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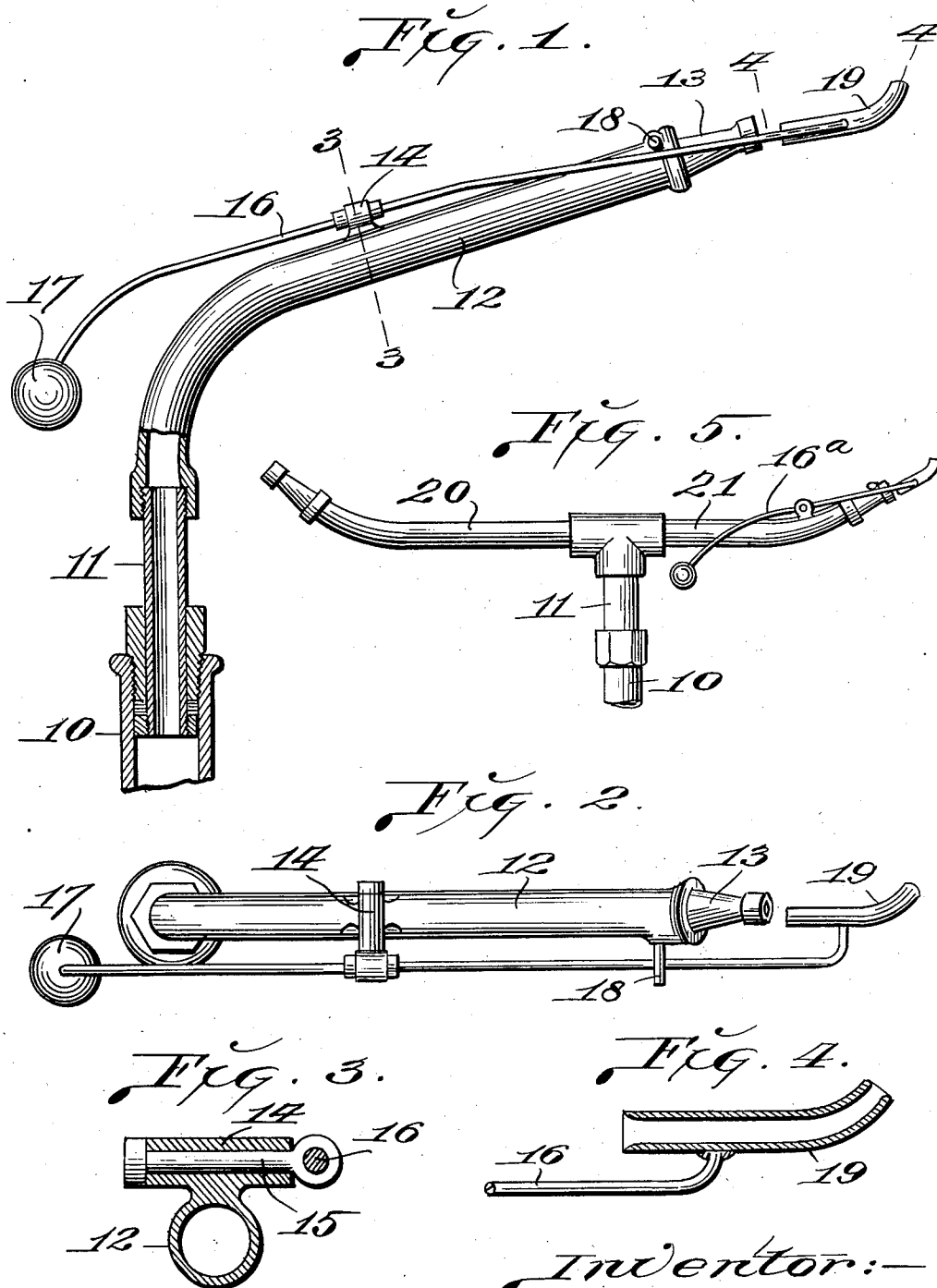
F. C. ORR

