June 24, 1930. F. E. ROACH 1,765,939

SPRINKLER

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Fig. 1

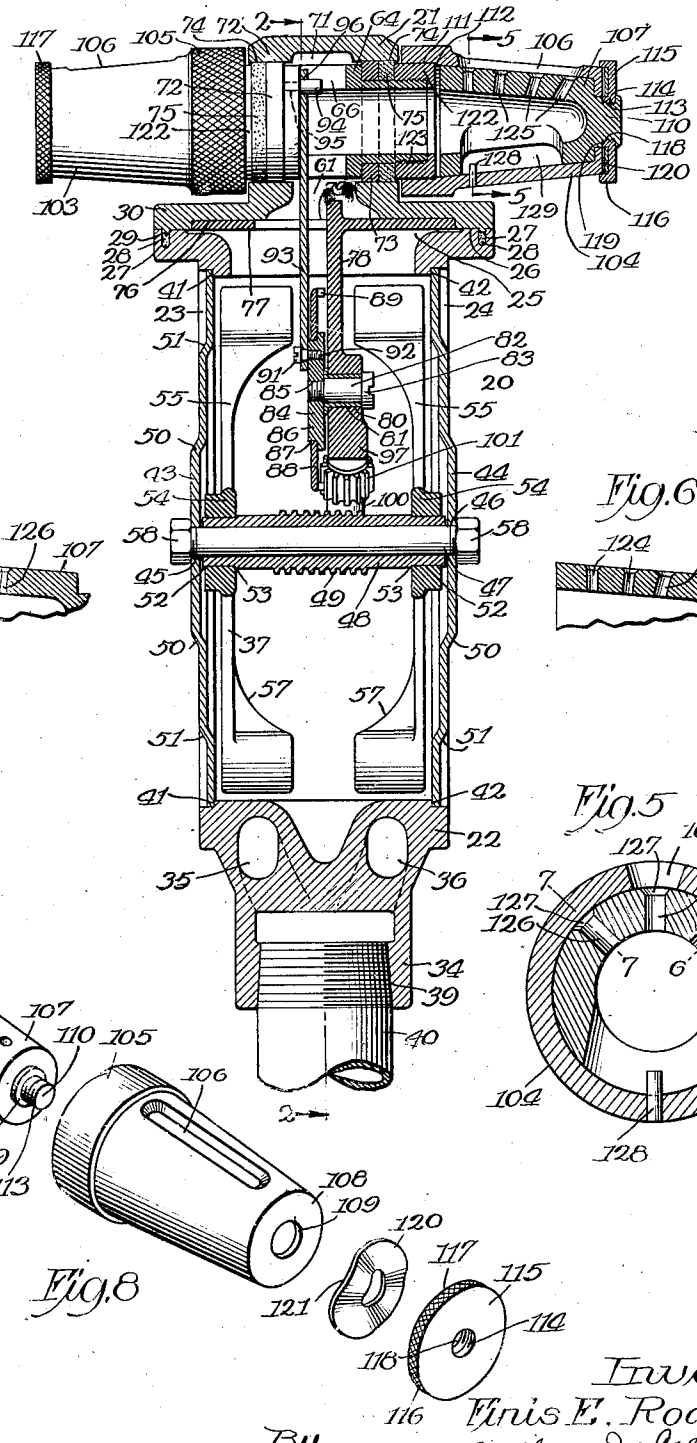


Fig. 7

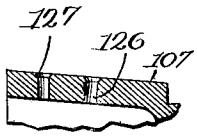


Fig. 6

Fig. 5

Fig. 8

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SPRINKLER

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Fig. 2

