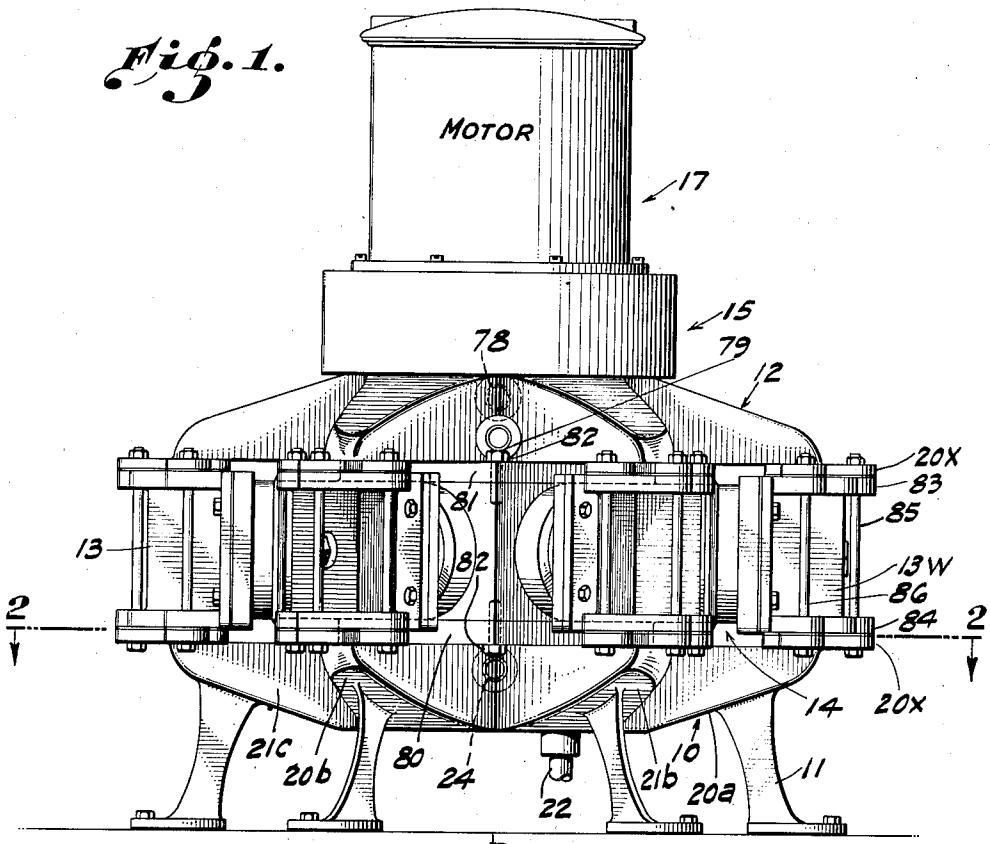
Sept. 16, 1941. K. E. LUNDIN 2,255,851

PUMP ASSEMBLY

Filed Oct. 21, 1940 3 Sheets-Sheet 1

Fig. 1.



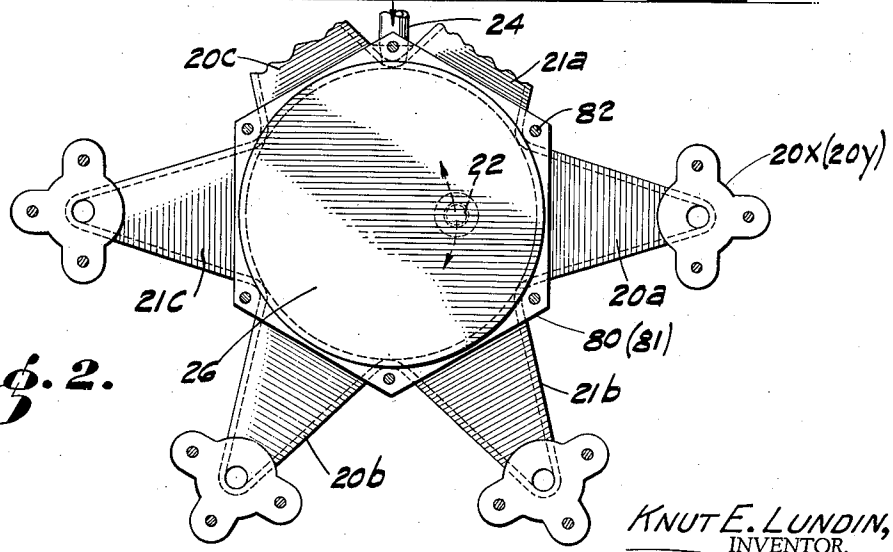


Fig. 2.

