

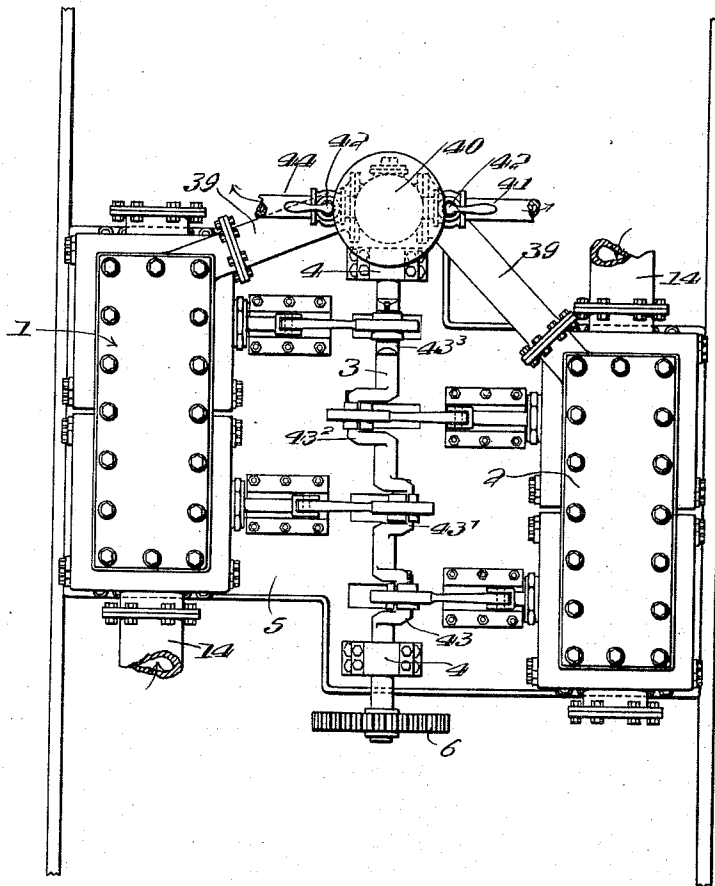
A. C. WEBB.
 PISTON PUMP FOR AUTO FIRE APPARATUS.
 APPLICATION FILED JULY 10, 1911.

1,018,795.

Patented Feb. 27, 1912.

7 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Lottie M. Fox.

Bertha von Behrens.

Inventor:

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Ray H. Wagner
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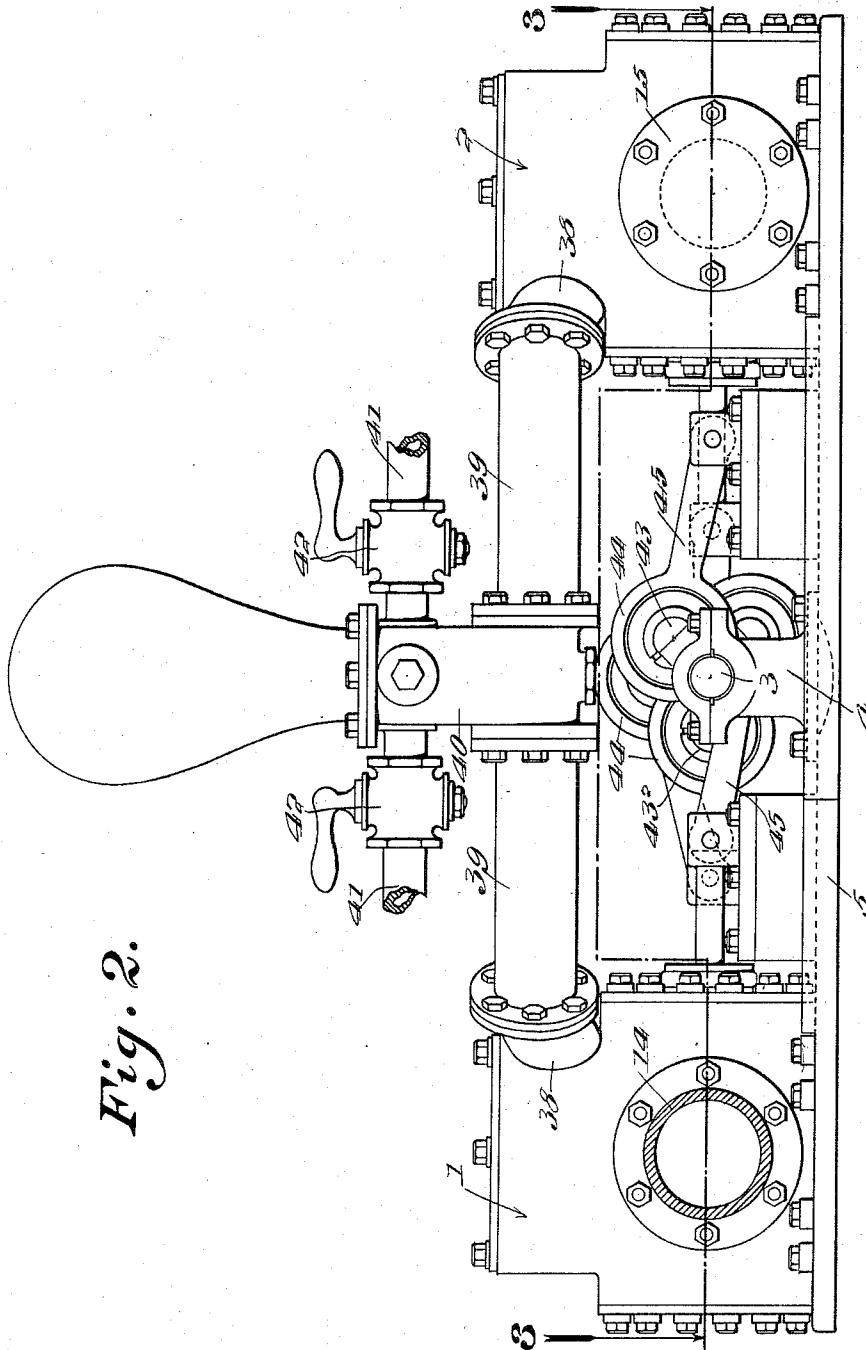