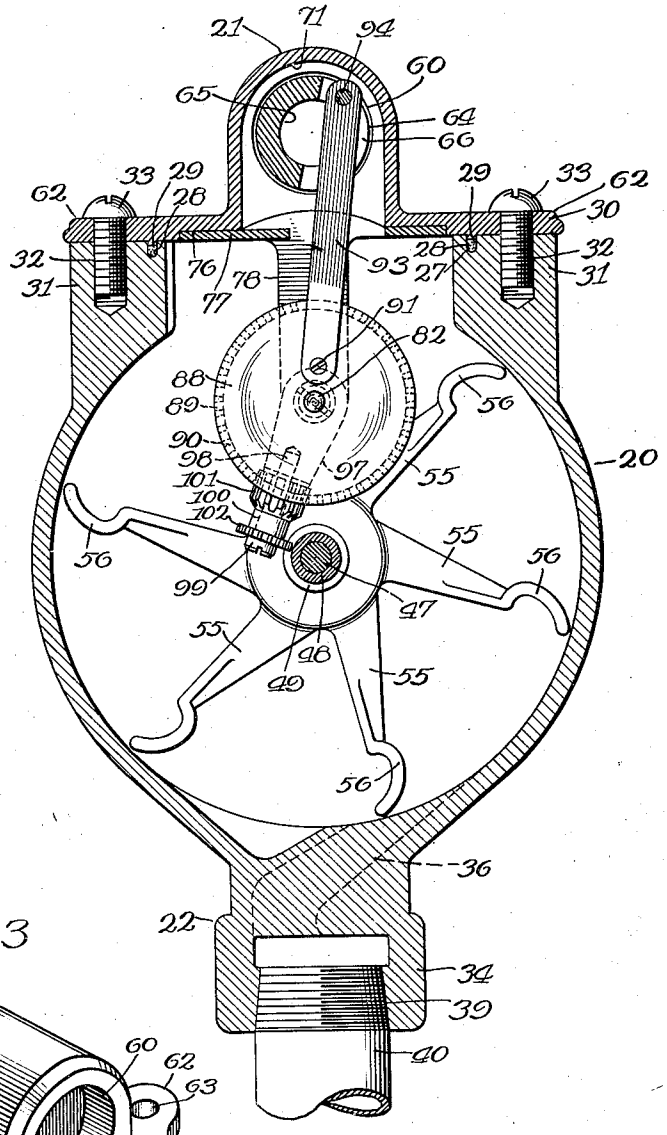


Fig. 3

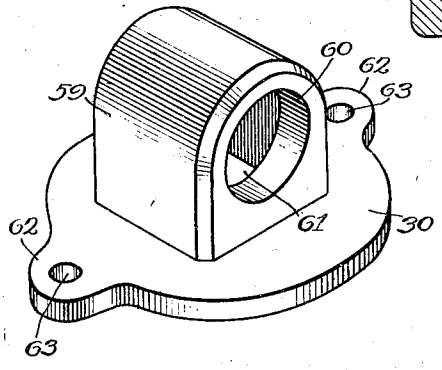
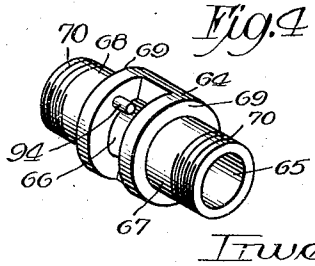


Fig. 4



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SPRINKLER

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Fig. 9

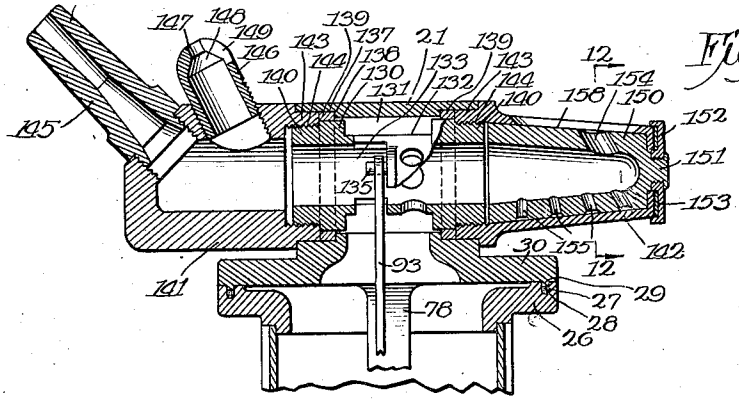


Fig. 10

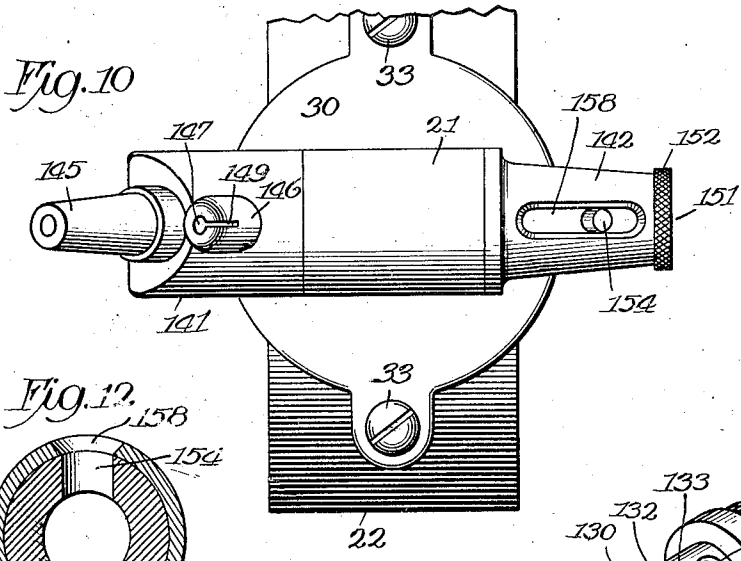


Fig. 12.

