Sept. 13, 1938. H. N. FALL 2,129,918

FLUID DISTRIBUTING SYSTEM AND APPARATUS

Filed June 11, 1935 2 Sheets-Sheet 1

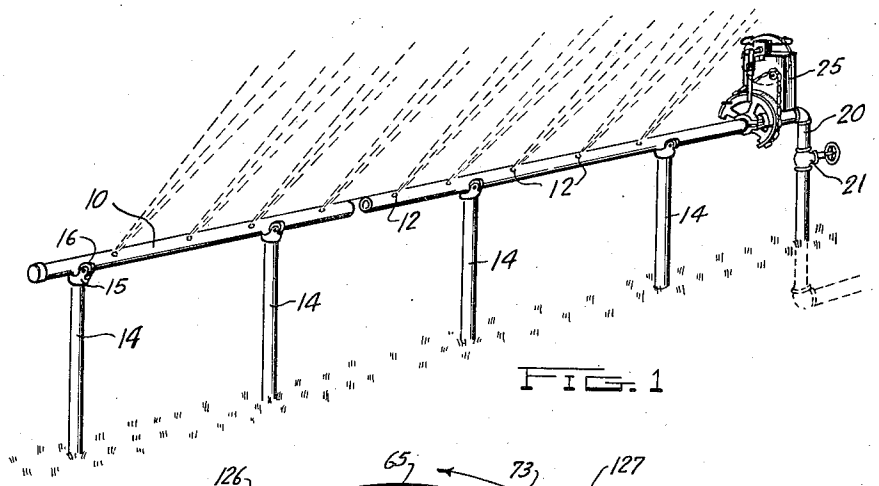


FIG. 1

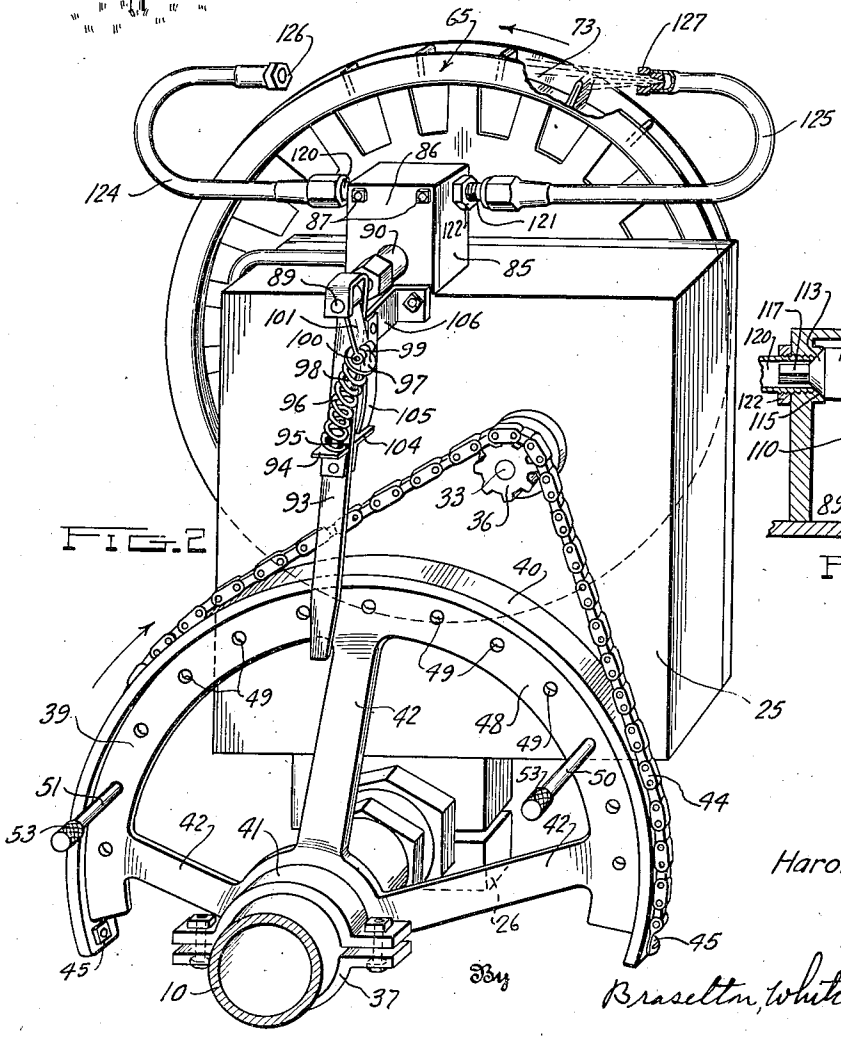


FIG. 2

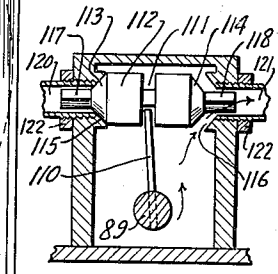


FIG. 3.