Fig. 2.

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 Bertha von Behrens

Inventor:
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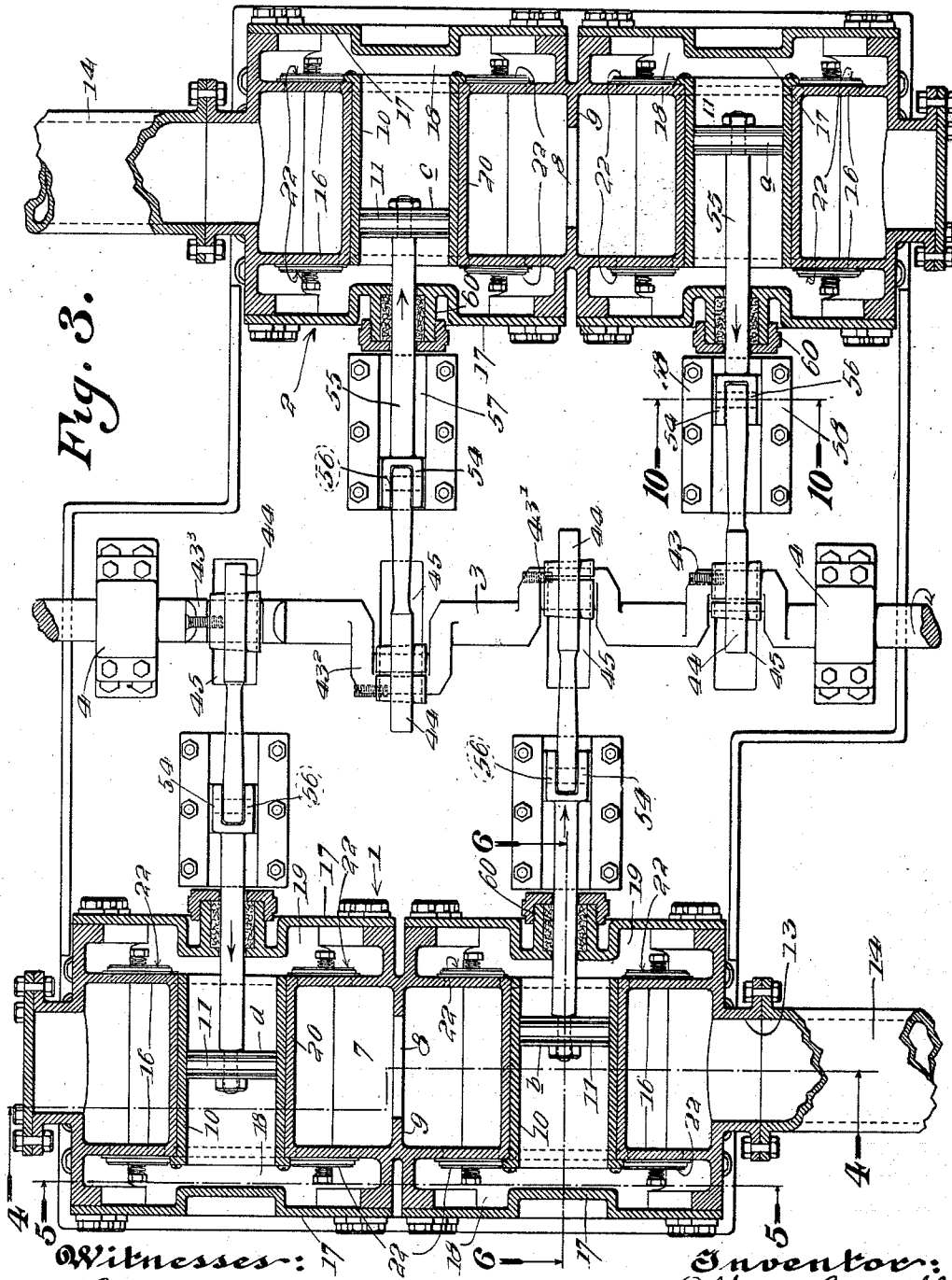