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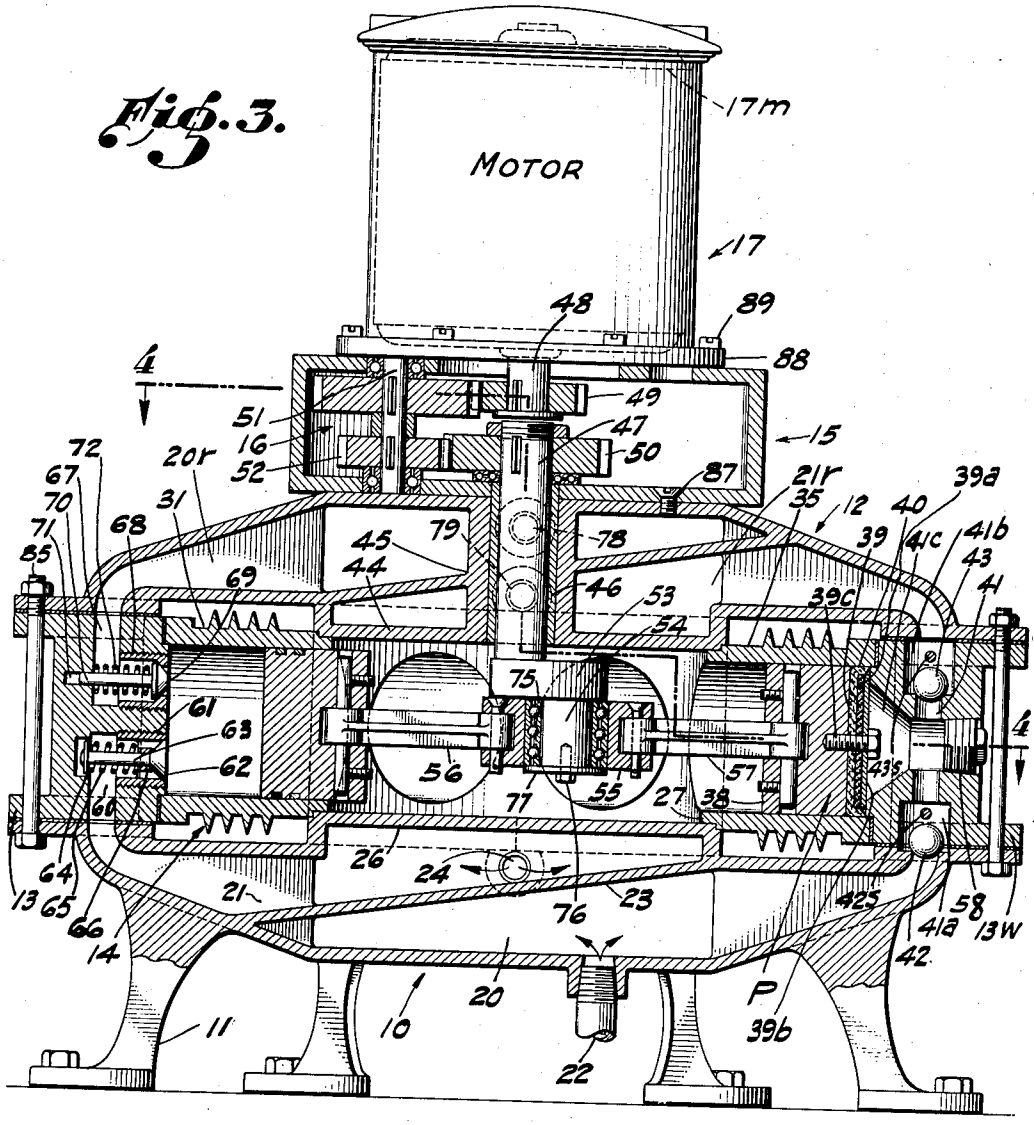
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Fig. 3.



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Fig. 4.