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FLUID DISTRIBUTING SYSTEM AND APPARATUS

Filed June 11, 1935 2 Sheets-Sheet 2

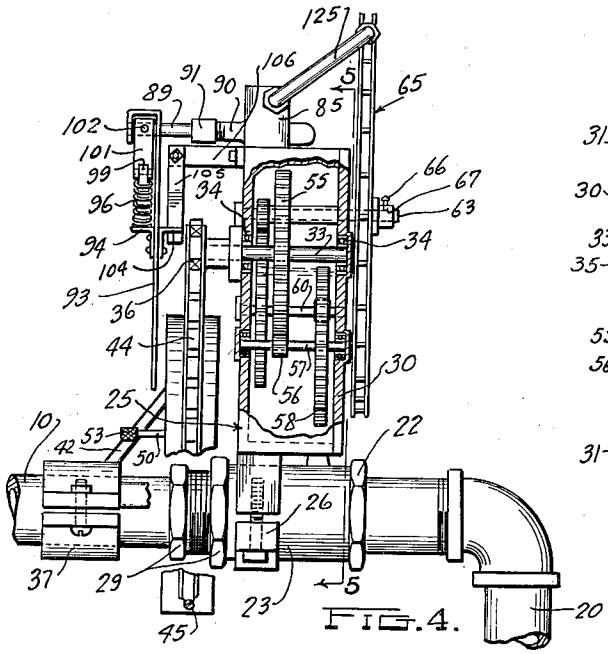


FIG. 4.

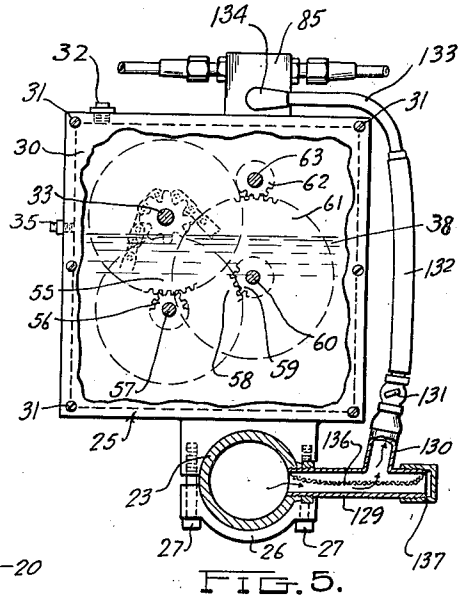


FIG. 5.

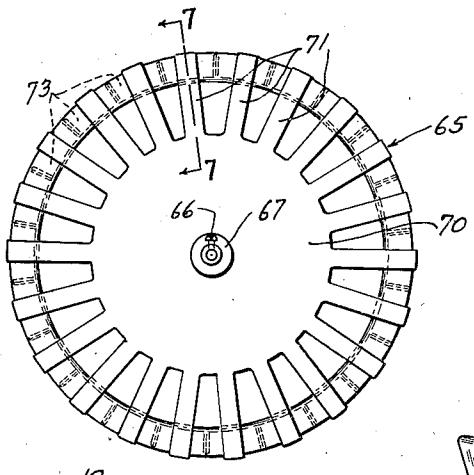


FIG. 6.

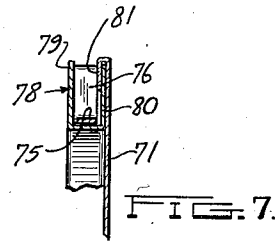


FIG. 7.