Fig. 3.

Witnesses:
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Fig. 4.

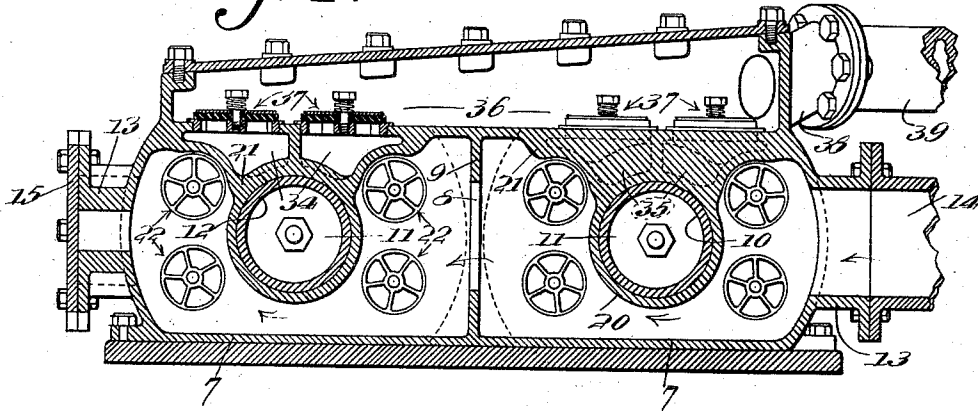
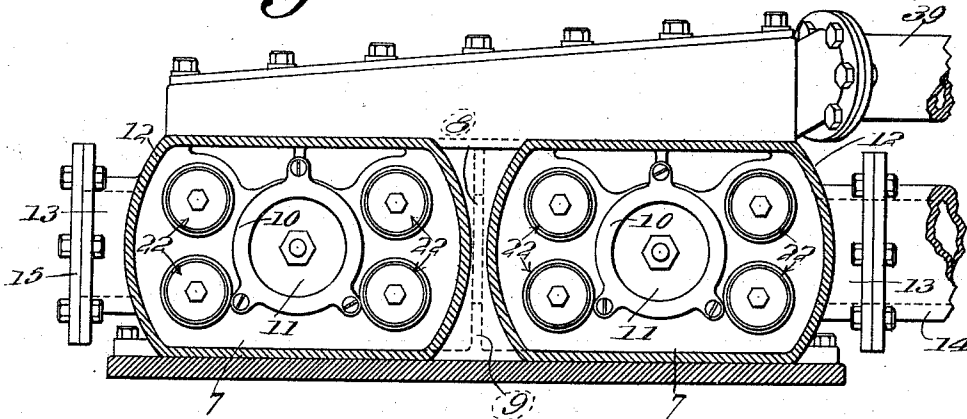


Fig. 5.



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Fig. 6.