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ROTARY WATER SPRINKLER

Filed Nov. 18, 1926

2 Sheets-Sheet 1



Inventor:—
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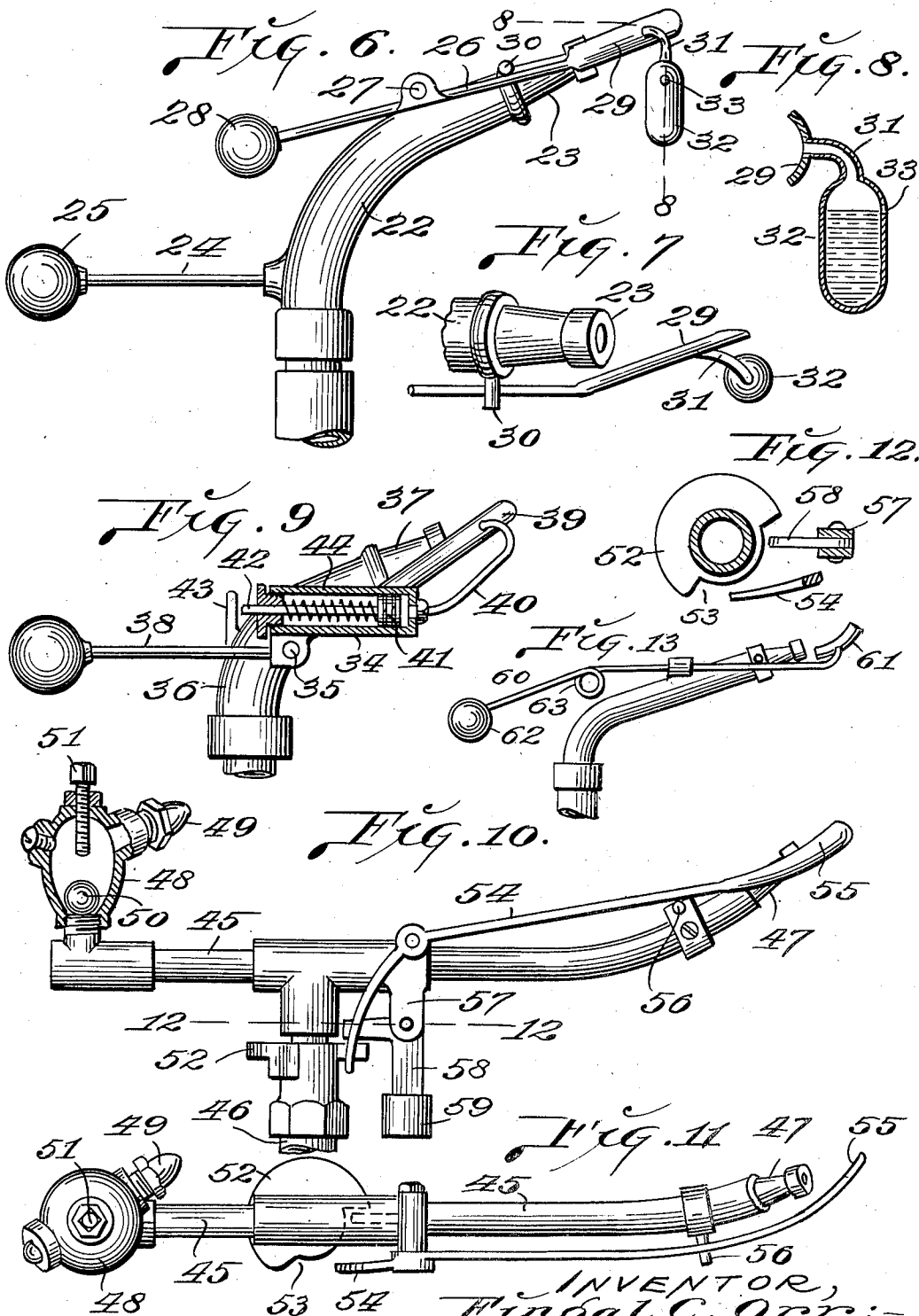
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INVENTOR,
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UNITED STATES PATENT OFFICE

FINGAL C. ORR, OF LOS ANGELES, CALIFORNIA

ROTARY WATER SPRINKLER

Application filed November 18, 1926. Serial No. 149,068.