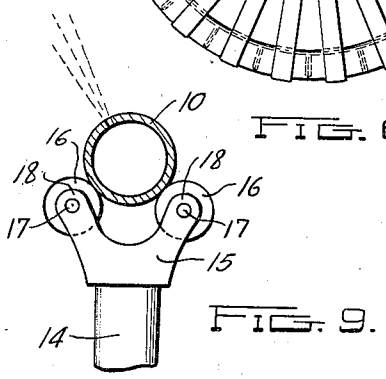


FIG. 9.

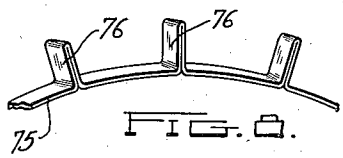


FIG. 8.

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Patented Sept. 13, 1938 2,129,918

UNITED STATES PATENT OFFICE

2,129,918

FLUID DISTRIBUTING SYSTEM AND APPARATUS

Harold N. Fall, Toledo, Ohio

Application June 11, 1935, Serial No. 26,024

9 Claims. (Cl. 299—68)

This invention relates to a fluid distributing system and apparatus, and more particularly to the distribution of water for irrigation purposes.

The invention contemplates an automatic oscillating means particularly adapted for utilization with a distribution pipe of the character wherein the pipe is capable of oscillation or rotation about its longitudinal axis.

A further object of the invention is the provision of a water pipe oscillating means of a semi-portable character which may be readily affixed to or detached from the water distributing means.

Another object of the invention is the provision of a fluid motor which may be directly connected to the water supply and distributing pipes and in which the direction of oscillation of the water distributing pipe depends upon the direction of rotation of a fluid actuated wheel, the reversing of oscillatory movement being accomplished by reversing the direction of the fluid actuated wheel.

Still a further object of the invention is the provision of a fluid motor of this character in which oscillatory movement of the water distributing pipe is maintained at a substantially uniform rate of speed in each direction after each change in the direction of rotation of the fluid actuated wheel is effected.

The invention further embraces a provision of a light weight, compact fluid motor having speed reducing means between the fluid actuated wheel and the water distributing pipe which is entirely enclosed and operates in a lubricant, thus insuring long life and constancy of operation.

The invention includes a fluid motor utilizing the water supplied to the distributing system as an actuating fluid, the arrangement being such that the water applied to the wheel is dispersed after it impinges against the wheel and is sprayed outwardly on the ground serving irrigation purposes as well as the water passing through the distribution pipe.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawings of a form of the invention, which may be preferred, in which:

Figure 1 is an isometric view showing a water distributing system and apparatus embodying my invention;

Figure 2 is an isometric view illustrating the distributing pipe oscillating means of my invention;

Figure 3 is a sectional view through the valve mechanism for accomplishing reversal of the water flow to change the direction of rotation of the fluid motor;

Figure 4 is a side elevational view of the arrangement shown in Figure 2, portions of the housing being broken away to show the arrangement of speed reducing mechanism;

Figure 5 is a side view of the arrangement shown in Figure 4 with the fluid wheel removed and portions of the housing broken away.

Figure 6 is a side view of the fluid actuated wheel forming a part of the motor;

Figure 7 is a detail of one of the bucket formations of the fluid wheel, the view being taken substantially on the line 7—7 of Figure 6;

Figure 8 is a view showing the method of constructing the bucket vanes of the fluid wheel;

Figure 9 is a fragmentary view showing a means of supporting the revoluble water distributing pipe.

While I have shown the arrangement of my invention as utilized for oscillating an irrigation tube or pipe for the distribution of water, it is to be understood that I contemplate the use of the invention with any arrangement where an oscillating movement is desired.

Referring to the drawings in detail, and especially to Figure 1, numeral 10 designates a water distributing or irrigating means in the form of a length of pipe or tubing which is provided with a plurality of spaced jets or fluid outlets 12 preferably arranged in a single row and through which water may be extruded to irrigate the surrounding ground. The water distributing pipe 10 may be made up of several connected sections of pipe supported upon spaced pedestals 14 which may be of lengths of pipe driven into the ground and carrying at their upper extremities fittings 15 as particularly shown in detail in Figure 9. These fittings 15 each carry a pair of rollers 16 journalled upon pins 17 supported upon ears 18 of the fitting, which rollers revolubly support the pipe 10. These supports 14 may be spaced apart sufficiently to carry the weight of the water distributing pipe and the water contained therein and preferably of such distance as to prevent extreme sagging of the pipe between the supports. As illustrated in Figures 1 and 9, the pipe 10 is revolubly supported upon rollers 16

so that it may be oscillated or rotated with a minimum of effort.

