft will be caused to drop into the pocket 19 and not run into the motor. This same end plate supporting the armature shaft also supports the bearing sleeve 20 for the inner ends of the piston rods 21.

Mounted on the end of the armature shaft 10 is a sleeve 22 that is provided with a cylindrical portion 23, the axis of which is at an angle to the axis of the shaft 10. This sleeve 23 is provided with a shoulder 24. Against this shoulder rests a ball race 25 on which run a series of balls 26. On the other side of these balls is an extended ball race plate 27 having marginal apertures 28 for receiving the piston rods 21. On the other side of this ball race plate is a series of balls 29 running in a race 30 which is retained in position by a locking plate 31. This plate is held in position by the nut 32 on the end of the armature shaft.

Thus, the assembly of the two races 25 and 30, the two sets of balls 26 and 29, and the ball race plate 27 turn on the sleeve 23 at an angle to the axis of the armature shaft 10.

The apertured plate 27 is mounted around a bearing sleeve 33 on the piston rod 21 which serves to space two bearing members 34 and 35 that have outwardly flaring bearing faces 36 and 37 on which the side walls of the ball race plate 27 bears with a rocking movement. These members 34 and 35 are held in position by having the member 35 abut against the shoulder 37^a and the member 34 held in position by a lock nut 38.

The rotation of the armature shaft 10, therefore, results in the successive reciprocation in opposite directions of the piston rods 21. These piston rods are mounted in bearing sleeves 39, the ends of which are formed into pockets 40 for receiving any drip from the piston rods, which drip is conveyed away through the passage way 41. A V-shaped shoulder 42 is provided on the piston rod to insure this drip and prevent the liquid from running along the piston rod.

Outside of these chambers 40 there is an enlarged water drip chamber 43. A cylinder is provided in the casing 44 having a lining 45 in which one end of the piston rod 46 travels, having the usual washer 47^a. This

piston is solid at 46 but hollow at 47 as the liquid enters the interior of the piston through the ports 48 from the inlet passage way 45a. It is discharged outwardly beneath the valve member 49 through the ports 50 into the forward cylinder 51. 52 designates the forward end of the piston, and 53 its washer. The forward cylinder is formed partially in the sleeve 54 and partially within the discharge manifold 55. That portion of the discharge manifold is formed by a threaded cup 56 which is provided with outwardly flaring apertures 57 closed by the metal valve plate 58 which is held in position by the spring 59 mounted on the valve guiding sleeve 60.

This valve guiding sleeve is hollow, forming a cylinder of its own to accommodate the valve pin 61 and spring 62 which serves to retain the valve member 49 in position.

The fluid makes its exit into the chamber 63 and then passes upwardly over the baffle plate 64 into the exit chamber 65, whence it makes its exit through a plurality of outwardly flaring openings 66 which break up the continuity of the stream and act in the nature of spray nozzles. Thence, the water passes into the outlet pipe 67, into the outlet manifold 68 which is mounted by a resilient washer 69 upon the tank pipe 70. This tank pipe is provided with a curved nozzle 71 cut away at 72, to cause the fluid to take a circular path in the tank 1. It will be noted that the fluid makes its inlet through the pipe 73 which is a part of the manifold 68. It thence passes into the inlet pipe 74, into the inlet passage way 45a between the portions 46 and 52 of the piston so that the fluid can enter the interior of the piston 47 through the ports 48.

Mounting of pump on tank

There is interposed between the pipes 74 and 67 and the manifold 68 and pipe 73, a pair of molded rubber rings 75 which are molded together at 76 where they are inserted between the manifold 68 and a cap member 77 forming a part of the manifold. Thus the pump rests upon rubber and its vibrations cannot be communicated to either the inlet pipe or the outlet pipe. As the motor is mounted upon rubber it likewise is insulated from the rest of the structure.

Anti-vibration nozzles

Due to the high speed of this pump it is essential to break up the continuity of the stream of liquid. Hence the outwardly tapered nozzles 66 are utilized which serve to spray the liquid into the exit line thereby breaking up any rythmic vibrations which are set up in a column of liquid by a rapidly reciprocating pump.

These nozzles are separate, adjustable members screwed into the bottom of the exit chamber of the distribution manifold. This manifold is held on the end of the pump by the threaded bolt 77′ and nut 78.

Assembly of the pump

It will be noted that the pump consists of the motor 2 to which housing is connected the pump casing 8 by the bolt 9 to which in turn is connected the distribution manifold 55 by the bolt 77′.

Collection chambers

In order to prevent oil and water from moving into areas where they are not desired, it will be noted that I have provided a series of collection chambers. The chamber 19 collects oil from the armature shaft bearings but prevents the oil from entering the motor.

The collection chamber 40 collects any oil on any of the piston rod shafts and redelivers that oil through the passage way 41 back into the oil chamber in which the bearings are turning.

Any leakage of water from the sleeve 45 and piston 46 will drip down into the chamber 43 from which it can be drained through the opening 43a as desired.

Valve assemblies

It will be noted that the piston valve 49 is independently assembled on the end of the piston where access can be had to it when the exhaust manifold is removed. The valve is formed of resilient material, as it is essential that it seat in tight condition on the end of its piston.

The metal valve member 58 in the exit manifold is carried by a separate threaded sleeve 56 and can be independently inspected, adjusted and installed.

Pneumatic switch control

The pneumatic switch control takes its water pressure line 79 from one side of the pump housing 8 where it communicates through the passage way 80 with the forward cylinder of the pump. When the pressure reaches a predetermined point, the switch is cut out in the usual manner and the pump stops. This forms no part of my present invention.

Oil is delivered to the bearing casing where the bearings are locked by removing the screw plug 81.