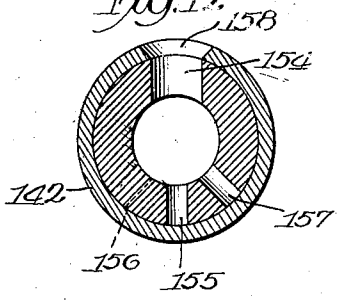


Fig. 11

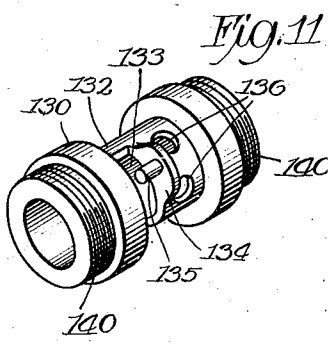
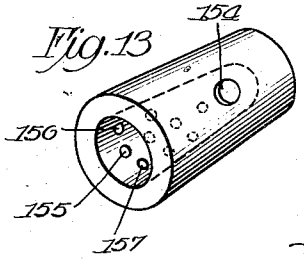


Fig. 13



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UNITED STATES PATENT OFFICE

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SPRINKLER

Application filed April 8, 1927. Serial No. 181,915.

My invention relates to sprinklers, being more particularly concerned with movable sprinklers which are impelled by means of the water passing through the sprinkler casing.

One of the objects of my invention is the provision of a sprinkler of the class described, having nozzles which are oscillated through a predetermined range of movement by mechanism actuated by the liquid passing through the sprinkler.

Another object of my invention is the provision of such a sprinkler, which is capable of throwing liquid to cover or serve areas of a plurality of different shapes and sizes, the sprinkler being readily adjustable to use any of a plurality of different nozzles.

Another object of my invention is the provision of such a sprinkler which is simple, efficient, easy to manufacture and assemble, and which is incapable of complete disassembly by means of ordinary tools, thereby making the sprinkler tamper proof.

Other objects and advantages of my invention will appear more fully from the following description, and from the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings:—

Fig. 1 is an elevational view in partial cross section, showing a sprinkler embodying my invention.

Fig. 2 is a similar view taken on the line 2—2 of Fig. 1.

Fig. 3 is a view in perspective of the sprinkler head employed in my sprinkler.

Fig. 4 is a detailed view in perspective of the oscillating sleeve of my sprinkler head.

Fig. 5 is an enlarged cross sectional view taken on the lines 5—5 of Fig. 1.

Fig. 6 is a partial cross sectional view of the nozzles taken on the line 6—6 of Fig. 5.

Fig. 7 is a partial cross sectional view of the nozzles taken on the line 7—7 of Fig. 5.

Fig. 8 is a detailed view in perspective of the disassembled parts of the nozzle casing.

Fig. 9 is a partial cross sectional view of a modified form of a sprinkler.

Fig. 10 is a plan view of the same.

Fig. 11 is a view in perspective of the oscillating sleeve shown in Fig. 9.

Fig. 12 is a cross sectional view of the nozzles shown in Fig. 9, taken on the line 12—12.

Fig. 13 is a view in perspective of the nozzle sleeve shown in Fig. 9.

Referring to Fig. 1, 20 indicates in its entirety the actuating device and supporting casing for the oscillating sprinkler nozzles supported in the sprinkler head 21. The casing 22 consists of a cast metal member, preferably of brass, or some other metal having similar non-corroding properties, having a substantially cylindrical shape, open at each end as at 23 and 24, and provided with a third aperture 25 at its top which is bounded by an annular flange 26. The annular flange 26 may be provided with an annular groove 27 adapted to receive a compressible washer 28, and to receive the annular shoulder 29 upon the cover plate 30 when the sprinkler is in assembled relation.

The flange 17 may also be made substantially thicker, as at 31, on each side to permit the provision of threaded apertures 32, to receive the screw bolts 33 passing through the cover plate 30.

The casing 22 is provided at one side, preferably the bottom, with an integral threaded nipple 34 communicating with the interior of the casing by a pair of ports 35 and 36, formed in the casting, and the ports 35 and 36 are preferably directed tangentially of the working circle of the water wheels 37 and 38 further to be described. The ports 35 and 36 may be formed according to the best nozzle practice, but it is sufficient to provide openings which taper gradually toward the interior of the casing so as to form an impelling current within the casing.

The nipple 34 may be provided with standard piping threads 39 to receive the end of a standpipe 40, which may supply water or other liquid to the sprinkler and also support the same. In the case of the use of the sprinkler for lawns, the standpipe 40 is preferably quite short, but if it is desired to sprinkle a larger area or to use the sprinkler for trees, the standpipe 40 may be made of

corresponding length to support the sprinkler at the height desired.

The casing 22 terminates at each end in openings 23 and 24, and while the casing may be of any exterior shape, it is preferably formed with a substantially cylindrical interior in order to avoid the formation of eddy currents, and in order to save material the exterior surface is also preferably made cylindrical. The openings 23 and 24 are bounded by annular shoulders 41 and 42, and these openings are closed by end plates 43 and 44. The end plates are centrally bored as at 45 and 46 to receive a shaft 47, which supports a rotatable sleeve 48 provided with a worm 49.

The end plates 43 and 44 may be stamped from sheet metal to the conformation shown, having a plurality of concentric cup shaped portions 50 and 51 for the purpose of providing additional space for the water wheel hubs, and to give the end plates increased rigidity. In order to permanently assemble my casing in such a manner that it is tamper proof, I prefer to provide end plates, 43 and 44, which have a very close fit, in the apertures 23 and 24 so that the plates will be retained frictionally within the walls of the casing 22. This method of assembly also has the advantages of simplicity and cheapness, requiring no fastening screws, or packing.