The present invention deals particularly with a simple and effective fluid actuated means for oscillating the pipe 10 and the arrangement hereinafter described is to be connected as illustrated in Figure 1 to the distributing pipe 10 and to a water supply riser 20 which is preferably equipped with a control valve 21. The water supply pipe 20 is fixedly connected by means of a union 22 to a fitting 23 which is secured to the casing 25 of the fluid motor of my invention by means of a clamp 26 and bolts 27 as illustrated in Figures 2, 4 and 5. In this manner the casing 25 is fixedly secured to the riser pipe 20 so that no relative movement occurs between these elements. The pipe 10 is connected to the fitting 23 through a packing gland (not shown) and a union 29 of such construction that pipe 10 may rotate or oscillate independently of fitting 23 and yet through the medium of the packing gland the arrangement is sealed against the escape of water at the union 29.

The oscillating means of my invention is carried by or contained within casing or housing 25 which in the embodiment illustrated is generally rectangular or box-like in configuration having an open side which is closed by means of a cover plate 30 held in place by means of screws 31. A shaft 33 is journalled in bearings 34 carried by a wall of casing 25 and the cover plate 30 respectively, which bearings may be of any suitable character, those shown being of the anti-friction type although any other types of bearings may be utilized without departing from the spirit of the invention.

The shaft 33 projects through the wall of the casing 25 and carries exteriorly thereof a toothed sprocket wheel 36 which is fixed to the shaft 33. Secured to the pipe 10 by means of a clamp 37 is a member or sector 39 preferably having a smooth or band-like periphery 40 and a central or hub portion 41 integrally connected to the peripheral structure by arms 42. A chain or flexible member 44 takes over the sprocket wheel 36 and is connected at its ends by means of screws 45 or other suitable means to the extremities of periphery of the sector 39. In this manner the sector 39 may be driven through the medium of chain 44 and the sprocket wheel 36. A web-like portion 48 of the sector is provided with a plurality of spaced holes 49 which are preferably slightly tapered and adapted to selectively accommodate pins 50 and 51 which have correspondingly tapered ends so as to be frictionally or wedgingly retained in openings 49. The pins 50 and 51 are preferably formed with knurled portions 53 so that they may be easily removed and placed in different openings of the series of openings 49 for a purpose as will be hereinafter explained, of regulating or limiting the degree of oscillation of the distributing pipe 10 and sector 39.

Contained within the housing 25 and fixed to shaft 33 is a comparatively large gear 55 meshing with a small pinion 56 carried upon shaft 57, the latter in turn carrying a large gear 58 meshing with pinion 59 carried on shaft 60, this shaft carrying a large gear 61 meshing with pinion 62 carried on shaft 63. Shaft 63 is journalled in the rear wall of casing 25 and cover plate 30 as are shafts 57 and 60, shaft 63 projecting through the cover 30 and carrying exteriorly of the housing a turbine or fluid actuated wheel 65, the latter being secured to the shaft by means of a set screw 66 carried by the hub 67 of the wheel 65.

The turbine wheel 65 which is adapted to be driven by fluid pressure, as hereinafter described, is preferably of extremely light weight construction. The body of the wheel is formed of a single plate 70 which is secured to hub 67 in any suitable manner and the outer or peripheral portions of the disk or body 70 terminate in projections 71. The vanes of the buckets 73 on the periphery of the wheel are formed as shown in Figure 8 preferably from a single strip of material as at 75 by the metal being folded upon itself at spaced distances. In order to complete the bucket structure, a member 78 of U-shaped cross section as indicated in Figure 7 is provided having lateral side walls 79 and 80 which form the sides of the turbine buckets. A cross section of the bucket structure is shown in Figure 7 with the member 75 lying adjacent the bight of the U-shaped member 78 and may be secured thereto by soldering, brazing or the like. The upper extremities of the projections 71 of the wheel 70 are folded over side wall 80 of member 78 as indicated at 81. The parts may be soldered, sweated or brazed together in order to make a rigid yet light weight construction. It is to be understood that the design of the turbine wheel may be modified without departing from the scope of the invention.