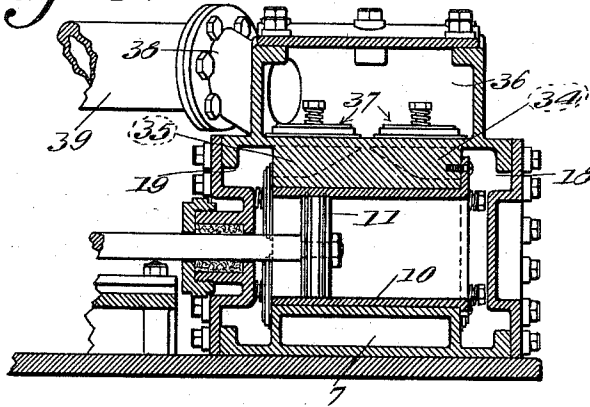
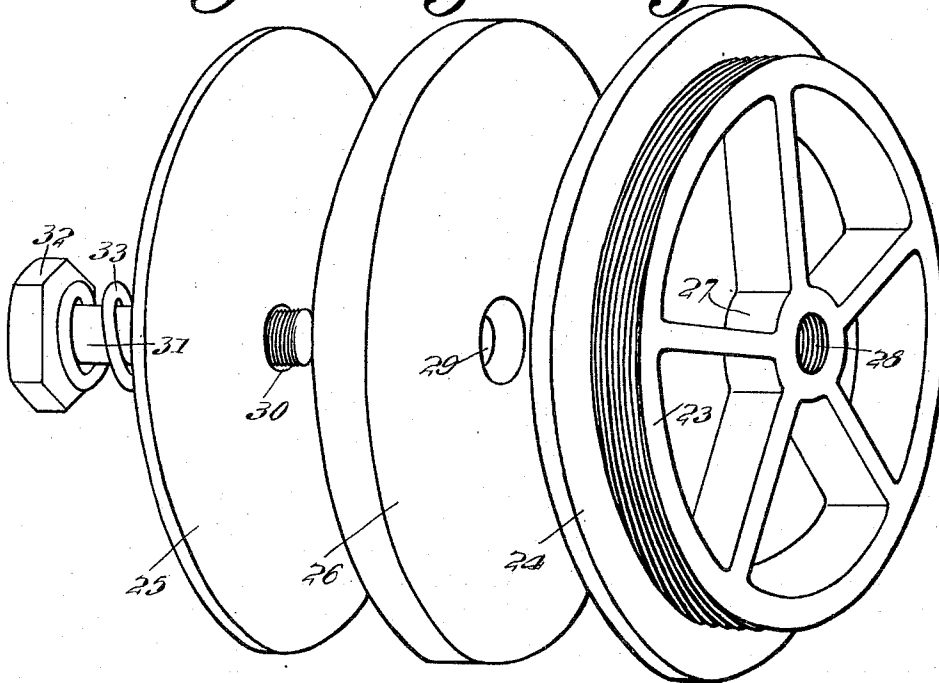


Fig. 7. Fig. 8. Fig. 9.



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Fig. 10.

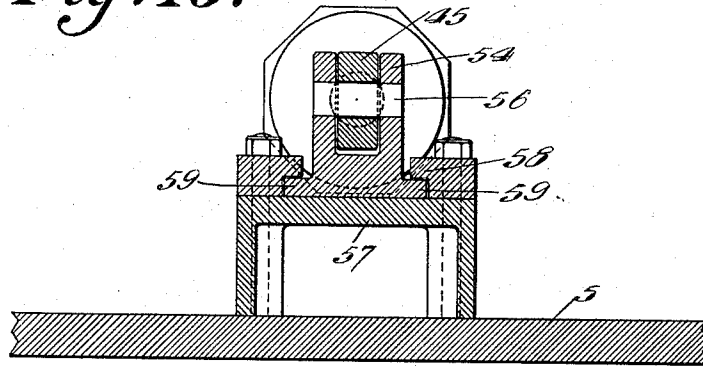
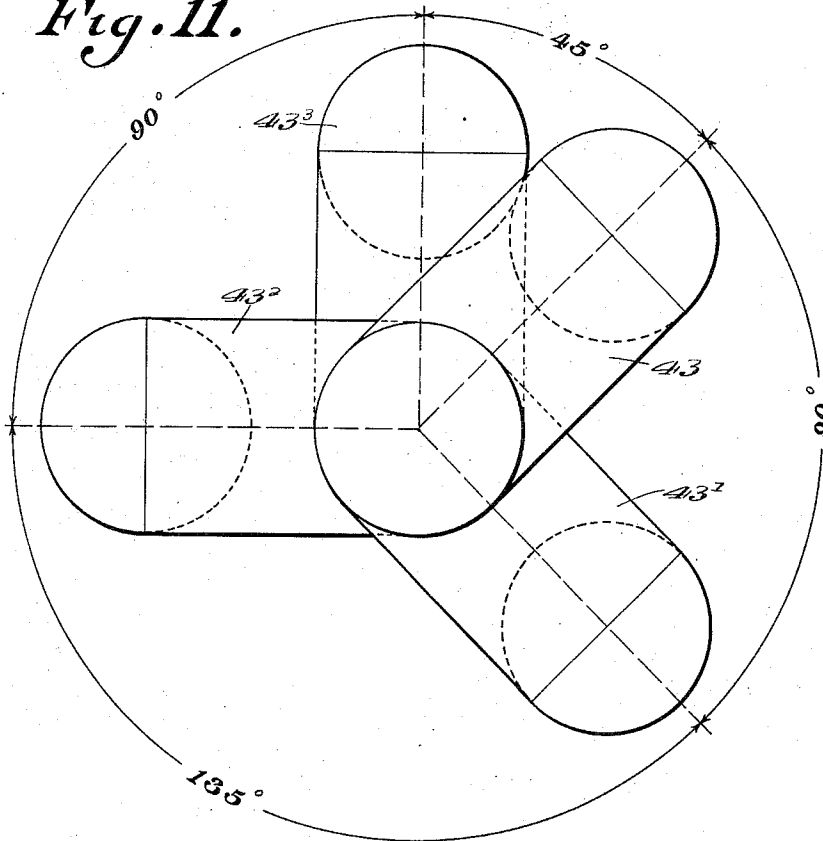