My invention relates to a sprinkler or water distributing device of the rotary arm type such as is disclosed in U. S. Letters Patent No. 1,598,541, issued to me on August 31, 1926, and in my co-pending applications for U. S. Letters Patent filed April 20, 1925, Serial No. 24,449, and July 16, 1925, Serial No. 43,975.

The principal objects of my present invention are to generally improve upon and simplify the construction of the sprinkling devices disclosed in my aforesaid patent and patent applications as well as other existing forms of rotary sprinklers and to provide a relatively simple and practical sprinkling device wherein the jet nozzle will rotate with an intermittent or step by step movement as distinguished from a continuous rotary movement.

Further objects of my invention are to provide a sprinkling device that is especially designed for use on lawns, golf courses, orchards, gardens, or wherever a thorough distribution of water is desired over a relatively large area, to provide a sprinkler that will act automatically to rotate the jet nozzle with an intermittent or step by step movement and further, to provide simple and efficient means for controlling and regulating the intermittent movement of the jet nozzle.

A further object of my invention is to utilize the force of the reaction of a portion of the jet of water issuing from the nozzle together with the movement of a weight that is acted upon by centrifugal force for imparting movement to the jet nozzle and for controlling such movement.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will hereinafter be more fully described and claimed and illustrated in the accompanying drawings, in which—

Fig. 1 is a side elevational view of a comparatively simple form of sprinkling device embodying my invention.

Fig. 2 is a plan view of the form of sprinkler seen in Fig. 1.

Fig. 3 is an enlarged cross section taken on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged horizontal section taken on the line 4—4 of Fig. 1.

Fig. 5 is an elevational view of a modified form of the sprinkler, the same being provided with main and secondary jet nozzles.

Fig. 6 is an elevational view of a modified form of the sprinkling device wherein the weight of a body of water is utilized as a counterbalance for the weight carrying arm that is pivotally mounted on the jet nozzle.

Fig. 7 is a plan view of the jet nozzle forming a part of the sprinkling device illustrated in Fig. 6.

Fig. 8 is an enlarged cross section taken on the line 8—8 of Fig. 6.

Fig. 9 is an elevational view, partly in section, of a further modified form of the sprinkling device.

Fig. 10 is an elevational view of a further modified form of the sprinkling device.

Fig. 11 is a plan view of the form of sprinkler that is illustrated in Fig. 10.

Fig. 12 is a horizontal section taken on the line 12—12 of Fig. 10.

Fig. 13 is an elevational view of a further modified form of my improved sprinkling device.

Referring by numerals to the accompanying drawings and particularly to the form of sprinkler illustrated in Figs. 1 to 4 inclusive, 10 designates an upright pipe that is connected to a source of water under pressure and journaled for rotation in the upper end of said pipe 10 is a short tubular member 11 to which is secured the lower end of an upwardly and outwardly projecting tube 12. The greater portion of this tube 12 occupies an angle of approximately 12° or 15° relative to a horizontal plane and seated in the outer end of said tube is a jet nozzle 13.

Formed integral with or fixed to the intermediate portion of tube 12 is a horizontally disposed bearing 14 for a shaft 15, which latter projects a slight distance beyond the side of tube 12 and secured to the projecting end of said shaft is an arm 16 that occupies a position substantially parallel with the main body portion of tube 12 and carried by the rear end of said arm 16 is a counterbalancing weight 17.

The length of that portion of the arm 16 that extends rearwardly from bearing 14 is such that the weight 17 on the rear end of said arm occupies a position a short distance away from the vertical axis of the tubular member 11 and on the opposite side of said axis from the tubular arm 12.

Projecting laterally from the forward end of the tube 12 is a pin 18 that overlies the forward portion of arm 16, thus serving as a stop to limit the upward swinging movement of the forward portion of said arm.

Arm 16 terminates a short distance in front of the forward end of jet nozzle 13 and secured to the forward end of said arm is a short tubular member 19, open at both ends and the forward portion of which is curved upwardly and laterally with respect to the axis of the main body portion of said tube.