Positioned above the casing 25 and secured thereto is a valve housing 85 having a cover plate 86 held in place by means of bolts 87. Journalled within the housing 85 is a shaft 89 which projects forwardly of the cover plate 86 through a boss portion 90 thereof. The shaft is fluid sealed by means of a packing gland contained within nut 91 illustrated in Figure 4. Journalled on the outermost extremity of the shaft 89 is an arm 93, the lower extremity being in the path of movement of the pins 50 and 51 adapted to be carried by sector 39. Secured to the arm 93 is a laterally extending bracket 94 having a short upwardly projecting stub shaft 95 which positions the lower end of a coil spring 96, the upper end of the coil spring engaging with a disk 97 having a tenon 98 projecting into the coil so as to prevent the disarrangement of the spring. The disk 97 is provided with a boss portion 99 which is connected by means of a pin 100 to a link 101, the upper end of which surrounds and is secured to shaft 89 by means of a pin 102.

Arm 93 is also provided with another laterally extending bracket 104 which is slotted to accommodate the extremity of a tension plate or flat spring 105 fixed to a bracket 106 secured to casing 25 by means of a screw or other suitable means. It is to be noted that the tension plate 105 projects loosely into the slot in bracket 104.

As the arm 93 is loosely journalled on shaft 89, the spring plate 105 projecting in the slotted bracket 104 acts as a resilient stop to limit the movement of the arm under the pressure of coil spring 96, thus maintaining the spring 96 and link 101 in assembled relationship.

Positioned interiorly of the valve housing or chamber 85 and secured to shaft 89 is an upwardly projecting arm 110 which projects into a peripheral recess 111 of a cylindrical valve member 112. Member 112 is provided with two oppositely disposed cone shaped valve surfaces 113 and 114, the valve surfaces being spaced apart a sufficient distance that they are alternately engageable with stationary valve seats 115 and 116. Member 112 is provided adjacent each of the valve surfaces with polygonal portions 117 and 118 which project loosely into tubular fittings 120 and 121 respectively. The portions 117 and 118 are preferably square so as to permit water or fluid to flow

past the valve surfaces into the tubes 120 and 121. The fittings 120 and 121, as illustrated in Figure 3, are threaded into bores in the opposite side walls of the housing 85 and are locked in position by means of nuts 122. Connected to the fittings 120 are tubes 124 and 125 having at their extremities jets or nozzles 126 and 127. The tubes are so formed that the jets 126 and 127 are in opposed relation and located adjacent the buckets of the turbine wheel 65 so that water extruded from these jets or nozzles will strike the wheel at the proper angle to rotate the same.

The water for driving the turbine wheel is obtained from the main supply through the fitting 23 by means of a tube 129 as illustrated in Figure 5, said tube having an upwardly projecting pipe 130 connected to a control valve 131, the latter connected by means of a flexible tube 132 and tube 133 to the valve chamber at the point indicated at 134. Positioned within pipe 129 is a strainer or screen 136 so as to prevent foreign matter from entering the valve housing. The tube 129 has a projecting portion provided with a threaded cap for cleaning out any foreign matter which may be trapped by the screen 136.

It is desirable that the gearing contained within the casing 25 should operate in oil. To this end a filler plug 32 is provided adjacent the upper portion of the casing and a plug 35 in the side wall of the casing is also provided in order to determine the level of the lubricant 38.