Fig. 11.



Witnesses:
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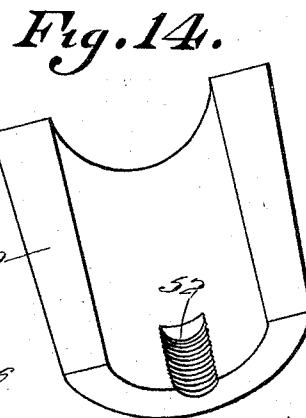
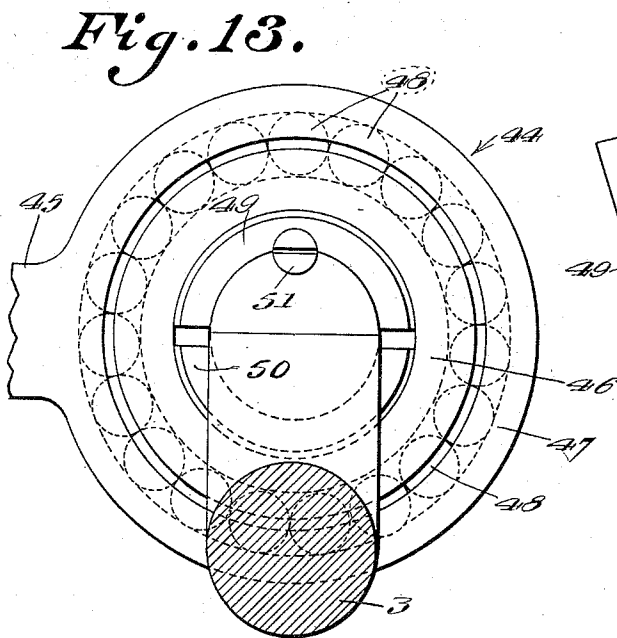
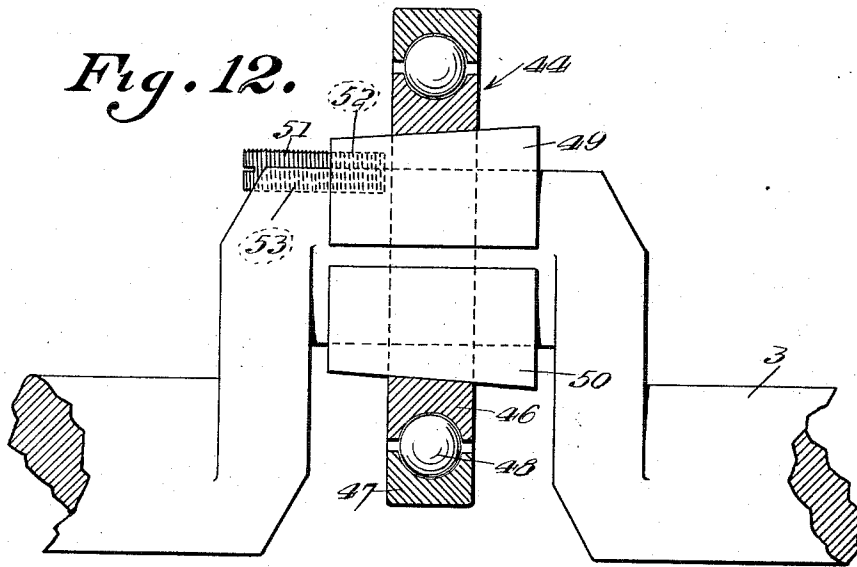
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7 SHEETS—SHEET 7.