By employing the corrugated end plates as shown, the end plates may even be made larger, by a slight amount, than the apertures into which they are pressed, and when the end plates are pressed into the apertures 23 and 24 by means of hydraulic presses or otherwise, their final position will be determined by the shoulders 41 and 42 against which the end plates lie in the casing 22.

The sleeve 48 may be provided with a pair of turned down portions 52, one at each end, terminating in the annular shoulders 53. The water wheels 37 and 38 comprise central hubs 54 having a plurality of radially extending arms 55 terminating in substantially flat curved blades 56. In order to clear the actuating mechanism projecting into the casing from the sprinkler head 21, the blades are cut away toward the center of the same as at 57, leaving the outer flattened and curved portions 56 disposed in the path of the water currents issuing from the ports 35 and 36.

In order to fix the water wheels 37 and 38 upon the sleeve 48, the apertures in the hubs 54 are preferably made a very close fit upon the reduced portions 52 of the sleeve 48, and the reduced portions 52 may be slightly tapered, if so desired.

The method of assembly of the parts so far described is as follows:

The water wheels 37 and 38 have their hubs forcibly pressed upon the ends of the sleeve 48 by a hydraulic press, or otherwise, and one of the end plates 43 having been pressed into position within the casing 22, the shaft 47, sleeve 48 and water wheels 37 and 38 are assembled within the casing, after which the other end plate 44 may be pressed into place by a hydraulic press and the nuts 58 threaded upon the ends of the shaft 47 to hold the shaft in fixed relation to the casing.

The nuts 58 not only provide means for holding the shaft within the casing, but they reinforce the end plates against any tendency to swell outward due to the pressure within the casing.

The sprinkler head 21 comprises a cast metal member having an upper portion 59 of substantially cylindrical shape, with a transverse bore 60 passing through the same and communicating with the bottom through an aperture 61. The sprinkler head is provided with a flat annular flange 30 having extending lugs 62, provided with apertures 63 for the reception of the screw bolts 33. The flange 30 is also provided with the downwardly projecting annular shoulder 29, which is adapted to be received in the groove 27 to compress the washer 28, forming a substantially water tight joint when the sprinkler head is assembled with the casing 22.

The bore 60 is adapted to receive an oscillating sleeve 64, having a central aperture 65 extending through the same and communicating with a transverse slot 66, made by cutting away a portion of the central part of the sleeve to a distance substantially half way through the sleeve.

The sleeve 64 may be turned down at each end as at 67 and 68, providing a pair of annular shoulders 69. The reduced portions 67 and 68 may be provided with screw threads 70. The sleeve 64 is preferably slightly smaller than the bore 60, and the bore 60 may be provided with an internal annular groove 71 for the purpose of conducting liquid more readily about the sleeve 64 for access to the slot 66 and bore 65 of the sleeve.

In order to rotatably support the sleeve 64 in the sprinkler head 21, I provide a pair of machined metal rings 72 and 73, of substantially rectangular cross section, which are adapted to receive the reduced portions 67 and 68 and permit rotation of the sleeve 64 within the rings 72 and 73. The external walls of the rings 72 and 73 are adapted to fit very closely within the bore 60 of the sprinkler head, being pressed into place upon either side of the sleeve 64 by means of a hydraulic press or the like, and if desired, the bore 60 may be tapered inward so as to provide a bore gradually decreasing in size from the outside, in which the rings 72 and

73 may be firmly seated without binding upon the annular shoulders 69.

The sprinkler head 21 should preferably be of sufficient length so that when the rotating sleeve 64 and rings 72 and 73 are assembled within the same, there is still provided an annular groove 74 at each end about the reduced portions 67 and 68, which grooves are adapted to receive the compressible washers 75 of leather or the like.

The supporting flange 30 of the sprinkler head 21 may be provided with a substantially cup shaped aperture 76, which is adapted to receive a supporting plate 77 having a close frictional fit with said aperture, and these parts may be assembled by means of a hydraulic press. The plate 77 may be provided with a downwardly extending arm 78 supported upon a bridge 79 on said plate, for the purpose of providing a support for the actuating mechanism of the sprinkler. The arm 78 may be provided with a transverse bore 80, slightly spaced from its lower end, and the bore 80 may be provided with a bushing 81 of brass, or other bearing metal, for the purpose of journalling a shaft 82.

The shaft 82 may consist of a screw bolt adapted to fit within the bearing 81, and confined in said bearing by its head 83 and by the gear 84 mounted upon the reduced threaded portion 85 of the shaft 82. The gear 84 may be constructed of a flat plate of metal 86, having an annular reduced portion 87 which is adapted to be received in an enlarged circular aperture in the plate 88.