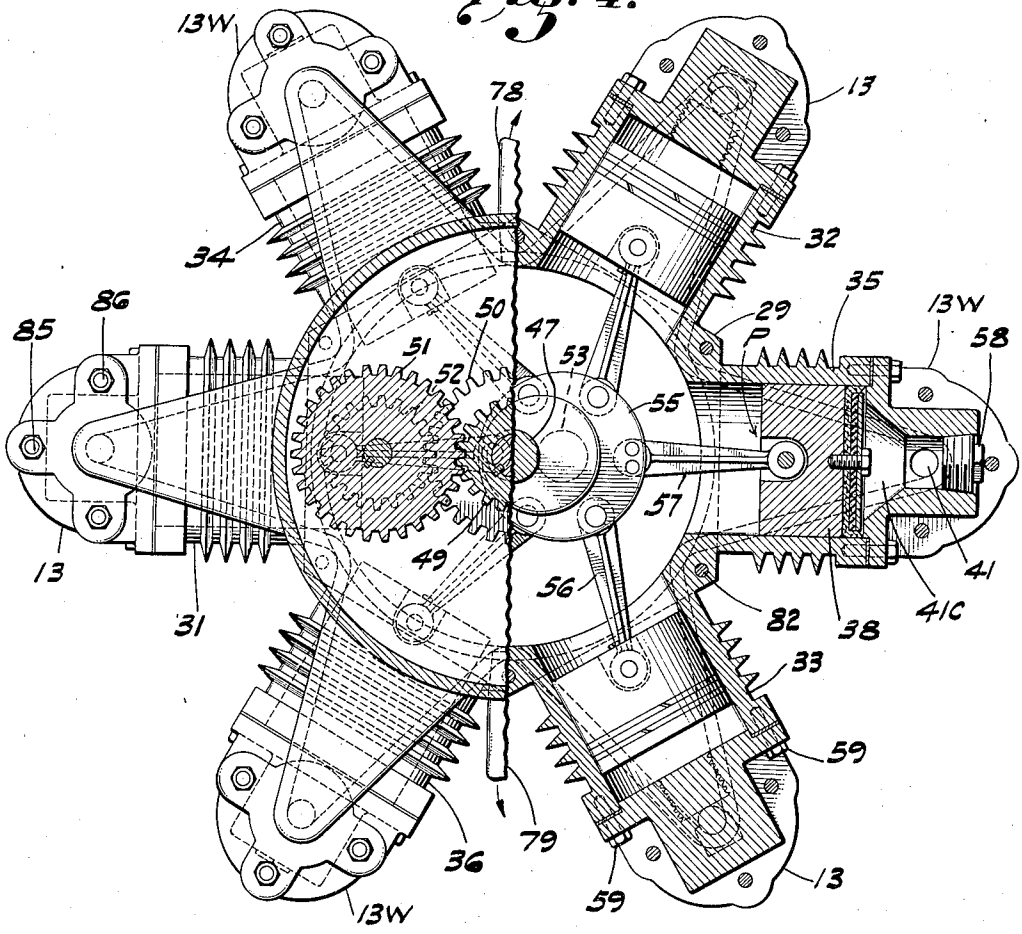


Fig. 5.

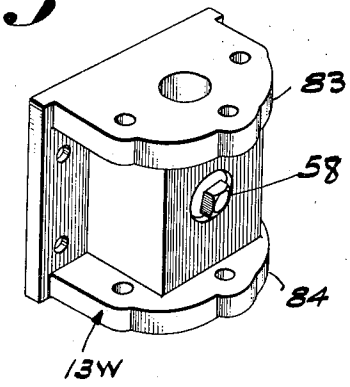
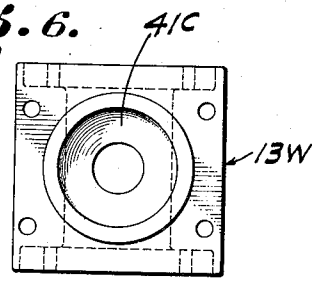


Fig. 6.



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Patented Sept. 16, 1941 2,255,851

UNITED STATES PATENT OFFICE

2,255,851

PUMP ASSEMBLY

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Application October 21, 1940, Serial No. 362,089

3 Claims. (Cl. 103—6)

This invention relates to pumping devices and particularly to a pumping assembly which is an improvement upon the pump structure for pumping either air or water or a combination of both, described in my co-pending application, Serial No. 330,518, filed April 19, 1940.

By the present invention the meritorious features of the piston structure set forth in my said application are maintained and a more sturdy dependable means is provided for supporting the multiple pump and its operating means, so that the vibration resulting from the rotation of the driving shaft and parts gyrated thereby does not tend to cause an injurious effect upon any part of the apparatus.