The weight of counterbalancing member 17 is slightly greater than the weight of the forward portion of arm 16 and tubular member 19 so that, under normal conditions, or while the sprinkler is at rest and no water is discharging from the jet nozzle 13, the gravity of the counterbalancing weight retains the forward portion of arm 16 against stop pin 18 and, when so positioned, the tubular member 19 occupies a position in front of the jet nozzle 13 with the open rear end of said tubular member 19 intersecting the path of travel of the jet of water that issues from said nozzle when the sprinkler is in operation.

Thus, when the water under pressure from the supply pipe 10 passes through tube 12 and discharges through jet nozzle 13, a relatively small portion of the jet of water will enter tube 19, pass therethrough and be discharged from the forward end thereof at a lateral and vertical angle relative to the path of travel of the jet of water issuing from nozzle 13. The reactive forces of the jet of water issuing from tubular member 19 will act to cause tube 12 and parts carried thereby to rotate with the bearing in the upper end of supply pipe 10 as the axis of rotation and as soon as the tubular arm 12 gains sufficient speed, centrifugal forces acting on counterbalancing weight 17 will cause the same to swing upward and consequently swinging arm 16 on its horizontal axis, the pin 15, and thus the tubular member 19 will be moved downward out of the path of travel of the jet of water issuing from nozzle 13.

Obviously, when such action takes place, the reactive forces of water passing through tubular member 19 are eliminated, thereby removing the forces that rotate arm 12 so that the same tends to slacken speed and come to rest, whereupon the gravity of weight 17 will swing arm 16 upon its axis and return tubular member 19 into position where it will again receive a portion of the jet of water issuing from jet nozzle 13.

The tubular member 19 that is carried by

the forward end of arm 16 is shaped so that the force or impingement of the water passing therethrough exerts lateral pressure on said tube tending to rotate the tubular arm 12 and whatever force or impingement tends to move the tubular member downwardly is practically counteracted by the counterbalancing weight 17. Further I have noticed in repeated tests and experiments that the jet or stream of water that passes through the tubular member 19 tends to act through suction to retain said tubular member in its normal position, and said tubular member only swings downward as a result of centrifugal forces developed as the arm 12 starts to rotate.

I have also found in tests and experiments that by providing a relatively long arm that carries the tubular member at its forward end and arranging the fulcrum for said arm on one side of the vertical axis of the swinging arm and the counterbalancing weight on the other side of said axis that the sprinkler operates to much better advantage than where the counterbalancing weight is located on the same side of the vertical axis with the fulcrum for the arm.

As a result of the operations just described, the tubular arm 12 will rotate with an intermittent or step by step movement and which action in rotary sprinklers of the type to which my invention relates has been found to be much more effective than where the jet nozzle carrying arm rotates at continuous speed.

A particular advantage of my improved sprinkling device is the simplicity of construction, for through the absence of complicated parts, the possibility of the device becoming inoperative through failure of the parts to function properly is eliminated and a further advantage is the low cost of production, installation and up-keep.

A further advantage of my improved construction of sprinkling device is that the rotary member 11 and tube 12 carried thereby are operated on an angle or on an axis that is several degrees out of the true vertical and thus the sprinkler will function in an entirely satisfactory manner even though the supply pipe 10 to which it is connected does not occupy a true vertical position and which latter condition very frequently exists where the vertical members of the supply pipe extend a substantial distance above the ground, or where the underground pipes of the water supply system are arranged on hillsides.

In the modified form of the sprinkler illustrated in Fig. 5, the upper end of the rotary member 11 carries a pair of oppositely arranged tubular members 20 and 21, each provided at its outer end with a jet nozzle and one of these tubular arms and jet nozzles is preferably larger than the other, thus forming a main jet nozzle and a secondary

or auxiliary jet nozzle. Where such construction is employed, I prefer to mount the weight carrying arm 16^a on the auxiliary arm 21.