The plate 88 may consist of a thinner plate of metal which has been stamped to substantially cup shape, after which a plurality of grooves 89 have been cut at regular intervals in the wall of said cup, thereby forming the gear teeth 90 projecting laterally from the plate 88. The plate 88 may be pressed upon the plate 86 by a hydraulic press or the like, thereby permanently assembling these parts and forming a gear 84, having a central portion 86 of substantial thickness, which is adapted to form a durable mounting upon the shaft 82 by screw threads, and an external portion 88 having laterally projecting teeth which may be cheaply and economically formed in the manner previously described.

The gear 84 is also provided with a crank which may consist of a screw bolt 91 having a reduced threaded portion 92, which is adapted to be threaded in the plate 86, passing through the connecting link. It will be observed that by providing a reduced threaded portion, the bolt 91 may be screwed tightly into the plate 86 without binding upon the connecting link 93. The sleeve 64 may also be provided with a crank pin 94, comprising a metal pin having a reduced threaded portion 95, which is adapted to be threaded in the wall of the slot 66 near one end of said slot, and the pin 94 is adapted to be received in an aperture 96 at the upper end of the link 93. It should be observed that the radius of the crank pin 91 is considerably less than the radius of the crank pin 94, so that when the gear 84 is rotated, the connecting link 93 will be reciprocated, and the sleeve 64 will be oscillated about its axis within the bore 60.

The supporting arm 78 may be provided with an enlarged lug 97 at its lower end, which is provided with a threaded bore 98 adapted to receive the reduced threaded end of the screw bolt 99. The screw bolt 99 rotatably supports and confines, between its head and the lug 97, a double pinion 100, comprising a sleeve having ordinary gear teeth 101 at its upper end, which are adapted to mesh with the teeth 90 upon the gear 84, and the worm gear teeth 102, which are adapted to mesh with the worm 49 on the sleeve 48. In order to support the worm gear 102 in position to mesh with the worm 49, the bore 98 in the lug 97 is disposed at an angle sufficient to offset the axis of the worm gear from the axis of the shaft 47 a distance equal to the sum of radii of the working circles of these members.

The method of operation of the mechanism is as follows. The water supply through the standpipe 40 issues from the ports 35 and 36 and impinges upon the blades 56 of the water wheels 37 and 38, filling the casing 22 and communicating with the sprinkler head 21 through the aperture 61 in the supporting plate 30. The water wheels 37 and 38 are rotated by the water jets, the worm 49 actuating the worm gear 102 and pinion 101. The pinion 101 actuates the annular gear 84, reciprocating the link 93 and oscillating the sleeve 64, which may support a plurality of nozzles.

I shall now describe the preferred construction of my adjustable nozzles shown in detail in Figs. 5 to 8, inclusive. The nozzles of my sprinkler head preferably comprise a pair of cast metal nozzle casings 103 and 104, having a shape substantially like that of a frustrum of a cone, and having knurled portions 105 at the base of said frustrum. The nozzle casings 103 and 104 are provided with longitudinal slots 106 extending through the lateral surface of the frustrum, and the slots 106 may be of any size which is adapted to completely clear a stream of water issuing from any of the ports in the nozzle sleeve 107 further to be described. The bases of the nozzle casings 103 and 104 are open for communication with the bore 65 of the sleeve 64, while the opposite end 108 is closed with the exception of a circular aperture 109 which is adapted to receive the stem 110 of the nozzle sleeve 107.

The interior surfaces of the frustro-conical members 103 and 104 are accurately ma-

chined to the frustro-conical shape, with the exception of the end portion 111, which is substantially cylindrical, terminating at the shoulder 112. The nozzle sleeves already referred to comprise cast metal members, whose exterior surfaces are accurately machined to fit within the frustro-conical members 103 and 104, the nozzle sleeves being slightly shorter than the distance between the shoulder 112 and the end of the nozzle casings 103 and 104. As the nozzle casings 103 and 104 and the parts therein are identical, I shall describe in detail only one of these devices, and I desire it to be understood that this description applies to both devices.

The stem 110 is provided with a reduced threaded portion 113 which is adapted to be received in a central threaded aperture 114 in a cap 115. The cap 115 comprises a substantially cup shaped member having an exterior wall 116 which is adapted to fit about the top of the frusto-conical member 104, and which has a knurled exterior edge 117 to facilitate manipulation. The cap 115 is provided with a central boss 118, so that when the cap 115 is threaded against the shoulder 119 of the stem 110, and the end of the stem is riveted over, as shown in Fig. 1, the cap 115 is firmly fixed upon the stem 110, providing a means for rotating the nozzle sleeve 107.

Within the annular interior of the cap 115 there is confined a spring washer 120, comprising a thin resilient member of phosphor bronze, or some other non-corroding resilient metal, having a plurality of equally spaced crimps or bends 121 in its edge, so that it is adapted to maintain the cap 115 and the end 108 of the nozzle casing in spaced relation. In order to support the nozzle casings upon the sleeve 64, I prefer to provide an annular metal ring 122, which is adapted to fit closely within the cylindrical portion 111, and which is provided with the internal screw threads 123, adapted to fit upon the screw threads 70 of the sleeve 64. The ring 122 may be a close frictional fit within the cylindrical surface 111, and may be pressed into place by a hydraulic press or the like, so that it cannot be removed by ordinary tools.