Stating more in detail the objects and advantages of the present invention, thereby an improved pair of castings is provided, the lower casting of the pair being adapted to form the basal and underlying support of the whole apparatus and at the same time serying as a supply means for the air and water, the upper casting serving as an outlet means for the fluid pumped thereupinto from the lower reservoir; and improved spacing and securing means being provided whereby said reservoirs are maintained at a proper vertical space from each other, thus providing room between them for the pump structure, which is superimposed upon the lower casting and is housed in a thoroughly protected manner between the two castings.

Still another object of the invention is to provide an improved piston cylinder head structure for each of the piston cylinders and at the same time utilize such structure as a part of an improved housing means for the pumping structure.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of the subject matter claimed without departing from the spirit of the invention.

Referring to the accompanying drawings, which illustrate what is at present deemed to be a preferred embodiment of the invention,

Fig. 1 is a side elevation of the complete apparatus.

Fig. 2 is a transverse section thereof, the plane of section being indicated by the line 2—2 on Fig. 1.

Fig. 3 is a vertical mid section of the complete apparatus except that the motor casing which surmounts the structure illustrated is shown in side elevation.

Fig. 4 is a stepped transverse section, the plane of section being indicated by the angular line 4—4 on Fig. 3.

Fig. 5 is a perspective of one of the water piston cylinder heads, all of which are of the same design and serve as spacers between the upper and lower hollow castings.

Fig. 6 is an end view of one of the water piston cylinder heads, shown in Fig. 5.

Referring in detail to the drawings, the structure shown comprises as to its main parts enumerating them from below upwardly, a lower casting 10 having foot portions 11 for resting upon a horizontal support, an upper casting 12, a series of combined piston cylinder heads and spacers 13, 13w which serve to separate said castings vertically to a sufficient extent to provide room between them for the pump structure 14, a gear case or gear housing 15 resting upon said upper casting 12 and containing gearing 16, and a motor housing 17 which is supported by said gear case 15.

The lower casting 10 is of a six arm, stellate character and contains a lower chamber 20 and an upper chamber 21, these chambers being in the present embodiment respectively used for water and air, the water entering the chamber 20 through a supply pipe 22. Said chambers 21 and 22 are separated by a partition wall 23, the air supply conduit 24 for the chamber 21 being shown in Fig. 3.

The stellate character of the chambers 20 and 21 is well illustrated in Fig. 2 where the lower chamber 20 is shown furnished with three radially extending arm portions 20a, 20b, and 20c, and the upper chamber 21 is shown furnished with radially extending arm portions 21a, 21b, and 21c, the arm portions of one chamber alternating symmetrically with those of the other chamber.

The central portion of the lower casting is furnished on its upper side with a flat circular rise 26 and upon this rise is superimposed the central portion of a pump housing frame 27 which includes a series of six pumping cylinders, three of which 31, 32 and 33 are shown for pumping air and alternating other three 34, 35 and 36 for pumping water. Said cylinders occupy substantially the same horizontal plane and are circumferentially arranged in relation to the center of the frame 27 with their axes extending radially. The three water pumping cylinders and

their pistons P and adjacent parts are shown as being of identical construction and, therefore, are all lettered in the same manner.

The upper hollow casting **12** in the main is shaped similarly to the lower casting **10** and contains an air reservoir **20***r* and a water reservoir **21***r*. Said casting engages the upper side of the frame **27** in a similar manner to said casting **10**, being furnished with a depressed wall portion **44** which fits into a circular depression provided for it in the upper face of the pump frame **27**. Said frame is hexagonal and its open top and bottom, in the assembled structure, are closed respectively by the upper casting **12** and the lower casting **10**.

The upper casting **12** has a flat top throughout its central part, and on this flat part rests the aforesaid gear case **15**, said gear case, in turn, supporting the motor casing **17**. The upper casting **12** has a tubular central portion **45** within which is a bearing sleeve **46** which receives a vertical shaft **47**, said shaft **47** is driven by the motor **17***m*, the motor shaft **48** operating the primary member **49** of the reduction gearing **16**, the final member **50** of said gearing being secured to the power delivery shaft **47** already mentioned. The reduction gearing construction includes a transmission shaft **51** and a pinion **52**, the latter pinion being in mesh with aforesaid gear **50**. The lower end of the shaft **47** carries a crank disk **53** which gyrates an eccentric pin **54** which in turn gyrates a piston operating head **55** with which the inner end of each of the piston rods is pivotally connected, except the master rod **57**, which is secured in a fixed relation to said head.