Witnesses:
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UNITED STATES PATENT OFFICE.

ALBERT C. WEBB, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE WEBB MOTOR FIRE APPARATUS COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF DELAWARE.

PISTON-PUMP FOR AUTO FIRE APPARATUS.

1,018,795.

Specification of Letters Patent.

Patented Feb. 27, 1912.

Application filed July 10, 1911. Serial No. 637,742.

To all whom it may concern:

Be it known that I, ALBERT C. WEBB, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Piston-Pumps for Auto Fire Apparatus, of which the following is a specification.

The present invention has reference to multi-cylinder double-acting piston pumps, and it comprehends, generally, an improved pump of that type designed primarily for attachment to the frame or chassis of a motor fire engine and for operation by the motor thereof when the vehicle is stationary.

The features of improvement relate to and reside in the construction of the pump case and in the arrangement of the several inlet and outlet valves, and, more especially, in the connections between the drive shaft and the pistons, the former element being provided with cranks that are so set or disposed that a continuous stream of water will be forced through the fire hose without occasioning the objectionable vibration therein.

A structural embodiment of the invention is illustrated in the accompanying drawings, whereof:

Figure 1 is a plan view of the complete pump. Fig. 2 is an enlarged end view thereof. Fig. 3 is a horizontal sectional view of the pump, taken on the line 3—3 of Fig. 2. Figs. 4 and 5 are longitudinal vertical sectional views of one of the pump cases taken, respectively, on the lines 4—4 and 5—5 of Fig. 3. Fig. 6 is a transverse vertical sectional view of said case, taken on the line 6—6 of Fig. 3. Figs. 7, 8, and 9 are enlarged perspective views of the main parts of one of the valves. Fig. 10 is an enlarged transverse vertical sectional view, taken on the line 10—10 of Fig. 3, and showing the connection between one of the piston rods and the corresponding pitman. Fig. 11 is a diagrammatic view showing the angular arrangement of the cranks with respect to each other. Fig. 12 is an enlarged side elevation of one of the cranks, showing the manner in which the corresponding pitman is connected thereto, the latter appearing in section. Fig. 13 is an end view of Fig. 12, and Fig. 14 is an

enlarged perspective view of one of the wedges carried by the cranks.

The pump shown in said drawings is of the duplex double-acting type and consists, primarily, of the two opposed cases 1 and 2, each of which is provided with a plurality of cylinders wherein the pistons work, and a drive shaft 3 that is connected with said pistons, as hereinafter described, and is journaled and supported in ball-bearings of any desired type, provided in uprights 4. Said cases are mounted upon a base 5, to which the uprights 4 are affixed and which, in turn, is mounted upon the chassis of the vehicle, shaft 3 being provided at one end with a gear 6 designed for connection in any suitable manner with the shaft of the motor (not shown), but preferably by means of the mechanism described and illustrated in a companion application filed concurrently herewith. In the present instance, each pump case contains two water inlet chambers 7 which communicate by way of an opening 8 in the transverse central partition wall 9, and each chamber contains, in turn, an interiorly located cylinder 10 having a piston 11 working therein. The end walls 12 of each case are provided with flanged cylindrical necks 13, one neck of a case having the discharge end of a supply or inlet pipe 14 fastened thereto, while the other neck is closed by a cap 15, or the like, one of the aforesaid supply pipes being connected to the neck of one case and the other pipe to the diagonally-opposite neck of the other case, as shown in Figs. 1 and 3. The side walls 16 of each inlet chamber are preferably spaced from the corresponding walls 17 of the case, so that a pair of auxiliary chambers 18 and 19 are produced, the inlet chamber being located intermediate the two auxiliary chambers, with which latter the open ends of the cylinders 10 directly communicate. The water entering a case through the inlet pipe 14 thereof will, accordingly, flow into the adjacent inlet chamber 7, and thence through the opening 8 into the other inlet chamber 7, passing below the cylinders 10 in said chambers, which cylinders are supported in the tubular portions 20 of the top walls 21 of the chambers.