The nozzle sleeve 107 may be provided with a plurality of rows of ports 124, 125 and 126, consisting of a plurality of apertures extending radially from the sleeve, said apertures, being flared at their exterior end by counter boring, as at 127. The rows of ports should each preferably include a different number of ports of various sizes and construction, and the ports at the inner end of the sleeve should preferably be adapted to direct their stream upward, while those toward the outer end of the sleeve should preferably have an increasing outward slant, as shown in Fig. 1. I desire it to be understood that the sleeve 107 may be made of substantial thickness so that the ports may be formed according to the best practice, or approximating the same, and I do not desire to be limited to the specific combination of ports illustrated. The closed space between port rows may be of greater width than slot 106 so that at intermediate points the ports may all be closed.

In order to limit the rotative motion of the sleeve 107, I prefer to provide a pin 128 projecting inward from the side of the frusto-conical member 104 at a point distant from the slot 106, and the pin 128 may be made to fit its aperture so closely that when driven into place, it is permanently assembled with the nozzle casing. In order to assemble the nozzle casing 104 with the nozzle sleeve 107 while the pin 128 is in place, I provide a substantially rectangular aperture 129 in the nozzle sleeve 107, and the pin 128 should not be of greater length than is permissible to allow the outer edge of the aperture 129 to clear the pin when these parts are moved into assembled position.

It will thus be observed that the aperture 129 may be made of such dimensions that when one edge of said aperture rests against the pin 128, the ports 124 will be in registry with the slot 126, and when the opposite edge rests against the pin 128, the ports 126 will be in registry with said slot, whereas at an intermediate position the ports 125 may be made to so register. It will also be observed that the pressure of the water within the sprinkler head will tend to force the nozzle sleeve 107 into wedged engagement with the frustro-conical member 104 so that the nozzle sleeve will be automatically retained in any adjusted position. Furthermore, the spring 120 is adapted to maintain the sides of the nozzle sleeve 107 in frictional engagement with the frustro-conical member 104 to maintain said adjustment, and any of the plurality of different nozzles may be brought into registry with the slot 106 by merely pushing inward upon the cap 115 and rotating the same.

The nozzle sleeves and nozzle casings may be made cylindrical instead of frusto-conical, if desired, but by making these sleeves of the shape shown, I have been able to secure a greater outward slant for certain of the nozzles, and the pressure of the water tends to maintain the nozzle sleeve in adjusted position.

The method of operation of my sprinkler is as follows. When the water under pressure is supplied to the standpipe 40, the sleeve 64 will be oscillated through a limited arc, as has been previously described, carrying with it the nozzles within the frusto-conical members 103 and 104. The water will issue from these nozzles in various directions, forming a row of streams which are

oscillated back and forth about a horizontal axis, covering a substantially rectangular area of ground, and this area is not subjected to a constant flow of water but to the recurring sprinkling action of a plurality of streams which may be made to move at any desired rate ranging from a quick oscillation to a movement which is scarcely discernible.

The sprinkler head 21 comprises a unitary member which is separable from the actuating mechanism and from which the cast metal nozzle casings 103 and 104 may be removed to substitute nozzles of different types, but the interior mechanism of the sprinkler is tamper proof, and the device can not be disassembled with the use of ordinary tools, beyond the substitution of parts intended to be removable.

Referring to Figs. 9 to 13, inclusive, I have here shown a modified form of sprinkler head in which the supporting arm 78 is cast integrally with the plate 30 and the sprinkler head 21. In this modification the sprinkler head is provided with a sleeve 130, adapted to fit within the bore 131 of the sprinkler head 21, and the sleeve 130 may be turned down at its central portion as at 132, to provide access to the interior of the sleeve through the slot 133. The sleeve 130 may be provided with a laterally projecting lug 134 which is adapted to support a pin 135 mounted thereon in a manner similar to the pin 94 at a distance from the axis of the sleeve 130 which is greater than the radius of the pin 91.

In order to provide further access to the interior of the sleeve 130, the reduced portion 132 may be apertured as at 136. Referring to Fig. 9, it will be noted that the bore 131 is enlarged as at 137, thereby forming an annual shoulder 138, and when the sleeve 130 is in assembled position, a groove which is adapted to receive the compressible washer 139 of leather or the like at each end of the sleeve 130.

The sleeve 130 may be provided with a turned down and threaded portion 140 at each end of said sleeve, and the nozzle casings 141 and 142 may be provided with turned down portions 143 adapted to be received in the bore 131, and internally threaded portions 144 adapted to be threaded upon the ends of the sleeve 130 to such point that the washers 139 are slightly compressed, thereby providing a water tight joint about the ends of the sprinkler head 21.