In the modified construction illustrated in Figs. 6, 7 and 8, the rotating tubular member 22 that carries the jet nozzle 23 is provided on its side opposite from the jet nozzle, with an arm 24 carrying a counterbalancing weight 25 and an arm 26 is mounted for swinging movement on a horizontal axis 27, and the latter projecting outwardly from the intermediate portion of tubular member 22. The rear end of arm 26 carries a counterbalancing weight 28 and on the forward end of said arm is a spoon shaped member 29 that normally occupies an inclined position immediately adjacent to the side and in front of the forward end of jet nozzle 23 (see Fig. 7).

The upward swinging movement of the forward portion of arm 26 is limited by a pin 30 that projects laterally from the upper forward portion of tubular member 22. Fixed to and leading downwardly from the forward portion of spoon shaped member 29 is a small open ended tube 31 that carries a small container or reservoir 32 and the latter being provided near its upper end with a drain aperture 33.

The weight of counterbalancing member 28 is slightly greater than the weight of member 29 and container 32 together with the small volume of water within said container, the level of which water is in the same horizontal plane with drain opening 33.

The operation of this form of sprinkler is practically the same as that of the form of device hereinbefore described, but the provision of the container 32 having the drain opening 33 is instrumental in effecting a relatively slow return of the arm 26 to its normal position after it has been moved into a substantially horizontal position by the centrifugal force developed during the rotation of tubular member 22 and which centrifugal force acts on weight 28 as hereinbefore described. As the jet of water issuing from nozzle 23 strikes against the inclined member 29 to produce reactive forces, a small amount of water will pass through tubular member 31, thereby filling the container 32 above the drain opening 33 and this additional weight at the forward end of arm 26 cooperates with the centrifugal force to move weight 28 upward and swing arm 26 into a substantially horizontal position.

As soon as member 29 moves downward out of the path of travel of the jet of water issuing from nozzle 23, the excess water within container 32 will start to drain out through opening 33, which draining action is comparatively slow owing to the small size of said opening and as the weight at the forward end of the arm 26 is thus slowly decreased due to the escape of water, said arm

will slowly return to its normal position as the preponderance of weight is slowly transferred to that portion of the arm to the rear of its axis.

In order to bring about comparatively quick movement of the counterbalancing weight carrying arm upon its axis and thereby quickly moving the spoon shaped member out of the path of travel of the jet of water issuing from the jet nozzle, I have devised the structure illustrated in Fig. 9 wherein a cylinder 34 is mounted on a horizontal axis 35 that projects from the intermediate portion of tubular member 36 that carries a jet nozzle 37 and connected to said cylinder 34 and arranged on the opposite side of the axis 35 is a counterbalancing weight carrying arm 38. Projecting upwardly from the forward portion of cylinder 34 is an inclined spoon shaped member 39, the forward portion of which normally occupies a position in the path of travel of the jet of water issuing from nozzle 37.

Leading from the forward portion of member 39 to the forward end of cylinder 34, is a small tube 40. Arranged for operation in cylinder 34, is a piston 41 and the rod 42 that is connected to said piston projects from the rear end of said cylinder and said rod is adapted to engage a post or shoulder 43 that is formed on tubular member 36. Interposed between piston 41 and the rear end of cylinder 34, is a relatively light coil spring 44.

In the operation of this form of sprinkler, a small portion of the water that impinges against the forward portion of spoon shaped member 39 will pass through tube 40 into the forward end of cylinder 34, thereby forcing piston 41 rearwardly and causing the rear end of piston rod 42 to engage and bear against shoulder 43 and as a result of this pushing action of the piston rod 42 against the post or shoulder 43 cylinder 34 and parts carried thereby will be quickly swung in a vertical plane on the horizontal axis 35 and member 39 will be moved downward out of the path of travel of the jet of water issuing from nozzle 37.

The form of sprinkler illustrated in Figs. 10, 11 and 12, is designed to operate with a relatively slow intermittent or step by step movement throughout a portion of the complete rotation of the jet nozzle carrying arm and to move quickly through the remaining portion of the complete revolution. Such forms of sprinklers are desirable where a semi-circular portion or area is to be sprinkled immediately adjacent to a fence or boundary line.