Communication between each inlet chamber and the two auxiliary chambers 18 and

19 is effected through the intermediary of inlet valves 22, a series of these valves being located in each wall 16. Each valve, as depicted in Figs. 7, 8 and 9, comprises a stationary annular body member or seat 23, which is threaded in an opening in said wall and is provided at its outer edge with a circumferential flange 25 that contacts with the outer face of the wall, and a movable member or valve proper adapted to seat against said body and consisting of an outer metal disk 25 and an inner rubber disk 26. The body member 23 is in the nature of a spider, and its hub 27 is provided with a threaded axial opening 28 that registers with unthreaded openings 29 and 30 formed axially through the disks 26 and 25. The threaded opening 28 receives the free end of a threaded pin or bolt 31 that passes loosely through the openings 29 and 30 and terminates at its outer end in a head 32, between which latter and the metal disk 25 there is interposed an expansible coil spring 33 that encircles said bolt and normally holds the valve proper in closed position against its seat.

The auxiliary chambers 18 and 19 have direct communication with pairs of opposed outlet passages 34 and 35 that are formed in the top walls of the inlet chambers and, in turn, lead into a main outlet chamber 36 located above said walls, the openings between said passages and the outlet chamber being normally closed by outlet valves 37 which are identical in construction with the aforementioned inlet valves and, on that account, require no separate description. Both the outlet valves and the inlet valves open outwardly, and their operation will be explained at length hereinafter. The passages 34 and 35 extend inwardly toward each other and are located directly above the cylinders 10, there being, preferably, four of such passages, and a similar number of outlet valves (one for each passage), associated with each cylinder, as well as four inlet valves in each of the side walls 16 of each inlet chamber.

Two main outlet chambers 36 are preferably employed, one for each case, these chambers extending the entire length of the cases and opening at their discharge ends into necks 38 to which the adjacent ends of the outlet pipes 39 are coupled, the latter leading directly to the air chamber 40 of the pump. From the last-mentioned chamber the water is discharged into the hose sections 41, said sections being equipped with suitable controlling valves 42.

When the pistons are in motion, the course of the current of water directly affected by any one of said pistons, for instance, that one which works in the cylinder depicted in the upper left-hand corner of Fig. 3, is as follows: Assuming that said piston is moving toward the left, it will draw water into

the intermediate or auxiliary chamber 19 from the corresponding inlet chamber by reason of the automatic opening of the valves 22 in the left-hand wall 16, the water filling said chamber 19 and flowing into the open end of the cylinder behind the piston. At the same time, the water in said cylinder in front of the piston and, also, that in the chamber 18, (which was drawn thereinto during the preceding stroke of said piston), will be forced into the passages 34, the pressure of the water opening the outlet valves 37 associated with that pair of passages, whereupon the water will flow into the outlet chamber 36, and thence through the neck 38 and outlet pipe 39 to the air chamber 40, from which latter it will pass into the hose sections 41. On the succeeding stroke of the piston, water will be drawn from the inlet chamber into the intermediate or auxiliary chamber 18, and, at the same time, the water previously drawn into chamber 19 will be forced therefrom into and through the passages 35, opening the corresponding valves 37 and then flowing into chamber 36, whence it proceeds as above described. It will be seen, therefore, that each stroke of each piston exercises both a suction and a discharge influence, or, in other words, is at once a suction and a discharge stroke, water being drawn into one of the intermediate or auxiliary chambers and the adjacent end of the cylinder at the same time that it is expelled from the opposite end of the cylinder and the other intermediate or auxiliary chamber. In consequence, it will be apparent that during each stroke of each piston there is a discharge of water into the outlet chamber.

The several pistons are individually connected with the main drive shaft 3, as has already been stated, said shaft being provided with a separate crank for each piston. Referring to Figs. 1 and 3, wherein said cranks are designated in order by the numerals 43, 43', 43², and 43³, it will be seen that each crank is encircled by the eye 44 of a pitman 45, said eye comprising concentric inner and outer annuli 46 and 47 which are formed as race members and have a series of anti-friction rollers 48 interposed between them. The inner race member 46 is fixed in place on the crank, preferably by means of a pair of opposed semi-cylindrical wedges 49 and 50 which are interposed between that member and the crank, as shown in Figs. 12 and 13. One of these wedges, in the present case the wedge 49, is fastened to the crank by suitable means, as, for instance, a screw 51 or the like which is fitted in mating openings or sockets 52 and 53 formed longitudinally in said member and the surface of the crank.