The nozzle casings 141 and 142 may be modified in this embodiment for the purpose of throwing streams to cover areas of various different shapes. For example, the nozzle casing 141 may support a nozzle 145 formed according to the best practice and adapted to throw a stream of water to a considerable distance. The casing 141 may also support a smaller nozzle 146 substantially shorter than the nozzle 145 and formed with a cylindrical aperture 147, leading to an interior 148 shaped like the frustrum of a cone. The nozzle 146 is, therefore, adapted to throw a stream to a considerably less distance than the nozzle 145, serving an area nearer to the sprinkler, while the nozzle 146 may also be provided with a slot 149 cut into the end of the nozzle in the plane of the illustrations and adapted to throw a substantially fan shaped spray which will cover the area immediately adjacent the sprinkler.

The nozzle casing 142 may be of similar shape to the cast metal member 104, with the exceptions already noted, being adapted to receive a nozzle sleeve 150 of substantially frustro-conical shape, having a stem 151 upon which may be threaded the cap 152 enclosing the sprinkler washer 153. The details of the nozzle sleeve and nozzle casing at this end may be substantially similar to the ones previously described and shown in Fig. 1. The nozzle sleeve 150 may, however, be provided with a plurality of apertures forming ports 154 and 155 of considerably different shape. It will be noted that the port 154 is adapted to throw a stream backward to the left in Fig. 9 which will cover an area on the other side of the sprinkler, leaving the ground area to the right of the sprinkler without service. The nozzle sleeve 150 is, of course, adapted to be turned by means of the cap 152 which may be pushed inward to turn the nozzle sleeve 150 to points where any of the ports 154, 155, 156 and 157 may register with the slot 158.

The details of the mounting of the cover plate 30 upon the flange 26 of the casing 22 may be exactly as shown in Fig. 1, the leather washer 28 within the groove 27 being compressed by the annual shoulder 29 to form a substantially water tight joint. The connecting link 93 of the actuating mechanism may have an aperture to receive the pin 135 and when the water is admitted to the casing 22 by means of the standpipe 40, the operation of the mechanical elements is substantially the same as that described for Fig. 1.

It should be noted, however, that when a port which is quite close to the axis of the sleeve 130, such as the ports 154, 155, 156 and 157, is rotated in a horizontal axis, the port oscillates back and forth about this axis without subtantially changing the range of the ports so as to throw a plurality of streams which may cover an area which is substantially rectangular. However, the outwardly and upwardly projecting nozzle 145 has its range greatly changed during each oscillation, and the tendency of such a nozzle is to cover an area which may have a parabolic outline. Furthermore, the sprinkler shown in Fig. 9 may be made to serve an area hav-

ing a substantially straight side so that the sprinkler may be placed adjacent the boundary line of a lot to sprinkle areas extending from said boundary line into the slot.

The ports 124, 125, 126, 155, 156 and 157 are preferably counter-bored at their interior ends also, to form ports tapering outward, and the amount of counter-bore may be increased gradually from the inner to the outer ports, so that each port farther out is shaped to throw its stream to a greater distance.

It will thus be observed that I have invented a sprinkler which has a nozzle casing containing a plurality of nozzles which may be easily adjusted to use any group of ports and that my actuating unit is adapted to oscillate the nozzles about a horizontal axis at any desired rate of speed.

While I have shown and described a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a sprinkler, the combination of a casing having an inlet nozzle in its wall, a water wheel rotatably mounted adjacent said casing, a shaft within said casing, a sleeve rotatably mounted on said shaft and confined between the walls of said casing, said water wheels being fixed on said sleeve, a worm on said sleeve, a cover for said casing having a downwardly extending boss, a pinion on said boss actuated by said worm, a gear meshing with said pinion, a connecting rod on said gear, and a discharge nozzle carried by said cover and oscillated by said connecting rod.

2. In a sprinkler head, a nozzle comprising a sleeve having a side aperture, a second sleeve secured thereto, a third sleeve adjustable secured within said second sleeve, and means operable in said aperture to oscillate the nozzle.

3. In a sprinkler head, a nozzle comprising a sleeve having a side aperture, actuating means operable through said aperture for actuating said nozzle, a terminal sleeve having a side aperture and secured to said apertured sleeve, and an adjustable sleeve in said terminal sleeve.

4. In a sprinkler head, a nozzle comprising a sleeve having a turned down portion, an aperture in said portion, actuating means engaging said portion for actuating said nozzle, a terminal sleeve having a side aperture and secured to said apertured sleeve, and an adjustable sleeve in said terminal sleeve and having a plurality of openings adapted to be brought into register with said terminal sleeve aperture.

5. In a sprinkler head, a nozzle comprising a sleeve having a central portion of enlarged diameter, and aperture in said central portion, actuating means engaging said central portion for actuating said nozzle, a terminal sleeve fixably secured to said first sleeve and having a side opening, and a port sleeve externally adjustable to present a plurality of rows of ports in conjunction with said terminal sleeve opening.

6. In a sprinkler head, the combination of a casing having a nozzle bore, a sleeve having peripheral communication with said bore and said casing, actuating means within said bore and casing for actuating said sleeve, a terminal sleeve for said first sleeve, and an adjustable port sleeve within said terminal sleeve.