The operation of the arrangement is as follows: When it is desired to oscillate distribution pipe 10, the oscillator of my invention is affixed between the upper end of the riser pipe 20 and the pipe 10 by means of the unions 22 and 29 and the clamps 26 and 37 drawn tightly about the fitting 23 and the distribution pipe 10. Water or other fluid may then be admitted to the riser 20, pipe 10 and the oscillator by means of the master valve 21 which permits a flow of water through the pipe 10 and also admits water to tube 129 and thence through control valve 131 to the valve chamber 85, the amount of water passing to the valve chamber being controlled by the valve 131 to regulate the speed of the wheel 65. With particular reference to Figure 3 for illustrative purposes, the valves 113 and 114 will be in the position indicated in Figure 3 which will permit the passage of water from the valve chamber past valve 114 through tube 125 and through jet 127 where the stream of water will impinge upon the buckets or vanes of the water wheel causing the same to rotate in a counter-clockwise direction as viewed in Figure 2. The wheel rotates at a comparatively high speed under the impulse of the pressure of the water and through the medium of the speed reducing gearing enclosed within casing 25 will move the shaft 33 and sprocket 36 at a comparatively slow rate of speed but with greatly multiplied power so that there is ample power to move the sector 39 and water distribution pipe 10 through the medium of the sprocket chain 44. I have found that a comparatively high ratio of speed of rotation of the turbine wheel with respect to the movement of distribution pipe 10 is desirable to the satisfactory operation of the device for giving the pipe 10 a slow oscillatory movement for water distribution and that a ratio of the speed of the turbine wheel to the sprocket wheel 36 of one to three thousand or even a higher ratio has been found to deliver ample power for oscillating a pipe several hundred feet in length. As illustrated in Figure 2, the water wheel traveling in a counter-clockwise direction drives the sector 39 and distribution pipe 10 in a clockwise direction and such movement of rotation will continue until the pin 51 comes in contact with the arm 93 causing the arm 93 to swing in a counter-clockwise direction about the shaft 89 as a center until the projection 95, pin 100 and shaft 89 are brought into substantially a straight line and slightly further movement of arm 93 thereafter causes the link 101 and spring 96 acting as a toggle mechanism to move in the opposite direction so as to cause the valve member 112 to move to its opposite position cutting off the supply of water to jet 127 and admitting the water supply in the valve casing 85 to be delivered through tube 124 and jet 126 to the vanes or buckets of the turbine wheel. The stream of water extruded through jet 126 striking the wheel, in a very short period of time causes the latter to reverse its direction of rotation and initiate rotation of the water distributing pipe 10 and sector 39 in a reverse or counter-clockwise direction. This action of sector 39 continues at a substantially constant rate because of the substantially constant rotation of turbine wheel 65 until the pin 50 engages with the arm 93 causing the latter to be again moved to the position as indicated in Figure 2 wherein the water supply to jet 126 will be cut off and the water diverted to the jet 127, reversing the turbine wheel and repeating the above described operations.

Through the use of a fluid actuated motor of the character above described, the water distribution pipe is oscillated at a substantially constant rate of speed after the turbine wheel has reached a uniform rate of speed, which takes place in a comparatively short period of time after the reversing operation. This substantially constant movement of the water distributing pipe results in a uniform distribution of water over the ground to be irrigated. The portion of the water directed against the turbine wheel after its impingement upon the vanes of the wheel is atomized and becomes a "mist" which also settles upon the surrounding ground and augments the irrigation without causing any puddling.

It is to be noted that the pins 50 and 51 may be moved to any selective position by inserting the pins in any of the several openings 49 so that the angle of movement of the water distributing pipe may be readily changed or varied to irrigate more or less area of ground if desired.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than is herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

What I claim is:

1. A device of the character disclosed, a rotatably mounted distributing pipe; a fluid motor mounted in fixed position adjacent thereto and having a fluid driven wheel; means for directing fluid flow against said wheel, valve means for changing direction of said fluid flow for alternately driving said wheel in opposite directions; and means including gearing for transmitting the rotary motion of said fluid driven wheel to said distributing pipe, and means movable with the distributing pipe for controlling said valve means.

2. A device of the character disclosed, a water distributing pipe journalled for rotary movement about its longitudinal axis; a casing fixedly mounted adjacent said distributing pipe; a fluid

actuated wheel journalled on said casing exteriorly thereof; a shaft journalled in said casing and projecting exteriorly of said casing; speed reducing means contained within said casing for transmitting rotary motion of said fluid actuated wheel to said shaft; means connecting said distributing pipe with said shaft for transmitting rotary movement of said shaft to said distributing pipe; and means controlled by movement of said distributing pipe for determining the direction of rotation of said fluid actuated wheel.