Each water pumping piston cylinder and its related parts, well shown in section in the right-hand portion of Fig. 3, includes the piston cylinder **35** having fitted within it a piston head **38**, to the outer face of which is attached a leather gasket **39** having a flexible peripheral lip **40** which is directed away from the outer end of the piston. Within the cupped portion of the gasket is nested the rubber disk **39***a* which is maintained in a compressed relation thereagainst to provide a leak proof condition between said peripheral lip **40** and its cylinder wall by means of the follower plate **39***b* and cap screw **39***c*.

Against the outer ends of the piston cylinders **34**, **35** and **36** abut, in a fluid tight manner the piston cylinder heads **13***w*. Each of said heads has extending through it a vertical passage **41** with an expanded lower inlet portion **41***a* and at its upper end an expanded outlet portion **41***b*, these expanded portions respectively containing the ball check valves **42** and **43**. Above the ball **42** is a stop pin **42***s* and above the ball **43** is a stop pin **43***s*. The central portion of the passage **41** is kept in communication with the piston cylinder by means of a spacious horizontal funnel shaped passage **41***c* which is located centrally of the head **13***w* and which has its large end directed toward the piston cylinder.

The head **13***w* of each water piston cylinder has a plug **58** screwing into the outer end portion of the passage **41***c*, this passage being of sufficient size to afford access for an operating tool into and through the head, so that the workman need not detach the head to obtain access to the interior thereof in order to apply the tool to the cap screw **39***c*. All six piston cylinder heads are shown held in place by cap screws **59**.

In order to make room for the heat radiating fins for the air cylinders each arm of the lower casting **10** has its upper side in a downwardly spaced relation to said fins, while the corresponding arm of the upper casting **12** likewise has its lower side in an upwardly spaced relation to the subjacent fins.

The flanged mouth portions **20***x* of the lower six arms all lie in the same horizontal plane which is on a level with the bottom faces of the piston cylinder heads **13** and **13***w*. The similarly flanged mouth portions **20***y* of the upper six arms are correspondingly arranged, being directed downwardly to the level of the upper faces of the piston cylinder heads **13**, **13***w*. Said upper mouth portions are identical in construction with those shown in plan in Fig. 2.

The piston heads **13** for the piston cylinders **31**, **32** and **33** that contain air, are constructed somewhat differently from those of my aforesaid pending application, containing an upwardly directed lower inlet passage **60** which communicates with the adjacent piston cylinder through a valve sleeve **61** that is screwed into a threaded bore provided for it in the piston cylinder head. Within said sleeve operates a check valve **62**, the right hand end of said sleeve (see Fig. 3) forming a seat for said valve. The stem **63** of said valve is furnished at its opposite end with a collar **64** against which operates a compression spring **65** tending to hold the valve to its seat. The valve operates through a spider structure **66** carried internally by the sleeve **61**.

Downwardly into the upper portion of the piston cylinder head **13** leads an intake passage **67** which communicates with the inner end of a valve cage **68**, having near its right hand end an internal valve seat for the head of the valve **69**. The latter valve is provided with a stem **70** which slides within a socket **71** provided for it in the head **13**. A spring **72** completes this part of the structure and tends to hold the valve **69** upon its said seat.

With the lower passage **60** communicates one of the three arms of the lower air supply chamber, whereas with the upper passage **67** communicates one of the three arms of the upper air reservoir.

The aforementioned piston operating head, however, through the center of which downwardly projects the gyratory pin **54**, is provided with a roller bearing structure **75** which is interposed between said pin and the surface of the opening through said head. A screw threaded socket is tapped centrally into the lower end of said pin, and into this socket screws a screw **76** the head of which engages a washer or disk **77** which engages the lower end of said bearing to keep it in place.

The air reservoir of the upper casting **12** is furnished with an air delivery outlet pipe **78**, and the water reservoir of said upper casting is provided with a water delivery pipe **79**.

Around the upper part of the lower casting **10** extends a hexagonal flange **80** and a like flange **81** extends around the lower part of the upper casting **12**. Cap screws **82** extend through these flanges into the corner portions of the hexagonal frame **27** to secure together the parts **10**, **12** and **14**. The piston cylinder heads **13** and **13***w* are provided at their outer ends with upper flanges **83** which (except for an intervening gasket) abut against the flanges of the downwardly directed mouth portions **20***y*; and lower flanges **84** which, (except for an intervening gasket) abut against the flanges of the lower mouth portions **20***x*. There are six upper and lower mated

flanges, which are securely held together in each instance by an outer spanner bolt **85** and the side spanner bolts **86**. When it is desired to tighten the cap screw **39c** it is necessary to remove the spanner bolt **85** before access may be had to the plug **58**.