7. In a sprinkler, the combination of a casing having an opening, a cover plate for said opening having a transverse bore communicating with said casing, a sleeve provided with a side aperture rotatably mounted in said bore, means operable in said aperture to oscillate said sleeve a second sleeve secured to said first named sleeve, a third sleeve adjustably secured within said second named sleeve, and annular shoulders in said bore to retain said first named sleeve within said bore.

8. In a sprinkler, the combination of a casing having an opening, a cover plate for said opening having a transverse bore communicating with said casing, a sleeve provided with a side aperture rotatably mounted in said bore, means operable in said aperture to oscillate said sleeve, a second sleeve secured to said first named sleeve, a third sleeve adjustably secured within said second named sleeve, annular shoulders in said bore to retain said first named sleeve within said bore, and means on said third named sleeve and projecting through said second named sleeve, to rotate said third named sleeve.

9. In a sprinkler head, a nozzle comprising a sleeve having a side aperture, means operable in said aperture to oscillate said sleeve, a second sleeve secured thereto and having an inward taper, a third sleeve tapered to fit within said second named sleeve and adjustably secured within the said second named sleeve, and a compressible washer between the end of said third named sleeve and said second named sleeve.

10. In a sprinkler, the combination of a casing member having an opening, a cover plate for said opening having a transverse bore communicating with said casing, a nozzle oscillatably mounted in said bore, said nozzle comprising a sleeve provided with a side aperture and oscillatably mounted in said bore, a second sleeve secured to said first named sleeve, said second named sleeve

having an inward taper and a longitudinal slot in one side, and a third sleeve tapered to fit within the said second named sleeve and having a plurality of nozzle openings movable to register with said slot, and means within said casing and operable in said side aperture of said first named sleeve for oscillating said nozzle.

11. In a sprinkler, the combination of a casing having an opening, a shaft within said casing, a water wheel rotatably mounted on said shaft, a cover for said opening, having a transverse bore communicating with said casing, a plate between said cover and said casing, a downwardly extending arm on said plate, a nozzle oscillatably mounted in said bore, a gear carried on the lower end of said arm, a connecting rod secured to said nozzle and said gear, and operative means between said gear and said water wheel.

12. In a sprinkler, the combination of a casing having an opening, a shaft within said casing, a water wheel rotatably mounted on said shaft, a cover for said opening, an oscillatable nozzle carried by said cover and having communication with said casing, a plate between said cover and said casing, a downwardly extending arm on said plate, a gear carried by said arm, a connecting rod secured to said gear and said oscillatable nozzle, a pinion carried by said arm and meshing with said gear, a worm gear operatively connected with said pinion, and a worm operatively connected with said water wheel and meshing with said worm gear.

13. In a sprinkler, the combination of a casing provided with a transverse bore communicating with the interior of said casing, a nozzle comprising a plurality of hollow sleeves, one sleeve of which is rotatably mounted in said bore, said rotatably mounted sleeve being provided with a side aperture communicating with said transverse bore and said casing, and means in said casing operable by water flowing through said casing and connected within said side aperture in said rotatably mounted sleeve for oscillating said nozzle.

14. In a sprinkler, the combination of a casing provided with a transverse bore communicating with the interior of said casing, a nozzzle comprising a plurality of hollow sleeves, one sleeve of which is rotatably mounted in said bore, said rotatably mounted sleeve being provided with a side aperture communicating with said transverse bore and said casing, means in said casing operable by water flowing through said casing, and connecting means between said rotatably mounted sleeve and said water operated means, said connecting means being operatively connected to said rotatably mounted sleeve within said side aperture.

15. In a sprinkler, the combination of a casing provided with a transverse bore communicating with the interior of said casing, a nozzle comprising a plurality of hollow sleeves, one sleeve of which is rotatably mounted in said bore, said rotatably mounted sleeve being provided with a side aperture communicating with said transverse bore and said casing, a pair of metal rings pressed in said bore to retain said rotatably mounted sleeve in said bore, means in said casing operable by water flowing through said casing, and connecting means between said rotatably mounted sleeve and said water operated means, said connecting means being operatively connected to said rotatably mounted sleeve within said side aperture.

16. In a sprinkler, the combination of a casing provided with a transverse bore communicating with the interior of said casing, a sleeve provided with a side aperture and rotatably mounted in said bore, means operable in said aperture to oscillate said sleeve, a metal ring having threaded engagement with said sleeve, a second sleeve having a close frictional fit over said metal ring, and a third sleeve adjustably secured within said second named sleeve.

17. In a sprinkler, the combination of a casing provided with a transverse bore communicating with the interior of said casing, a nozzle comprising a plurality of hollow sleeves, one sleeve of which is rotatably mounted in said bore, said rotatably mounted sleeve being provided with a side aperture communicating with said transverse bore and said casing, a connecting rod secured to said rotatably mounted sleeve at a point within said side aperture, and means in said casing responsive to the flow of water through said casing for reciprocating said connecting rod and oscillating said nozzle.

In witness whereof, I hereunto subscribe my name this 1st day of March, 1927.

FINIS E. ROACH.