In this form of sprinkler, a horizontally disposed tubular arm 45 is mounted to rotate on a vertical axis at the upper end of a vertically disposed supply pipe 46 and one end of said tubular member is bent upwardly and laterally to a slight degree and said bent end

carries a jet nozzle 47. The end of tubular member 45 is bent upwardly and laterally so that the jet of water issuing from the nozzle 47 will produce a certain degree of reaction which will cause the member 45 to rotate on its axis. The end of the member 45 opposite from the nozzle carries a small housing 48 from the upper portion of which projects an angularly disposed jet nozzle 49 and loosely arranged within said housing is a ball 50, which, when moved upward in the housing under the force of water passing there-through, will strike the end of a pin or bolt 51 that is seated in the upper portion of said housing, thus producing sufficient vibration to break or overcome the friction between the member 45 and its vertical bearing.

The vibration developing device just described is practically the same as the structure that is disclosed in my co-pending application filed July 16, 1925, Serial No. 43,975.

Arranged on the upper portion of supply pipe 46 and adjacent to the vertical bearing for member 45, is a horizontally disposed disk 52 having a portion of its margin cut away to form an arcuate notch 53. Pivotaly mounted on the side of the intermediate portion of member 45 is an arm 54 that carries at its outer end a spoon shaped member 55 that projects into the path of travel of the jet of water that issues from nozzle 47 and said arm is supported in its normal position by a pin 56 that projects laterally from the outer portion of member 45. The inner end of arm 54 extends downwardly to a point where it will engage the edge of disk 52 as the horizontally disposed member 45 is rotated.

Depending from the intermediate portion of member 45 is a lug 57 to which is pivotally connected an elbow shaped member 58 carrying on the lower end of its vertical arm a weight 59 and the free end of the horizontal arm of said member 58 normally occupies a position just above the edge of disk 52.

In the operation of this form of the sprinkler, the depending inner end of arm 54, when engaged by the edge of disk 52, swings said arm on its axis so that member 55 on the outer end of said arm occupies a position above the nozzle 47 and out of the path of travel of the jet of water issuing therefrom. The force of water passing through hollow member 48 strikes pin or bolt 51, thereby producing sufficient vibration to break or overcome the friction in the vertical bearing of member 45 and the reaction of the jet of water discharging from the nozzle on the laterally bent end of member 45 will cause the latter and parts carried thereby to move with a relatively slow, wavering, step by step movement as long as the depending rear end of arm 54 is in engagement with disk 52 and the spoon shaped member 55 is retained out

of the path of travel of the jet of water issuing from nozzle 47.

When the depending end of arm 54 drops into arcuate notch 53 member 55 will move downwardly so as to be engaged by the jet of water issuing from nozzle 47 and as a result of the materially increased reactive forces developed as the jet of water strikes said member 55, the member 45 and parts carried thereby are rotated with a relatively quick movement for approximately half a complete revolution or for a distance corresponding to the length in degrees of arcuate notch 53 and to bring the member 45 to a stop after this relatively quick movement, I have provided the weighted member 58.

During the quick swinging movement of member 45, weight 59 will swing outward and upward as a result of centrifugal forces and thus the horizontal arm of member 58 will be moved downward in arcuate notch 53 and said horizontal arm will strike against the shoulder at the end of notch 53, thereby bringing member 45 to a stop and at this time the depending rear end of arm 54 is in engagement with the edge of disk 52 so as to elevate the outer end of said arm and the member 55 carried thereby.

In the modified construction illustrated in Fig. 13, the arm 60 that is pivotally mounted on the side of the jet nozzle and which carries a tube or spoon shaped member 61 at its forward end, and which last mentioned member is adapted to be engaged by the jet of water issuing from the nozzle, has its rear portion, or that portion between its pivot and the counterbalancing weight 62 at the rear end, formed of wire having a certain amount of resiliency and said wire adjacent to the pivot point is provided with a coil 63. During the operation of this form of device, the coil 63 permits the counterbalancing weight 62 to vibrate slightly, which vibration tends to break the friction between the nozzle and its bearing and consequently rendering the operation of the rotating nozzle more effective.