The gear housing **15** is secured to the flat top wall of the upper casting **12** in any suitable manner, for example, by screws **87**.

Upon the flat top of said gear housing is superimposed the motor housing **17**, the latter housing having a peripheral basal flange **88** provided with suitable apertures to receive screws **89** whereby the motor housing is secured to said gear housing.

It will aid in understanding the operation of the apparatus, to point out the course the water follows through the passages shown in the right hand portion of Fig. 3 on its way from the water chamber **20** up to the water reservoir **21***r*.

As the pin **54** of the crank disk **53** continues its gyratory movement from the position of Fig. 3 it, in turn, imparts a gyratory movement to the piston operating head **55**, thus causing the master rod **57** (which is in this instance substituted for a piston rod like the rod **56** at the opposite side of the head **55**) to start the piston head **38** on its leftward travel. The water, which has previously entered chamber **20** through supply pipe **22**, is now entrained from said chamber upwardly past valve **42**, through the passage **41** and **41***c* into the piston cylinder **35**. After the piston head completes its leftward movement and moves toward the right, the water is ejected from the cylinder **35** through the passage **41** and, passing upwardly from said passage past the valve **43** enters the superjacent arm of the stellate shaped water reservoir **21***r*. During the outward movement of the piston head **38** the compressed water in advance thereof will tend to additionally expand the gasket structure and cause its peripheral lip **40** to make a more liquid tight fit. Wear upon the gasket is thus compensated for.

While the water is thus being pumped upwardly through the right hand portion of the structure shown in Fig. 3, the air, through an opposed cycle of operations, is being pumped upwardly in the left hand portion thereof, this air pumping operation being similar except for a difference in the passage which communicate with the piston cylinders **31** and in the valves mounted in said passages. From the air chamber **21** the air is entrained through the passage **60** and thence enters the left end of the sleeve **61** within which the valve **62** operates. The suction of the adjacent receding piston head will then entrain the air past the valve **62** into the piston chamber **31** and the return movement of said piston head will expel the air past the upper valve **69**, thence through the sleeve **68** and into the air reservoir **20***r* via the vertical passage **70**.

From the foregoing description of portions of the operation, the simultaneous functioning of the other four pistons and their related parts will readily be understood.

What is claimed is:

1. In a pumping assembly, a lower water chamber of a stellate character, the points or arms of said chamber extending in generally horizontal directions, a lower air chamber overlying said water chamber, said air chamber being also of a stellate character and having its arms arranged in alternation with the arms of said water chamber, a pump structure superimposed upon the structure of said chambers, said pump structure having piston cylinders provided with pistons radiating from a common center, alternate piston cylinders being in valve controlled communication with the arms of said water chamber and the intervening piston cylinders being in valve controlled communication with the arms of said air chamber, a stellate shaped water reservoir overlying said pumping assembly and having its arms in communication with the piston cylinders which pump water, a stellate shaped air reservoir overlying said water reservoir and having its arms arranged in alternation with the arms of said water reservoir and in communication with the pump cylinders which pump air, and a driving shaft operatively connected with the inner ends of said pistons.

2. The subject matter of claim 1 and, said driving shaft extending downwardly through said upper reservoirs and terminating above said lower air chamber.

3. In a pumping assembly, a lower casting having foot portions to rest upon a horizontal support, said casting having upper and lower wall portions with a space between them and a transversely extending partition between said wall portions dividing said space into an upper and a lower chamber for air and water, a pump structure superimposed upon said lower casting, said pump structure having a plurality of piston cylinders containing pistons radiating centrally therefrom, the outer ends of said cylinders having heads, valve controlled passages within said heads, an upper casting superjacent to said pump structure, said upper casting having within it reservoirs to receive air and water delivered from said valve controlled passages, said cylinder heads serving as spacing members between said castings to maintain them sufficiently separated vertically to provide room for said pump structure, and securing means for said cylinder heads to aid in maintaining the entire structure in a properly assembled relation, said valve controlled passages communicating with said piston cylinders to complete a pumping means for forcing air and water upwardly from the chambers of said lower casting to the reservoirs of said upper casting.

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