The opposite end of each pitman is pivotally mounted in a fork 54 formed on the outer end of the piston rod 55, a pin 56 being

passed through registering apertures in the fork legs and the pitman end. (See Fig. 10.) Said fork is slidably mounted upon a bed plate 57 and is guided and held in place by longitudinally undercut cleats 58 which overhang and engage the longitudinal flanges 59 formed upon the lower side edges of the fork. The piston rods project through suitable stuffing boxes 60 provided upon the inner side walls 17 of the two pump cases.

Referring to Figs. 1 and 3, it will be seen that the cranks 43, and 43² operate the pistons on the right-hand side of the drive shaft 3, while the cranks 43' and 43³ operate those on the left-hand side. These cranks are so arranged that the beginning of the stroke of each piston will overlap the end of the stroke in advance thereof; that is to say, each stroke of each piston ends just after the stroke of another piston has started, so that there will be no interval between successive strokes. For this reason, a continuous stream of water will be forced through the hose sections, when the pump is in operation, and there will be no appreciable vibration of the same, as would be the case where a stroke ended before the commencement of the succeeding stroke. The angular arrangement of the cranks is depicted in Fig. 11 and from that figure it will be seen that the angle between the cranks 43 and 43' is one of 90°; that between the cranks 43' and 43², 135°; that between the cranks 43² and 43³, 90°; and that between the cranks 43³ and 43, 45°. The angle between the cranks 43 and 43² as well as that between the cranks 43' and 43³, is 135°. Assuming, then, that the various pistons are in the positions illustrated in Fig. 3, wherein they are indicated, for the sake of perspicuity, by the reference letters *a*, *b*, *c*, and *d* and that the drive shaft 3 is rotating in a counter-clockwise direction, it will be seen that piston *a* has started on its in-stroke, piston *b* is completing its in-stroke, piston *c* has just completed its in-stroke and is about to start on its out-stroke, while piston *d* has just completed half of its out-stroke. During the first half of a revolution of shaft 3, the strokes of the pistons take place as follows: the piston *c* starts on its out-stroke just before the piston *b* reaches the end of its in-stroke, the piston *b* completes its in-stroke and starts on its out-stroke just before the completion of the out-stroke of piston *d*, the piston *d* completes its out-stroke and starts on its in-stroke just before the piston *a* reaches the end of its in-stroke, and the piston *a* completes its in-

stroke and starts on its out-stroke just before the piston *c* completes its out-stroke. During the last half of the revolution of shaft 3, the strokes of the pistons take place as follows: the piston *c* starts on its in-stroke just before the piston *b* completes the end of its out-stroke, the piston *b* completes its out-stroke and starts on its in-stroke just before the piston *d* reaches the end of its in-stroke, the piston *d* completes its in-stroke and starts on its out-stroke just before the piston *a* reaches the end of its out-stroke, and the piston *a* completes its out-stroke and starts on its in-stroke just before the piston *c* reaches the end of its in-stroke. The described arrangement results, therefore, in the desired overlapping of strokes, and the avoidance of intervals arising between the termination of a stroke of a piston and the commencement of the following stroke.

The operation of the apparatus is believed to be apparent from the foregoing, and, hence, to require no further or separate description.

What is claimed is:

In a pump of the character specified, the combination of a case provided with an apertured central partition wall arranged within its interior to divide the same into a pair of communicating supply chambers, each of which has its vertical side walls spaced from those of the case to produce a pair of intermediate chambers, the top wall of each supply chamber being formed with pairs of opposed passages extending inwardly toward each other and opening at their outer ends into the adjacent intermediate chamber; a supply pipe opening into one of said supply chambers; an outlet chamber located above said top walls and extending the entire length of the case, the inner ends of said passages opening into said outlet chamber; an open-ended cylinder disposed within each supply chamber and opening at its ends into the adjacent intermediate chambers; a double-acting reciprocatory piston working in each cylinder; piston-controlled valve connections between each supply chamber and the adjacent intermediate chambers; a fluid-controlled connection between each passage and said outlet chamber; and a discharge pipe leading from said outlet chamber.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

ALBERT C. WEBB.

Witnesses:

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LOTTIE M. FOX.