3. A device of the character disclosed, a rotatable water distributing pipe; a casing fixedly mounted adjacent said distributing pipe; a fluid actuated wheel journalled on said casing; a member carried by said distributing pipe; speed reducing means contained within said casing for transmitting rotary motion of said fluid actuated wheel to said member; a valve chamber associated with said casing; a plurality of tubes communicating with said valve chamber and terminating in jets adjacent said fluid actuated wheel, said jets arranged for actuating said wheel in opposite directions; a valve within said casing; and means arranged to periodically actuate said valve for alternately directing fluid flow from one of said jets against said fluid actuated wheel for changing the direction of rotation of the latter.

4. A device of the character disclosed, a water distributing pipe journalled for rotary movement about its longitudinal axis; a member associated with said pipe and movable therewith; a fluid motor fixedly mounted adjacent said distributing pipe including a fluid actuated wheel; means connecting said member and said fluid actuated wheel for transmitting rotary movement of said wheel to said distributing pipe; a chamber; a plurality of tubes communicating with said chamber and terminating in jets adjacent said fluid actuated wheel, said jets being arranged to actuate said wheel in opposite directions; a valve within said chamber; and means controlled by movement of said member for imparting reciprocating movement to said valve to alternately direct fluid flow from one of said jets against said fluid actuated wheel to reverse the direction of rotation thereof.

5. A device of the character disclosed, a revolubly supported distributing pipe; a relatively stationary casing; a member connected to said distributing pipe; a fluid actuated wheel journalled on said casing; means for transmitting rotary motion of said fluid actuated wheel to said member and distributing pipe; a valve chamber associated with said casing having a fluid inlet; a valve for controlling the flow of fluid to said valve chamber; a valve in said chamber; a pair of tubes projecting from said valve chamber and having fluid extruding jets positioned adjacent said fluid actuated wheel, said jets being arranged to operate said wheel in opposite directions; and means controlled by the movement of the member for periodically changing the direction of movement of said member and distributing pipe.

6. A device of the character disclosed, a rotatably mounted distributing pipe; a casing fixed mounted; a fluid actuated wheel journalled on said casing; speed reducing gearing contained within said casing and adapted to transmit rotary motion of said fluid actuated wheel to said distributing pipe; a valve chamber carried by said casing having a fluid inlet; a valve in said chamber; a plurality of tubes in communication with said valve chamber and having fluid extruding jets positioned adjacent said fluid actuated wheel arranged to cause actuation of the wheel in opposite directions; means controlled by the movement of said distributing pipe for actuating said valve to selectively direct the flow of fluid through said tubes to change the direction of rotation of the fluid actuated wheel.

7. A device of the character disclosed, a rotatable distributing pipe; a relatively stationary casing; a member carried by said distributing pipe; a fluid actuated wheel journalled on said casing; speed reducing gearing contained within said casing and adapted to transmit rotary motion of said fluid actuated wheel to the member carried by the distributing pipe; a valve chamber carried by said casing having a fluid inlet; a valve for controlling the flow of fluid to said valve chamber; a valve in said chamber; a pair of tubes projecting from said valve chamber and having fluid extruding jets positioned adjacent said fluid actuated wheel, said jets being so arranged as to cause the wheel to operate in opposite directions; means controlled by the movement of the member connected to the distributing pipe for actuating said valve to alternately direct the flow of fluid through said tubes to change the direction of rotation of the fluid actuated wheel.

8. A device of the character disclosed, a fixedly mounted casing; a member mounted for oscillatory movement; a fluid actuated wheel journalled on said casing; speed reducing mechanism contained within said casing and adapted to transmit rotary motion of said fluid actuated wheel to oscillate said member; a valve chamber; a valve for controlling the flow of fluid to said chamber; a valve in said chamber; means communicating with said chamber for directing fluid against said fluid actuated wheel; and means controlled by movement of said member for actuating said valve to change the direction of fluid flow and reverse the direction of rotation of said wheel.

9. A device of the character disclosed, a relatively stationary casing; a member mounted for oscillatory movement; a fluid actuated wheel journalled on said casing; a plurality of fluid conveying tubes arranged adjacent said fluid actuated wheel for selectively directing jets of fluid against said wheel in different directions; speed reducing means within said casing adapted to transmit rotary motion of said wheel to the member to be oscillated; and means controlled by movement of the member to be oscillated to direct flow of fluid alternately through said tubes to change the direction of rotation of the fluid actuated wheel.

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