One of the features of my invention is the provision of a shoulder 38a from the nut 38 mounted on the piston rod 21 which engages with the pin 38b mounted on the partition 14 so that the piston rods cannot rotate while permitting their free reciprocation.

I desire to comprehend within my invention such modifications as may be clearly embraced within my claims and the scope of my invention.

Having thus fully described my invention what I claim is new and desire to secure by Letters Patent, is:

1. In combination, a driving housing, a pump housing and a fluid delivery manifold, a shaft extending into said driving housing and an angularly disposed non-rotating ball race plate on said shaft, a plurality of non-rotating, reciprocating piston rods actuated by said ball race plate, and means in said driving housing for slidably supporting said piston rods.

2. In combination, a driving housing, a pump housing and a fluid delivery manifold, a shaft extending into said driving housing and an angularly disposed non-rotating ball race plate on said shaft, a plurality of non-rotating, reciprocating piston rods actuated by said ball race plate, and means in said driving housing for slidably supporting said piston rods, pistons on said piston rods, cylinders for said pistons in said pump housing, and means of supplying fluid to said cylinders and pistons.

3. In combination, a driving housing, a pump housing and a fluid delivery manifold, a shaft extending into said driving housing and an angularly disposed non-rotating ball race plate on said shaft, a plurality of non-rotating, reciprocating piston rods actuated by said ball race plate, and means in said driving housing for slidably supporting said piston rods, pistons on said piston rods, cylinders for said pistons in said pump housing, and means of supplying fluid to said cylinders and pistons, valve mechanism carried by said pistons, and valve mechanism carried by said delivery manifold.

4. In combination, a driving housing, a pump housing and a fluid delivery manifold, a shaft extending into said driving housing and an angularly disposed non-rotating ball race plate on said shaft, a plurality of non-rotating, reciprocating piston rods actuated by said ball race plate, and means in said driving housing for slidably supporting said piston rods, pistons on said piston rods, cylinders for said pistons in said pump housing, and means of supplying fluid to said cylinders and pistons, valve mechanism carried by said pistons, valve mechanism carried by said delivery manifold, and means in said manifold for breaking up the continunity of the fluid stream delivered by said pump.

5. In combination, in a pump, piston rod driving mechanism, an oil chamber housing said piston rod driving mechanism, a water supply chamber, a cylinder communicating therewith, a piston in said cylinder on said rod, a water drain chamber, an oil collecting chamber, said water chamber and oil collecting chamber being adjacent said piston rods, and means for draining oil from the oil collection chamber back into the main oil chamber.

6. In combination, a motor having an armature shaft, an oil chamber having spaced partitions, piston rods slidably mounted thereon, means in said oil chamber for driving said piston rods from the armature shaft of the motor projecting therein, a chamber for collecting oil from the armature shaft, chambers for collecting oil from the piston rods, a water drainage chamber outside of the main oil chamber, a plurality of cylinders communicating therewith, pistons in said cylinders on said rods, a water supply chamber communicating with said cylinders, and a delivery manifold chamber receiving water from said chambers.

7. In combination, a piston rod and cylinder therefor, a partition slidably supporting said rod, an oil chamber formed in one wall of said partition having an aperture whose margin is closely adjacent to said piston rod for removing oil therefrom, a water drip chamber arranged exteriorly of said oil collecting chamber communicating with the end of the cylinder in which said piston rod operates whereby surplus moisture and oil are removed from said piston rods and cylinders.

8. In combination, a tank, a motor mounted on said tank, means for resiliently insulating said motor from the tank, a pump driven by said motor, an exit pipe from said pump supporting said pump on said tank and resilient means between said exit pipe and said tank.

9. In combination, a tank, a motor mounted on said tank, means for resiliently insulating said motor from the tank, a pump driven by said motor, an exit pipe from said pump to said tank supporting said pump on said tank and resilient means between said exit pipe and said tank, and a pipe in said tank for directing the fluid delivered thereto in a swirl.

10. In combination, a tank, an inlet pipe therefor, a manifold mounted thereon, comprising an inlet passageway for incoming water and an outlet passageway communicating with the tank pipe, inlet and outlet pipes mounted within said manifold in said passageways and resilient means for resiliently supporting said pipes within said manifold.

11. In combination, a pump having an inlet pipe and outlet pipe, a manifold having an inlet passageway and outlet passageway in which said pipes fit and resilient rings interposed between said pipes and said manifold for connecting and supporting the manifold and the pump with respect to one another to dampen vibration.

12. In combination, a pump having an inlet pipe and outlet pipe, a manifold having an inlet passageway and outlet passageway in which said pipes fit and resilient rings interposed between said pipes and said manifold for connecting and supporting the manifold and the pump with respect to one another to dampen vibration, and means in said pump for breaking up the continuity of the

stream delivered whereby the pulsations of the delivered fluid will be dampened as delivered by the pump.

13. In a pump, a cylinder, piston and piston rod, a receiving chamber for fluid from said cylinder having a back wall partition open at the top, a second chamber for receiving said fluid from the first chamber as it flows over the top of said partition, said second chamber having restricted apertures below said partition for the exit of fluid from the second chamber.

14. In a pump, a cylinder, piston and piston rod, a receiving chamber for fluid from said cylinder having a back wall partition open at the top, a second chamber for receiving said fluid from the first chamber as it flows over the top of said partition, said second chamber having restricted apertures below said partition for the exit of fluid from the second chamber, said apertures having outwardly flared mouths.

15. In a pump, a delivery manifold comprising a pair of chambers separated by a partition open at the top, a plurality of cylinders delivering fluid to one side of the partition, and discharge means on the other side of the partition for breaking up the continuity of the fluid flowing from the pump.

In testimony whereof, I affix my signature.

CHARLES P. EISENHAUER.