Thus it will be seen that I have provided a water sprinkler that is relatively simple in construction, inexpensive of manufacture, very effective in performing the functions for which it is intended and the operation of which sprinkler is wholly dependent upon forces developed by the flow of water under pressure through the sprinkler and its nozzle.

It will be understood that minor changes in the size, form and construction of the various parts of my improved water sprinkler may be made and substituted for those herein shown and described without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. The combination with a jet nozzle mounted to rotate on a vertical axis and adapt-

ed to discharge a jet of water at an angle relative to its axis of rotation, of an arm pivotally mounted on said nozzle and adapted to swing in a vertical plane, a member carried by the forward end of said arm and adapted to be engaged by the jet of water issuing from the jet nozzle, means for stopping the upward swinging movement of the forward end of said arm so that said member tends to normally occupy a position in the path of travel of the jet of water, said member having a portion that is angularly disposed relative to the path of travel of the jet of water so as to impart lateral thrust to the nozzle when impinged by the jet of water issuing therefrom, the force tending to hold the member in the path of travel of the jet of water being not so great that the centrifugal force produced by rotation of the nozzle is incapable of moving said member out of the path of the jet of water, and a weight carried by the rear portion of said pivotally mounted arm and disposed on the opposite side of the vertical axis of the jet nozzle from the fulcrum of said swinging arm.

2. The combination with a jet nozzle mounted to rotate on a vertical axis and adapted to discharge a jet of water at an angle relative to its axis of rotation, of a counterbalanced arm pivotally mounted on said jet nozzle and adapted to swing in a vertical plane, a tubular member carried by the forward end of said arm for receiving and deflecting a portion of the jet of water that discharges from said nozzle, means for stopping the upward swinging movement of the forward end of said arm so that said tubular member tends to occupy a position in the path of travel of the jet of water, said tubular member having a portion that is angularly disposed relative to the path of travel of the jet of water so as to impart a lateral thrust to the nozzle when impinged by the jet of water issuing therefrom, and the force tending to hold the tubular member in the path of travel of the jet of water being not so great that the centrifugal force produced by rotation of the nozzle is incapable of moving said tubular member out of the path of travel of said jet.

3. The combination with a jet nozzle mounted to rotate on a vertical axis and adapted to discharge a jet of water at an angle relative to its axis of rotation, of a counterbalanced arm pivotally mounted on said jet nozzle intermediate its ends, a tubular member carried by the forward end of said arm and adapted to be engaged by the jet of water issuing from said jet nozzle, means whereby said tubular member is normally held in the path of travel of the jet of water issuing from said nozzle, said tubular member having a laterally curved portion whereby lateral thrust is imparted to the nozzle when said curved portion is impinged by the jet of water issuing from the nozzle and the force tending to hold the tubu-

lar member in the path of travel of the jet of water being not so great that the centrifugal force produced by rotation of the nozzle is incapable of moving said member out of the path of travel of the jet of water.

4. The combination with a jet nozzle mounted to rotate on a vertical axis and adapted to discharge a jet of water at an angle relative to its axis of rotation, of a weight carrying arm pivotally mounted on said jet nozzle with its weight on the opposite side of the vertical axis of the jet nozzle from the fulcrum of said arm, a portion of which arm is formed of resilient material, a deflector carried by the forward end of said arm and adapted to be engaged by the jet of water issuing from said jet nozzle, a stop projecting outwardly from the forward portion of the nozzle for limiting the upward swinging movement of the arm so that the deflector carried by said arm comes to rest in the path of travel of the jet of water issuing from the nozzle, said deflector having a laterally inclined portion whereby lateral thrust is imparted to the nozzle when said inclined portion is impinged by the jet of water issuing from the nozzle and the force tending to hold the deflector in the path of travel of the jet of water being not so great that the centrifugal force produced by rotation of the nozzle is incapable of moving said deflector out of the path of travel of the jet of water.

In testimony whereof I affix my signature.

FINGAL C. ORR.